1 November 2010 – 5 November 2010

Book of Abstracts

2010 Gulf and Caribbean Fisheries Institute MEETING

San Juan, Puerto Rico

63rd Annual Gulf and Caribbean Fisheries Institute

San Juan, Puerto Rico

Hosted by

Puerto Rico Departamento de Recursos Naturales y Ambientales

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63rd Annual Gulf and Caribbean Fisheries Institute
1 November 2010 – 5 November 2010

Monday: November 1, 2010

OPENING CEREMONY (0830 - 1015)

Opening Address: Virdin Brown**, Chairman, Board of Directors, GCFI**
Program Chair: Alejandro Acosta, **GCFI** and Aida Rosario, **PRDNR**

Dignitaries: TBD

Keynote Address: **Dr. Callum Roberts, University of York**

Break (1010 - 1030)

GCFI SPECIAL SESSION: 'MANAGEMENT OF CORAL REEF ECOSYSTEMS FOR SUSTAINABLE FISHERIES' (1030 – 1215)

Session Moderator: Richard Appeldoorn and Aida Rosario

10:30 Appeldoorn, R. Can We Stop the Madness? Managing for Resilience in Coral Reef Fisheries.

10:45 Ruiz, I et al. From Habitat Mapping to Ecological Function: Incorporating habitat into coral reef fisheries management.

11:00 Pagan, F. et, al. Including Ecological Function into Habitat Networks Using Numerical Modeling: Assessing Performance and Cost.

11:15 Cerveny, K. Managing Habitat in Coral Reef Ecosystems for Fisheries: Just What is Essential?

11:30 Hernandez, E. Long-term ecological and socio-economic consequences of water quality and coral reef habitat degradation.

11:45 Pittman, S. Importance of seascape complexity for resilient fish habitat and

sustainable fisheries.

12:00 Ault, J. et al, Coral Reef Fish-Habitat Modeling to Support Ecosystem-based Management

Lunch Break (1215 – 1330)

Concurrent Session:

GCFI SPECIAL WORKSHOP: Incorporating climate adaptation into marine turtle conservation: capacity strengthening for planning and implementation.

Hosted by WWF and WIDECAST, with the support of CIDI/OAS, CaMPAM, and GCFI. If you are interested in participating in this session please contact: Marianne Fish.

13:30 Folger Renchen, G et al,. Assessing the ecological and economic impact of derelict traps in the U.S. Virgin Islands (Student)

13:45 Box, S. Long and short term economic drivers of overexploitation in Honduran coral reef fisheries due to their dependence on export markets.

14:00 Casey, J. and P. Schuhman. Illustrating the economic value of natural resource conservation: Divers' willingness to pay for species sightings and diversity in Barbados

14:15 Duarte, L.O. and L. Manjarres. Preliminary economic valuation of the biotic marine resources in the Gulf of Salamanca, Colombian Caribbean Sea.

14:30 Ortiz,L. et al, Using LEK to investigate the historical ecology and cultural heritage of the USVI fishery (Student)

14:45 Ley-Cooper, K. Developing sustainability principles for assessment, management and eco- labelling in Sian Ka'an and Banco Chinchorro Biosphere Reserves Mexico (Student)

15:00 Shivlani, M. and R. Koeneke. Spatial characterization of artisanal fisheries in Puerto Rico: Geographic Information Systems (GIS) approach for assessing the regional effort and landings.

15:15 Margles, S. et al, Mapping Fisheries Uses and Values using Open OceanMap: A case study from St. Kitts and Nevis.

15:30 Potts, A. et al, Evaluating the needs of the Fishing and Associated Livelihoods in the Coastal Fishing Sector of Trinidad and Tobago.

Break (1545 – 1600)

16:00 Gill, D. ReefFix Phase 1: Cost-Effective Valuation Tools for Coral Reef Managers.

16:05 Haughton, M. The Implementation of Principled Ocean Governance in Caribbean Fisheries

16:10 Maharaj, B. and A. Potts. The Big Squeeze on fishing sites? An assessment of the

inclusion of rural fishing communities within the draft Regional spatial development plans of the municipalities of Trinidad.

16:15 Mahon, R and L.F. Andrade Falla. The Caribbean Sea Commission.

16:20 Mateo, J and E.Balbuena. Trade of aquatic exotic fauna in Dominican Republic during the period 2006-2010.

16:25 Matos-Caraballo, D. and J, Agar. Comprehensive Census of the Marine Commercial Fishery of Puerto Rico, 2008.

16:30 Murray, P. A. Fisheries enforcement in the OECS in the context of fishermen's drivers.

16:35 Rodriguez Gil, L. A et al, . Effect of red tides and hurricanes on the fishery of the Octopus on the coast of the Yucatan State.

16:40 Open Discussion with Authors

GMA REGIONAL FISHERS SUMMIT -- FISHERS FORUM (1700-1800)

17:00 Strategic planning by fishers for capacity development—McConney, Patrick

17:15 Fishers building capacity for sustainable fisheries-- Mitchell Lay, GMA winner, Antigua and Barbuda, Chair, GMA Committee

17:30 NGOs and fishers: meeting in the middle—Nathalie Zenny, TNC

17:45 **Discussion All presenters, GCFI members and audience**

18:00 **Closing**

Informal Reception & Welcome Address (1900)
Robert Glazer, Executive Director, GCFI

Student Social: Students and GCFI Board of Directors (2000)

TUESDAY: November 2, 2010

GCFI MEMBERSHIP MEETING (0715 - 0820) (Open to All)

Concurrent activity: Fisher forum field trip (0900-1200) by invitation *Contact person Andy Maldonado*

Concurrent Sessions:
GCFI SPECIAL WORKSHOP: Development of Sustainable Aquaculture Practices for the U.S. Caribbean by invitation *Contact person* Jessica Beck

GCFI SPECIAL WORKSHOP: Incorporating climate adaptation into marine turtle conservation: capacity strengthening for planning and implementation.

Hosted by WWF and WIDECAST, with the support of CIDI/OAS, CaMPAM, and GCFI. If you are interested in participating in this session please contact: Marianne Fish.

GCFI SPECIAL SESSION: 'NEW AND EMERGING TECHNOLOGIES FOR MONITORING OF FISHERIES AND HABITAT' (0830-1200)

Session Moderators: Richard Appeldoorn and Alejandro Acosta

0830 Gandilhon, N. et al, Creation of an autonomous system on moored Fish Aggregating Device (FAD) for a permanent acoustic monitoring of marine mammals and other perspectives for marine environment attention, Guadeloupe, F.W.I.

0850 Barbour, A. et al, PIT tag antennae arrays as fishery monitoring tools in tropical environments (Student)

0910 Taylor, C. et al, Mapping coral reef ecosystems: advances in automated techniques for mapping habitats and habitat use by reef fishes.

0930 Gleason, A. et al, Damage Assessment of Vessel Grounding Injuries on Coral Reef Habitats Using Underwater Landscape Mosaics.

0950 Pagan, F. and R.S. Appeldoorn. Use of Small ROV Systems to Survey Mesophotic Ecosystems.

1010 Bejarano, I. et al, Use of Mixed-Gas Rebreathers to Access Fish Assemblages in Mesophotic Coral Ecosystems (MCE) off La Parguera Shelf-Edge, Puerto Rico. (Student)

Break 1010- 1030

1030 Armstrong, R. et al, Large scale mapping and monitoring of mesophotic coral reef habitat in the Puerto Rico Shelf.

1050 Scharer-Umpierre, M. et al, Underwater Audio and Video Recorders to Assess Reproductive Behaviors of Groupers during Spawning Aggregations.

1110 Rowell, T. et al, Use of passive acoustics to map grouper spawning aggregations, with emphasis on red hind, *Epinephelus guttatus*, off western Puerto Rico (Student)

1130 Rivera J. et al, Detection of Mona Island and Abrir La Sierra, Puerto Rico Red Hind (*E. guttatus*) 1 m Off the Bottom with Hydroacoustic Techniques.

1150 **Closing**

Lunch (1200-1330)

SPAWNING AGGREGATION SCIENCE and MANAGEMENT (1330- 1715)
SPONSORED BY SCRFA

Session Moderator: Yvonne Sadovy and Martin Russell

1330 Introduction (Yvonne Sadovy and Martin Russell)

1345 Heppell, S. et al, Oceanographic patterns associated with Nassau grouper aggregation spawn timing: Shifts in surface currents on the nights of peak spawning.

1400 Nemeth, R. et al, Interactions among Three Species of Sharks and Grouper Spawning Aggregations in the US Virgin Islands.

1415 Kadison, E. et al, Yellowfin grouper (*Mycteroperca venenosa*): reproductive biology, behavior and conservation of a large Caribbean grouper.

1430 Luckhurst, B. Long-term site fidelity of tagged red hinds Epinenephelus guttatus at two spawning aggregation sites in Bermuda.

Break (1445-1500)

1500 Bernard, A. et al, Assessing the genetic consequences of spawning aggregation overfishing: The Nassau grouper (*Epinephelus striatus*) aggregation in St. Thomas, US Virgin Islands as a case study

1515 Jackson A. et al, Genetic connectivity of Nassau grouper aggregations in the Caribbean Sea (Student)

1530 Kellison, T. et al, Progress in assessing geomorphological characteristics and reef fish utilization of reported reef fish aggregation sites in the Florida Keys, USA.

1545 Bent, H. et al, Large grouper spawning aggregations in the central MPA of the Seaflower Biosphere Reserve.

1600 Heyman, W. and L. Carr. It is better to be disturbed than dead: The effect of dive ecotourism on reef fish spawning aggregations.

1615 Archer, S et al, Development of a novel method for monitoring recovery on spawning aggregations.(Student)

1630 Russell, M. Reef fish management and the Great Barrier Reef.

1645 Sadovy, Y. Mating aggregations in need of makeover

1700 End of Session Discussion or Wrap Up Summary

Break (1715 – 1730)

SPAWNING AGGREGATION WORKSHOP SPONSORED BY SCRFA

1730-1930

Session Moderator: Martin Russell

TUESDAY EVENING

GCFI POSTER SESSION – RECEPTION (1930)

Poster Session Coordinator: Read Hendon and Darcie Graham

MARINE & COASTAL HABITATS

1 **Bouchon, C.** Level of contamination by metallic trace elements and organic molecules in the seagrass beds of Guadeloupe Island.

2 **Gardner, C.** Mapping hard bottom reef fisheries habitat off northwest Florida – needs, methods, and status.

3 **Garza-Perez, J. R.** Seasonal changes in a sublittoral desert: Progreso Blanket, Yucatán México.

4 **Griffith-Mumby, R.** Future of Reefs in a Changing Environment (FORCE) Project.

5 **Jean, M.** A mesophilic thaumarchaeal species of the mangrove swamp of Guadeloupe (F.W.I.) contains eukaryotic type of chlorophyll.

6 **Lacas, S.** Primary production dynamics of *Thalassia testudinum* (Konig) seagrass beds in Guadeloupe Island.

7 **Orvañanos-Donis, D. P.** Definition of benthic seascapes and their temporal characterization in Sisal Yucatán Mexico.

8 **Schärer-Umpierre, M.** Enhancing Condado Lagoon essential fish habitat with an artificial reef trail.

9 **Vega, M.E.** Habitat health status among coastal lagoons of Yucatan, Mexico: index of biotic integrity.

INVERTEBRATE BIOLOGY, ECOLOGY & ASSESSMENT

10 **Anderson, J.** PaV1 detection by the Caribbean spiny lobster (*Panulirus argus*) and its effect on population spatial structure. (Student)

11 **McCauley, S.** High larval settlement of the long-spined black sea urchin, *Diadema antillarum*, in the United States Virgin Islands. (Student)

12 **Hernandez-Delgado, E.** Seawall construction activities cause a localized mass mortality of threatened elkhorn coral (*Acropora palmata*) at Vega Baja, Puerto Rico.

13 **Hernandez-Delgado, E.** Sediment stress, water turbidity and sewage impacts on threatened elkhorn coral (*Acropora palmata*) stands at Vega Baja, Puerto Rico.

14 **Bissada-Gooding, C.** Observing queen conch density and behaviour in Barbados.

15 **Monrroe, J.** Temporal variation of traces metals contents in mollusc *Arca zebra*, water and surface sediments, collected of natural bank Coche-Chacopata, Sucre state, Venezuela.

16 **Monrroe, J.** Industrially, is making good use of tuna? Study of physicochemical changes of frozen tuna, *Katsuwonus pelamis*, in storage.

17 **Perry, H.** Distribution and aspects of the life history of the deepwater geryonid crab, *Chaceon quinquedens*, in the Northern Gulf of Mexico.

18 **Reyes-Sosa, C.** Processing of sea cucumber, *Isostichopus badionatus*, in the Costas del Estado of Yucatán, México.

19 **Ruiz-Diaz, C.** The simulation of the interaction among a sea fan colony, its immune system, and a potential pathogen.

20 **Tello, J.** Habitat fragmentation and genetic variability in two populations of *Crassostrea rhizophorae*, Guilding 1828, in Adyacentes Regions at the Laguna de Términos, Campeche, Mexico.

MANAGEMENT & SOCIO-ECONOMICS OF MARINE FISHERIES

21 **Adams, C.** Consumer awareness and response to grouper mislabeling fraud.

22 **Alexandridis, K.** Studying the historical ethno-ecology of the USVI-St.Thomas fishing community.

23 **Alexandridis, K.** Bottom-up community participation in fisheries management: case studies and future directions.

24 **Callwood, K.** Policy implications of larval dispersal scales by Caribbean spiny lobster in the Bahamas. (Student)

25 **Canty, S.** Reducing the susceptibility of parrotfish to fish traps: a meta-analysis identifying feasible management strategies.

26 **Chaibongsai, P.** High profit pelagic fisheries lure artisanal fishers into cycles of debt, risk, and climate vulnerability.

27 **Deane, L.** Communication between marine science and policy in the eastern Caribbean.

28 **Diaz Vesgas, R.** Assessment of the artisanal shrimp trawl fishery effects on fish bycatch size structure in the Gulf of Salamanca, Colombian Caribbean Sea.

29 **Duarte, L. O.** Spatial distribution of simple biological indicators in the artisanal fishery of the northern Colombian Caribbean Sea.

30 **Frenkiel, L.** Out reach program of Caribbean Sea biodiversity.

31 **Graham, D.** Impact of oil on blue crab recruitment in Mississippi waters.

32 **Larkin, S.** Assessing consumer awareness of seafood harvesting and consumption issues.

32 **Maraj, V.** Current status of the small-scale seine fishery in Barbados. (Student)

34 **Peterson, M.** The 50 year history of the "other" Gulf and Caribbean Journal.

35 **Reynal, L.** Estimation of the number of fishing trips in insular context of the Lesser Antilles: comparison between three methods used in Guadeloupe and Martinique.

36 **Shivlani, M.** Recent improvements in the scientific SEDAR-CIE peer review process for fisheries stock assessments in the Gulf of Mexico and Caribbean regions.

37 **Watson, R.** Fish aggregation devices … not that simple: considering various factors for

the implementation of a FAD network. (Student)

38 **Williams, S.** Using tagging and mapping technologies for effective fisheries conservation.

39 **Williams-Peter, S.** Framework for good governance: increasing the economic gains of small-scale fishers through participation in fish marketing.

PELAGIC & RECREATIONAL FISHERIES

40 **Anderson, J.** Spatial distribution and abundance of young kingfish (*Menticirrhus* spp.) species in coastal waters of the northern Gulf of Mexico.

41 **Colletti, C.** The effect of seascape structure on the spatial distribution of juvenile fish within Benner Bay Mangrove Lagoon, St. Thomas, United States Virgin Islands (USVI).

42 **Podsim, L.** Early life history of dolphinfishes in the northern Gulf of Mexico.

43 **Rojas, A.** Fishery biology of the "bonito" *Thunnus atlanticus* (Lesson, 1831) in San Andres Island, Colombia Caribbean.

DEMERSAL AND REEF FISH FISHERIES

44 **Barimo, J.** Prey detection by gray snapper, *Lutjanus griseus*, and a novel means of predator avoidance.

45 **Bouchon-Navaro, Y.** Long term decline of a keystone fish species (*Stegastes planifrons*) on the coral reefs of Guadeloupe Island.

46 **Carr, L.** Age-frequency distributions of protected mutton snapper (*Lutjanus analis*) aggregation following 17 years of protection.

47 **Claydon, J.** Identifying individual Nassau grouper, *Epinephelus striatus*, from natural markings.

48 **Collins, A.** A preliminary assessment: do goliath grouper affect fish diversity on shipwrecks?

49 **DeVries, D.** Factors affecting accuracy and precision in a multi-species reef fish survey: examples from the NE Gulf of Mexico.

50 **Duque, G.** Coral reef fish diversity reduction along a pollution gradient in San Andres Island, Colombian Caribbean.

51 **Johnson, D.** Distribution of red snapper (*Lutjanus campechanus*) and their spawn in the northern Gulf of Mexico.

52 **Karnauskas, M.** Comparisons between abundance estimates from underwater visual census and catch per unit effort in a patch reef system. (Student)

53 **Kingon, K.** Locating and mapping reef fish habitat on a tight budget. (Student)

54 **Kimmel, J.** Parrotfish as ecosystem engineers on U.S. Caribbean coral reefs.

55 **López-Peña, A.** Environmental factors associated to spatial distribution of demersal fishes in the Gulf of Salamanca (Colombian Caribbean Sea): implications to identification and management of essential habitats.

56 **Noh, V.** Fecundity and spawning frequency of the tiger grouper *Mycteroperca tigris* (Serranidae, Epinephelinae) from the southern Gulf of Mexico. (Student)

57 **Pomare, C.** Fishing biology of the "yellowtail" *Ocyurus chrysurus* (Bloch, 1791) on San Andres Island, the Colombia Caribbean.

58 **Kojis, B.** Distribution and abundance of fish populations in various habitats in the mutton snapper (*Lutjanus analis*) conservation area on the south shelf of St. Croix, U.S. Virgin Islands.

59 **Rodriguez, A.** Mitochondrial DNA evidence for a natural intergeneric hybrid between *Ocyurus chrysurus* and *Lutjanus jocu* (Perciformes: Lutjanidae).

60 **Saillant, Eric.** Testing for genetic isolation between Gulf of Mexico and U.S. Atlantic East Coast gray triggerfish using a mitochondrial DNA molecular marker.

61 **Tarnecki, J.** Ecological differences between natural versus artificial reefs in the northern Gulf of Mexico. (Student)

62 **Sierra Rozo, O**. Ontogenetic patterns of parrotfishes according to the use of habitat in San Andres Island (Seaflower Biosphere Reserve), during the rainy season.

63 **Trott, T.** Investigations into the dynamics of a black grouper spawning aggregation in Bermuda.

64 **Urvoix, L.** Search for bio-indicators to monitor the evolution of coral reef habitats (Student)

WEDNESDAY: November 3, 2010

Concurrent Session. GCFI SPECIAL WORKSHOP: NOAA Aquaculture by invitation Contact person Jessica Beck

GCFI SPECIAL WORKSHOP: Incorporating climate adaptation into marine turtle conservation: capacity strengthening for planning and implementation.

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BIOLOGY AND MANAGEMENT OF REEF FISHES

(0830-1215)

Session moderator: Brian Luckhurst

0830 Gledhill, C. et al, A survey of deep water reef fishes on the continental shelf of Puerto Rico and U.S. Virgin Islands.

0845 Caballero, D. et al, Sexuality and sexual cycle of the tiger grouper Mycteroperca tigris from coral reefs of the Campeche Bank (southeastern of Gulf of Mexico) (Student)

0900 Legare, B. et al, Juvenile Nassau grouper (*Epinephalus striatus*) utilization of nearshore habitats size dependant home-range and habitat use (Student)

0915 Renán, X. et al, Using otolith shape analysis to identify different stocks of

Epinephelus morio from the Campeche Bank.

0930 Semmens, B. et al, Environmental and anthropogenic drivers to Basin wide patterns in Caribbean reef fish diversity.

0945 Pattengill-Semmens, C. et al, Integrating time-series of community monitoring data.

Break (1000 – 1015)

1015 Stallings, C. et al, Bycatch of an economically-important grouper and its prey in a sub-tropical trawl fishery.

1030 Szedlmayer, S. and P. Mudrak. A Predation affects on juvenile red snapper, Lutjanus campechanus, in the northern Gulf of Mexico.

1045 Trejo_Martinez, J. et al, Reproduction in yellowtail snapper *Ocyurus chyrsurus* B. 1790, from the Campeche Bank, southeastern Gulf of Mexico. (Student)

1100 Nemeth, M. et al, Comparing Populations of Coral Reef Fishes from two Marine Protected Areas in Puerto Rico to Assess the Effects of Fishing Intensity.

1115 Wetmore, L and J. Rooker. Characterization of cross-shelf trophic connectivity of Mesoamerican reef fish populations in Belize (Student)

1130 Brandt, M. et al, Reef fish community differences among the U.S. Virgin Islands and implications for management.

1145 Hill, R. and S. Guenette. A good starting point: a promising trophic model for southwest Puerto Rican coral reef ecosystems.

Lunch Break (1245-1345)

FIELD TRIP (1400- 1700)
Visit to Old San Juan.

CINEFISH (Wednesday evening, 1830-2100)

THURSDAY: November 4, 2010

MARINE PROTECTED AREAS MANAGEMENT AND SCIENCE

a CaMPAM activity sponsored by the United Nations Environment Programme and NOAA CRCP

Session moderator: Georgina Bustamante (CaMPAM Coordinator)

0830 Lasseter, A. Using oral histories to study the social impacts of a marine protected area.

0845 Dromard, C.R. et al. Evaluation of marine protected area's performances: the case of

Little Cayman and Cayman Brac, Cayman Islands.(Student)

0900 Garcia, J et al. Coral fish movement ability estimation in marine protected areas of Martinique (FWI).

0915 Gould, W. Integrated gap analysis project: assessing conservation of freshwater, estuarine, marine, and terrestrial biodiversity.

0930 Hernandez-Delgado, E.A et al, Development of interdisciplinary criteria to identify priority candidate no-take marine protected areas in Puerto Rico: integration of ecosystem-based and community-based models.

0945 Peña, M. and P.McConney. Institutional Arrangements for Local Management of Marine Areas in the Eastern Caribbean.

Break (1000 – 1015)

1015 Peralta-Meixueirio, M.A. and Vega-Cendejas., M.E. Spatial and temporal evaluation of fish assemblages in the Ria Lagartos Lagoon System, Mexico (Student)

1030 Trott, T.et al, Efforts to enhance protection of the Sargasso Sea.

1045 Renoux. R. and T. Bervoets. The Simpson Bay Lagoon: towards an internationally managed marine area.

1100 Dalton, T.et al, Formal co-management arrangements and MPA success in the Wider Caribbean.

1115 Causey, B. Proposal for an International Network of MPAs: Islands in the Stream.

1130 Bustamante, G. et al, CaMPAM training program: overview of 12 years building MPA capacity and developing partnerships in the Wider Caribbean.

1145

Lunch Break (1200-1300)

GCFI SPECIAL SESSION: INVASIVE LIONFISH CONTROL AND MANAGEMENT

(1300- 1700)
Session Moderator: James Morris

1300 Akins, L. et al, Best Practices and Removal Strategies for Control of Invasive Lionfish.

1315 Potts, J. et al, Age and growth of invasive lionfish in the Western North Atlantic.

1330 Claydon,J.et al, Invasive Red Lionfish in Shallow Habitats of The Turks & Caicos Islands.

1345 Green, S. Invasive lionfish deplete native fish populations in the Caribbean. (Student)

1400 Bernal,N. et al, The Impacts Of The Indo-Pacific (*P. volitans* and *P.miles*) On Fish Assemblages In Near Shore Benthic Reefal Habitats Of The Central And Southern Bahamas. (Student)

1415 Santos-Martinez, A. et al, Trophic And Reproductive Aspects Of The Lion Fish *Pterois volitans*, in San Sandrés Island, Biosphere Reserve- Seaflower, Colombian Caribbean.

1430 Morris. et al, Bioenergetics and trophic impacts of invasive lionfish in the Atlantic.

1445 Albins, M. Effects of the invasive Pacific red lionfish on Bahamian coral reef fish communities: a large-scale, long-term experiment.

Break (1500 – 1515)

1515 Sanchez, C. Strategy for the Control of the Fish Leon (*Pterois* sp.) in the Archipelago of San Andres, Providence and Santa Catherine, Colombia: Approaches and Experiences.

1530 Johnson, B. et al, Red Lionfish (*Pterois volitans*) Control Strategies in the Caribbean UK Overseas Territories (Cayman Islands, Virgin Islands and Turks And Caicos).

1545 Melendez, J.et al, Implementation of the Management Plan for the Control of the Lionfish in Puerto Rico.

1600 Molina-Ureña, H. Lionfish In Costa Rica: Threats, Actions, and Opportunities.

1615 Acero, A. et al, Reconstructing the lionfish invasion of the Western Atlantic

1630 Smith, N. Artificial structures facilitate Indo-Pacific lionfish invasion into marginal Atlantic habitats.

1645 Frias-Torres S. Comprehensive strategies to fight the Atlantic lionfish invasion.

1700 Gulli-J.A. A Practical Solution to Lionfish Management: The Caribbean oceanic restoration and education foundation's Caribbean lionfish response program.

1715 Donaldson, T. et al, Why are Lionfishes (Pterois, Scorpaenidae) So Rare in Their Native Ranges?

18:00 GCFI BOARD OF DIRECTORS MEETING (1800 - 1920)

19:30 Cocktail Reception

FRIDAY: November 5, 2010

SUSTAINABLE FISHERIES (0830-1215)

Session Moderator: TBA

0830 Prada, M. et al, Strategies to confront illegal, undocumented and unreported fishing

within the Seaflower Biosphere Reserve, western Caribbean.

0845 Mateos- Molina, D. et al, Evaluating the Effectiveness of the No-take Zone within the Mona Island Natural Reserve, Puerto Rico. (Student)

0900 Gedamke, T and J Schull. Genesis of a of Cooperative Fishery Independent Survey for an Island Platform in the US Caribbean.

0915 Smith,W and G. Kyle. Specialization Characterization of Texas Inshore Fishing Guides: Associated Perceptions and Attitudes of Recreational Fisheries Management. (Student)

0930 Hendon, J.R. et al, Management of Response Efforts to the Deepwater Horizon Oil Spill: Perspectives From A Northern Gulf of Mexico Research Laboratory.

0945 Bolaños, N. The richness and abundance of reef fish of Serranilla, Alicia And Bajo Nuevo, Seaflower Biosphere Reserve - San Andres, Providencia, and Santa Catalina, Colombia.

1000 Patterson, W. et al, Effect of Circle Hook Size on Reef Fish Size Distribution and Catch Rate in the Northern Gulf of Mexico Recreational Fishery.

Break (1015-1030)

1030 Louis-Jean, L.et al, Impact of the Trammel Net in Martinique Fishery (Student)

1045 Hernandez-Pacheco, R.et al, Massive bleaching impacts in the demography of the Caribbean reef-building star coral *Montastraea annularis*: A modeling approach. (Student)

1100 Ocaña, F. Aspects about the ecology and recreational fishery of *Donax striatus* (Bivalvia, Donacidae) in Las Balsas beach, Gibara, Cuba. (Student)

1115 Norris, N. et al. Ghost Fishing by Lost and Derelict Fish Pots in the Commonwealth of Dominica.

1130 Phillips, M. et al, Preliminary Investigation of the Movements and Habitat Use of Juvenile Queen Conch Aggregations. (Student)

1145 Zeline-Ariste, O. et al, Habitat Impact in the Reproductive Cycle of *Strombus pugilis* in the Campeche Bank and Analysis of Apicomplexa and Urospherule-Like Granules. (Student)

Lunch Break (1200-1330)

BIOLOGY AND MANAGEMENT OF INVERTEBRATES (1330-1515)

Session Moderator: Dalila Aldana

1330 Castro Gonzalez, et al, Progress in the Responsible and Ecosystem Management of the Queen Conch *Strombus gigas* in the Seaflower Biosphere Reserve, Colombian Caribbean.

1345 Peel, J. et al, Importance of a Marine Protected Area in the Mexican Caribbean (Xel Há) on the Conservation of an Endangered Species as Queen Conch, *Strombus gigas.*

1400 Zamora-Bustillos, R. et al, Evidence of Multiple Paternity in *Strombus gigas* Using Two Microsatellite Loci.

1415 Claydon, J.et al, Large-Scale Deployment Of Discarded Conch Shells Enhances Juvenile Habitat For Spiny Lobster, Nassau Grouper and Red Hind.

1430 Sullivan-Sealey, K. The Process of Certification For A Sustainable Bahamian Lobster Fishery: The Quest to Quantify Illegal, Unregulated and Unreported (IUU) Catches .

1445 Behringer, D. et al, PaV1 Infection In The Florida Spiny Lobster Fishery and its Effects On Trap Function And Disease Transmission.

1500 Meggs, L. et al, Settlement Patterns of Spiny Lobster (*Panulirus argus*) Postlarvae on Collectors in Jamaican Waters and Culture of Juveniles.

1515 Santos-Valencia, J. Reproductive cycle of *Busycon perversum* (Mollusca: Gastropoda) from the Gulf of Mexico.

1530 Stevely, J. et al, Sponge mortality in the Florida Keys, USA: patterns of species response and population recovery.

Break (15:45-16:00)

AQUACULTURE (1600- 1645)

Session Moderator: Arthur Potts

1600 Perry, H. et al, Expansion of the Soft Crab Fishery in Mississippi Using Cultured Blue Crabs.

1615 Renán, X. et al, Preliminary results on growth and feeding of wild-caught *Epinephelus morio* in captivity.

1630 Saillant, Eric. Genetic management of aquaculture based marine stock enhancement; Main issues and current developments in Mississippi.

STUDENT AWARD PRESENTATIONS (1645)

CLOSING CEREMONY (1700)

Consumer Awareness and Response to Grouper Mislabeling Fraud
El Conocimiento y la Respuesta de Consumo al Mero Etiquetando Mal Fraude
Conscience De Consommateur et Réponse au Mérou Etiquetent Mal Fraude

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ABSTRACT

Widespread media attention has recently been directed toward the mislabeling of grouper. This form of economic fraud involves a seafood business erroneously labeling a finfish item as grouper, while substituting a cheaper species of fish. These negative reports are thought to have had an adverse impact on consumer perception of grouper products. In addition, patterns of purchasing and consumption of other types of seafood are thought to have been impacted. To assess these hypotheses, a telephone survey was conducted with 249 grouper consumers in Florida. The survey asked respondents about their grouper purchasing behavior, awareness of the reported fraud, the effect that their awareness has had on their grouper and general seafood consumption, and their willingness to pay to avoid mislabeled grouper through a labeling program that may enhance product integrity and, thus, consumer assurance. The survey found that most respondents were aware of the mislabeling issue, and that this awareness has negatively impacted grouper consumption at restaurants. The survey also revealed a willingness to pay for a labeling program, but willingness to pay was limited by cost and payment frequency. Probability-based models were estimated to identify consumer attributes and beliefs that explained willingness to pay for a labeling program. The findings from the model estimations could help in the development of a labeling program designed to address product integrity and enhance consumer assurance with regard to the identity and source of the grouper they purchase.

KEYWORDS: mislabeling , grouper, willingness to pay

Effects of Invasive Pacific Red Lionfish (*Pterois volitans*) on Bahamian Coral-Reef Fish Communities: A Large-Scale, Long-Term Experiment
Efectos de la Invasión Del Pez León Rojo Del Pacífico (*Pterois volitans*) en las Comunidades de Peces de Arrecifes Corales de las Bahamas: Un Experimento a Gran Escala y a Largo Plazo
Effets de la Rascasse Volante Rouge du Pacifique Envahissantes (*Pterois volitans*) sur les Communautés des Poissons des Récifs Coralliens des Bahamas: Une Expérience à Grande Échelle et à Long Terme

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ABSTRACT

Previous experiments examining the effects of the invasive Pacific red lionfish (*Pterois volitans*) on native coral-reef fish communities have been limited to small patch reefs (several square meters) and short time periods (two months or less). Although these experiments have shown that single small lionfish are capable of reducing the recruitment of native fishes by up to 90% on small patches of reef habitat, broader-scale impacts remain suggestive. Over time, such drastic effects on the survival of juvenile fishes will likely translate into substantial changes in the adult reef-fish community, both directly by reducing the number of juveniles that survive to adulthood, and indirectly by reducing prey availability for native predators. Here I present preliminary results from an ongoing large-scale (thousands of square meters), long-term (>15 months) field experiment in which I manipulated the density of invasive lionfish on five pairs of large isolated reefs to create low-lionfish-density and high-lionfish-density treatments. I then conducted quarterly surveys of the native fish community on each reef. After the first three months of the experiment (summer 2009), the mean increase in the density of small coral-reef fishes was nearly five times greater on the low-lionfish-density reefs than on the high-density reefs. This result corroborates earlier small-scale experiments and shows that the effect of lionfish on the net recruitment of native coral reef fishes scales-up from single lionfish on small patch reefs to high densities of lionfish on large contiguous reefs.

KEYWORDS: invasive species, coral reefs, piscivory, community interactions, marine fishes

Best Practices and Removal Strategies for Control of Invasive Lionfish
Las Mejores Prácticas y Estrategias para la Eliminación y Control del Invasor Pez León
Meilleures Pratiques et Stratégies pour la Suppression de Contrôle des Lionfish

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Indo-Pacific lionfish (*Pterois volitans/miles*) have successfully invaded the western Atlantic, Caribbean, and Gulf of Mexico waters via anthropogenic influenced pathways and represent the first time a non-native marine fish has become established in these waters. The rapid spread and dramatic increases in abundance have caused great concern for the ecology and human health throughout the region. Recent studies are showing the impacts of this venomous, predatory invader could be severe and, without intervention, irreversible. With little to no pre-existing infrastructure allocated to marine invasions, most countries in the Caribbean region have been grappling to understand the invasion and how to minimize its impacts to native marine systems. The Reef Environmental Education Foundation (REEF) working closely with NOAA, the USGS, and Simon Fraser University (SFU) has been working with many countries in the region to transfer knowledge, build capacity, and help develop response plans to address the lionfish invasion. Hands on training in impact study design, removal and handling techniques, and awareness campaigns have been conducted in 11 countries around the region. These programs have been successful on a local level, however, a broader regional perspective and communication was needed. In August 2010, an International Coral Reef Initiative in partnership with REEF, NOAA, Mexico, and France, organized and held a two day workshop in Cancun, Mexico, bringing together over 40 representatives from 20 countries, states and territories to establish a framework of communication and cooperative action and develop a best practices document in addressing the invasion. This effort represents the beginning of a collaborative framework to facilitate regional approaches and efforts in dealing with marine invasions.

Studying the Historical Ethnoecology of the USVI-St.Thomas Fishing Comminity
El Estudio de la Etnoecología Histórico de las Islas Vírgenes de E.U. - St. Thomas de Pesca de la Comunidad
Étudier L'Ethnoécologie Historiques des Îles Vierges Américaines - Saint Thomas de Pêche Communautaire

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ABSTRACT

Fishing in the US Virgin Islands has been a part of island survival and culture since before Europeans and slave trade found its way into the Caribbean. However, any potential decreases in Virgin Island fisheries, is likely to directly impact the viability of the local fishing industry, and have negative consequences to the fishing communities and their fisheries-dependent livelihoods. The aim of our research is to collect, study, and analyze local ecological knowledge of fishermen and the St. Thomas fishing community and how such knowledge of the past and the present can be best used to inform future sustainable and resilient decisions in regards to USVI fisheries and its management. Our research methodologies includes community-based participatory methods, observational studies, historical archival research, and literature review to gather subjective information to be evidence-based evaluated using qualitative models and methods of analysis. Such methods include content analysis, qualitative classification, photographic interpretation, longitudinal or panel analysis, classification matrixes, and mapping of social networks. We also seek to understand the conditions and thresholds that are likely to produce a sort of "domino effect" and negative feedback mechanisms, ensuing fishery decline resulting in species extinction, coral decay, loss of jobs and food, and increased fish prices in a recession weakened tourism-based economy. We will contribute to the construction of a web-based archive, which will include our findings and digitally cataloged photos and data. This archive will provide the fishing community and future generations with easily accessible public knowledge about themselves, their history, and their environment.

KEYWORDS: community-based management, local ecological knowledge, participatory research, qualitative methods, ethnoecology

Bottom-Up Community Participation in Fisheries Management: Case Studies and Future Directions
Participación Comunitaria en la Gestión de la Pesca: Estudios de Casos y Orientaciones Futuras
Participation de la Communauté dans la Gestion des Pêches Ascendantes : Études de Cas et des Orientations Futures

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ABSTRACT

In recent years an increasing number of case studies and evidence-based science has outlined the needs, and enhanced benefits of grassroots or bottom-up community participation in sustainable and resilience ecosystem management. The fishing communities both at global, and at local levels have a key role to play as valuable collaborators and partners in the scientific understanding of changes in the ways that human societies and groups interact with their natural and marine environment. In most cases local fishing communities have multiple and critical dependences to their local marine environment, including livelihoods and employment outcomes, social and community wellbeing and happiness, the sustainability of food and other economic and social services, as well as traditional and customary responsibilities for the sustainability, resilience and preservation of marine resources for future generations. Empowering communities to achieve adaptive, resilient, and self-organizing potential for the future has multiple benefits for the communities themselves and beyond. At the same time, such approaches are contributing to social and collective learning, promoting social cohesion, responsibility, and accountability at the community/grassroots level, and achieving alternative sustainable and resilient development outcomes that improve the flows and interactions among the natural, social, economic, financial and physical capital within and across them. We will present case studies of alternative and resilient community-based fisheries projects around the world, and will provide a case for a paradigm shift towards bottom-up community participatory ways for fisheries management. This research is funded by NSF/VI-EPSCoR, award number no 203056.

KEYWORDS: community fisheries management, ecosystem management, social resilience, sustainable development, social learning

Spatial Distribution and Abundance of Young Kingfish (*Menticirrhus*) Species in Coastal Waters of the Northern Gulf of Mexico
Distribución Espacial y Abundancia de Juveniles de Lambe (*Menticirrhus*) en las Aguas Costeras del Norte del Golfo de Mejíco
Répartition Géographique et Abondance des Juveníles de Bourrugue (*Menticirrhus*) dans les Eaux Côtières du Nord du Golfe du Mexíque

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ABSTRACT

The southern kingfish (*Menticirrhus americanus*), the northern kingfish (*M. saxatilis*) and the gulf kingfish (*M. littoralis*) are members of the drum family (Scianidae) and are found in the northern Gulf of Mexico (GOM). Studies of distribution and abundance have been conducted for the early life-stages of many sciaenids, but little is known about the early life history of young *Menticirrhus* species. The purpose of this study is to determine the spatial distribution and abundance of young *Menticirrhus* species in coastal Mississippi. Specific habitats included barrier island surf zones and grass beds, and mainland marsh-edges and sandy shorelines. Five hundred sixty-seven *Menticirrhus* were collected during this study, with over 85% of the specimens collected in 2006. Densities of both *M. americanus* and *M. littoralis* peaked during summer, while densities of *M. saxatilis* peaked in spring. All three kingfish species co-occurred within surf zone and sandy shoreline habitats, but *M. americanus* were the dominant kingfish along protected sandy shorelines, and *M. littoralis* were the dominant kingfish along open surf zones. Only *M. americanus* were collected from marsh-edges and all three species were absent from grass beds. Length frequency distributions of all three kingfishindicated accelerated growth with increasing size and warmer water temperatures.

KEYWORDS: *Menticirrhus*, spatial distribution, abundance, northern Gulf of Mexico

PaV1 Detection by the Caribbean Spiny Lobster (*Panulirus argus*) and its Effect on Population Spatial Structure
Detección de PaV1 por el Caribe Langosta (*Panulirus argus*) y su Efecto sobre la Estructura Espacial de la Población
Détection de PaV1 par la Langouste des Caraïbes (*Panulirus argus*) et de ses Effets sur la Population de Structure Spatiale

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ABSTRACT

Panulirus argus virus 1 (PaV1) is a contact-transmitted pathogen that causes mortality in the gregarious Caribbean spiny lobsters (Panulirus argus). However, studies have shown that P. argus has the ability to detect and avoid shelters inhabited by infected conspecifics, thereby reducing infection risk but also causing increased mortality due to a lack of available (disease-free) shelters. Ultimately, disease avoidance and shelter limitations could have population wide affects through increased PaV1 transmission or increased predation. Based on its role in many other aspects of lobster ecology, olfaction is the most likely mode of PaV1 detection. To test the role of olfaction and determine the source of the olfactory cue in the PaV1 detection, we are using y-maze experiments. We are also exploring the effect of diseased lobsters on population spatial structure in nature and the effect flow has on this structure. Preliminary results show that diseased lobster avoidance is driven by olfaction, and moreover, the olfactory cue alone was equivalent in effectiveness to having a diseased lobster present and visible thereby causing shelter avoidance. Juvenile shelter avoidance in a shelter limited environment (sponge die-offs) could result in a population bottleneck that would affect the adult demographics along with the entire Caribbean spiny lobster fishery. This research is ongoing and additional results will be available by the time of the GCFI meeting.

KEYWORDS: Spiny, Lobster, PaV1, Disease, Bottleneck

Can We Stop the Madness? Managing for Resilience in Coral Reef Fisheries
¿Podemos Detener la Locura? Manejando la Resiliencia en las Pesquerías de los Arrecifes de Coral
Pouvons-Nous Arrêter la Folie ? En Maniant la Résilience dans les Pêcheries des Récifs de Corail

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ABSTRACT

Current fisheries management assumes that with enough data populations can be precisely monitored and regulated. However, coral reef ecosystems (CREs) are complex, nonlinear socio-economic systems that easily overwhelm capacities for data collection and analysis. A more effective approach may be to manage for resilience, which ecologically means taking care of the system's productive capacity. Protecting essential habitats and habitat linkages, trophic pathways and population structures then become the key ecological goals of fisheries management. The main threats to the *local* management of CREs are overfishing, land-based sources of pollution (LBSP) and lack of enforcement. Studies now strongly suggest that overfishing has a strong impact on benthic ecosystem health, most likely through the disruption of trophic structures. While it is unclear how much fishing effort must be reduced below MSY to protect CREs, it is clear that this reduction is significant. Thus, management need not wait for theory to reduce fishing effort and restore lost species and ecological function. Turbidity and eutrophication are the principal LBSP affecting CRE health and productive capacity. Efforts to deal with these go beyond conventional mechanisms of fisheries management and must instead interact with those mechanisms overseeing coastal development and land-use. Effective enforcement is the weak link in current management regimes, yet it is the primary mechanism for re-enforcing the covenant that should exist between stakeholders and managers. Habitat management is explicitly spatial. Marine reserves enhance system resiliency in multiple ways, both biologically and socially, and should be an integral component to CRE management.

KEYWORDS: coral reefs, resilience, ecosystem-based management, fisheries, habitat

Development of a Novel Method for Monitoring Recovery on Spawning Aggregations
Desarrollo de Una Metodología Para Monitorear la Recuperación de las Agrupaciones de Desove
Élaboration d'une Méthode Originale pour Surveiller le Rétablissement sur des Agrégation de Ponte

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ABSTRACT

Many spawning aggregations have been fished beyond the point of sustainability, leading to increased calls for protection through seasonal and/or site-specific fishery closures. Once a closure has been put in place, monitoring the aggregation is imperative in order to learn whether protections lead to the recovery of populations. Current methods for monitoring the status of spawning aggregations rely on simple counts, usually combined with capturing a subset of the fish to collect data such as length and weight. Handling fish during the spawning aggregation can be stressful for the fish, which could ultimately lead to decreased spawning success, increased susceptibility to predators, or increased mortality through capture trauma or infection. Here we present a novel method for monitoring fish on a spawning aggregation that does not require the capture and handling of the fish. We show that reliable length-distribution data can be collected by divers using a video-based system with parallel lasers calibrated to a specific distance apart. Annual changes in size distribution can be used as one measure of the health of the population, because the technique can detect recruitment of new individuals into the spawning population. In addition to tracking size distribution trends over time, the length distribution information can be combined with a length-weight regression and an estimate of total number present in order to accurately estimate spawning biomass. We discuss the validation and application of this method with a spawning aggregation of Nassau grouper, *Epinephelus striatus*, in the Cayman Islands.

KEYWORDS: Nassau grouper, *Epinephelus striatus*, spawning aggregations, monitoring, recovery

Large Scale Mapping and Monitoring of Mesophotic Coral Reef Habitat in the Puerto Rico Shelf
Coastal and Marine Management and Education in the South Eastern Caribbean (CaMMESEC)
La Gestión Costera Y Marina Y Educación En El Caribe Sur Oriental (CaMMESEC)
Gestion Côtière Et Marine etdDe L'éducation Dans Les Caraïbes Du Sud-Est (CaMMESEC)

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ABSTRACT

The Buccoo Reef Trust (BRT) and International Coral Reef Action Network (ICRAN) developed this three-year project funded by the United Nations Foundation to assist Tobago and other countries of the South Eastern Caribbean to respond to the challenges they face in managing and sustaining their coral reef environments. The overall objective was to improve the South Eastern Caribbean's Marine Environment, through enhanced access to research and education facilities and expertise, and the exchange of sustainable practices for tropical islands. Initiatives developed and implemented under this project were covered within the following areas: enhanced management capacity for Buccoo Reef Marine Park (BRMP) in Tobago and the South Eastern Caribbean; the strengthening of the sub-regional node of the Global Coral Reef Monitoring Network; demonstration of alternative income generating approaches; and education and awareness outreach. Approximately 700 persons and 7 MPAs from throughout the South Eastern and wider Caribbean benefited from the execution of this project. 14 small grants supported specific in-country capacity building initiatives, several publications and tools were produced to support management and education, and invaluable partnerships and relationships were established to ensure the continued improvement and enhancement of MPA management within the South Eastern Caribbean countries. The CaMMESEC project was varied and broad in its scope but was extremely valuable in assisting the MPAs, especially in Tobago, Barbados, Grenada, St. Vincent and the Grenadines and St. Lucia, improve their managerial and operational abilities.

KEYWORDS: CaMMESEC, Buccoo Reef Trust , ICRAN, MPA Management, South Eastern Caribbean

Large scale mapping and monitoring of mesophotic coral reef habitat in the Puerto Rico Shelf
Cartografía a Gran Escala y Monitoreo de Arrecifes Mesofóticos en la Plataforma de Puerto Rico
La Cartographie à grande échelle et la Surveillance de l'Nabitat du Récif de Corail dans le Plateau Mesophotic de Porto Rico

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ABSTRACT

While the distribution and status of shallow-water reefs in many parts of the world has been well documented in the last few decades, large-scale mapping and long-term studies of mesophotic reefs are very rare. Mesophotic coral ecosystems (MCEs, 30-100 m) in the Puerto Rico Shelf can be divided into two broad categories, low-gradient platforms, and high-gradient slopes. The insular shelf and slope areas between 30 to 100 m in Puerto Rico have an area of approximately 3,900 Km^2 (or 46% of the total area between 0-100 m), representing potential habitat for these deeper reef communities. The Seabed autonomous underwater vehicle (AUV), which was designed for high-resolution underwater optical and acoustic imaging, has provided unprecedented information on the distribution, community structure, and status of these reefs throughout the US Caribbean. Some of these reefs are structurally complex with high coral cover and abundant fish and invertebrate fauna. The AUV benthic assessments can provide the required information for selecting unique areas of high coral cover, biodiversity and structural complexity for habitat protection and ecosystem based management. Data from Seabed sensors and related imaging technologies are being used to conduct multi-beam sonar surveys, photo mosaicking, and multisensor fusion of acoustic and optical data.The capabilities and limitations of the Seabed AUV for characterizing and monitoring coral reef habitats are discussed.

KEYWORDS: mesophotic, coral reefs, mapping, monitoring, AUV

Coral Reef Fish-Habitat Modeling to Support Ecosystem-based Management
Modelando los hábitat de los peces arrecifales para apoyar un manejo ecosistemático
L'Habitat du poisson du des Récifs Coralliens à l'Appui de la Modélisation Basée sur l'écosystème de Gestion

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Establishment of the primary linkages between the dynamics of stock productivity and reef habitats underlies the potential for quantitative determination of sustainable yields and ecosystem services from multispecies coral reef fisheries. Here we explore the necessary range of data and statistical and analytical models necessary to evaluate these dynamics and advise management decision-making in regional coral reef ecosystems. We present examples from the Florida Keys and discuss the range of potential applications of these models to fishery resource issues across the broader Gulf of Mexico and Caribbean Sea.

Pit Tag Antennae Arrays as Fishery Monitoring Tools in Tropical Environments
Pit Matrices Etiqueta de Antenas Como Herramientas de Seguimiento de la Pesca en Ambientes Tropicales
Pit Tag Antennes comme des Outils de Surveillance des Pêches dans les Environnements Tropicaux

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ABSTRACT

Long-term monitoring of marine and estuarine fishes is labor-intensive and subject to varying environmental conditions and spatio-temporal constraints. To better understand fish populations and increase predictive capabilities, scientists and managers need reliable long-term monitoring systems, which collect data on populations through all environmental conditions and reduce the labor required for data collection. For this purpose, we adapted autonomous passive integrated transponder (PIT) tag antennae for use in tropical environments. These antennae function through all environmental conditions, and only require labor for construction, data download, maintenance, and the marking of fish. Antennae have long life spans and function continuously. The utility of this recapture system was demonstrated during a nursery habitat study in Charlotte Harbor, Florida USA. From November 2008 to February 2010, we marked 1,642 juvenile common snook (*Centropomus undecimalis*) with PIT tags. Between November 2008 and August 2010, the 11 antennae we constructed throughout 4 mangrove creeks recorded 362,880 detections. The antenna array recaptured 78.7 % of marked fish at least once. The detailed recapture information allowed for highly precise calculation of apparent survival and examination of long-term habitat use. In addition to discussing the data we have collected, this paper details how to design and construct customized PIT tag antenna systems and covers the issues and limitations associated with adapting these systems to tropical marine and estuarine environments. These

systems may be especially useful in the tropics for monitoring juvenile reef fishes that use nearshore habitats such as nurseries (e.g. mangroves).

KEYWORDS: Mark-recapture, telemetry, *Centropomous undecimalis*, nursery habitat, mangroves

Prey Detection by Grey Snapper *Lutjanus griseus* and a Novel Means of Predator Avoidance
Detección de la presa por el pargo del manglar Lutjanus griseus un medio innovador para evitar a los predadores
Détection de Proies par *Lutjanus griseus* et de nouveaux moyens d'évitement des prédateurs

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ABSTRACT

Studies of prey detection by olfaction in teleost fishes have focused largely on amino acids as odorants while studies with respect to nitrogenous waste are few by comparison. Although threshold sensitivities for amino acids are often in the nano-molar range, gill and renal membranes are thought to be less permeable to amino acids than lower molecular weight compounds such as ammonia or urea. Furthermore, amino acids are generally conserved for protein synthesis and are a minor constituent of excreta. This study examined detection of ammonia, urea, and amino acids by *Lutjanus griseus* (gray snapper). *Opsanus beta* is a preferred prey item of *L. griseus*. *O. beta* is unique among teleosts in that adults can facultatively shift between ammonia and urea excretion. Experiments were conducted in 8000 l outdoor mesocosms with flow-through seawater and a sediment/seagrass substrate to simulate natural habitat. Odorants were injected into small experimental shelters designed to mimic toadfish burrows. Shelters were equipped with low-light video cameras to remotely monitor snapper behaviours. Results indicate that *L. griseus* are more responsive to ammonia than either urea or an ammonia/urea mix with threshold sensitivities below 5 µM. Additionally, *L. griseus* are more responsive to an amino acid/ammonia mix than either an amino acid/urea mix or amino acids without waste-N. These results suggest that urea masks the aroma of ammonia but not those of amino acids.

KEYWORDS: Grey Snapper, Chemical Crypsis, Toadfish, Urea, Predator Avoidance

PaV1 Infection in the Florida Spiny Lobster Fishery and its effects on Trap Function and Disease Transmission
PaV1 Infección en la Florida, La Langosta Común de la Pesca y Sus Efectos Sobre la Función de Captura y Transmisión de la Enfermedad
PaV1 Infection dans la Pêche de la Floride la Langouste Blanche et ses Effets sur Trap Fonction et la Transmission des Maladies

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ABSTRACT

The Caribbean spiny lobster (*Panulirus argus*) is one of the most economically valuable fisheries in the Florida Keys and tops this list for much of the Caribbean. In 2001, the fishery in Florida experienced a major decline in landings of ~30%, from which it has not recovered. This decline was coincident with discovery of a lethal viral pathogen, PaV1, found infecting juvenile lobsters in the Florida Keys. *P. argus* has a complex life history and is exploited throughout its range – two factors that have made it difficult to determine the cause of the decline. Here we describe the first assessment of PaV1 within the fished segment of the population. We used PCR analysis to measure PaV1 prevalence from lobsters caught in commercial traps throughout the Florida Keys. We also tested the effect of diseased lobsters within traps on trap attractiveness, and on the transmission of PaV1 to other trapped, but healthy, lobsters. We found a mean prevalence of 11% in the fished population with PCR+ lobsters as large as 95 mm carapace length (76 mm is legal). We also found that traps harboring an infected lobster caught significantly fewer lobsters than traps containing healthy lobsters. Furthermore, healthy lobsters confined in traps with diseased lobsters became infected with PaV1 more frequently than those confined with other healthy lobsters. This study demonstrates the indirect and subtle effects that pathogens can have on fishery function through altered animal behavior and the unintended consequences of fishery practices on pathogen epidemiology.

KEYWORDS: lobster, fishery, virus, PCR, Florida Keys

Use of Mixed-Gas Rebreathers to Access Fish Assemblages in Mesophotic Coral Ecosystems (MCE) off La Parguera Shelf-Edge, Puerto Rico
El Uso de Rebreathers de Mezcla de Gases para Evaluar las Comunidades de Peces de los Ecosistemas Coralinos Mesofoticos (MCE) en El Veril de la Parguera, Puerto Rico
Utilisation des Recycleursde Mélange Gazeux à l'Accès des Communautés de Poissons dans les Mésophotique Ecosystèmes Coralliens (Mce) au la Pente du Plateau de la Parguera, Puerto Rico

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ABSTRACT

Diver-based visual census is used to evaluate shallow reef fish communities for ecological and fisheries purposes. Yet, depth limits to conventional scuba (~30 m) could bias the data. Fishes in Mesophotic Coral Ecosystems (MCEs) are important to scientists and managers because it is thought thatthese assemblages (1) contain the lower distribution of many shallow species, (2) contain additional commercially important species limited to these depths, and (3) are difficult to assess using other technologies due to the extreme geomorphology of slope environments. This study surveyed the fishes associated to six MCE sites offLa Parguera from 50 to 85m depth, using rebreather trimix technical diving. This approach provides reasonable bottom time to perform censuses and roving surveys, take photographs or collect samples at mesophotic depths; however its high cost may limit its applicability. Seventy-five fish species were identified in 64transects and 30species in 60 roving surveys. This rich ichthyofauna includes both common inhabitants of shallow reefsand species confined to deep habitats. MCEs are dominated by zooplanktivores (one-third of species; 63% of abundance) while herbivores dominate shallow reefs. Surveys found a higher abundance of fishery commercial species compared to shallow reefs, suggesting that MCEs serve as refugia for heavily exploited fishes. Depth and topographic complexity could shape MCEs assemblages; there is a greater abundance of zooplantivores and fishery-exploited species at more rugose sites. Research and monitoring of MCE fish assemblages are critical to enhance our knowledge on species composition and to compare ecological processes with shallow reefs.

KEYWORDS: Fish Assemblage, Mesophotic coral ecosystems (MCE), Rebreather, Fishery exploited fishes, Deep refugia

Large Groupers Spawning Aggregation In the Central MPA of The *Seaflower* Biosphere Reserve
Agregaciones Reproductivas de Grandes Serranidos en el AMP Centro de la Reserva de Biosfera *Seaflower*

Grands Mérous Agregation de Reproduction dans le MPA du Centre de la Réserve de Biosphère Seaflower

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ABSTRACT

Large Groupers are predatory fish, with large size, diversity of shapes and colors, and are considered a group of species extremely vulnerable to fishing because of its slow growth, late sexual maturity, long life and spawning aggregations in predictable locations and times. In the San Andrés, Old Providence and Saint Kathleen Archipelago, *Seaflower* Biosphere Reserve, you can find species like *Epinephelus adscensionis*, *E. itajara*, *E. striatus*, *E. guttatus*, *E. morio*, *Mycteroperca venenosa*, *M. tigris* and *M. bonaci* among others. Prada et al., (2005) reports spawning aggregations of *M. bonaci* and *M. tigris* on the islands of Old Providence and Saint Kathleen, known as the Center Marine Protected Area (Center MPA). This investigation purpose is to study the large Groupers spawning aggregations in the Center MPA of Seaflower BR, where visual censuses were conducted in areas with coral reef habitats platform edges (where the most of visualizations happens), reef crests, plain coral reefs and headlands, where the most abundant fish spawning aggregations species were *M. tigris*, *E. striatus* and *Cephalopholis fulva* (first report of Spag's for the last two in the study area) and small abundances of *M. bonaci* and *M. venenosa*. We also found that most of the events of aggregation occurred around the full moon time (three to four days before or after) and that the most common behaviors and more frequently in fish were the color changes and pregnant females and less frequently were the courtship and aggression.

KEYWORDS: Spawning Aggregation, Large Groupers, Central MPA , Seaflower BR

The Impacts of the Indo-Pacific (*P. volitans* and *P. miles*) on Fish Assemblages in Near Shore Benthic Reef Habitats of the Central and Southern Bahamas
Los Impactos del Pez León *P. volitans* y *P. miles*
Les Impacts du Poisson-Lion Originaire de L'Océan Indien et Pacifique (*P. Volitans* and *P. miles*) sur les Assemblages de Poissons des Habitats des Récifs Près de la Côte Benthique dans le Centre et le Sud des Bahamas

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ABSTRACT

Since the first recorded sightings of the Indo-Pacific Lionfish (*P. volitans* and *P. miles*) in the 1990s, this invasive mid-level predator has become a common member in a wide range of benthic fish habitats throughout the Caribbean. Although the origins of this cryptic invasion are unknown, the success of lionfish, specifically in the near shore waters of The Bahamas, has been documented through increased abundance in the number of benthic habitats utilized since 2005. Long term impacts of lionfish on near shore fish assemblages in the wider Caribbean is not known, but invasive species management planning requires some information on changes in the abundance and diversity of reef fishes, especially species exploited In commercial fisheries. This large synoptic survey of fish assemblages from reef habitats on two islands in The Bahamas examines how the presence of lionfish alters established fish assemblages. Patch, hard bottom, fringing and channel reefs adjacent to the islands of Great Exuma (Central Bahamas) and Great Inagua (Southern Bahamas) were evaluated via a rapid assessment methodology. Roving diver fish surveys, benthic epifauna and macro-algal assessments were conducted with a coastal assessment of anthropogenic impacts (ranking) from development and/or fishing pressure. Univariate and Multivariate statistics were used to determine if the presence of lionfish is significantly altering the recorded fish assemblages when compared to sites absent of lionfish. This protocol of characterization can be applied to help understand how lionfish may affect near shore ecology, and ultimately the production of commercially important fisheries species.

KEYWORDS: lionfish, invasive species, habitat alteration, marine ecology, The Bahamas

Assessing the Genetic Consequences of Spawning Aggregation Overfishing: The Nassau Grouper (*Epinephelus striatus*) Aggregation in St. Thomas, US Virgin Islands as a Case Study
La Evaluación de las Consecuencias Genéticas de la Pesca Excesiva de Desove de Agregación: El Mero de Nassau (*Epinephelus striatus*) La Agregación en St. Thomas, Islas Vírgenes de EE.UU. como un Caso de Estudio
L'Evaluation des Conséquences Génétiques de la Ponte D'Agrégation Surpêche: La Concentration du Mérou Rayé à Saint-Thomas, Îles Vierges Américaines Comme une Étude de Cas

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ABSTRACT

The Nassau grouper (*Epinephelus striatus*) has undergone widespread decline across its geographic distribution as a result of intensive commercial and recreational fishing, including on its spawning aggregations. Within US Virgin Islands waters, known spawning aggregations have declined to low levels. However, a remnant spawning aggregation historically numbering over 1000 individuals at Grammanik Bank, St. Thomas, has ostensibly begun to recover since implementation of protective measures in 2005, and may now comprise approximately 200 individuals. The genetic consequences of such dramatic aggregation declines and incipient recovery are unknown. We report a preliminary genetic characterization of the St. Thomas aggregation using 14 microsatellite loci developed specifically for *E. striatus*, and address the hypothesis that the remnant population will show low genetic diversity and evidence of a genetic bottleneck. We genotyped aggregated individuals comprising two successive spawning years (2009, n = 81; and 2010, n = 73). Analyses indicate relatively high current levels of genetic diversity (mean gene diversity = 0.805 and 0.814 and mean allelic richness = 11.01 and 10.93, for 2009 and 2010, respectively). Genetic analyses of both temporal samples using the software BOTTLENECK 1.2.02 provide mixed support for a genetic bottleneck. Ongoing work includes analyzing individuals collected from a third set of St. Thomas samples (2008) to monitor temporal changes in genetic diversity as the aggregation recovers. Future work will compare the genetic diversity status of the overfished St. Thomas aggregation to a relatively un-fished aggregation from the Cayman Islands to further assess the genetic consequences of rapid aggregation declines.

KEYWORDS: Nassau grouper, microsatellite, genetic diversity, aggregation, population decline

Reconstructing the Lionfish Iinvasion of the Western Atlantic
Reconstuyendo la Invacion del Pez leon en el Atlantico Occidental
Reconstituer la Iinvasion Lionfish de l'Atlantique Ouest

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ABSTRACT

Lionfish are popular ornamental fishes native from the Indo-Pacific that were introduced into Florida waters and are rapidly spreading and establishing through the Western Atlantic (WA). Although unfortunate, this invasion provides an excellent study system for addressing questions of conservation genetics and evolutionary marine ecology. Using mitochondrial sequence data, previous studies investigated population genetics of invasive lionfish at two locations (the US east coast and the Bahamas [BS]) showing that two species (Pterois volitans and P. miles) have invaded the WA and that their introduction resulted in a strong founder effect. Here, we expand upon previous genetic studies of invasive lionfish by adding mitochondrial control region sequences from Bermuda (BM) and three Caribbean locations to cover a wider range of the WA lionfish invasion (total six WA locations and 755 specimens). Our results show that while P. miles is restricted to the northernmost locations (BM and North Carolina [NC]), P. volitans is ubiquitous and much more abundant. The WA populations of P. miles and P. volitans are characterized by one and nine haplotypes vs. at least 38 and 36 in the native range, respectively. These findings confirm the strong founder effect previously documented, ultimately suggesting that the ubiquity of lionfish is the result of dispersal from the source of introduction (i.e., Florida) and not multiple independent introductions across the WA. Population structure analyses on P. volitans at the six invasive locations indicate significant differentiation between the northern (NC, BM, and BS) and the Caribbean populations. Finally, the progression of the lionfish invasion as documented from sightings is analyzed in conjunction with the genetic evidence to test six major scenarios of connectivity and phylogeographic breaks inferred for reef organisms in the Greater Caribbean. These results show that the lionfish dispersal provides support for five of the six scenarios.

KEYWORDS: invasive species, lionfish, genectics, coral reefs, connectivity

Observing Queen Conch Density and Behaviour in Barbados
Observando la Densidad y el Comportamiento del Caracol en Barbados
Densité et 'observations de lambi dans la Barbade

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ABSTRACT

Queen conch, *Strombus gigas*, a slow moving marine gastropod is vulnerable to depressed reproductive activity resulting from density dependent mechanisms such as the Allee effect. Now heavily exploited throughout most of its range, the density of remaining conch populations has become a matter of concern for conservation and recovery of depressed populations, and for management of viable stock densities. In this study we observed individual behaviours and density of neighbours in a Barbados conch population, to determine any patterns and/or ranges in conch densities at which particular behaviours occur. Tagged conch were observed by SCUBA divers biweekly for one year from May 2009 through May 2010. On each occasion the individual's behaviour (quiescent, buried, feeding, pairing or spawning), water depth and temperature were recorded, together with the number of neighbours within a 20 m radius. Pairing and spawning were only observed at medium (3-6 conch per circle or 25-50 ha^{-1}) and high (≥ 7 conch per circle or ≥ 58 ha^{-1}) densities. Feeding was only observed at high densities, whilst quiescent and burying behaviour was observed predominantly at low densities. These results corroborate previous findings of a minimum density threshold for conch spawning and confirm the importance of protecting spawning aggregations.

KEYWORDS: queen conch, Caracol, density, behaviour, Allee effect

The Richness and Abundance of Reef Fish of Serranilla, Alicia, and Bajo Nuevo, Seaflower Biosphere Reserve - San Andrés, Providencia and Santa Catalina, Colombia
Riqueza y Abundancia Íctica de los Complejos Arrecifales de Serranilla, Bajo Alicia y Bajo Nuevo, Reserva de Biosfera Seaflower - Archipiélago de San Andrés, Providencia y Santa Catalina-Colombia
La Richesse Et l'Abondance des Poissons de Récif de Serranilla, Bajo Alicia, et Bajo Nuevo, Seaflower Réserve de la Biosphère - San Andrés, Providencia et Santa Catalina, Colombia

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ABSTRACT

In April 2010 there was a scientific expedition to collect biological data to remote areas to the north of the Archipelago of San Andrés, Providencia and Santa Catalina Seaflower Biosphere Reserve, which by its very condition of isolation don't have bio-ecological basic information. Data were collected from the fish community (richness and abundance of reef fish with important ecological and economic), macro-invertebrates, coral communities, turtles and other species of the region's biodiversity. We used different methodologies (Atlantic and Gulf Rapid Reef Assessment AGRRA, Reef Environmental Education Foundation REEF, Reef Rapid Assessments ERA, among others). 82 stations were sampled: 26 in Serranilla, 14 in Alicia Shoal and 42 in Nuevo Shoal, results showed a total of 154 species of reef fishes. Nuevo Shoal was observed 126 species, followed by Serranilla with 106 species and 74 species in Alice Shoal. The ten most common species between stations visited were *Acanthurus coeruleus, Chromis cyanea, Balistes vetula, Holocentrus rufus, Halichoeres garnoti, H. maculipinna, Stegastes partitus, Sparisoma aurofrenatum, A. bahianus,* and *Thalassoma bifasciatum respectively*. In all stations, the five most abundant species were *H. garnoti, C. cyanea, A. bahianus, S. partitus and T. bifasciatum*. In contrast to some of the uncommon or rare species appear to be new records for the Archipelago (N. B-C et al. Unpublished data). Monitoring abundance, showed for example that *S. partitus, Haemulon album, H. melanurum, Scarus vetula, S. taeniopterus, Caranx ruber, B. vetula, Sphyraena barracuda, A. coeruleus, Mellichthys niger*, and *Gynglimostoma cirratum* are very abundant in these areas

PALABRAS CLAVES: *Riqueza íctica*, peces con interés ecológico y económico, Reserva de Biosfera Seaflower-Archipiéla

Level of Contamination by Metallic Trace Elements and Organic Molecules in the Seagrass Beds of Guadeloupe Island
Nivel de Contaminación de Las Praderas De Phanerogamas Marinas De Guadeloupe Por Metales Trasa, Hidrocarburos Aromáticos Y Pesticidas
Niveau De Contamination Des Herbiers De Phanérogames Marines De Guadeloupe Par Des Éléments Trace, Hydrocarbures Aromatiques Et Pesticides.

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ABSTRACT

In terms of area of extent, seagrass beds represent the main marine coastal ecosystem in the French West Indies. They also constitute nurseries for many invertebrates and fishes harvested by local fisheries. In Guadeloupe, coastal fish stocks are declining; concurrently, some agricultural areas, rivers, and mangroves areas have been shown to be heavily contaminated by pollutants. Moreover, the National Park of Guadeloupe plans to re-introduce West Indian manatees in the Grand Cul-de-Sac Marin Bay (GCSM), from which they disappeared at the beginning of the last century. Considering these facts, a study of contamination of the seagrass beds (8,000 ha) of GCSM was conducted on both sediments and marine phanerogams (*Thalassia testudinum* and *Syringodium filiforme*). The analyses concerned 6 metals (Cd, Cu, Hg, Pb, V, Zn), tributyltin, 18 polycyclic aromatic hydrocarbons (PAHs), 8 polybrominated diphenyl ethers (PBDEs), 38 polychlorobiphenyls (PCBs), dithiocarbamates (CS2 residues) and 225 pesticide molecules. In general, the level of contamination of the seagrass beds was low for both sediments and phanerogams. Metallic trace elements were the main pollutants, but their locations remained coastal and their distribution can be explained by proximity to river mouths and current patterns. The level of contamination was lower in plants than in sediments; however, the level of contamination between these two compartments was significantly correlated. In conclusion, the level of contamination of the GCSM seagrass beds is low and does not appear to be a risk factor for fish and shellfish nurseries or grazing manatees.

KEYWORDS: seagrass, contamination, trace elements, hydrocarbonates, pesticides

Long Term Decline of a Keystone Fish Species *(Stegastes planifrons)* on the Coral Reefs of Guadeloupe Island
Disminución a Largo Plazo de una Especie de Peces Clave *(Stegastes planifrons)* en los Arrecifes de la isla De Guadeloupe
Déclin d'une Espèce-Clé de Poisson *(Stegastes planifrons)* des Récifs Coralliens de Guadeloupe

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ABSTRACT

The health of Caribbean coral reefs has significantly declined for the last 30 years. This phenomenon is characterized by a shift from benthic communities dominated by corals to macroalgae communities. Several causes, such as herbivorous fish overfishing, eutrophication of coastal waters, *Diadema* urchins epizooty, among others have been evoked. A long term monitoring study of*Stegastes planifrons* on a reef of Guadeloupe Island shows a significant decrease of the abundance of that species between 1988 to 2010. The density of *Stegastes* decreased from 28.6 ± 1.2 individuals for 300 m^2 of reef surface, in 1988, to 1.89 ± 1.2 individual for 300 m^2 between 2005 to 2010. Main negative turn points in the tendency correspond to the year 1989 (hurricane Hugo) and 1995 (hurricanes Luis and Marylin). These phenomena were the cause of important architectural destructuring of the reef habitat.Field observations of the territories of *Stegastes planifrons* led to an estimate on the average size of a territory of 1.26 ± m^2. Cross-calculation between these data shows that the reef surface controlled by *Stegastes planifrons* decreased from an estimate of 8 % to 0.8 % over a period of 22 years. *Stegastes planifrons* is known to significantly control algal communities. On their territories, the algal diversity is higher than outside and above all macro-algae are replaced by turf. The strong decline of *Stegastes planifrons* on the reefs of the French Antilles might have played a significant role in the shift between corals to macroalgae observed these last decades in the reef communities.

KEYWORDS: *Stagastes planifrons*, Guadaloupe, Time series, coral reef health

Long and Short Term Economic Drivers of Overexploitation in Honduran Coral Reef Fisheries Due to their Dependence on Export Markets
Factores Económicos a Largo y Corto Plazo Que Impulsan la Sobre Explotación de las Pesquerías en los Arrecifes Coralinos de Honduras, Debido a su Dependencia de los Mercados de Exportación
Facteurs Économiques à Long et Court Terme Qu'ils Promeuvent le Sur l'Exploitation des Pêcheries dans les Récifs Corallins du Honduras, Étant Donné leur Dépendance des Marchés d'Exportation

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ABSTRACT

Improvement in international trade routes which have connected rural fishing communities to international markets have significantly altered the supply and demand dynamics of small scale fisheries for many Caribbean coastal and island communities. In the current study I examine the economics of a small fishing community in the Bay Islands of Honduras, to assess how connecting the community to international markets in 1992 has affected fish price structure, fishing effort, and profit shares. The study brought together data from the purchasing records of the main fish buyer in the community, direct data of fish landings and continuous records from the main fish exporter, dating back to establishment of the enterprise. Whilst the results show the "classic" reductions in landed catches of the grouper, snapper complex, more surprisingly the study found that the price per pound paid to fishermen has not changed in local currency (Lempira) since 1992. This is significant as the lempira has more than halved in value against the dollar over the same time period, whilst costs of fishing, especially fuel, have risen sharply, as has the cost of living. In consequence the profit margin of the local fishermen has continued to fall, pushing them to continually increase effort to maintain income levels. The inabilities of fishermen to set their sale price in relation to their fishing costs and the continual shift in profit share from fishermen to exporters over the time period are important causes of escalating effort and the overexploitation of coral reef fisheries in Honduras.

KEYWORDS: Serranidae, Lutjanidae, Artisanal, Profit-share, Utila

Reef Fish Community Differences among the U.S. Virgin Islands and Implications for Management
Las Diferencias en las Comunidades de Peces de Arrecife Entre las US Virgin Islands y Implicaciones para la Gestión
Les Différences dans les Communautés de Poissons de Récif Entre Les Us Virgin Islands et Implications pour la Gestion

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ABSTRACT

Understanding the spatiotemporal relationships of reef fish communities can aid in applying ecosystem-based management principles. Reef fish communities of the U.S. Virgin Islands (USVI) fall under the management purview of the USVI Department of Planning and Natural Resources (DPNR) and NOAA. Management actions and laws are based on territory-wide catch estimates and fishery independent data sets and are therefore applied equally across the three islands of St. Thomas, St. John, and St. Croix. However, fishing practices and intensity differ on St. Croix and a significant distance separates it from St. Thomas and St. John. A multivariate analysis of synoptic fishery-independent reef fish data revealed separation of reef fish communities between St. Thomas and St. Croix. For some species this difference could be fisheries-related. However, non-targeted species and communities also varied significantly within similar habitats, suggesting potential ecological impacts. While both islands possess similar reef habitats (e.g., deep shelf edge reefs, shallow nearshore reefs), these habitats are distributed across a more extensive shelf area on St. Thomas. Reef fish communities differed significantly along a nearshore to offshore gradient while St. Croix reef fish communities did not, suggesting that shelf size may also be influencing reef fish community composition and distribution. These results suggest that reef fish community composition is controlled by the combined effects of resource extraction and biophysical variability.

KEYWORDS: reef fish communities, US Virgin Islands, Multivariate analysis, Ecosystem based management, Fishery independent data sets

CaMPAM Training Program: 12 Years of Building MPA Capacity and Developing Partnerships in the Wider Caribbean
El Programa de Capacitación de CaMPAM: 12 Años de Trabajo en la Formación de Capacidades de las AMP y el Establecimiento de Asociaciones con Diversas Instituciones del Gran Caribe
Programme de Formation du CaMPAM: 12 Ans de Travail dans le Renforcement des Capacités des AMP et des Partenaires dans la Région des Caraïbes

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ABSTRACT

Since its creation in 1997 by the UNEP Caribbean Program, the Caribbean MPA Management Network and Forum (CaMPAM) has undergone a notable transformation to improve its effectiveness and better serve the needs of MPA practitioners in the Wider Caribbean region. The continuous effort by UNEP to attract the interest and energy of individual experts, and develop a diversity of partnerships has been the *philosophical stone* that has converted CaMPAM into a communication and training program that now serves the MPA community of the wider Caribbean. However, despite the existence of this and other MPA training initiatives (by OPAAL, TNC, MAR Fund, GEF, national MPA agencies, and other) that have contributed to the increasing qualification of MPA practitioners, there are still large differences in capacity between countries and there are also in different stages of developing effectively designed and managed MPA national systems, one –a good one but not the only- important tool to achieve an effective national coastal management scheme. Among the challenges facing MPA managers are lack of economic incentives for local community participation in MPA management, lack of government support for regional environmental initiatives, and weak national policies supporting the effective implementation of MPA programs. This paper presents an overview of the strategy of the CaMPAM capacity building program, and the work of UNEP-CEP and its committed partners to address those challenges and better serve and meet the training needs of an ever changing MPA community.

KEYWORDS: marine protected areas, Wider Caribbean, training, conservation, partnerships

Sexualidad y Ciclo Sexual de la Cuna Gata *Mycteroperca tigris* de los Arrecifes Coralinos del Banco de Campeche (Sureste del Golfo de México)
Sexuality and Sexual Cycle of the Tiger Grouper *Mycteroperca tigris* from Coral Reefs of the Campeche Bank (Southeastern Gulf of Mexico)
Sexualité et Cycle Sexuel de la Badèche Tigre *Mycteroperca Tigris* Originaire Des Récifs Coralliens du Banc de Campeche (Sud-Est du Golfe du Mexique)

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RESUMEN

Debido a varias características de su ciclo de vida, los meros (Serranidae, Epinephelinae, Epinephelini) son especies muy sensibles al impacto producido por la actividad pesquera. En particular, dos aspectos de su biología reproductiva los hacen aun más vulnerable: su sexualidad (hermafroditismo protógino) y su comportamiento de desove (formación de agregaciones reproductivas). La cuna gata *Mycteroperca tigris*es un mero de valor comercial en toda su área de distribución geográfica, incluyendo la plataforma continental (Banco de Campeche) de la Península de Yucatán, en el sureste del Golfo de México. Los principales aspectos reproductivos de esta especie han sido poco estudiados y no existen datos disponibles para las poblaciones distribuidas en el Golfo de México. El propósito del presente trabajo fue de definir el patrón de sexualidad y caracterizar el ciclo sexual de la cuna gata en zonas de arrecifes coralinos del Banco de Campeche, donde la especie forma una agregación reproductiva explotada vía la pesca. Un total de 621 organismos (326 hembras y 295 machos) fueron capturados mensualmente, entre enero de 2008 y octubre de 2009. El examen histológico de las gónadas reveló que la mayoría de los machos colectados presentaron testículos con una cavidad interna delimitada por una membrana (88%) y/o senos espermáticos en la pared de las gónadas (74%), dos caracteres distintivos de un hermafroditismo de tipo protógino. La proporción de sexos (macho: hembra) global (1:1.10) no fue significativamente diferente de una proporción sexual equilibrada (1:1). La evolución mensual de los valores del índice gonádo-somático y del porcentaje de las fases sexuales permitió ubicar el periodo de desove de la especie entre marzo y mayo con picos de emisión de gametos en abril.

PALABRAS CLAVES: Sexualidad, Ciclo sexual, *Mycteroperca tigris*, Golfo de México

Policy Implications of Larval Dispersal Scales by Caribbean Spiny Lobster in The Bahamas.
Implicaciones de Política de Gestion de las Escalas de Dispersión Larvarias de Langosta Común del Caribe en The Bahamas
Implications Politiques de Gestion des Échelles de Dispersion Larvaires de la Langouste des Caraïbes dans les Bahamas

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ABSTRACT

Caribbean spiny lobster (*Panulirus argus*) supports major fisheries throughout the Caribbean, especially in The Bahamas, which reports the highest catches and where lobster serves as the number one food export. *Panulirus argus* possesses a long pelagic larval duration (PLD), estimated at 5-7 months. The possibility for long-range dispersal increases the difficulty when determining origins of local adult populations. Additionally, larval behavior can constrain dispersal, complicating the dispersal scenario and its implications for conservation and management. We used a coupled biophysical model to explore policy implications of lobster larval dispersal in The Bahamas by simulating dispersal from scaled egg production of 47 Bahamian release locations to determine the mean dispersal kernel and identify hotspots of settlement. The model, initialized biweekly from April through September (the highest months of larvae production in The Bahamas) simulated lobster larval dispersal using a maximum PLD of 180 days, and included diel and ontogenetic changes in vertical migration that influence transport. The dispersal kernel in The Bahamas was 100-300 km, indicating that larvae released within its boundaries typically settled there as well. Due to the long PLD, larval particles travelled 4000 km or more from source locations; those same larval particles still settled within The Bahamas, suggesting local retention – a finding that contradicts the common perception that lobster in The Bahamas originate elsewhere. This new knowledge has important ramifications for the conservation and management of the Bahamian *P. argus* fishery, including the implementation of MPA networks and assessment of current input and output management controls.

KEYWORDS: connectivity, biophysical modeling, dispersal kernels, Caribbean spiny lobster, MPAs

Reducing the Susceptibility of Parrotfish to Fish Traps; A Meta-Analysis Identifying Feasible Management Strategies
Reduciendo la Susceptibilidad de los Peces Loro a las Trampas; Un Meta-Análisis que Identifica Estrategias Viables De Manejo
En Réduisant la Susceptibilité des Poissons Perroquet aux Pièges; Une Méta-Analyse Identifiant Des Stratégies Faisables De Maniement

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ABSTRACT

Parrotfish are essential to the health and resilience of coral reefs. As the Caribbean's main herbivores they reduce the extent and canopy height of macroalgae, create space for coral settlement and mediate spatial competition between corals and algae. Due to their crucial ecological function protecting parrotfish populations is an increasing management priority across the region. Identifying and implementing realistic yet effective management strategies for areas that are subject to fishing pressure is essential considering that 98% of Caribbean coastal waters are not under marine protection. Parrotfish may be particularly vulnerable in locations where fish traps are widely used. Their simple construction and ease of deployment, combined with their ability to capture fish not susceptible to hook-and-line make this non-selective fishing gear advantageous to fishers. However their sustained use has been widely blamed for the overexploitation of near shore reef fish populations including parrotfish in many areas of the Caribbean.In the current study we collated data from the literature and combined this with results from original trap experiments conducted in Honduras to build a regression model to calculate the importance of different factors affecting the susceptibility of parrotfish species to trapping, including design, dimensions, mesh size, deployment substrate, depth and soak times. The results suggest easily interpretable management guidelines for fish trap use to be applied in areas where banning fish traps is currently unachievable due to limited enforcement capacity, strong cultural connections to fish traps, or a large economic dependence with few available alternatives.

KEYWORDS: Scaridae Vulnerability, Fish Traps, Management Strategies

Age-Frequency Distributions of a Protected Mutton Snapper (*Lutjanus analis*) Aggregation following 17 Years of Protection
Distribuciones de Frecuencia de Edades de Pargos Criollos (*Lutjanus analis*) de Agregaciones Protegidas Luego de 17 Años de Protección
Distributions de Fréquence D'Ages de Vivaneaux Sobres (*Lutjanus analis*) D'Agrégations Protégées après 17 Années de Protection

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ABSTRACT

Snappers have historically been an important economic stock for the U.S. Virgin Islands, annually contributing nearly 4% of total landings by weight prior to seasonal closures set in place to prevent stock collapse. Evidence of depleted mutton snapper (*Lutjanus analis*) stocks in St. Croix led the Caribbean Fisheries Management Council into developing the Mutton Snapper Seasonal Area Enclosure (MSSAE) in 1993. The MSSAE closes fishing off at a historical fish spawning aggregation (FSA) site, during the March-June mutton snapper spawning season. Between March 2009 and June 2010, 139 mutton snapper were collaboratively harvested with St. Croix fishers within the MSSAE from an anchored fishing vessel at coordinates provided by local fishers. From this sample, 61 otoliths were collected and analyzed to develop age-frequency distributions, an important tool for creating growth curves and examining population structures. This analysis is part of the first effort since the MSSAE was enacted for gauging how successful management programs have been over the past 17 years for rebuilding local mutton snapper stocks. Researchers determined that the sampled population had a mean age of 6.5 ± 1.8 yrs, with a mode of 7 yrs. Additional analyses on length-frequency and weight-frequency distributions, along with examinations of gonadal conditions, provide preliminary evidence that the MSSAE's historical FSA site remains active, although the size of the spawning population continues to be difficult to assess.

KEYWORDS: mutton snapper, age-frequency distributions, fish spawning aggregations, St. Croix, closed areas

Illustrating the Economic Value of Natural Resource Conservation: Divers' Willingness to Pay for Species Sightings and Diversity in Barbados

Para Ilustrar el Valor Económico de la Conservación de los Recursos Naturales: La Voluntad de los Buceadores de Pago Para el Avistamiento de Especies y la Diversidad en Barbados

Illustrant la Valeur Économique de la Conservation des Ressources Naturelles: La Volonté de Plongeurs à Payer pour Observations D'Espèces et la Diversité à la Barbade

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ABSTRACT

The omission of economic concerns, especially a balanced analysis of the costs and benefits of protecting endangered species and their habitats has led to conservation policies that are often ineffective. As such, the systematic failure to recognize the economic value of natural resources has contributed to the continuing decline of ecosystems and biodiversity. The economic consequences of natural resource mismanagement are staggering. For example, the difference between potential and actual net economic benefits from the world's marine fisheries is estimated to be on the order of a US$50 billion per year (World Bank and FAO 2008). According to UNEP (2008), Caribbean coral reef degradation will result in declines of up to US$300 million per year in revenues from dive tourism and up to US$140 million per year in fisheries losses. This paper uses a Choice Model to estimate the economic value of species conservation for divers in Barbados. Initial results suggest divers are willing to pay significantly more (per dive) than they are currently paying, in order to preserve biodiversity.

KEYWORDS: Choice Models, Biodiversity, Barbados, SCUBA

Avances en el Manejo Responsable y Ecosistemico del Caracol *Strombus gigas* en la Reserva de Biosfera Seaflower, Caribe Colombiano

Progress in the Responsible and Ecosystem Management of the Queen Conch *Strombus gigas* in the Seaflower Biosphere Reserve, Colombian Caribbean

Avancements sur le Management Responsable et Eco-Systemique de Lambi *Strombus gigas* dans la Reserve de Biosphere Seaflower, Caraïbes Colombienne

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RESUMEN

En el archipiélago de San Andrés se desarrolló desde inicios de los 80s una intensa pesquería del caracol que, al igual que en el resto del Caribe, diezmó las poblaciones en pocos años. Desde 2000, con la puesta en marcha de la RB-Seaflower, hubo cambios y compromisos adicionales en el manejo de la pesca. Modelos tradicionales de manejo fueron poco exitosos para esta pesquería, por lo que se han incorporado progresivamente nuevas reglas y objetivos a largo plazo que aplican conceptosde reclutamiento por clases de edad, mortalidad y tasas de crecimiento desarrollados por FAO. El nuevo modelo integra datos de distribución y abundancia del caracol, independientes de la pesquería, ponderados por estratos de hábitat y profundidad.Estas aproximaciones toman como referencia un nivel de rendimiento máximo sostenibley definen un tamaño mínimo del stock (50 caracoles /ha), por debajo del cual la pesca es inviable. Además, fijan un nivel máximo de pesca independiente de la densidad del stock (< 8% biomasa disponible) para prevenir sobrecapitalización y tener un margen de protección frente a errores de manejo.Además, el modelo considera: el efecto de reservas marinas,la estimación del stock basado sólo en caracoles adultos, el tamaño del banco, el uso de frecuencias de tallas para evaluar reclutamiento y el análisis de datos de distribución espacial para evaluar la accesibilidad del stock. Bajo este esquema se prohíbe el incremento de la cuota de pesca sin nuevos estudios que lo soporten, pero se permite su disminución si la CPUE decrece. Con la aplicación de estos nuevos criterios se espera alcanzar un adecuado manejo del caracol en la RB-Seaflower.

PALABRAS CLAVES: *Strombus gigas*, Manejo ecosistemico, Manejo responsable, RB-Seaflower, San Andres

Proposal for an International Network of MPAs: *Islands In The Stream*

Propuesta para una res Intrenacional de AMPs: Islas en la corriente

Proposition pour un réseau international d'aires marines protégées: Les Îles dans l'Actuelle

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ABSTRACT

This paper describes an opportunity to create an international network of MPAs around the Gulf of Mexico, working through collaboration with partner nations around the Caribbean and utilizing the concept of connectivity throughout the region. A network in the comparably-complex Gulf of Mexico region could protect sensitive marine areas such as interconnected deep water coral banks and hard-bottom communities vital to the health and sustainability of the region's marine resources. Historically considered and managed as isolated environments, recent discoveries have documented important biological linkages between these underwater communities that are maintained by the clockwise motion of the Yucatan, Loop and Florida currents. Individual reefs and banks, some of which are connected by bathymetric ridges and scarps, provide a nearly-continuous "corridor" from Cuba, Belize and Mexico, then into the Gulf itself. Though separated by large expanses of ocean, the fishes, corals, and invertebrates common to these reefs and banks demonstrate that the health and vitality of resources "downstream" are linked closely to those located "upstream". They are dependent on one another for continued recruitment and replenishment. The Gulf of Mexico region is important for several human uses, which can be preserved so that conservation goals are met while respecting ongoing recreational and economic activity.Existing uses of the Gulf of Mexico can co-exist with a highly protected network of marine protected areas. This paper explores a strategy to establish an international network of MPAs.

Bioenergetics and Trophic Impacts of Invasive Indo-Pacific Lionfish
Bioenergéticas e impactos tróficos del invasor Pez león del Indo-Pacífico
Bioénergétique et des impacts trophiques de envahissantes Indo-Pacifique Lionfish

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ABSTRACT

The lionfish (*Pterois volitans* and *P. miles)* has recently invaded the Atlantic and is threatening native fish communities and coral reefs by altering biodiversity and causing trophic disruption. A bioenergetics model was developed for lionfish and used to model the potential impact on native reef fish communities. Model parameters were derived by laboratory evaluation of consumption and respiration rates for seawater temperatures from 14 to 32°C for lionfish ranging from 19 to 400 g. The model was calibrated with laboratory growth and consumption data, and performance was analyzed to determine the parameters most sensitive to error. The optimal temperature for lionfish consumption is 29.8°C and based on the environmental conditions and observed growth, daily consumption estimates of the observed 393 lionfish/hadensity could remove up to 2.186 kg prey/d during the summer in the Bahamas. This model is a useful tool for examining the influence of temperature on predation rates, exploring the interaction between lionfish and prey communities, and developing predictive values of lionfish trophic impacts throughout the invaded range.

KEYWORDS: lionfish, bioenergetics

Managing Habitat in Coral Reef Ecosystems for Fisheries: Just What is Essential?
Manejando el Hábitat de los Arrecifes de Coral para las Pesquerías: ¿Que Es Esencial?
En Maniant l'Habitat des Récifs de Corail pour les Pêcheries : Qui Est Essentiel ?

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ABSTRACT

Essential Fish Habitat (EFH) is a concept easily understood for single species but difficult to define and incorporate into management across the complex of exploited coral reef fishes. We define EFH by examining distribution patterns across lifestages for 28 species of surgeonfishes, groupers, snappers, grunts and parrotfishes in La Parguera, PR. Patterns were mapped on a Cross-Shelf Habitat (CSH) framework that incorporates both habitat types and geomorphic zones of the insular shelf to create a matrix of individually unique CSHs. Visual counts of 21,877 fishes were mapped on habitats in 24x4-m transects. Patterns were summed across species for early juveniles, juveniles and adults to determine community-scale patterns. Fishes use a wide variety of CSHs during ontogeny, yet certain CSHs stand out in importance. For early juveniles these include vegetated areas (mangrove and *Thalassia*) inside the inner reef line, low relief dead coral areas on the Inner Shelf, and in the Outer Shelf in coral dominated areas associated with the emergent reef. The intermediate-depth forereef of the inner emergent reef is of importance for all lifestages. Nevertheless, it would be difficult to target for protection specific CSHs occurring within a broad seascape, especially since some threats (turbidity, eutrophication) act at the seascape scale. Management should target larger scale priority areas where the full complement of essential CSHs occurs or where threats can be isolated. Management of threats in such priority areas could protect areas critical for fish production and be an important component in regional coastal and marine spatial planning efforts.

KEYWORDS: Essential fish habitat, Coral reefs, Fish-habitat distributions, Reef fisheries management, Marine spatial planning

High Profit Pelagic Fisheries Lure Artisanal Fishers into Cycles of Debt, Risk, and Climate Vulnerability
La Pesca Pelágica de Alta Rentabilidad Lleva a Pescadores Artesanales a Ciclos de Deuda, Riesgo y Variabilidad Climática
La Pêche Pélagique à Bénéfices Élevés Appâte les Pêcheurs Artisanaux dans la Faillite, Les Risques et l'Impact de la Vulnérabilité Climatique

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ABSTRACT

Fishing is an important source of income to many who have limited employment opportunities in tropical rural areas. Typically, most descriptions of fishing practices in these areas have been restricted to reef fish fisheries, and studies that document pelagic fisheries are rare. This paper provides a socio-economic description of the artisanal pelagic fishery in San Pedro de Macorís, Dominican Republic, where we conducted 19 in-person interviews in March 2010. We found that fishermen used extensive local knowledge on migration routes to target a variety of pelagic species including dolphin, billfishes, and tuna, which were available at varying periods during the year. The study also found high levels of dependence on fishing. Average individual income of fishermen (from fishing alone) was three times that of the average rural individual income, but these high earnings were offset by risks and vulnerability. Fishermen identified multiple threats to their livelihood and well-being, including: lack of access to safety equipment and loss of life at sea, reductions in the availability of stocks, climate-driven variability in the timing of arrival of migratory stocks, and cycles of debt incurred due to the unpredictable nature of the fishery. Despite fishers' perceived reductions in fish stocks, reducing harvesting capacity is difficult given the high earnings obtained and the severe lack of alternative income strategies. Short-term improvements in livelihoods may be attained through projects to increase fishers' access to credit, savings programs, and safety equipment. Longer-term improvements are challenging given the overexploited status of stocks upon which fishers are dependent.

KEYWORDS: pelagic, artisanal, economics, fisheries

Invasive Red Lionfish in Shallow Habitats of The Turks & Caicos Islands
El Pez Leon Invasor en Hábitats Superficiales de Las Turks & Caicos Islands
Rascasses Volantes Invasives en Eau Peu Profondes des Îles Turks & Caicos

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ABSTRACT

The distribution of invasive lionfish, *Pterois volitans*,in shallow habitats (<1 m to 3 m depth) has been monitored around South Caicos, Turks & Caicos Islands (TCI) since the first sighting in November 2007. Lionfish appear to be significantly more abundant in seagrass rather than reef habitats. Moreover, the increase in density (estimated from catch per unit effort) increased significantly from 2009 to 2010 in seagrass, but not on shallow reefs. Within seagrass lionfish were found almost exclusively in blowout ledges. The size frequency distribution of lionfish captured in shallow habitats (n = 126) were compared to specimens caught by fishermen and SCUBA diving tourist operations (n = 809) from around the TCI as part of a government initiated competition. The locations of capture of these specimens was unknown, but was assumed to come from deeper predominantly reef habitats and were significantly larger than those caught in exclusively shallow habitats (16.7 cm SL +/- 4.3 SD versus 11.2 cm SL +/- 4.6 SD). Whilst this may be partly attributable to different methods of capture, this may indicate ontogenetic shifts in habitat use.

KEYWORDS: lionfish, invasive, seagrass, blowout

Large-Scale Deployment of Discarded Conch Shells Enhances Juvenile Habitat for Spiny Lobster, Nassau Grouper and Red Hind
Utilización a Gran Escala de las Conchas del Caracol Reina Aumentan el Habitat de Juveniles de Langosta Espinosa, Mero de Nassau y Mero Colorado
Déploiement à Grande Échelle des Coquilles Vides de Lambis Augmente Habitats pour les Juvéniles de Langouste Blanche, Mérou Rayé et Mérou Couronné

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ABSTRACT

In the Turks and Caicos Islands (TCI), discarded queen conch shells are important shelter for juveniles of spiny lobster (*Panulirus argus*), Nassau grouper (*Epinephelus striatus*) and red hind (*Epinephelus gutattus*), all species important to local fisheries. Small scale artificial enhancement of conch shells is known to increase the abundance of these species, but use of this strategy on a scale significant for fisheries had not previously been tested. In January 2009, 1800 conch shells were placed in 3 plots in a contiguous 600 m long stretch of seagrass in Cockburn Harbour, South Caicos, TCI. Plots were spaced at increasing distance from the reef and were subsequently surveyed 8 times between May 2009 and April 2010. Juvenile spiny lobster, Nassau grouper and red hind were observed in all three plots. Spiny lobsters were almost 10 times more abundant than groupers. Densities of lobsters peaked in January 2010 at 1 lobster in every 10 to 16 conch shells and densities remained high throughout the study period. Densities of the groupers were substantially lower with a maximum density of 1 Nassau grouper every 75 shells and 1 red hind every 150 shells. Despite being congeners, Nassau grouper were more abundant with increasing distance from the reef and red hind displayed decreasing abundance with distance from the reef. A strategy to enhance nursery function of seagrass with discarded conch shells appears to be most effective for spiny lobsters rather than groupers.

KEYWORDS: queen conch, spiny lobster, red hind, Nassau grouper, seagrass

Identifying Individual Nassau Grouper, *Epinephelus striatus*, from Natural Markings
Identificación de Individuos de Mero de Nassau, *Epinephelus striatus*, por Marcas Naturales
Identification d'Individus de Mérou Rayé, *Epinephelus striatus*, par Marques Naturelles

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ABSTRACT

Nassau groupers, *Epinephelus striatus*, have patterns of dark spots around their eyes. This study investigated whether these spots could be used as natural markers to identify individuals from digital photographs taken in situ. In order to serve as useful natural tags, markings need to be unique, to persist over time and to be distinguishable from photographs without the need to capture individuals. Photographs were taken of juvenile Nassau groupers ranging in size from an estimated 9 to 40 cm TL in a seagrass area in South Caicos, Turks and Caicos Islands. Individuals appeared to display unique patterns of spots. Individuals were recognisable by the spots around their eyes which persisted over the study period. These natural markers were recognisable from photographs taken with an unsophisticated underwater digital camera whilst SCUBA diving and snorkelling. The use of natural markings of Nassau groupers has the potential to enhance information collected during underwater visual census of this species.

KEYWORDS: Nassau grouper, photo-identification, natural marking, seagrass

The Effect of Seascape Structure on the Spatial Distribution of Juvenile Fish within Benner Bay Mangrove Lagoon, St. Thomas, United States Virgin Islands (USVI)
El Efecto de la Estructura de Marina Sobre la Distribución Espacial de Juveniles dentro de Benner Laguna Mangrove Bay, St. Thomas, Islas Vírgenes De Los Estados Unidos (Islas Vírgenes)
L'Effet de la Structure Seascape sur la Répartition Spatiale des Juvéniles à 'Intérieur de la Lagune de la Baie Benner Mangrove, St. Thomas, Iles Vierges Américaines (Îles Vierges Américaines)

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ABSTRACT

Coastal mangroves in the Caribbean are typically connected to adjacent habitat types through the movements of fish. Understanding the distribution of fish in mangroves therefore requires consideration of the surrounding seascape. This research adopts a multiscale seascape approach to examine the spatial distribution of juvenile fish in a mangrove lined bay in the U.S. Virgin Islands. We sampled fish from the mangrove

fringe using fish traps at 12 random locations. The seascape was mapped for the entire bay from high resolution aerial photography and field validation. Seascape composition was quantified from the habitat map at a range of scales surrounding each sample location using geographical information system tools. Within the bay, the site-to-site differences in the amount of mangrove were insignificant. Instead, structurally heterogeneous seascapes containing mangroves with adjacent dense seagrass and macroalgae in close proximity to coral reefs had significantly highest fish species richness and abundance of juvenile fish. Lowest richness and abundance were characteristic of mangroves with low seagrass cover in adjacent areas and high cyanobacterial cover associated with the inner bay. Similarly, juvenile *Haemulon flavolineatum* (French grunt), *Ocyurus chrysurus*(yellowtail snapper) and *Lutjanus apodus* (schoolmaster snapper)were most abundant at mangrove fringe with a high percent cover of macroalgae (~40%) and seagrass (~10%) proximal to coral reefs than in seascapes dominated by cyanobacteria. In contrast, *Eucinostomus melanopterus* (flagfin mojarra) and *Spheroides testudineus (checkered puffer*)were more abundant in seascapes with high cyanobacteria cover and low macroalgal and seagrass cover, farthest from coral reef.

KEYWORDS: seascape structure, mangroves, seagrass, spatial scale, Caribbean

A Preliminary Assessment: Do Goliath Grouper affect Fish Diversity on Shipwrecks?
Evaluacion Preliminar: Puede la Diversidad de Peces en Arrecifes Artificiales ser Afectada por la Presencia de el Mero Guasa
Une Évaluation Préliminaire: Le Mérou de Goliath Affectent-Ils la Diversité de Poissons sur des Naufrages?

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ABSTRACT

The association between goliath grouper and artificial reefs, especially shipwrecks, has been well established. Goliath grouper (*Epinephelus itajara*) have been protected from all harvest within U.S. waters since 1990, and the species is showing signs of recovery within the Gulf of Mexico and south Atlantic (U.S.). Complaints from some recreational fishermen imply that goliath grouper are affecting community composition at fishing sites. In this study, six shipwrecks were surveyed seasonally over the course of two years (2008 -2010). The total number of goliath grouper was assessed through underwater visual surveys. Goliath grouper sizes were estimated using laser measurement and underwater video. Visual census was performed during each survey to assess the species diversity (number of species) of commercially and recreationally important fish. Species diversity was compared to the total number of goliath grouper observed as well as to season, site size, and site depth. Community composition varied between sites and between seasons, but preliminary analyses do not suggest a negative relationship between goliath grouper abundance and the presence of other commercially or recreationally important fish species.

KEYWORDS: goliath grouper, artificial reefs, *Epinephelus itajara*, shipwrecks

Formal Co-Management Arrangements and MPASuccess in the Wider Caribbean
Arreglos formales de co-manejo y el éxito de las AMP atreves del Caribe
Formelle accords de co-gestion et Succès de AMP dans la région des Caraïbes

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ABSTRACT

A popular conservation tool in the wider Caribbean, marine protected areas are increasingly being managed through co-management arrangements, where government authorities share planning, management, and decision making responsibilities with local users and other stakeholders. Co-management arrangements are expected to improve the planning and management process and enhance social and ecological impacts of MPAs, yet few empirical studies have examined the relationship between co-management and MPA success. Using social and ecological data from a rapid assessment of twenty-eight MPAs and their associated communities in the wider Caribbean, this study investigates relationships between formalized co-management arrangements and measures of MPA success, which consist of stakeholders' perceptions and measured ecological impacts. Findings indicate that formal co-management arrangements were not associated with stakeholders' perceptions of the management process and social impacts, nor with measured impacts on fish and coral conditions; however, co-management arrangements were related to stakeholders' perceptions of some ecological factors. These empirical results support claims in the resource management literature that simply formalizing a co-management arrangement does not necessarily lead to management success. A variety of factors associated with co-management can affect social and ecological performance of MPAs, and it is important that these factors be carefully considered in the design of co-management arrangements.

KEYWORDS: marine protected area, wider Caribbean, co-management

Communication between Marine Science and Policy in the Eastern Caribbean
Comunicación entre la Ciencia de Marina y la Política en el Caribe del Este
Communication entre les Sciences Marines et la Politique dans les Caraïbe Orientales

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ABSTRACT

Marine science seldom "speaks for itself". Marine science, relevant to solving real problems, is still being done without any effort to inform and influence marine policy. This situation applies more to fisheries than MPAs, which often incorporate advocacy, but both are deficient. We suffer the consequences of marine policies that do not utilise research results. Research should mobilise knowledge (scientific, local, traditional) and stimulate learning to enhance future policy-making. Policies that encourage overfishing or poorly designed and operated MPAs, despite available scientific information, are witness to this deficiency. Why do these dysfunctions persist? There is insufficient attention, on both sides, to improving the communication between science and policy. Communication entails understanding people, pathways and products in the context of its purpose or main message. Marine scientists and managers require professional assistance in this area. The Centre for Resource Management and Environmental Studies (CERMES) is seeking to investigate and address these issues and means for improving communication through its Local Area Management Project (LAMP). LAMP, in the context of governance institutions for locally managed marine areas, sought to determine communication products and pathways for influencing policy makers and other key change agents; to use policy groups in Dominica and Grenada for learning best practices and information sharing; and to develop communication strategies for marine resource governance. Lessons learned from these study sites about communication between marine science and policy are likely to be applicable to an array of marine resource governance institutions and arrangements in the Wider Caribbean.

KEYWORDS: communication, governance, local area management, policy, science

Factors Affecting Accuracy and Precision in a Multi-Species Reef Fish Survey: Examples from the NE Gulf of Mexico
Factores que Afectan la Exactitud y Precisión en una Prospección de Peces de Arrecife Multiespecífica: Ejemplos del Noreste del Golfo de México
Facteurs qui Affecten l'Exactitude et Précision d'une Prospection de Poissons de Récif Multiespecifique: Exemples du Norest du Golfe du Mexique

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ABSTRACT

Incorporating stratification by habitat type in the design of a reef fish survey is an obvious way to improve efficiency, optimize survey resources, and obtain more accurate abundance estimators for a given species. The issue becomes complex, however, in a multi-species survey covering a diversity of habitats. Post-stratification of collection records -- censoring some or many depending on the species -- may be necessary. It is no secret that the heavily exploited reef fishes (mostly serranids and lutjanids) in the northeastern Gulf of Mexico are closely tied to hard/live bottom habitat most or all of their lives. Cross-shelf mapping and video surveys conducted by NOAA Fisheries Service's Panama City lab revealed that such habitat is not only widespread across the West Florida shelf, but also varies widely in relief, rugosity, morphology, density, area, and in density and composition of attached biota. Not surprisingly, these different forms of hard bottom often hold different suites and densities of reef fishes; and demographics within species may also vary. Variability related to depth, zoogeographic boundaries, species-specific patchiness, and behavior relative to survey gear is also common. All of these factors can result in species-specific effects on the precision and accuracy of survey indices; and must be considered in the design of, and analysis of data from, a multi-species reef fish survey. We present some species-habitat-location examples and compare frequency of occurrence and precision of abundance indices between trap and camera data for several species of reef fish from the NE Gulf.

KEYWORDS: reef fish survey, post-stratification, Gulf of Mexico, precision, hard bottom habitat

Evaluación del Efecto de la Pesquería de Arrastre de Camarón sobre la Estructura de Tamaños de la Ictiofauna Acompañante en el Golfo De Salamanca, Caribe de Colombia
Assessment of the Artisanal Shrimp Trawl Fishery effects on Fish Bycatch Size Structure in the Gulf Of Salamanca, Colombian Caribbean Sea
Evaluation De l'Effet de la Pêche au Chalut des Crevettes sur la Structure des Tailles de la Ictiofaune Accompagnante dans le Golfe de Salamanca, dans les Caraïbes en Colombie

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RESUMEN

Las pesquerías de arrastre se han caracterizado por afectar las poblaciones de especies no objetivo y los ecosistemas en que operan. En el Golfo de Salamanca se desarrolla recientemente una pesquería artesanal de arrastre de camarón, por lo que se requieren estudios que analicen los efectos ecológicos de esta actividad. Para este propósito, se efectuaron muestreos a bordo que permitieran identificar y cuantificar la pesca acompañante. Se calculo el porcentaje de tallas por encima de la talla a la madurez (L_m) y la talla optima de captura (L_{opt}). Se registraron más de 50 especies entre peces, de las cuales solo especies pequeñas y sin interés comercial o de consumo como *Stellifer chaoi*, *Symphurus caribbeanus* y *Trinectes paulistanus* presentaron tamaños que excedieron en más del 75% de los casos los indicadores biológicos evaluados. Los individuos capturados de especies medianas y grandes, con interés comercial y de consumo (e.g. *Conodon nobilis*,*Cathorops mapale*,*Scomberomorus brasiliensis*) tuvieron en todos los casos tamaños inferiores a L_m y L_{opt}. De acuerdo a los resultados, preocupan los efectos sobre la estructura de tamaño de la comunidad íctica demersal, principalmente sobre los juveniles, lo cual sugiere el papel de la zona de pesca como sitio de cría y reclutamiento. Es urgente la implementación de medidas para mitigar el impacto de la pesca de arrastre artesanal sobre las comunidades marinas y el ecosistema que promuevan la sostenibilidad de la actividad pesquera en esta región del Caribe de Colombia. Estudio auspiciado por Colciencias (Proyecto 1117-489-25529), Universidad del Magdalena.

PALABRAS CLAVES: Biodiversidad, Pesquería artesanal, Indicadores biológicos, Pesca acompañante, Mar Caribe

Why are Lionfishes (*Pterois*, Scorpaenidae) So Rare in their Native Ranges?
Por Que *Lionfish* (Pterois, Scorpaeidae) Tienen poco com en sus Variedades Indígenas?
Pourquoi les Poissons Lions (*Pterois*, Scorpaenidae) Sont-Ils Assez Rare Dans Leurs Aires de Répartition?

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ABSTRACT

Rarity in tropical and subtropical coral reef fishes is an important ecological and biogeographical concept that has received little attention until recently. These studies have emphasized the relative lack of information about the processes that limit the distributions or abundances of rare species. This lack of information extends even to assumptions about ecological processes acting upon life history traits that may vary significantly from what might be seen in common species. Lionfishes (genus *Pterois*, family Scorpaenidae) of the Indo-West Pacific region are typically uncommon or rare throughout most of their native ranges. Two species, however,*Pterois volitans* and *P. miles*, both invasive species in the Caribbean and Gulf of Mexico, are anything but rare. Since their introduction to the western Atlantic region, both species, but especially *P. volitans*, have exploded in terms of patterns of distribution, colonization rates, and abundance. Shifts in the behavior of these lionfishes are apparent, as well, and the success of these invasive species is causing major negative impacts already. How and why these species have become successful within the western Atlantic is the subject of considerable research. The how and why of their rarity within their native ranges has drawn less attention. In this paper, we present the preliminary results of various surveys conducted within the western and central Pacific over the last thirty years in an attempt to understand patterns of lionfish (*P. volitans*, *P. antennata*, and *P. radiata*) distribution, abundance, habitat association and behavior.

KEYWORDS: Abundance, Behavior, Distribution patterns, Habitat use, Life history

Evaluation of Marine Protected Area's Performances: The Case of Little Cayman and Cayman Brac, Cayman Islands
Evaluación de los Rendimientos de las Áreas Marinas Protegidas: El Caso de Little Caimán and Caimán Brac, Caimán Islandés
Evaluation des Performances des Aires Marines Protegées: Le Cas de Little Cayman et Cayman Brac, Cayman Islands

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ABSTRACT

Cayman Brac and Little Cayman are small remote islands (< 30 km²) centrally located in the northwest Caribbean. Their MPA's were established in 1986 and have never been assessed to determine the performance on their coral reef fish assemblages after 24 years of conservation and active enforcement of no-take zones. In this study, important fish species for reef health status and species most commonly targeted by fishers have been compared between protected areas and non-protected fished areas. An Underwater Visual Census (UVC) was carried out around both islands during the months of January through to April 2009. For 53 target species, biomass, size and density were investigated for comparisons. With no commercial fisheries, low fishing pressure, and low population, data collected demonstrated mixed results of their MPA's concerning efficiency, effectiveness and performance. Cayman Brac in particular only showed a significant difference ($p<0.01$) in the north MPA when mean fish size per transect were compared. Little Cayman's north MPA showed significant differences in mean Biomass per transect ($p<0.001$) and mean biomass per family ($p<0.05$). In its south MPA, significant differences were found in mean biomass per transect ($p<0.001$), and per family ($p<0.05$), mean fish size per transect ($p<0.001$), mean size classes per species ($p<0.001$), and mean density per transect ($p<0.01$). Additionally, ratios of herbivore to carnivore were investigated for each MPA. Overall, the results show that the MPAs of Cayman Brac are inefficient and ineffective, however Little Cayman demonstrated a more balanced system of MPAs, but vulnerable to over fishing.

KEYWORDS: Marine Protected Areas, Coral reef fish, Reserve effect, Cayman Islands

Valoración Económica Preliminar de los Recursos Marinos Vivos en el Golfo de Salamanca, Caribe de Colombia
Preliminary Economic Valuation of the Biotic Marine Resources in the Gulf Of Salamanca, Colombian Caribbean Sea
Évaluation Économique Préliminaire des Ressources Marines Biotiques dans le Golfe de Salamanque Colombie, Mer des Caraïbes

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RESUMEN

La toma de decisiones adecuada para el uso y manejo de los bienes y servicios ecosistémicos requiere de la evaluación de la importancia o valor de dichos bienes para la sociedad. No obstante, consideraciones económicas son marginalmente incorporadas en las evaluaciones de las pesquerías artesanales del Caribe. Considerando la importancia ecológica, social y económica del Golfo de Salamanca, Caribe de Colombia, se realizó una valoración económica preliminar de los recursos marinos vivos enfocada a los valores de uso directo relacionados con el servicio de pesca. Para este propósito, se estimó la biomasa de peces demersales en el área de estudio (796.6 km2) a partir de tres cruceros de evaluación efectuados en 1997. Las tasas promedio de captura fueron estimadas con el estimador de proporción. El cálculo del valor económico anual de los recursos pesqueros se realizó con base en el muestreo de las capturas entre los años 1994 y 1998, empleando el precio a nivel del consumidor (valor presente) de cada una de las especies. Un total de 87 especies de peces fueron registradas en los cruceros científicos y se obtuvo una biomasa demersal estimada de 738.30 ± 56.93 t (I.C. 95%) que atribuye un valor económico promedio de US$ 1,687,052. Tres especies de pargos (L. synagris, L. analis y L. jocu) representan porcentajes acumulados de alrededor del 53% del valor económico total. Se estimaron capturas promedio anuales (incluyendo especies pelágicas) de 525 t que representan US$857.851. El mayor porcentaje del valor se debió a Cetengraulis edentulus (50.9%). Además del valor ecológico, el área ofrece servicios importantes económica, social y culturalmente para los pescadores artesanales locales. Estudio auspiciado por Colciencias (Proyecto 1117-335-18591), Universidad del Magdalena.

PALABRAS CLAVES: Valoración económica, Servicios ecosistémicos, Pesquería artesanal, Mar Caribe, Colombia

Distribución Espacial de Indicadores Biológicos Simples en la Pesquería Artesanal del Norte del Mar Caribe de Colombia
Spatial Distribution of Simple Biological Indicators in the Artisanal Fishery of the Northern Colombian Caribbean Sea
Distribution Spatiale des Indicateurs Biologiques Simples dans la Pêche Artisanale de la Mer des Caraïbes, La Colombie

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RESUMEN

Las poblaciones de peces y el esfuerzo pesquero están estructurados espacialmente, por lo cual las estrategias de análisis y de manejo de los recursos requieren incorporar la dimensión espacial para responder a las consideraciones ecosistémicas que demanda la comunidad internacional. Para evaluar el estado de explotación de los recursos pesqueros se han propuesto indicadores biológicos simples basados en los tamaños individuales y en las tasas de capturas. El presente estudio explora los patrones espaciales de las capturas de *Opisthonema oglinum*, *Caranx crysos*, *Lutjanus synagris* y *Lutjanus analis*a la luz de dichos indicadores en la pesquería artesanal del norte del mar Caribe de Colombia. Los datos empleados provienen del registro de capturas y esfuerzo realizado durante el periodo comprendido entre 1993 y 2001. Los indicadores empleados fueron longitud a la madurez, longitud óptima de captura, longitud de mega-reproductores y CPUE. Para el análisis del estado de explotación, se propuso un modelo que considera puntos de referencia múltiples basados en tamaños individuales, empleando la aproximación del semáforo. Los resultados fueron representados mediante un sistema de información geográfica. La mayor fracción de los individuos capturados tuvo longitudes inferiores a los indicadores evaluados en todas las zonas en que operó la pesquería, pero la CPUE fue variable espacialmente. Las mayores señales de sobreexplotación fueron evidenciadas en las capturas de *O. oglinum* y de *C. crysos* con red de tiro, de *L. synagris* con línea de mano y de *L. analis* con red de enmalle. El régimen de pesca artesanal observado precisa ser modificado en la región para establecer esquemas de uso responsable de los recursos. Estudio financiado por Colciencias (Proyectos 1117-335-18591, 1117-341-19398) y Universidad del Magdalena.

PALABRAS CLAVES: Indicadores biológicos, Pesquerías artesanales, Análisis espacial, Mar Caribe, Colombia

Reducción de la Diversidad de Peces de los Arrecifes Coralinos a Lo Largo de un Gradiente de Contaminación en La Isla De San Andres, Caribe Colombiano
Coral Reef Fish Diversity Reduction along a Pollution Gradient in San Andres Island, Colombian Caribbean
Reducción de la Diversidad de Peces de Los Arrecifes Coralinos a Lo Largo de un Gradiente de Contaminación en La Isla de San Andres, Caribe Colombiano

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RESUMEN

Los arrecifes oceánicos de La isla de San Andrés es uno de los ecosistemas coralinos más extensos y productivos del hemisferio occidental. En la isla, se han identificado aproximadamente 57 especies de coral y 273 especies de peces que representan 54 familias, de las cuales dos son endémicas. Se realizaron censos de peces según Thomson y Schmidt (1997), en tres estaciones a lo largo de un gradiente de contaminación de aguas negras provenientes de un emisario submarino. Con los datos de los censos se calcularon los índices de riqueza de Margalef (d), uniformidad de Pielou (J´), diversidad de Shannon (H´) y Dominancia de Simpson (λ). En general, la diversidad de peces arrecifales disminuyó en las estaciones más cercanas al foco de contaminación. Los grupos de peces más abundantes fueron el de los herbívoros y coralivoros tales como los cirujanos (Acanthuridae), loros (Scaridae) y los loritos (Labridae), mientras que la mayoría de peces omnívoros y carnívoros se presentaron en baja frecuencia (Lutjanidae, Serranidae, Haemulidae). El principal indicador de los efectos contaminantes del emisario submarino fue *Gramma Loreto*, el cual disminuyo su abundancia en las estaciones cercanas al foco de contaminación. Es importante disminuir los niveles de contaminación de la isla, ejerciendo el status de reserva de la biosfera.

PALABRAS CLAVES: Biodiversity, Fishes, Coral reefs, Pollution, San Andres Island

Assessing the Ecological and Economic Impact of Derelict Traps in the U.S. Virgin Islands
Evaluar el Impacto Ecológico y Económico de Capturas de Peces Abandonados en Las Islas Vírgene
Évaluation de l'Impact Économique et Écologique de Pièges à Poissons Abandonnées dans les Iles Vierges

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ABSTRACT

Fish traps are a widely used multi-species fishing gear in the Caribbean and around the world. When traps are lost or discarded they are considered derelict and are often considered a threat due to "ghostfishing" and habitat damage leading to marine debris removal programs. In the Caribbean, very little is known about the distribution of derelict traps and whether they pose a threat to fisheries and marine habitats. This study uses underwater controlled experiments to quantify the mortality associated with derelict traps and a "TrapCam" to record animal behavior within and around traps. In addition, a combination of local knowledge and autonomous underwater vehicles was used to locate and survey derelict traps in St Thomas, US Virgin Islands. Twelve unbaited traps (6 actively fishing & 6 with door open) were monitored for 3 days a week for 6 months. Fish sizes, condition and behavior were recorded, as well as the deterioration of the biodegradable rot cord that is required under US Virgin Islands regulations. The number of days fish spent in the traps before escaping or expiring was determined and timing of entry and behavior was recorded from the surveillance camera. The economic value of mortality was estimated based on market value. The vast majority of fish appeared able to enter and leave the traps, but some species-specific vulnerability was evident. This study will for the first time objectively and quantitatively determine the impact of derelict fish traps and will provide useful information for both fishing communities and managers.

KEYWORDS: derelict gear, ghostfishing, fish traps, marine debris, fisheries

SPrograma Educativo y de Difusiòn de la Ciencia sobre la Conservación de la Biodiversidad del Mar Caribe Programa Educativo para la Conservación de la Biodiversidad del Caribe: Out Reach Program of Caribbean Sea Biodiversity Programme Educative sur la Biodiversité Marine de la Caraibbe

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RESUMEN

Con el objetivo de sensibilizar a la sociedad sobre el valor ecológico, económico y cultural que tiene la biodiversidad marina del Caribe, se creó el *Programa educativo **del Caracol rosa, del Caribe.*** Desde 2002 el Centro de Investigación CINVESTAV, el Archipiélago de las Ciencias de las Antillas francesas y el Parque de Xel-Há, han implementando sobre resultados de investigación; el desarrollo de un Paquete Educativo sobre esta especie como uno de los mecanismos utilizados para sensibilizar a la población sobre cómo a partir del conocimiento del ciclo de vida de una especie se elaboran las regulaciones pesqueras y su cultivo para su uso sostenible y responsable. Este Programa dio origen al "Programa Educativo Conservación de la biodiversidad del Mar Caribe", el cual ha elaborado exposiciones franco mexicana que han sido expuestas en diversos Museos y espacios públicos de México y Francia. El presente trabajo presenta el contenido de este programa, cómo se aplica y los resultados del mismo. Es un programa que ha sido apoyado por instituciones públicas, empresas eco turísticas como el Parque de Xel Ha y el Caribbean Fisheries Management Council. A través de estos años ha generado también la edición de libros, y actividades-juegos que pueden ser adaptados a las situaciones particulares de cada región. Este programa ha permitido también la capacitación de maestros y las experiencias con pescadores, restaurantes, empresarios, y artesanas. Se resumen algunas distinciones que ha recibido este programa educativo sobre la conservación de la biodiversidad Marina del Caribe

KEYWORDS: Education, Program, Caribbean, Biodiversity, Conservation

Comprehensive Strategies to Fight the Atlantic Lionfish Invasion
Estrategias en la Lucha contra la Invasión Atlántica del Pez León
Des Stratégies Globales de Lutte Contre l'Invasion Lionfish Atlantique

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ABSTRACT

The magnitude of the Atlantic invasion of the Indo-Pacific red lionfish (*Pterois volitans*) requires a comprehensive approach with several eradication and control strategies. Based on Sun Tzu's *The Art of War* from 600 BC, we can apply a 3-step process: knowing the enemy, finding allies, and attack. Recent reports indicate lionfish habitat use is more diverse than previously expected (from shallow mangrove habitat to deep sea reefs), expanding their minimum temperature tolerance and colonizing ability. Potential native predators are few and scarce. A case study for the goliath grouper (*Epinephelus itajara*) as one of the most likely lionfish native predators is presented. The attack strategy proposed includes regulation of the aquarium trade on exotic imports, engagement of the biomedical community for lionfish toxin use, fishers and divers for lionfish collection (both for food and for scientific study), and outreach to chefs, restaurants and the general public to generate a strong market demand for lionfish. A brief evaluation on potential outcomes achieved with the synergistic effect of the strategies proposed is also presented.

KEYWORDS: Lionfish, goliath grouper, fisheries, aquarium trade, market

A New Bioassay to Study Toxicity and Ecological Impacts of the Atlantic Lionfish Invasion
Un Nuevo Bioensayo para Estudiar la Toxicidad e Impactos Ecológicos en la Invasión Atlántica del Pez León
Un Essai de Nouvelles pour Étudier la Toxicité et les Effets Écologiques de l'Invasion de l'atlantique Lionfish

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ABSTRACT

In the Atlantic invasion of the Indo-Pacific red lionfish (*Pterois volitans)*, the toxicity strength of its poisonous spines is of extreme interest for biomedical and ecological reasons. We used the broad-spectrum toxicity bioassay Microtox® to test whether active toxin could be recovered from dead and previously frozen lionfish specimens. Microtox® employs a bioluminescent marine bacterium (*Vibrio fischer*i) as the test organism. The bacteria are exposed to a range of concentrations of the material being tested. The reduction in intensity of light emitted from the bacteria is measured along with standard solutions and control samples. The change in light output and concentration of the toxicant produce a dose / response relationship. The results are normalised and the EC50 (concentration producing a 50% reduction in light) is calculated. As opposed to more classical methods using brine shrimp or fish larvae as test organisms, Microtox® allows for rapid, sensitive, standardized, ecologically relevant and cost effective results. We obtained positive EC50 results from aliquots (an homogenate obtained from the toxin-producing glands) by using only the dorsal spines of dead lionfish specimens. Although the work is still in progress, our results, coupled with a basic protocol of sample collection, could open new lines of research requiring a fast method to determine lionfish toxicity levels for ontogenetic and eco-regional comparisons.

KEYWORDS: Microtox, Atlantic, lionfish, ontogenetic, regional

Creation of an Autonomous System on Moored Fish Aggregating Device (FAD) for a Permanent Acoustic Monitoring of Marine Mammals and other Perspectives for Marine Environment Attention, Guadeloupe, F.W.I
Creación de un Nuevo Sistema Autónomo sobre un Dispositivo de Concentración de Peces Pelágicos Anclado para el Control Acústico Permanente de los Mamíferos Marineros y Otras Perspectivas de Viligencia del Medio Marino, Guadeloupe, Antillas Francesas
Création d'un Système Autonome Installé sur un Dispositif de Concentration de Poissons Ancré (D.C.P) pour le Suivi Acoustique Permanent des Mammifères Marins et autres Perspectives pour la Surveillance du Milieu Marin, Guadeloupe, Petites Antilles Françaises

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ABSTRACT

The Fish Aggregating Devices (FADs) are widely used in pelagic fisheries. The increased use of these artificial floating objects in the Caribbean is due to their heavy contribution to fishing activities in coastal areas. In Guadeloupe, their mutualisation through the deployment of a fleet of moored FADs, monitored and maintained since 2008, aims to ensure reliable and sustainable fishing devices. To complete an inventory of cetaceans in the Exclusive Economic Zone (EEZ) in the French West Indies, concerned by a project for marine mammal's sanctuary, we assessed the concept of a permanent observatory. Thus, the use of a buoy as a support for a hydrophone has led us to create a customized prototype merging the high technological development of an autonomous acoustic system with a powerful FAD revised with a new engineering. Funded on triptych collaborative skills (Biology - Fisheries - Technologies), our results highlight here the formalization of a new technological answer. We have developed a continuous recording hydrophone (192 kHz, 24 bit) and upgraded the use of a moored FAD at depths of 800 meters. Environmental pressures (natural and anthropogenic), technological constraints (power autonomy, large storage needs, data recovery) and scientific requirements (spatial and temporal scale, variability of species and habitats) were considered. This new concept also suggests other opportunities to improve marine environments research and conservation attention, as a complementary solution of instantaneous methods of observation. The perspective of this work could be the creation of a synchronized network of FADs as instruments for cetaceans monitoring.

KEYWORDS: Acoustics, FADs, Cetacean

Coral Fish Movement Ability Estimation in Marine Protected Areas of Martinique (FWI)
Estimaciónde las Capacidades de los Desplazamientos de los Peces Coralinos en las Areas Marinas Protegidas (AMP) en Martinique
Estimation des Capacités de Déplacement des Poissons Coralliens dans les Aires Marines Protégées (AMP) en Martinique

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ABSTRACT

Marine protected areas (MPA) are valuable tools for biodiversity conservation and fisheries management. Their effectiveness is highly dependent on fish's spillover through unprotected areas. Nowadays, many studies focus on predictive modeling to determine MPA optimal size. We proposed an empirical study in Martinique to evaluate the efficacy of different MPAs according to size (73 ha, 1164 ha, 956 ha). Two complementary methods were selected: 1) Mark-recapture technique aiming at defining insular movements. A total of 1880 fish belonging to 43 species were marked. 2) Acoustic telemetry aiming at determining the movement capacity of coral fish on several time scales (day, season and annual) and their local movement patterns. Three families of fish were selected according to their mobility abilities: the semi pelagic: Snappers, (*Lutjanus apodus, Lutjanus synagris*) and the one with reduced mobility Surgeonfishes, (*Acanthurus chirurgus*) and Parrotfishes (*Sparisoma chrysopterum and viride*). Thirty individuals were tagged per species. Areas home range of some species were determined both by tracking mobile techniques: 1089 m² for *Sparisoma sp.*, 1754 m² for *A. chirurgus* and 4724 m² for *L. apodus* and recapture of individuals: *A.chirurgus* had covered 3.4 km in average and one *L. apodus* had covered 10km during the reproduction period. Different responses were observed according to family, mobility of species and MPA size.

KEYWORDS: MPA, Martinique, fish, acoustic, home range

Mapping Hard Bottom Reef Fisheries Habitat off Northwest Florida – Needs, Methods, and Status
Cartografía del Hábitat de las Pesquerías de Arrecife de Fondo Duro en el Noroeste de Florida-Necesidades, Métodos y Estado
Cartographie de l'Habitat des Pêcheries de Récif de Fond dur au Nord-Ouest de Floride- Besoins, Méthodes et État

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ABSTRACT

The west Florida shelf (WFS) supports some of the most valuable reef fish fisheries in the U.S. Gulf of Mexico. However, very little of its area has been mapped with enough resolution to accurately locate and quantify the hard/live bottom habitat these fisheries are so strongly tied to. Such maps are essential for designing an efficient fishery independent survey of reef fishes, enabling pre-stratification by habitat, and thereby minimizing variance and optimizing survey resources. Accurate habitat maps will also be critical for ecosystem based fisheries management and marine spatial planning. In support of a recently expanded fishery independent reef fish survey, the Panama City NMFS lab began mapping cross-shelf transects on the northern WFS using multibeam and side scan sonar. Two transects ~ 1.5-2.5 X 30 nm were mapped with a 300 kHz multibeam sonar and seventeen single swath cross-shelf transects ~20-30 nm X 150 m were mapped using a 600 kHz side scan sonar. An inexpensive live video drop camera and occasionally an ROV were used for visual ground truthing. Although the multibeam provided bathymetry and backscatter data at very high resolution, the side scan hardware and software was much more user friendly and provided data on which hard/live bottom habitat could, after a very short learning curve, be easily identified. Given the scale of most interest for fisheries-related needs, the 600 kHz side scan sonar may be the most cost-effective tool for our purposes.

KEYWORDS: reef fish, hard bottom, habitat mapping

Seasonal Changes in a Sublittoral Desert: Progreso Blanket, Yucatán México.
Cambios Temporales en un Desierto Sublitoral: El Manto Progreso, Yucatán, México.
Changement Temporaries du Désert Infra-Littoral: Le Manteau Progreso, Yucatan, Mexique.

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ABSTRACT

A thin layer of medium to coarse calcareous sediments, termed Progreso Blanket sedimentary unit, characterizes the bottom of the sublittoral zone of Yucatán. This extensive sand bottom is the predominant feature of the inner shelf of the Campeche Bank. A very active and productive artisan fishing fleet operates in this area, exploiting populations of groupers, snappers, octopus and sea cucumber (in terms of catch volume and economic importance). A relatively small area (1,240 km^2) within this blanket in the northwestern zone of the Yucatán Peninsula was characterized and monitored during one year employing remote sensed imagery and direct field sampling with SCUBA. A multivariate statistics approach defined six different seascapes in the area, and their variability through the climatic seasons (dry, rainy, north-winds) was determined along with the variability of fish communities and their association to the seascapes. Significant differences in benthic covers were found between dry and rainy seasons with north-winds season, but not between dry and rainy seasons. And fish communities fluctuated in an ascending gradient from the north-winds season up to the rainy season. The term sublittoral desert is appropriate for this area because of the resemblance of the sandy plains to land deserts, and because of the low fish biomass and species richness recorded. This ecological trait has important fisheries management implications: the necessity of an increased fishing effort to have a positive economic benefit, and the inherent fragility of the communities due to their low biodiversity and abundance.

KEYWORDS: Seascapes, Variability, Change, Benthos, Fish

Genesis of a Cooperative Fishery Independent Survey for an Island Platform in the US Caribbean
Encuesta Independiente para una Coperativa Pesquera en una Plataforma de Islas en el Caribe de los EEUU
Generation d'un Questionaire Independant sur la Cooperation des Peches pour les Plateformes Insulaires des Antilles Americaines

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ABSTRACT

Fisheries managers in the US Caribbean are currently assessing stocks towards the new annual catch limit (ACL) requirements of the reauthorized Magnuson-Stevens Act. Stock assessment scientists, via the Southeast Data, Assessment and Review stock assessment process (SEDAR), have evaluated all of the available data sources and assessment techniques and overall consensus is that data limitations preclude comprehensive stock assessment for most species. Data limitations in US Caribbean fisheries have made clear the need for a new way forward in assessing the population status of fisheries resources. This project represents a significant step towards filling those gaps by developing a cost-effective fishery independent survey for coral reef fisheries in the US Caribbean. Designed as a pilot project on St. Croix, this survey utilizes the resources of the local fishing communities, universities, resource managers, and existing habitat and socioeconomic data to execute the first spatially comprehensive survey in the region. The study uses both random stratified and geostatistical sampling (systematic and model based) approaches to generate an optimal survey design; and is executed cooperatively with the input and participation of local fishers. Outcomes of this project will address current fishery data-limitations in the US Caribbean, and serve as a model for data collection and assessments in other US territories and Caribbean countries where small-scale fisheries preclude the financial expenditure of expensive, ship based fishery independent surveys. This presentation will talk about the genesis of this cooperative survey, its implementation and will provide a first glance at preliminary results.

KEYWORDS: St. Croix, Fishery Independent, stock assessment, US Virgin Islands, coral reefs

Reeffix Phase 1: Cost-Effective Valuation Tools for Coral Reef Managers
Reeffix Fase 1: Herramientas Costo-Efectivas de Valoracin de Arrecifes Coralinos
Reeffix Phase 1: Outils Coût-Efficaces de Valorisation pour les Responsables de la Gestion de Récifs Coralliens

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ABSTRACT

ReefFix is an Integrated Coastal Zone Management (ICZM) tool that aims to build capacity within marine management agencies by promoting cost-effective economic valuation methodologies which can be used by managers to get a better understanding of the value of coastal ecosystems and build public awareness. This programme, (supported by the government of Chile) is currently being implemented by the Organization of American States' Inter-American Biodiversity Information Network (IABIN) programme at sites around the region. As part of Phase I, the Barbados and St. Vincent and the Grenadines exercises were conducted between the months of October 2009 to May 2010 with the aim of valuing some of the ecological goods and services provided by the reefs and associated ecosystems within the Folkestone Park and Marine Reserve and the Tobago Cays Marine Park. It utilises three methodologies, two developed by the World Resource Institute (WRI) which focus on direct use (fisheries, tourism and recreation) based on market prices and a benefits transfer technique using a habitat typology developed by Troy and Wilson (2006). Results from the Tobago Cays exercise indicated that reefs could be contributing over US$11.7 million in benefits in the Tobago Cays and as much as US$66.1 million in Folkestone. The results are based on data gathered from key informants and available local and national statistics and are therefore limited by the quantity and quality of data available during the short study periods. Differences between methodologies increase the versatility of ReefFix however assumptions in both techniques must be acknowledged.

KEYWORDS: economc valuation, coral reefs, capacity building

Damage Assessment of Vessel Grounding Injuries on Coral Reef Habitats using Underwater Landscape Mosaics
Evaluación de Daños del Buque a Tierra Lesiones en los Hábitats de Arrecifes de Coral don Mosaicos Submarino Paisaje
L'Evaluation des Dommages d'un Navire à la Terre de Blessés sur les Récifs de Corail Utilisation Mosaïque Paysage Sous-Marin

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ABSTRACT

Vessel groundings are a source of disturbance to coral reefs worldwide. Documenting the extent of damage caused by groundings is a crucial first step in the reef restoration process. Underwater landscape mosaics, created by merging thousands of downward-looking images, combine quantitative and qualitative aspects of damage assessment and provide a georeferenced, high-resolution, spatially accurate, permanent record of an injury. Here, we present landscape mosaics of two grounding scars. A 15 m (49 ft) long vessel created one scar, located in the Florida Keys, impacting 150 m^2 of reef. A much larger scar along the south coast of Puerto Rico was created by a 289 m (920 ft) long liquefied natural gas tanker. In both cases mosaics enabled observations at a new spatial scale, had spatial accuracy comparable to GPS, and provided context for traditional, smaller scale observations.

KEYWORDS: underwater image, reef restoration, Evening Star, Suez Matthew

A Survey of Deep Water Reef Fishes on the Continental Shelf of Puerto Rico and U.S. Virgin Islands
Un Estudio de los Arrecifes de Peces de Aguas Profundas en la Plataforma Continental de Puerto Rico y Las Islas Vírgenes de EE.UU
Une Enquête de Récif Poissons d'Eau Profonde sur le Plateau Continental de Porto Rico et Les Îles Vierges Américaines

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ABSTRACT

Between 1979 and 1985, the National Marine Fisheries conducted a series of fishery independent surveys for reef fish off of Puerto Rico using bottom longlines and fish traps. A recent survey was conducted in March 2009 along the west coast of Puerto

Rico and the U.S.Virgin Islands using video cameras, chevron fish traps and bottom longlines. The cameras and fish traps were deployed at depths between 34 and 115 meters while longlines were deployed at depths between 53 and 670 meters. Ninety-one fish species were observed by cameras. Eleven fish species were captured in traps, ten of which were also observed on cameras; 29 fish species were captered on longline gear. *Malacanthus plumieri*, *Balistes vetula*, *Halichoeres garnoti*, *Cephalopholis fulva* and *Epinephelus guttatus* were the most frequently observed species by the cameras. Trap catch was dominated by *Lutjanus buccanella*, *L. synagris* and *C. fulva*. Longline catch was dominated by *Mustelus sp.*,*Carcharhinus acronotus* and *Centophorus sp*. Survey results indicate that the use of cameras provides a more complete view of fish assemblages than either bottom longlines or fish traps; however, several shark species were caught in waters greater than the depth where cameras can be deployed.

KEYWORDS: Fishery Independent Survey, Reef Fish

Integrated Gap Analysis Project: Assessing Conservation of Freshwater, Estuarine, Marine, and Terrestrial Biodiversity
Análisis Integrado del Proyecto Gap: Determinación de la Conservación de la Biodiversidad de las Ecosistemas Agua Dulce, Estuario, Marina, y Terrestre.
Analyse Intégré de Projet Gap: L'Evaluation de la Conservation de la Biodiversité des Écosystèmes d'Eau Douce, d'Estuaire, Marine, et Terrestre.

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ABSTRACT

The structure and function of freshwater, estuarine, and marine environments are affected by surrounding and upstream terrestrial ecosystems. Conservation areas often encompass both terrestrial and aquatic resources. Government policy makers and natural resource managers must often consider a complex landscape matrix and need accurate, fine-scale information on the distribution of species and habitats in order to develop conservation management plans. An integrated terrestrial and aquatic GAP analysis project is addressing this need. The goal is to develop a comprehensive set of databases on Puerto Rico and the US Virgin Islands' freshwater and marine resources – including habitat description and mapping, species distributions and conservation status, and protected areas and conservation priorities – combined with existing Puerto Rico and USVI terrestrial GAP databases, to conduct integrated analyses of gaps in conservation protection. As a start to this project we have complied an annotated list of 1226 animal species associated with terrestrial and aquatic habitats in Puerto Rico and the US Virgin Islands, including 714 fishes, 349 birds, 67 reptiles including 7 turtles, 45 mammals including 9 marine mammals, 26 amphibians, 11 crustaceans, 2 corals, 1 ray, 1 conch, and 1 sea urchin. We have modeled the distributions of over 200 of the terrestrial species and are working on 200 aquatic species and their habitat distributions. These will be used to develop species range maps and predicted distributions, which will then be assessed in terms of the degree to which species and habitats are protected for conservation by reserves and other protected areas.

KEYWORDS: biodiversity, conservation, habitat mapping, protected areas, species distributions

Impact of Oil on Blue Crab Recruitment in Mississippi Waters
Impacto de Petroleo en el Reclutamiento de Jaiba Azul en Las Aguas de Mississippi
Effets du Pétrole sur le Recrutement de la Population de Crabe Bleu Dans les Eaux du Mississippi

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ABSTRACT

Blue crab life history includes an offshore larval stage vulnerable to changes in environmental conditions in the Gulf of Mexico (GOM), particularly on the continental shelf adjacent to Mississippi and Louisiana. Blue crabs spawn from March through October in the northern Gulf of Mexico (nGOM). Hatching of eggs occurs near the barrier islands with zoeae immediately transported to surface waters of the open GOM. Toward the end of this planktotrophic phase, metamorphosis to the megalopal stage occurs and they recruit to estuaries across the nGOM. There is high spatial and temporal overlap between the occurrence of blue crab larvae offshore and the presence of oil and dispersant in offshore waters. Blue crab megalopal settlement is being measured daily using simple settlement collectors deployed in quadruplicate at six sites along the Mississippi coast. Deployment will occur from July 1 to October 31 with the collectors suspended from piers. Once each day the collectors will be removed from the water and all blue crab megalopae and early crab stages present will be removed and preserved in ethanol for identification and enumeration. The seasonal pattern in daily counts of megalopae will be compared to similar data from previous years (1991-1999 and 2007). Loss of recruitment due to oil-induced larval mortality will radiate into the coastal food web, as blue crabs are a keystone species in northern Gulf estuaries. These data are critical to assessing ecosystem response to the oil spill and will provide an important baseline for measuring ecosystem recovery.

KEYWORDS: blue crab larvae, recruitment, Mississippi, oil impacts

Invasive Indo-Pacific Lionfish (*Pterois volitans*) Deplete Reef Fish Populations in the Caribbean
El invasor Pez Leon del Indo-Pacifico (*Pterois volitans*) agota las poblaciones de peces de arrecife en el Caribe
Envahissantes Posson-Papillon (*Pterois volitans*) Épuisement les Populations de Poissons Coralliens dans les Caraïbes

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ABSTRACT

Invasive species are a leading threat to biodiversity across the world's ecosystems. One spectacular invasion that is currently unfolding is that by predatory Indo-Pacific red lionfish (*Pterois volitans*), which are rapidly spreading across Caribbean coral reefs. There is growing concern that populations of these exotic predators will severely impact Caribbean marine ecosystems, particularly by preying on native coral reef fish species. Reconstructing historical reef fish biomass for nine invaded reefs in the Bahamas, we reveal that lionfish have depleted the biomass of their prey by 40-90% in less than four years since their initial colonization of the area. We conservatively estimate that resident lionfish populations must be reduced by up to 95% to prevent further erosion of native fish biomass on those reefs already impacted by lionfish predation. The exponential increases in lionfish abundance observed on many Caribbean reefs strongly suggest that lionfish are capable of severely impacting native fish communities. Our study highlights the urgency of this invasion at the forefront of ecology and conservation research.

Future of Reefs in a Changing Environment (Force) Project
Proyecto el Futuro de Los Arrecifes en un Ambiente Cambiante (Force)
Le projet de l'Avenir des récifs dans un environnement en Changement (Force)

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ABSTRACT

FORCE takes an ecosystem approach, linking social and ecological aspects, towards managing Caribbean coral reefs in the face of climate change. It brings together scientists from 20 organizations from the Caribbean, Europe, USA and Australia. The overall objective is to identify the most appropriate management interventions for coral reefs and the governance structures needed for their implementation. FORCE will determine the effects of climate change, overfishing, pollution and poor governance on the health of Caribbean reefs. The team will then assemble and refine a toolbox of management measures that can be used to improve the health and wise use of coral reefs. Not all management measures are equally effective so the project will use ecological models and novel social science methods to assess the efficacy of each tool and the governance constraints to its implementation. A series of natural and social science case studies will be undertaken in five countries. New field investigations will quantify the effects of changing reef health on biodiversity, seek ways of improving fisheries management, and allow the effects of ocean acidification and coral bleaching to be modelled more accurately. The empirical studies will be integrated with global climate models.

PALABRAS CLAVES: Caribbean, coral reefs, climate change, social, ecological

A Practical Solution to Lionfish Management: CORE Foundation's Caribbean Lionfish Response Program
Una Solucion Practica Para Controlar La Poblacion Del Pez Leon: Programa De Repuesta De La Fundacion CORE Para Peces Leon en el Caribe
Une Solution Pratique pour la Gestion du Poisson-Papillon: Programme d'Intervention de la Fondation Core Auprès du Posson-Papillon des Caraïbes

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ABSTRACT

In less than a decade, the Indo-Pacific Lionfish has rapidly spread throughout the Atlantic and Caribbean regions. Marine ecosystems, as well as the fisheries-based economies of smaller Caribbean countries, will be adversely affected by the invasion of Lionfish if not properly managed in a timely manner. The Caribbean Oceanic Restoration Education (CORE) Foundation, based in the USVI, has successfully developed and implemented an efficient, yet simple lionfish management program using a bilateral marine management strategy, the Caribbean Lionfish Response Program. This two-pronged programmatic approach includes placing divers in the water to locate and remove the non-native Indo-Pacific Lionfish species, while simultaneously, educating local and visiting user groups, youth, and the general public on the threat that Lionfish pose to Caribbean environs, fisheries and tourism. Working together with local agencies, environmental organizations, dive shops, divers, local fishermen and tourist allows CORE to utilize all resources as one. CORE has also established the Caribbean Alliance, a collaborative partnership between other territories and countries throughout the Caribbean. Currently, all parties involved are moving forward together with the common goal of maintaining the critical environmental balance of the Caribbean's beautiful underwater world. This paper will provide unique insights into how CORE has built and maintained a practical/field-tested marine invasive species eradication/public awareness program. CORE is sincerely committed to not only working with their existing partners, but also hopes that their successes and failures can be shared with other agencies and organizations, thus providing a tested model for areas facing similar catastrophic oceanic management challenges.

KEYWORDS: Lionfish, Invasive control, public awareness, management

The Implementation of Principled Ocean Governance in Caribbean Fisheries
La Implementacion de los Principios de la Gobernanza Oceanica en las Pesquerias del Caribe
La mise en œuvre de principes de gouvernance des océans dans les pêches des Caraïbes

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ABSTRACT

Over the past three decades a number of principles, such as the precautionary and ecosystem approaches, have emerged to guide countries towards achieving sustainable and profitable fisheries and healthy marine ecosystems. This paper examines the issues and challenges regarding the governance of marine fisheries in the Caribbean and the extent to which the principles of good ocean governance have been implemented in the policy, legal and institutional frameworks at the regional and national levels. The paper concludes that while the principles have been generally accepted at the international level they are not adequately incorporated in domestic policies and legislations, which is where they are needed most to ensure sustainable fisheries and protection of the ecosystems.

KEYWORDS: principled ocean, governance, Caribbean, fisheries

Management of Response Efforts to the *Deepwater Horizon* Oil Spill: Perspectives from a Northern Gulf Of Mexico Research Laboratory
Manejo de la Respuesta al Derrame de Petroleo en la Plataforma Petrolera "Deepwater Horizon": Perspectivas de un Laboratorio de Investigacion del Norte Del Golfo de Mejico
Coordination des Efforts de Reponse a la Maree Noire Occasionnee par l'Accident Survenu sur la Plateforme "Deepwater Horizon": Perspectives d'un Laboratoire de Recherche Localise dans le Nord du Golfe du Mexique

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ABSTRACT

The offshore drilling rig *Deepwater Horizon* exploded on April 20, 2010 and sank two days later. Crude oil subsequently leaked into northern Gulf of Mexico waters for more than 100 days. The Gulf Coast Research Laboratory (GCRL), an academic research institution focused on marine resources of the northern Gulf of Mexico, soon after

formed an oil spill operations team to manage its response to the spill. The team was comprised of marine and fisheries scientists, outreach specialists, and administrators whose objectives were to coordinate research logistics, explore approaches to obtain investigative research funding, and develop outreach strategies. Initial response efforts focused on complying with health and safety requirements through HAZMAT training and coordinating with research partners to identify immediate sampling needs. Acquiring baseline samples not available through ongoing or historical datasets was also a priority, and numerous sampling trips were funded through institutional monies to address those needs. To position GCRL for extramural funding, research concept papers were solicited from scientists for both hypothesis-driven, investigative studies and descriptive resource assessments; funding targets for investigative studies were the National Science Foundation (NSF) and the BP Ocean Trust Fund, while resource assessments would be part of the Natural Resources Damage Assessment (NRDA) process. To date, funding has been received through the NSF RAPID programs and from early release of BP Ocean Trust Fund monies. GCRL's outreach strategy focused on its scientists interpreting spill-related processes affecting marine resources, including a "town hall" meeting during which local citizens questioned GCRL scientists on spill-related issues.

KEYWORDS: oil spill, response management, Deepwater Horizon

Oceanographic Patterns Associated with Nassau Grouper Aggregation Spawn Timing: Shifts in Surface Currents on the Nights of Peak Spawning
Patrones Oceanográficos Asociados a las Agrupaciones de Desove del Mero de Nassau: Cambios en las Corrientes de Superficie en las Noches de Mayor Desove
Les Modes Océanographiques Associés aux Aggregations de Frai de Mérou de Nassau: Les Changements dans les Courants de Surface sur les Nuits du Frai Maximal

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ABSTRACT

There is virtually nothing known about the fate of fish larvae born on spawning aggregations from the time of spawning to settlement, yet the location of the aggregation site must be important in determining their fate. While aggregations always form in the same place and at the same time in part to assure a large number of adults will congregate for spawning, oceanographic patterns of dispersal and retention of the larvae may provide a driving force for the selection of specific spawning locations. During the winters of 2008 and 2009 we deployed Surface Velocity Profile drifters at the Nassau grouper spawning aggregation site on Little Cayman Island, BWI. A single drifter was deployed each night, then recovered 12 hours later in order to determine trajectory paths off the aggregation. In contrast to the path taken on nights prior to spawning, in both years the drifters released on the night of peak spawning showed substantial eddy formation near the aggregation site. This repeated pattern suggests an oceanographic-based "importance of place" for the aggregation site that may result in local recruitment. This would mean that local aggregations of fish are directly responsible for the long-term survival of local populations. This gives substantial credence to the need to identify and protect specific locations because they are unique and critical to the long-term survival of the many species that aggregate there.

KEYWORDS: Nassau grouper, aggregation, spawning, dispersal, satellite drifters

Long-Term Ecological and Socio-Economic Consequences of Water Quality and Coral Reef Habitat Degradation
Consecuencias Ecológicas y Socio-Económicas a Largo Plazo de la Degradación de la Calidad del Agua y de los Arrecifes de Coral

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ABSTRACT

Increasing urban and industrial construction has resulted in significant chronic coastal water quality degradation (i.e., turbidity, high sediment loads, eutrophication), limiting light availability and reducing photosynthetic capacity of the reef. In the long term, this could result in a loss of biodiversity and economic yield. Highly turbid reefs are characterized by low coral species richness, % living coral cover and species diversity. Non-reef building taxa become dominant. This has potential ramifications over the short and long term on fish communities, since fish diversity and species richness were both significantly correlated with % coral cover and rugosity, which are dependent upon healthy coral growth. There was also a general tendency of lower fish density, biomass, and species richness, particularly of non-targeted taxa (herbivores, mobile invertebrate feeders, planktivores), as turbidity increased. A similar pattern was observed across non-point source sewage pollution gradients and across turbidity stress gradients from beach renourished sites. Also, fish communities from degraded reefs following the 2005-2006 post-bleaching mass coral mortality showed similar declines. But there was no correlation between turbidity and piscivore densities, for which the most probable explanation seems to be overfishing. We suggest that localized impacts of water quality and coral reef degradation are being further enhanced to larger spatial scales by overfishing and recurrent massive bleaching and coral mortality cycle impacts. The increasing scale of impacts suggests that these are unlikely to recover even on very large temporal scales (decades, possibly centuries). Therefore, negative impacts on fish communities and economic yield are likely to persist.

KEYWORDS: Coral reef, Fish communities, Habitat degradation, Turbidity, Water quality decline

Development of Interdisciplinary Criteria to Identify Priority Candidate No-Take Marine Protected Areas in Puerto Rico: Integration of Ecosystem-Based and Community-Based Models
Desarrollo de Criterios Interdisciplinarios para la Identificación de Zonas Candidatas a Áreas Marinas Protegidas de No Captura en Puerto Rico: Integración de Modelos Basados en Ecosistemas y en la Comunidad
Elaboration de critères pour identifier les candidats interdisciplinaire Prioritaire Prenez-les Aires Marines Protégées à Puerto Rico: Intégration des Modèles sur l'écosystème et à Base Communautaire

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ABSTRACT

This project provided a quantitative baseline regarding the actual status of coral reef-associated fisheries within Arrecifes La Cordillera Natural Reserve (ALCNR) in northeastern PR and identified community expectations of and support for the

designation of no-take marine protected areas (MPAs) within the reserve boundaries. We used a holistic approach that employed a set of biophysical and socioeconomic methods as part of a participatory model to develop a set of interdisciplinary criteria necessary for the establishment of priorities for the identification of candidate no-take MPAs. Populations of the most significant fishery-targeted species were significantly depleted, particularly in areas subjected to intense recreational activities and spearfishing. Most grouper (Serranidae), snapper (Lutjanidae), and barracuda (Sphyraenidae) populations were nearly absent at most sites. Most individuals belonged to smaller size categories. Herbivores represented 55-71% of the total fish biomass, suggesting strong overfishing of apex predators. A no-take MPA designation was supported by 80% of the artisanal fishermen, 73% of the concessionaires (i.e., SCUBA diving, charter boats), and 52% of registered vessel operators. All stakeholder groups agreed that coral reef conditions in the reserve had declined, as had water quality which affected the health of the coral reefs and fisheries which depended on healthy reefs. This study highlighted the pervasive views held by many stakeholders concerning PR Department of Natural and Environmental Resources (PRDNER) and recommended that any no-take MPA designation process consider improving stakeholder understanding of PRDNER's objectives, management actions, and accomplishments and an overall rehabilitation of the agency's image in relation to stakeholder trust.

KEYWORDS: Community-based model, Fisheries management, Marine protected area, Puerto Rico, Reef fish community

Sediment Stress, Water Turbidity and Sewage Impacts on Threatened Elkhorn Coral (*Acropora palmata*) Stands at Vega Baja, Puerto Rico
Estrés Sedimentario, Turbidez del Agua e Impactos de Aguas Usadas sobre las Poblaciones del Coral Amenazado Cuerno de Alce (*Acropora palmata*) en Vega Baja, Puerto Rico
Stress des sédiments, turbidité de l'eau et les impacts des eaux usées sur Elkhorn Coral (*Acropora palmata*) à Vega Baja, Puerto Rico

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ABSTRACT

Poorly implemented beach renourishment activities and increasing raw sewage pollution from local storm sewers and other non-point sources have significantly impacted coral reef communities at the candidate Vega Baja Submarine Gardens Natural Reserve, Puerto Rico. There have been recurrent violations to legal water turbidity and microbiological water quality standards. Percent living cover of threatened Elkhorn coral (*Acropora palmata*) across six reefs declined by 29% within 1997 and 2008, for an annual mean loss of 2.65%. But mortality rocketed to 52% between December 2008 and June 2009 across the zone following beach renourishment and recurrent sewage spills. Mortality was lower at outer reefs with stronger oceanographic conditions (34-37%), in comparison to reefs located inside the shallow platform, closer to the shoreline (52-69%), or closer to polluted areas (81-97%). When 2009 data from 13 sites in Vega Baja were compared to 8 control sites at Manatí (located west of Vega Baja), there was no evidence of recent coral mortality at the control sites. Massive coral mortality at Vega Baja produced a significant phase shift in community structure in many of the sites from dominance by *A. palmata* towards dominance by non-reef building benthic categories (i.e., algal turf, recently dead corals, and dead corals with algae). Fish communities at severely disturbed sites were depauperate. There is a need to designate the area as a Natural Reserve, and to develop and implement an integrated coastal-zone management plan with emphasis in protecting one of the largest remaining *A. palmata*stands in Puerto Rico.

KEYWORDS: *Acropora palmata*, Puerto Rico, sediments, sewage, turbidity

Seawall Construction Activities Cause a Localized Mass Mortality of Threatened Elkhorn Coral (*Acropora palmata*) at Vega Baja, Puerto Rico
La Construcción de un Malecón Causa una Mortandad Masiva Localizada del Coral Amenazado Cuerno de Alce (*Acropora palmata*) en Vega Baja, Puerto Rico
Construction d'une Digue Cause de Masse de Mortalité Localisée des Espèces Elkhorn Coral (*Acropora palmata*) à Vega Baja, Puerto Rico

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ABSTRACT

Improper implementation of sedimentation controls at a seawall construction site at Vega Baja beach, Puerto Rico, resulted in significant high turbidity followed by localized mass mortality of threatened Elkhorn coral (*Acropora palmata*) populations along a east-west gradient during August 13-20, 2010. A total of 63 tagged coral colonies along 8 permanent transects (0.5 to 2.2 km downstream of the construction site) were unblemished before the event. Those located below 0.9 km away showed an increase in % frequency infections (22-78% with decreasing distance). None of the corals located farther away were impacted. Fifty more corals were tagged after the incident along two transects at 0.6 (east) and 0.8 km away (middle). A total of 90% of the corals were partially killed by patchy necrosis (PN) at each site, with 75% still showing active infections at the east and 50% at the middle site. Also, 45% of the colonies showed 26-50% recent tissue loss at the east, while 23% of those from the middle showed only 6-25% tissue loss. Live % coral cover was significantly lower at the east site (44%) than at the middle (66%). Recent mortality was higher at the east site (37%) in comparison to the middle (20%). Frequency of large lesions was significant at the east site. This event was more devastating than a previous one during the winter of 2008. Sea surface temperature anomaly was +2.0°C during this event, suggesting that the combined stress of high turbidity and warm temperature could have triggered such an impact.

KEYWORDS: *Acropora palmata*, mass mortality, patchy necrosis, seawall construction, turbidity

Massive Bleaching Impacts in The Demography of the Caribbean Reef-Building Star Coral *Montastraea annularis*: A Modeling Approach
Impactos del Blanqueamiento Masivo en la Demografía del Coral de Estrella *Montastraea annularis*, Constructor de Arrecifes en el Caribe: Un Acercamiento de Modelaje
Impacts Massive de Blanchiment dans la Démographie des coralliens Etoile des Caraïbes *Montastraea annularis*: une approche de modélisation

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ABSTRACT

The northeastern Caribbean region experiencedrecord-breaking sea surface warming and prolonged massive bleaching during 2005 that was followed by an unprecedented white plague-like coral disease outbreak. This resulted in significant mortality of the principal Caribbean reef-building coral *Montastraea annularis*. We evaluated the demographics and size structure of a *M. annularis* population before, during, and after this event, and stochastically simulated population dynamics with different bleaching/mortality regimes over a period of 100 yrs. Also, determined the life cycle transitions that contributed the most to population decline after recurrent events using a life table response analysis by constructing size-based transition matrices from 2001-2009 from permanent photo-transects. Temporal variation in the population growth rate indicated a demographic equilibrium before the event, an increase in mortality for two years after the event, and demographic recovery by the third year. However, population size structure did not recover entirely. Stochastic simulation showed that viability of the population becomes strongly compromised with only 10% annual probability of bleaching and mortality, while a 20% probability led to population extinction. Life table response analysis determined that mortality of small colonies accounted the most for population decline after the event. The natural history of *M. annularis* has showed that recovery by sexual recruitment is unlikely. The fate of present small colonies will determine population viability in the near future. Considering forecasted sea surface warming trends by global circulation models, massive coral bleaching and mortality would be more recurrent in the near future, strongly compromising the future of *M. annularis* populations.

KEYWORDS: coral bleaching, coral demography, *Montastraea annularis*, population matrix models, stochastic simulation

It Is Better to be Disturbed than Dead: The Effect of Dive Ecotourism On Reef Fish Spawning Aggregations
Mas Vale Estar Perturbado que Muerto: El Efecto del Ecoturismo por Buceo en las Agregaciones de Desove de Peces Arrecifales
C'est Mieux Être Perturbé que Mort: L'Effet de l'Ecotourisme de Plongée sur les Agrégations de Frai de Poissons Récifaux

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ABSTRACT

Reef fish spawning aggregations are both ecologically critical and visually astonishing. Sustainable management of reef fisheries depends in part on development of protected areas that safeguard these critical breeding areas for important reef fishes. Ecotourism on these sites has been suggested as a viable economic alternative to fishing spawning aggregations, as it may contribute to both awareness of about and direct protection (by replacement) of sites. Yet divers could create their own negative effects on aggregations, which would in turn reduce the utility of this conservation strategy. We evaluated the impact of divers on a multi-species reef fish spawning aggregation in Belize using 9 hours of underwater video, extracted from over 100 hours of historical footage taken between 1998 and 2008. We evaluated 746 unique interaction events between divers and fish spawning aggregations of snappers and groupers. Disturbance events were minimal and we will describe these in detail. We tentatively conclude that small groups of experienced divers following a code of responsible dive tourism do not negatively affect spawning aggregations at the site we examined. We urge that similar experiments be repeated in other places towards the development of a responsible dive tourism industry that can promote the conservation of reef fish spawning aggregations.

KEYWORDS: spawning, aggregations, reef, fish, ecotourism

A Good Starting Point: A Promising Trophic Model for Southwest Puerto Rican Coral Reef Ecosystems
Un Buen Punto de Partida: Un Modelo Trófico Prometedor para los Ecosistemas Puertorriqueños del Arrecife Coralino del Sudoeste
Un Bon Point de Départ: Un Modèle Trophique Prometteur pour des Écosystèmes Portoricains de Récif Coralien de Sud-Ouest

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ABSTRACT

Coral reef ecosystems, such as the well-studied La Parguera reef system (SW Puerto Rico), exhibit complex interactions difficult to predict with conventional fisheries management models. A newly-developed trophic model, based on Ecopath with Ecosim, offers alternative means to evaluate fishing policies that might achieve desirable ecological and social outcomes, to compare the system to other modeled reef ecosystems, and to explore data and data gaps. The model is based on fisheries and ecological data, primarily centered on species of commercial and ecological importance, grouped by habitat preferences. It has been balanced for current conditions although additional fisheries data (recreational and ornamental) need to be included to improve the representation. The model construction process identified gaps in available data (e.g., diet compositions, metrics of fishing effort, landings, and estimates of primary production) and balancing raised interesting ecological questions. Some groups, such as parrotfish appear to be so underutilized as prey that the accuracy of biomass estimates and our understanding of predator-prey relationships are questioned. Although model structures vary, complicating direct comparisons, a similar Caribbeanmodel built for the 1970-1980s estimated total biomass 5.6 times higher than the present model. Changes of this magnitude, if accurate, highlight the need for further study of the roles fishing and environmental change have played in reshaping this system over the last 30-40 years. This modeling effort identified data needs, generated hypotheses for future research, and provides an initial look at ecosystem-based fishery management scenarios for this reef system.

KEYWORDS: ecosystem model, coral reef ecosystem, Ecopath with Ecosim, fishing impacts, predator-prey

Genetic Connectivity of Nassau Grouper Aggregations in the Caribbean Sea
Conectividad Genética de Nassau Grouper Agregaciones en el Mar Caribe
Connectivité Génétique des Agrégations Nassau Grouper dans la Mer des Caraïbes

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ABSTRACT

Overexploitation of spatially and temporally predictable spawning aggregations formed by Nassau grouper is resulting in rapid elimination of aggregations by fisherman. These ecologically important top predators regulate species composition and abundances of coral reef species such that increased fishing of Nassau grouper potentially makes marine communities more vulnerable to natural and anthropogenic disturbances. It is the objective of this study to determine how sustainable aggregation-based fisheries are by determining the extent of genetic connectivity between aggregations. Genomic DNA was extracted from samples collected in aggregations in the Cayman Islands and U.S. Virgin Islands. Three mitochondrial markers (12S, ATP synthase, cytochrome b) were sequenced and 9 polymorphic microsatellite loci were isolated. Statistical analyses were performed on mitochondrial sequences to determine population structure and genetic connectivity. Preliminary results reveal high genetic connectivity and no statistically significant genetic structure at either the aggregation level or regional level between aggregations in the Cayman Islands and the U.S. Virgin Islands (Fst=0.01283, p=0.74585). Such results suggest that spawning aggregations do not represent distinct populations.

KEYWORDS: genetic connectivity, *Epinephelus striatus*, spawning aggregations, U.S. Virgin Islands, Cayman Islands

A Mesophilic Thaumarchaeal Species of the Mangrove Swamp of Guadeloupe (F.W.I.) Contains Eukaryotic Type of Chlorophyll
Una Thaumarchaea Mesophila Del Manglare de Guadeloupe (F.W.I.) Contiene Clorofila Eucaryotica
Une Thaumarchaea Mésophile de la Mangrove de Guadeloupe (F.W.I.) Contient de la Chlorophylle Eucaryotique.

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ABSTRACT

Large white mats of prokaryotic organisms (Archaea and Bacteria) have been recently discovered in the mangrove swamp of Guadeloupe (French West Indies). Here, we report evidence of two eukaryotic photosynthetic pigments in a giant multicellular Thaumarchaeota, Candidatus *Photothauma chlorophyllense* (Muller et al., 2010). Microfluorescence spectrometry in combination with thin layer chromatography points out the presence ofchlorophyll a and pheophytin a after ethanol extraction. These two pigments were identical to those obtained from plants represented in this experiment by *Leucaena leucocephala*. In order to identify the structures were chlorophyll could be stocked into the Archaea, we also studied the filament structure by electronic microscopy. In ESEM, the analysis showed that each filament was composed by numerous archaeal cells covered by a thick membrane which can be removed by critical point treatment. In TEM sections, more electron dense structures were observed. They can be associated in the archaea movement or be structures implicated in photosynthesis. For the first time chlorophyll gene expression in Archeae is reported here, and could catalyze light-driven proton transfer across the cell membrane, although the gene has already been observed from clone bank of Pearl River, China. Thus, this discovery could reconsider the implication of Archaea in the establishment of photosynthesis and permit a better understanding of its evolution on earth. Furthermore, this study shows that mangrove shelters a wide diversity of microorganisms, thereby it is essential to study and protect its exceptional, but harvested, biodiversity proved here by the presence of Candidatus*Photothauma chlorophyllense*.

KEYWORDS: archaea, mangrove, chlorophyll a, microbiology

Red Lionfish *(Pterois volitans)* Control Strategies in the Caribbean UK Overseas Territories (Cayman Islands, Virgin Islands and Turks and Caicos)
El Pez León Rojo *(Pterois volitans)* Estrategias de Control en los Territorios de Ultramar del Reino Unido el Caribe (Cayman Islands, Virgin Islands y Turks Y Caicos)
Red Lionfish *(Pterois volitans)* Stratégies de Lutte dans les Territoires d'outre-Mer des Caraïbes au Royaume-Uni (Cayman Islands, Virgin Islands et Turks Et Caicos).

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ABSTRACT

The Red Lionfish *(Pterois volitans)*, native to the Indian and Pacific Oceans, has invaded the Western Atlantic and more recently the Caribbean. While the lionfish has biological characteristics that provide advantages over native Atlantic fish species, and which predisposes it to rapid proliferation, most countries in the region lack the human and financial resources to effectively control this new invader. In 2009, the Joint Nature Conservation Committee (JNCC) offered financial assistance to the Cayman Islands, British Virgin Islands and Turks and Caicos jointly to assist in their control efforts on this invasive species. In the Cayman Islands, the responsibility for conservation of marine resources lies with the Cayman Islands Department of Environment. The Departments efforts on lionfish control are focused on conservation management, research, raising public awareness, equipment and volunteer training. This talk will highlight key elements of the efforts currently underway in the Cayman Islands with further examples from the British Virgin Islands and Turks and Caicos.

KEYWORDS: lionfish, Cayman, Turks and Caicos, Virgin Islands, control

Distribution of Red Snapper (*Lutjanus campechanus*) and their Spawn in The Northern Gulf Of Mexico
Distribución del Pargo Rojo (*Lutjanus campechanus*) y su Progenie en el Norte del Golfo de Méjico
Répartition Géographique des Vivaneaux (*Lutjanus campechanus*) et de leur Frai Dans le Nord du Golfe du Mexique

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ABSTRACT

The U.S. National Marine Fisheries Service has established yearly fishery independent long-line surveys in the northern Gulf of Mexico (2001 to the present). Using the results from this survey, together with a similarly administered yearly ichthyoplankton survey (SEAMAP, 1982 to the present), we examine the distribution of red snapper together with their egg production and larvae in the northern gulf. Results indicate a remarkable westward trend in size of adult snapper but no size trend with respect to depth. Larval spreading also shows a westward (counter clockwise) bias in larval transport around the northern Gulf. Using annual fecundity estimates according to size/age we examine the geographic distribution of egg production. The relationship of these distributions to the Deep Water Horizon oil discharge and its potential impact is examined. Our long term goal is to determine the relative contribution of highly fecund larger snapper to populations across the northern gulf.

KEYWORDS: red snapper, distribution, currents, oil spill, Gulf of Mexico

Yellowfin Grouper (*Mycteroperca venenosa*): Reproductive Biology, Behavior and Conservation of a Large Caribbean Grouper
Guacamayo (*Mycteroperca venenosa*): Biología Reproductiva, Comportamiento y Conservación de un Mero Grande de Caribe
Le Badèche de Roche (*Mycteroperca venenosa*): Biologie de la Reproduction, Analyse Comportementale et Conservation d'un Grand Mérou des Carraïbes

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ABSTRACT

The temporal, spatial and behavioral dynamics of a spawning aggregation of yellowfin grouper were examined using underwater visual surveys, histological analysis, and hydro-acoustic tracking. Yellowfin grouper aggregated to spawn on the Grammanik Bank, a shelf-edge coral reef, during two or three consecutive months from February through April each year from 2004 to 2009. Fish arrived at the site on the full moon, and departed 10 to12 days after the full moon (dafm). Highly skewed male dominated sex ratios (>4:1, M:F) on the full moon dropped to near unity by 4 dafm each month, indicating that males arrived at the spawning site early. Males were on average significantly larger than females. Aggregations of up to 600 fish swam elevated over the reef showing distinct coloration and behaviors. Spawning was observed in March and April 2008 and 2009 from 6 through 10 dafm. During spawning, 7 to 12 putative males followed one female, "rushing" her upward to release gametes. Spawning began near sunset and continued into the night. Histological analysis of ovarian tissue indicated that some females were capable of spawning on two consecutive nights, although the majority spawned every two or three nights. Most hydro-acoustically tagged fish came to the aggregation site two months each year, however left the area for weeks between spawning events. This yellowfin grouper aggregation is the most well studied for the species, and could provide information regarding the effectiveness of seasonal closures, along with the protection of spawning sites, for enhancing regional stocks of Caribbean groupers.

KEYWORDS: spawning aggregations, Serranidae, marine protected areas, histology, grouper fishery

Comparisons between Abundance Estimates from Underwater Visual Census and Catch Per Unit Effort in a Patch Reef System
Comparación entre Estimados de Abundancia de Peces Obtenidos por Métodos Submarinos de Censos Visuales y el Método de Captura Por Unidad De Esfuerzo, en un Sistema Arrecifal Fragmentado
Comparaison entre les Estimations d'Abondance de Poissons à Partir des Techniques Sous-Marines d'Observation Visuelle et Celles des Prises Par Unité d'Effort, Dans un Système Récifal Parcellé

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ABSTRACT

Catch per unit effort (CPUE) and underwater visual census (UVC) are often used to produce indices of fish abundance, but each sampling method has inherent biases. We compared CPUE (using hook and line) and UVC abundance estimates (using the stationary cylinder method on SCUBA) in a patch reef system at Glover's Reef, Belize. UVC and CPUE data were collected at 63 randomly selected sites, and sampling was repeated at a subset of sites to assess temporal variability. The most commonly caught species, yellowtail snapper, porgy, lane snapper, white grunt, and mutton snapper, had occurrence rates of over 25% in both the CPUE and UVC data. For all 5 species, the average size observed in the UVC was significantly smaller than sizes that were caught. Correlations between CPUE and UVC abundance were significant when CPUE and UVC data were collected simultaneously (fishers fishing while divers counting fish, Mantel $R = 0.34$, $P = 0.03$), but correlations were not significant when data were collected on different days (Mantel $R = 0.07$, $P = 0.18$). These correlations were not improved when spatial effects were accounted for using partial Mantel tests. Further work will evaluate the causes of variability over time and between sampling methodologies. Both CPUE and UVC data are used to inform spatial management plans and to assess effectiveness of existing fishery management regimes. Therefore an understanding of the biases of each method will improve the ability to accurately measure management performance indicators.

KEYWORDS: CPUE, underwater visual census, spatial autocorrelation, commercial fish species, patch reef system

Progress in Assessing Geomorphological Characteristics and Reef Fish Utilization of Reported Reef Fish Aggregation Sites in the Florida Keys, USA
El Progreso en la Evaluación de las Características Geomorfológicas y la Utilización de Peces de Arrecife de Denuncias de los Sitios de Agregación de Peces de Arrecifes en los Cayos de Florida, EE.UU.
Les Progrès Réalisés dans l'Evaluation des Caractéristiques Géomorphologiques et l'Utilisation de Poissons de Récif de Sites de Concentration de Poissons des Récifs Signalé dans les Keys de Floride, USA

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ABSTRACT

Fish spawning aggregations (FSAs) are a vital part of the life cycle of many reef fish species. In many cases, a lack of knowledge of the location of FSA sites prohibits their protection and effective management, and practical approaches to identify those sites and assess their utilization by aggregating species are needed. We are using acoustic technologies at reported FSA sites in the Florida Keys, USA, to accomplish two objectives: (1) assess whether reported FSA sites are characterized by similar habitat characteristics, with a focus on geomorphological features, and (2) determine whether sites reported to have been "fished out" in previous decades are currently utilized by remnant or recovering aggregations. For the habitat component, preliminary results from the upper and lower FL Keys indicate that drowned, margin-parallel, rocky ridges, known locally as outlier reefs, are features found in proximity to all FSA sites studied. In particular, three geomorphic characteristics were consistently observed: a steep slope of the landward boundary of the upper-slope terrace; an exposed outlier reef forming the seaward boundary of the upper-slope terrace; and at least one other exposed outlier reef on the upper-slope terrace. For the fish utilization component, sonar surveys located and divers identified aggregating fish during predicted spawning periods (including hundreds of snappers at two locations near Key West), but spawning has not yet been observed. From a management perspective, the results suggest the benefit of using acoustic and habitat approaches to identify critical sites for fisheries monitoring and management focus.

KEYWORDS: reef fish, spawning, aggregation, geomorphology, acoustics

Parrotfish as Ecosystem Engineers on U.S. Caribbean Coral Reefs.
Los peces loros como los ingenieros de los arrecifes coralinos en el Caribe Americano
Le Poisson de Perroquet est un ingénieur de l'écosystème sur US récifs coralliens des Caraïbes.

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ABSTRACT

Coral reefs provide a variety of ecosystem services, but a myriad of threats act synergistically to stress reefs in U.S. Caribbean waters. We consider the contribution of parrotfish grazing to coral reef health, evaluate the spatial variation in fishing activities that impact parrotfish abundance, and discuss the trade-offs between cultural and ecological obligations that are inherent to effective management of parrotfish in the U.S. Caribbean.

KEYWORDS: parrotfish, herbivores, coarl reefs, Caribbean, ecosystem

Locating and Mapping Reef Fish Habitat on a Tight Budget
La Localización y Mapeo de Hábitat de Peces de Arrecife en un Presupuesto Apretado
La Localisation et la Cartographie des Habitats des Poissons de Récif avec un Budget Serré

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ABSTRACT

Unlike the terrestrial environment where comprehensive maps are readily available, maps of the ocean are scarce and usually lack the detail required to identify benthic habitats. A relatively inexpensive, commercially available product may help marine researchers overcome this obstacle. This system, distributed by Humminbird for fishermen, records sidescan imagery, bathymetry data, and GPS coordinates simultaneously and costs under $2000. The Humminbird system reveals geologic features and habitat types as well as schools of fishes and other large marine animals. The main advantages of this particular system are the sidescan component and the ability to record all the imagery, maps, and coordinates on to a SD card. The recorded data can be downloaded to a computer, converted into a more usable format and then incorporated into ArcGIS to create georeferenced habitat maps. Using the Humminbird, I mapped several artificial reefs and hardbottom sites in the northeastern Gulf of Mexico and verified the imagery with dive surveys. The mapping methods were improved as the study progressed and ideally consist of recording one parallel transect at a time by starting the recording at the beginning of each transect and stopping it at the end. This greatly reduces the amount of post-processing and makes the imagery easier to manage. Relatively small ledges, rocks, and reef balls can be identified and accurately mapped using this approach. The Humminbird system has great potential and should benefit future reef fish research and provide essential maps for effectively implementing ecosystem based management.

KEYWORDS: habitat mapping, hardbottom, artificial reefs, Gulf of Mexico, sidescan

Distribution and Abundance of Fish Populations in Various Habitats in the Mutton Snapper (*Lutjanus analis*) Conservation Area on the South Shelf St. Croix, U.S. Virgin Islands
Distribución y Abundancia de las Poblaciones de Peces en Diferentes Hábitats en el Pargo Criollo (*Lutjanus analis*) Área de Conservación en el Sur Plataforma St. Croix, Islas Vírgenes De EE.UU
Distribution et Abondance des Populations de Poissons dans les Divers Habitats de la Snapper Mouton (*Lutjanus analis*) Zone de Conservation de la Croix du Sud du Plateau Saint-Laurent, Les Îles Vierges Américaines

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ABSTRACT

In 1993, the Caribbean Fishery Management Council and US Virgin Islands Government established the Mutton Snapper Seasonal Closed Area (MSSCA) south of St. Croix from March 1 – June 30th to protect a spawning aggregation of mutton snapper (Lutjanus analis). Bottom tended fishing gear was subsequently banned year round in the closed area to protect coral reef habitat. The habitat within the closed area was mapped. Using benthic transects and roving diver survey techniques a total of 143 fish species and 19,843 individuals were counted within the MSSCA. Eighty–seven species and 8,477 individuals in the roving surveys and 107 species and 13,552 individuals in the benthic transect surveys. Eupomacentrus partitus, Thalassoma bifasciatum, Scarus taeniopterus were among the most abundant fishes in all benthic habitats. Acanthuridae, Scaridae and Holocentridae were the most abundant preferred edible fish (PEF) families totaling 77.3% of the PEF. Family Lutjanidae was not common and comprised 1.46% of PEF. Ten individuals of Lutjanus analis were observed in 2009 and 2010. Only one lionfish (Pterois voltans) was observed on the outer reef slope in July 2010 despite over 250 diver hours from April 2009 to July 2010.

KEYWORDS: fisheries management, coral reefs, Lion fish, mutton snapper, fish populations

Primary Production Dynamics of *Thalassia testudinum* (Konig) Seagrass Beds in Guadeloupe Island, FWI
Dinamica de la Produccion Primaria de los Pastos Marinos de *Thalassia testudinum* (Konig) en la Isla de Guadeloupe
Dynamique de la Production Primaire des Herbiers de Phanérogames Marines à *Thalassia testudinum* (Konig) en Guadeloupe (Antilles Françaises)

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ABSTRACT

The present work was realized in the framework of the project of the National Park of Guadeloupe of reintroduction of the manatee (Trichechus manatus). The aim was to study the dynamics of the leaf primary production, the associated litter and its micro-fauna in *Thalassia testudinum* seagrass beds in order to evaluate the potential grazing impact of manatees.According to sites, the leaf primary production fluctuated between 2.6 ± 0.4 g to 4.0 ± 0.7 g of dry weight.$m^{-2}.d^{-1}$ in the absence of grazing and between 0.9 ± 0.3 g and 1.4 ± 0.4 g of dry weight. m^{-2}. d^{-1} when cutting the leaves to simulate manatees "grazing". Moreover, areas 50 cm x 50 cm were completely denuded from leaves and rhizomes to simulate the "rooting" by manatees. These areas have not recovered after 3 months. The average mass of leaf litter fluctuates between 36.12 ± 7.5 g d.w. m^{-2} and 6.2 ± 0.9 g d.w. m^{-2}. According to sites, the decay of litter reached 82 % and 69.6 % in three months. The fauna associated with litter consisted mainly of Polychaetes, Crustaceans, Plathelminths and Nematods which constitute an important link in the seagrass foodweb. Results from this study show that manatees grazing might disturb the primary productivity of seagrass beds. It will be necessary to be careful in the choice of areas of acclimation in terms of surface and duration of use, and in the choice of the number of manatees that can be reintroduced in the seagrass habitats.

Assessing Consumer Awareness of Seafood Harvesting and Consumption Issues
Valorando el Conocimiento de Consumo de Mariscos que Cosechan y Asuntos de Consumo
Evaluer Conscience de Consommateur de Fruits de Mer Moissonnant et les Problèmes de Consommation

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ABSTRACT

The diverse nature of seafood species, the myriad product forms available to consumers, the many different harvesting techniques, concerns regarding the sustainability of fish stocks and habitat, and a rapidly changing global supply situation make it difficult for consumers to make informed decisions when purchasing seafood. To assess consumer awareness of seafood related issues a telephone survey of 400 seafood consumers in Florida was conducted. Respondents were asked about their awareness and concerns associated with seafood issues such as seafood safety, environmental effects of seafood harvesting techniques, and incorrect labeling of seafood. In addition, respondents were asked how important economic, environmental, or seafood safety assurances would be in developing a hypothetical seafood labeling program. The survey also sought to determine how much seafood-related information should be available on issues regarding nutrition, safety, origin, and harvesting method versus how much information respondents feel is currently available. The survey found that consumer awareness and concern is highest for issues related to seafood safety. Although respondents showed the greatest concern for seafood safety issues, the information that would provide the most assurance in a labeling program was that the seafood was correctly labeled with respect to species. The survey also found that respondents, in general, feel that not enough information is available regarding country of origin and harvesting method. The results of this survey provide valuable information to seafood producers and marketing organizations as efforts are directed toward developing effective future seafood marketing campaigns.

KEYWORDS: consumer awareness, seafood, harvesting, consumption, marketing

Using Oral Histories to Study the Social Impacts of a Marine Protected Area
Utilizando la Historia Oral para Estudiar los Impactos Sociales de una Área Marina Protegida
A l'Aide de l'Histoire Orale á l'Etude les Impacts Sociaux de Une Aire Marine Protégée

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ABSTRACT

The Oculina Bank Habitat Area of Particular Concern, off the east coast of Florida, is the first deepwater, federally protected marine closure in the U.S. Since 1984, the marine protected area has gone through regulatory changes that have impacted different fisheries and stakeholders in multiple ways. This paper presents the preliminary results of a participatory project that examines the socio-economic impacts since implementation of the MPA. Using texts from 45 oral histories conducted with fishermen from the commercial, charterboat, and recreational sectors, the texts are

analyzed to examine the socio-economic impacts within and across the three fishery sectors. The results reveal how multiple stakeholder groups perceive and are impacted by the MPA.

KEYWORDS: MPA, Oral History, socio-economics, Florida, *Oculina varicosa*

Fishers Building Capacity For Sustainable Fisheries
Pescadores fomentan capacidad para pesquerías sostenibles
Renforcement des Capacités des Pêcheurs pour une Pêche Durable

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ABSTRACT

Caribbean nations rely on fishing industries to contribute to the social, cultural and economic realities of their communities, and to provide an excellent and enjoyable source of protein to their people. Sustainable fishing industries require the involvement of fishers and other stakeholders in all areas from policy development to fishing techniques and practice. The need for information and to build the capacities of fishers in the areas of suitable techniques for sustainable fisheries, communications, advocacy, negotiation and representation has been identified as critical activities that would allow for fisher engagement in sustainable fisheries management and practices. The Caribbean Network of Fisherfolk Organisations has developed, with the assistance of critical partners from Caribbean Regional Fisheries Mechanism, University of The West Indies Centre for Resource Management and Environmental Studies, Commonwealth Foundation, United Nations Environment Program, Centre Technique de Coopération Agricole et Rurale, Caribbean Natural Resources Institute, Gulf and Caribbean Fisheries Institute and national fisheries departments, strategic goals in relation to capacity building, communications and fisherfolk engagement in fisheries management. Activities include training modules designed to strengthen and develop fishers and their organisations, fishers exchanges promoting the ecosystem approach to fisheries and sharing of information on sustainable fishing techniques, and the representation of fishers at fisheries management and other related forums.

PALABRAS CLAVES: Caribbean, sustainable, fisheries, capacity, partners

Juvenile Nassau Grouper (*Epinephalus striatus*) Utilization of Nearshore Habitats with Connection to Spawning Aggregation
Menores Mero de Nassau (*Epinephalus striatus*) la Utilización de los Hábitats Cercanos a la Costa con Conexión a la Agregación de Desove
Juvenile Mérou Rayé (*Epinephalus striatus*) l'Utilisation des Habitats Côtiers avec une Connexion à l'Agrégation de Ponte

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ABSTRACT

The Nassau grouper (*Epinephlaus striatus*) is an important component of the reef community found throughout the western Atlantic and Caribbean (Sadovy and Eklund 1999). Once abundant, overfishing during the 70s and 80s caused a region wide fisheries collapse (Sadovy and Eklund 1999, Ehrhardt and Deleveaux 2007). The Nassau grouper are known to form spawning aggregations over deep (40m) shelves and mesosphotic reefs and juveniles settle in nearshore macroalgae beds (Dahlgren and Eggleston 2000). Transitioning from macroalgae beds to rocky habitats around 7cm, juveniles will spend the years prior to maturity within shallow nearshore habitats (Dahlgren and Eggleston 2001). Juvenile to mature Nassau grouper ranging from 16-55cm were manually tracked in Brewers bay St Thomas and Lamesure bay St John. A clear segregation of mature and immature grouper was observed. Grouper under 30cm were found only within shallow (>4m) rocky area with sparse coral cover (2.02%/m^2) where as grouper of mature size, 40cm or greater, were found in deeper areas (4-10m) with higher coral cover (14-20%/m^2). The mature grouper formed distinct home ranges with little or no overlap where immature groupers home ranges had high to complete overlap with each other. In addition to the nearshore habitat shifts observed, acoustically tagged grouper at the spawning aggregation have been tracked back to nearshore reefs of St John, completing the cycle. The results of this study show clear habitat partitioning between mature and immature Nassau grouper within a near shore habitat and a connection between nearshore and spawning local spawning aggregations site.

KEYWORDS: Nassau, Grouper, Nearshore, Habitat, juvenile

Developing Sustainability Principles for Management and Eco-Labelling in the Sian Ka'an and Banco Chinchorro Biosphere Reserves, Mexico
Principios para la Evaluación, Manejo Sustentable y Eco-Etiquetado en las Reservas de la Biosfera de Banco Chinchorro y Sian Kaan

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ABSTRACT

An assessment of biological and economical aspects of lobster fisheries (*Panulirus argus*) within two Biosphere Reserves in Mexico, the Banco Chinchorro and Sian Ka'an, was conducted with the aim of proposing alternatives for improvement in the management at these Protected Areas. A local eco-labelling scheme, representing all cooperatives that fish in these two areas, will be presented and discussed. The ecolabelling scheme is an innovative way used to increase compliance with management arrangements, which may in turn lead to more sustainable fisheries. This project views the eco-label implementation scheme as a commercial and legal strategy intended for generating an added value to sustainable practices, and discusses how it can be used as a instrument to help scientific monitoring the lobster population. The *Panulirus argus*-spiny lobster fisheries are most highly valued single species captured in the Mexican Caribbean, and the Banco Chinchorro & Sian Ka'an cooperatives represent more than 50% of the State of Quintana Roo's total catch. Whilst recognizing that sustainability has environmental, ecologic, economic and social dimensions, addressing it in relation to these fisheries requires an extended analysis of the dynamics of the lobster population, which is an ongoing process. Ecological aspects, survey techniques, and stock assessment will be discussed. The relationship between the socio-economic status of the cooperatives, whose livelihood depends mainly on these fisheries, and the possible impact on the lobster population will be analysed.

KEYWORDS: lobster, *Panulirus argus*, eco-labelling, sustainability, fisheries management, protected areas

Factores Ambientales Asociados a la Distribución Espacial de Peces Demersales en el Golfo de Salamanca (Caribe Colombiano): Implicaciones para la Identificación y Manejo de Hábitats Esenciales
Environmental Factors Associated with the Spatial Distribution of Demersal Fishes in the Gulf Of Salamanca (Colombian Caribbean Sea): Implications for the Identification and Management of Essential Habitats
Les Facteurs Environnementaux Associés à la Distribution Spatiale des Poissons Démersaux du Golfe de Salamanca (Caraïbes Colombiens): Implications pour l'Identification et la Gestion des Habitats Essentiels

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RESUMEN

Los peces demersales explotados en el Mar Caribe de Colombia han mostrado señales de sobreexplotación y los ambientes que los sostienen están siendo degradados. En consecuencia se ha observado un claro patrón de disminución en varias poblaciones. Identificar los requerimientos de hábitats de dichas especies es un requisito necesario para asegurar su viabilidad en el tiempo. En este contexto, se exploraron los patrones de distribución de la estructura de tamaños de dos peces demersales *Lutjanus synagris* y *Balistes capriscus*) y su asociación con características ambientales. Para ello se analizóinformación demográfica y ambiental obtenida por 15 cruceros científicos realizados entre diciembre de 1995 y marzo de 1998 en el Golfo de Salamanca, Caribe colombiano. Un total de 4095 tallas de captura fueron exploradas en relación con cinco variables ambientales: (i) profundidad, (ii) tipo de fondo, (iii) temperatura, (iv) salinidad y (v) distancia a los aportes de descargas continentales. La distribución espacio-temporal de la estructura de tallas fue explorada mediante un Sistema de Información Geográfico; mientras que la relación entre la estructura poblacional y el comportamiento de las variables ambientales fue evaluada utilizando Modelos Lineales Generalizados. La profundidad fue el factor que presentó mayor asociación con la estructura de tamaños, seguido por el tipo de fondo y la salinidad, aunque no se observóun patrón evidente. Para ambas especies se encontráque la proporción de individuos de mayor tamaño aumentó con la profundidad. Los resultados señalan la importancia de utilizar aproximaciones holísticas que consideren información de la historia de vida de las poblaciones y del ambiente, con el fin de identificar y manejar posibles hábitats esenciales. Estudio auspiciado por Colciencias y Universidad del Magdalena (Convenio 780-2009).

PALABRAS CLAVES: *Balistes capriscus*, *Lutjanus synagris*, *Modelos Lineales* Generalizados, Hábitas Esenciales, Mar Caribe de Colombia

Impact of the Trammel Net in Martinique Fishery
Impacto del Trasmallo en la Pesqueria Martiniquena
Evaluation des Impacts de la Pêche au Filet Trémail en Martinique

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ABSTRACT

Small scale fisheries in Martinique are an important social and economic sector. Fisheries' management is a local priority concern to limit coastal resources decline. The net fishery account for 20% of the fishing techniques used and causes serious ecological problems as well as for species selectivity. Among the gears used, the trammel net (bottom net) is the most problematic technique. Experimental fishing, targeting lobster (26 trials) and fish (21 trials), has been conducted to determine the impact of these techniques. For the fish technique, the trammel net caused 68% of bycatch (0.41 $g.h^{-1}.m^{-2}$) (non commercial, undersize commercial and rotten individuals). The non commercial species represent most of the catches (59%). The lobster fishing showed that trammel net is more selective with 22% of discards. The lobster counted for 47% (0.63 $g.h^{-1}.m^{-2}$). The other 53% catches are crabs, finfishes and rays. To assess the impact of trammel nets on benthic communities, 4 "cleanness" classes have been determined. The benthic species and debris catches (algae, coral, rock, seagrass) in the nets have been estimated to cover 63% (mean value) of the net surface (visual estimation). Trammel nets have a significant impact on benthic coral communities. Among the major problems caused by these three layers net, bycatches of protected species is a reality difficult to assess. Fifteen marine turtles have been caught, and 73% were dead by drowning. A policy (ban, no fishing area, fishing period…) in order to limit the impact of trammel nets is required for more sustainable small scale fisheries.

KEYWORDS: Martinique, Selectivity, Small scale coastal fishery, Trammel net, Sustainable fishery

Long-Term Site Fidelity of Tagged Red Hinds (*Epinephelus guttatus*) at Two Spawning Aggregation Sites in Bermuda
La Fidelidad a Largo Plazo Sitio de Etiquetó Mero Cabrilla (*Epinephelus guttatus*) en Dos Sitios de Agregación de Desove en Bermuda
La Fidélité à Long Terme de Site d'Etiqueté De Merou (*Epinephelus guttatus*) à Deux Sites d'Agrégation Frayant dans les Bermudes

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ABSTRACT

The results of a multi-year tagging program of red hind (*Epinephelus guttatus*) at two spawning aggregation sites (NE and SW) in Bermuda are presented. From 1995-2003, a total of 935 red hinds were caught, tagged and released, primarily at spawning aggregation sites, and were recaptured by hook and line fishing. Fishing and tagging effort were concentrated during the summer spawning period at the two aggregation sites. The mean tag-recapture rate varied between aggregation sites (NE = 30.8%, SW = 14.0%) and the mean overall tag-recapture rate was 16.8%. The majority of recaptures occurred either in the same spawning month in which tagging took place or at approximate intervals of one, two or three years, often in the same month each year, suggesting some consistency in presence on site. The longest period at liberty of a tagged fish was in excess of four years. Although many of the tagged fish were recaptured more than once, the maximum number of recaptures of a tagged fish was four.

KEYWORDS: spawning aggregation, red hind, *Epinephelus guttatus*, tagging, Bermuda

The Big Squeeze on Fishing Sites? An Assessment of the Inclusion of Rural Fishing Communities within the Draft Regional Spatial Development Plans of the Municipalities of Trinidad
El Gran Medida de los Lugares de Pesca? Una Evaluación de las Comunidades Pesqueras Rurales en el Proyecto los Municipios de Trinidad
The Big Squeeze sur les Sites de Pêche? Une Évaluation de l'Inclusion des Communautés Rurales de Pêcheurs dans le Projet de les Plans Régionaux d'Aménagement du Territoire de les Municipalités de la Trinité

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ABSTRACT

Artisanal fishing communities' sites and centres are squeezed by competing uses for valuable coastal real estate. This big squeeze signifies the marginalization and disempowerment of fishing communities relative to needs of other users of coastal space. Inadequate provisions made for the fishing sector or hitherto absence of its consideration within local level plans contributes to limits on the amount of fishers based at their facilities and militates against the industry being a supplier of jobs to local people. This paper contests that local government has a role to ensure that adequate space is reserved for fishing communities and spatial development plans are sensitive to the needs of this key sector of the local economy. It assesses and compares 11 Draft Municipal City and Borough level Spatial Development Plans presented by the Ministry of Local government of the Government of Trinidad and Tobago in 2010 on the conceptual treatment of local fishing industries therein. The paper concludes by considering the assessment as it relates to the prospect for integrated coastal zone management in Trinidad and Tobago.

KEYWORDS: Artisanal, Spatial, Planning, IMA, Trinidad

The Caribbean Sea Commission
La Comision Del Mar Caribe
La Commission De Mer Des Caraïbes

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ABSTRACT

The Caribbean Sea Initiative (CSI) and the Caribbean Sea Commission (CSC) are critical aspects of regional ocean governance in the Wider Caribbean Region. The Association of Caribbean States (ACS) and partners have been pursuing the CSI since 1998 mainly through promotion of the UN Resolution *'Towards the sustainable development of the Caribbean Sea for present and future generations'* at the UN General Assembly. In the resolution the UNGA *'Recognizes* that the Caribbean Sea is an area of unique biodiversity and a highly fragile ecosystem that requires relevant regional and international development partners to work together to develop and implement regional initiatives to promote the sustainable conservation and management of coastal and marine resources …,'. The CSC was established in 2008 to promote and oversee the sustainable use of the Caribbean Sea. The Commission comprises: National delegations of Members and Associate Members, The Secretary General of the Association, several organisations and three experts. There are three Sub-Commissions: Legal; Scientific and Technical; and Governance, Public Information and Outreach. The Sub-Commissions will clarify information that the CSC needs to meet its mandate to provide advice to the ACS council; identify individuals, organizations or projects that can provide the expertise and information needed; coordinate the acquisition, review and synthesis of the information needed; formulate or oversee the formulation of draft advisory documents for consideration by the CSC; obtain and provide clarification on matters as requested by the CSC.

KEYWORDS: governance, institutions, policy, cooperation

Current Status of the Small-Scale Seine Fishery in Barbados
El Actual Estado de la Pesquería con Jábega de Pequeña Escala en Barbados
Situation Actuelle de la Petit Pêcherie avec les Gabare à la Barbade

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ABSTRACT

The seine fishery in Barbados is considered a minor fishery, operating largely as an alternative fishery during the pelagic fishery 'off-season'. As such, it remains poorly documented and the contribution of this fishery to the island's fishing industry is largely unknown. This study addresses this lack of information by describing the current seine fishery including the number of active nets and seine fishers, gear specifications, fishing operation and catch composition. Data were collected between July and September 2010 through structured interviews with seine net captains, informal conversation with crew members, personal observation and participation in fishing trips. Additional catch rate information was obtained from captains via telephone. There are approximately 65 seine fishers (92% males) currently active in Barbados, operating six large seine nets based along the west (4), south (1) and east (1) coasts. Nets range in length from 400 – 800 yards and have panels of 1" and 1 ¼" mesh. Unlike the typical beach seine operations of neighbouring islands, Barbadian seine nets are set and hauled offshore using one or two motorized vessels, and most engage in 'chubbing', targeting reef fishes, particularly parrotfishes and surgeonfishes. All nets target schooling jacks when available. Preliminary estimates indicate that around 6 mt of fish, with an ex-vessel value of US$50,000 are landed by the seine fishery over the 3-month summer season. A significant proportion of the landings is reef fishes, raising concern amongst some fishers and coastal managers over the environmental impact of this fishery on the nearshore reefs.

KEYWORDS: seine fishery, Barbados, small-scale

Mapping Fisheries Uses and Values using Open Oceanmap: A Case Study from St. Kitts and Nevis
Cartografia de Usos y Valores de las Pesquerias Usando Open Oceanmap: Un Caso de Estudio en St. Kitts y Nevis
Localisation de l'Exploitation et de la Valeur des Pêches Utilisant le Logiciel Open Oceanmap: Étude de Cas pour St.Kitts Et Nevis

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ABSTRACT

In St. Kitts and Nevis, as elsewhere in the Caribbean, commercial fisheries support local communities and economies. These fisheries involve vessels of varying sizes and

capacities, using a variety of gear types and fishing strategies, and covering a large part of the coastal ocean. In general, the spatial component of fishing activities is relatively poorly understood. While a variety of data are collected by national agencies to monitor and enforce fishery regulations, the thematic, temporal, and spatial resolution of these data vary considerably. To inform a marine zoning plan, accurate spatial information about coastal fisheries is central to informing intelligent management and policy decisions. Open OceanMap is a data collection tool used to effectively collect local knowledge in support of fisheries management and marine spatial planning/zoning. The Nature Conservancy partnered with Ecotrust to adapt Open OceanMap for use in St Kitts and Nevis to assist the country in understanding the spatial distribution of fishing effort and the value they place on specific areas of the ocean – more specifically, the value associated with commercial fisheries. These data will support a marine zoning plan that protects the marine environment while minimizing impacts on commercial fishermen and communities. This presentation will describe how important fisher information was collected in S. Kitts and Nevis, highlighting the importance that a tool such as Open OceanMap played in fostering/facilitating a participatory approach. Lessons learned, results, and future directions will also be discussed.

KEYWORDS: marine spatial planning, participatory mapping, community-based fisheries management, participatory spatial planning, participatory GIS

Trade of Aquatic Exotic Fauna in Dominican Republic during the Period 2006-2010
Caracterizacion del Comercio de Fauna Acuatica Exotica en Republica Dominicana durante el Periodo 2006-2010
Une Caracterisation du Commerce Une Faune Aquatique Exotique en Republic Dominicaine durant la Periode 2006-2010

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ABSTRACT

The results of a review of export and import records of exotic species of aquatic fauna marketed towards and from Dominican Republic are presented as well as the regulatory mechanisms in place that characterize such goods trade.Our results show that while ornamental freswater fish are the most frequent item of imports, marine aquarium pets are the capture from the wild and exported mainly for aquarium supply or as aquaculture products. The competences of govermental institutions involved in traffic control and monitoring of potencially invasive species as well as management recommendations are provided.

KEYWORDS: exotic, aquatic, fauna, trade, Dominican Republic

Evaluating the Effectiveness of the No-Take Zone within the Mona Island Natural Reserve, Puerto Rico
Evaluando la Efectividad de la Zona de No Pesca en la Reserva Natural Isla de Mona, Puerto Rico
Évaluant l'Efficacité de la Zone Interdite à la Pêche dans la Réserve Naturelle de l'ILe De Mona, Porto Rico

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ABSTRACT

No-take marine reserves or no-take zones (NTZ) have become an effective tool for restoring marine populations threatened by overfishing by allowing populations to recover from excessive extraction and eventually export larvae and/or adults to adjacent areas (spillover). In 2004, a NTZ was established within the Mona Island Natural Reserve, Puerto Rico's largest and most distant marine protected area (MPA). Mona Island is important as a potential stepping stone across a partial biogeographic barrier, yet populations there are thought to be largely dependent upon self–recruitment. Thus, it is critical that the effectiveness of this NTZ be evaluated. The objective of this study is to evaluate the effectiveness of the Mona Island NTZ with respect to coral reef fish populations threatened by overfishing. We used a before-after-control-impact (BACI) design to analyze these effects. Fish abundance and biomass of selected species known to be fishery targets were used as indicators of NTZ effect. Belt transects and roving surveys, stratified by habitat type and depth, were used to quantify fish abundances and sizes in areas previously sampled in 2005/06 (before reserve effects would be evident). Permutational multivariate analyses of variance (PERMANOVA) were carried out to assess temporal changes between 2005/06 and 2009/10, and spatial differences between take and NTZ of Mona Island. Significant increases in fish abundance and biomass were observed, suggesting a NTZ effect for important fishery resources. This study provides information to determine if marine reserve goals are being achieved at this bio-geographically important Caribbean site.

KEYWORDS: fisheries management, coral reef fishes, no-take zone, Mona Island, threatened species

Comprehensive Census of the Marine Commercial Fishery of Puerto Rico, 2008
Censo Comprensivo de la Pesquería Marina Comercial de Puerto Rico, 2008
Le Recensement Complet de la Pêcherie Commerciale Marine de la Porto Rico, 2008

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ABSTRACT

Puerto Rico's Law 278 of November 29th, 1998, also knows as Puerto Rico's Fishing Law, define that a full time commercial fisher is a person that receive 50% or a higher income from the fishing activity. A part time commercial fisher (CF) receives less than 50% of their income from the fishing activity. The Regulation 6768, knows as PR's Fishing Regulation, established that a part time CF has a minimum of 20% of the total income must be produce by his fishing activity. The mentioned definitions required that the CF must submit their IRS documents to receive a commercial fisher license. Most CF did not like to reports their income to the IRS because they belief that they are poor, thus they do not have the income to contribute to the local government. During 2004-07, the DNER Commercial Fisheries Statistics Program (CFSP) observed that many CF left the fishing activity. Also they observed that many CF were active but they did not obtained the commercial fishing license. The mentioned facts conclude the necessity to realize this fishing census. During January-November 2008, the CFSP personnel realized a fishing census at the 42 coastal Puerto Rico's municipalities. The census goals were: obtain data to determine the total number of active CF, socioeconomic information, number and length of active commercial vessels, number of motors and the motor's horsepower and determine the number and type of active gears. All goals were reached and results and discussed in this paper.

KEYWORDS: commercial, fishers, fishery, socioeconomics

High Larval Settlement of the Long-Spined Black Sea Urchin, *Diadema antillarum* in the United States Virgin Islands
Un Solución Alto para Larvas de Larga Maculiventris Negro Erizo de Mar, *Diadema Antillarum*, en las Islas Vírgenes de los Estados Unidos
Importante Colonie de Larves de l'Oursin Noir à Longue Épines, *Diadema antillarum*, dans les Iles Vierges Americaines

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ABSTRACT

Larval abundance is suggested to be a limiting factor for populations of the long black spiny sea urchin *Diadema antillarum* recovering from the 1983-84 Caribbean-wide die-off, yet such data are scarce. Coral reef recovery may well depend on this keystone herbivore as well. Using methods comparable to similar previous studies in the Caribbean, this study is the first to quantify larval settlement rates on shallow water (<7 m) coral reefs within the United States Virgin Islands. In January 2010, larval traps were deployed in two areas of low (0.21 m^{-2}±0.09 SE) and high (2.75 m^{-2}±0.44 SE) densities of adults in Brewer's Bay, St. Thomas. Monthly settlement rates of juvenile *Diadema* to date are high (max. ~17 m^{-2}) compared to previous studies of settlement in nearshore reefs in Puerto Rico (max. ~0.3 m^{-2}) and the Florida Keys (max. 1.9 m^{-2}). Larval settlement appears to be seasonal, with all of the juveniles appearing between May-July 2010. Surprisingly, fewer juveniles settled in the area with the highest adult density, suggesting that post-settlement mortality is important. Quantifying larval settlement patterns allows managers to better understand factors affecting coral reef recovery.

KEYWORDS: settlement, keystone herbivore, Allee effect, source-sink dynamics

Strategic Planning by Fishers for Capacity Development
Planificación Estratégica de los Pescadores para el Desarrollo de la Capacidad
La Planification Stratégique par les Pêcheurs pour le Développement des Capacités

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ABSTRACT

Strategic planning a process for identifying an organization's vision or long-term goals and objectives, and then determining the best approach for achieving those aims given the various constraints and opportunities expected to confront the organization over the period of the plan. Over the past decade, fisherfolk organizations, especially groups of fishermen, have been encouraged to engage in strategic planning under various initiatives of collaborating governmental and non-governmental organizations. The development of long-term organizational or network capacity among these groups is typically one purpose of strategic planning. Capacity can be defined and measured in many different ways, but critical here is the ability of fishers to self-organize, learn and adapt in changing circumstances while maintain a strategic direction. It is a feature of organizational or network resilience. This paper unpacks some of the concepts introduced above and suggests a practical participatory approach to strategic planning by fishers for capacity development in the context of the GCFI Fisheries for Fishers Initiative.

PALABRAS CLAVES: capacity, development, fishers, planning, strategic

Settlement Patterns of Spiny Lobster (*Panulirus argus*) Postlarvae on Collectors in Jamaican Waters and Culture of Juveniles
Las Pautas del Arreglo de Langosta del Caribe (*Panulirus argus*) Postlarvales En Recaudadores en Aguas y Cultura Jamaiquinas de Jóvenes
Les Modèles de Règlement de Homard Épineux (*Panulirus argus*) Postlarvae sur les Collecteurs dans les Eaux et la Culture Jamaïcaines de Juvéniles

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ABSTRACT

This project investigated the patterns of settlement of postlarval spiny lobster (*Panulirus argus*) using the modified GUSI collector. Growth rates of lobsters in captivity were also investigated using food comprising green mussel, *Perna viridis*, and squid, in a series of mariculture experiments. In the settlement study, a total of 449 postlarvae and 119 juveniles were caught during a 16 month period using 2 collectors per month at each of three sites distributed around the coast of the island. These sites were all in nearshore coastal waters accessible by boat. Results revealed periods of peak settlement in July and between October and November annually. Comparative catchability of the GUSI collector and modified Witham collector used exclusively by an earlier study, suggested that the Modified GUSI yielded slightly more larvae than the latter type. Growth experiments in aquaria under laboratory conditions, showed that juvenile piny lobsters could be grown in captivity by feeding them green mussel, *Perna viridis*, and squid.. Lobsters in these experiments grew for up to twelve months after which they were released back to the wild. The lobsters showed very little intra-specific aggression in captivity. Their territoriality also appeared to break down as up to five individuals could be reared in a single tank, thus permitting higher stocking densities than one per tank. Lobsters readily accepted prepared food and after the inclusion of squid to the diet, experienced little apparent difficulty while moulting.

KEYWORDS: spiny lobster, jamaica, collectors, postlarvae, mariculture

Implantación Del Plan De Co-Manejo para el Control del "Lionfish" Pez León en Puerto Rico
Implementation of the Management Plan for the Control of the Lionfish in Puerto Rico
Une Implantation du Plan de Co-Maniement pour le Contrôle du "Lionfish" au Puerto Rico.

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RESUMEN

En estas breves líneas, pretendemos proporcionar los elementos básicos en los cuales se fundamenta la Implantación del Plan de Co-Manejo del Pez León para Puerto Rico. Partiendo de la siguiente pregunta: ¿De qué manera podemos aplicar las actividades o mecanismos utilizados por los seres humanos, qué han diezmado comunidades de peces

comerciales y aplicarlos para el control de especies invasivas en el Caribe? La visión de los diferentes investigadores es que no podemos hacer nada en contra de la invasión del pez león en el Caribe. Sin embargo, durante años hemos observado como prácticas de pesca comercial, han llevado a diversas especies de vertebrados e invertebrados marinos a las lista de especies en peligro de extinción y se ha buscado controlar su explotación. Partiendo del hecho de que estas técnicas han sido exitosas en mermar especies comerciales a nivel mundial, por qué no ponerlas en práctica con el Pez León en Puerto Rico? Si logramos aplicar estos mismos mecanismos, a esta especie invasiva podríamos controlar su expansión en el Caribe. Desde esta perspectiva, se ha configurado la implantación del programa. Involucrando a diferentes grupos en el proceso, y atendiendo los efectos de este organismo a nivel económico y cultural en la Isla. Debido a su efecto perjudicial en otros organismos (peces comerciales, ornamentales e invertebrados), ambientes marinos (arrecife de coral, pradera de hierbas marinas, manglar) y sectores económicos (industria turismo, industria deportes acuáticos, etc.), se crea un efecto unificador en diferentes grupos de interés particular (Deportes Acuáticos, Buceo, Turismo de Aventura, Pescadores Comerciales, Pescadores Ornamentales, Restaurantes, Hoteles), que pueden ser integrados en el proceso de un plan de co-manejo pesquero a diferentes niveles.

PALABRAS CLAVES: Lionfish, Puerto Rico, Implementation

Lionfish in Costa Rica: Threats, Actions, and Opportunities
Pez León en Costa Rica: Amenazas, Acciones y Oportunidades
Rascasse Volante en Costa Rica: Menaces, Actions et Opportunités

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ABSTRACT

Although University of Costa Rica (UCR)'s scientists were tracking lionfish dispersal across the Caribbean through GCFINET since 2008, the first sighting of this invasive species in Costa Rica was in April 2009. By then, we were prepared to provide a well-documented warning and technical advice to the Ministry of Environment authorities. An immediate and serious response facilitated establishment of the Lionfish Inter-institutional Task Force (LITF-CR) of scientists, government agencies, NGOs, and local communities. LITF-CR coordinates actions under four response axes: Impact Control, Monitoring, Research, and Outreach. A set of three datasheets were designed to start a database of sightings, extractions, and research samples, to be filled by observers, collectors, and scientists, respectively. *Pterois volitans* is the only species reported in Costa Rica, but preliminary results indicate it has reached unprecedented densities. Live import and local marketing is banned, but aquarists maintain black markets. The potential invasion to the Tropical Eastern Pacific coast is one of the greatest threats we are currently facing.

KEYWORDS: invasive species, *Pterois volitans*, reef ecosystems, reef fishes

Variación Temporal del Contenido de Metales Trazas en el Molusco *Arca zebra*, Agua y Sedimentos Superficiales, Extraidos del Banco Natural Coche-Chacopata, Estado Sucre, Venezuela
Temporal Variation of Traces Metals Contents in Mollusc *Arca zebra*, Water and Surface Sediments, Collected from the Natural Bank Coche-Chacopata, Sucre State, Venezuela
La Variation Temporelle du Contenu des Traces de Métaux dans *Arca zebra* Mollusques, l'Eau et les Sédiments de Surface, Prélevés des Ressources Naturelles de la Banque Coche-Chacopata, l'Etat De Sucre, Venezuela

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RESUMEN

Se determinaron las concentraciones de los metales pesados (Cd, Zn, Mn, Fe, Cu, Ni, Co, Pb), en el molusco *Arca zebra* (tejido blando – $mg \cdot kg^{-1}$ masa seca), agua y sedimentos superficiales, del banco Coche-Chacopata, estado Sucre, durante el período comprendido entre los meses de septiembre 2008 a febrero 2009, con el fin de monitorear el comportamiento de estos metales durante el muestreo y además constatar que estos no excedan los límites permisibles para el consumo humano de estos moluscos bivalvos según organismos internacionales (FAO/OMS), para ser incorporados a los planes de manejo integral de la zona costera del estado Sucre. El análisis de los datos obtenidos permitieron establecer dos períodos, uno de lluvia (septiembre – diciembre) y otro de surgencia (diciembre – febrero). Los metales estudiados presentaron la siguiente tendencia de bioacumulación en el molusco Fe>Zn>Cd>Cu observándose una preferencia por los metales esenciales Fe y Zn con promedios de 148,865 y 49,377 respectivamente. Estos mostraron diferencias significativas en la mayoría de los meses muestreados, observándose sus mayores valores durante febrero, correspondientes, probablemente, al establecimiento del período de surgencia. La tendencia del Cd fue una disminución de su concentración durante el muestreo, coincidiendo con la baja de los metales biodisponibles en el sedimento, durante el mismo período. El Cu obtuvo su pico más alto (4,208) en el mes de diciembre finalizando el período de lluvia. Para el agua los metales obtenidos fueron Fe (56,620) y Cu (0,595). En los sedimentos se encontró la presencia de todos los metales estudiados. También se evaluaron los parámetros fisicoquímicos del agua (temperatura, salinidad, pH, oxígeno disuelto), obteniéndose resultados dentro de los parámetros normales (T=29,35ºC; pH=8,37; sal=34,91 $mg \cdot g^{-1}$; TOD=3,49 $mg \cdot l^{-1}$).

PALABRAS CLAVES: *Arca zebra*, bioacumulacion, metales traza, bivalvos, Coche-Chacopata

Industrialmente, ¿Se Hace Buen Uso del Atún? Estudio de los Cambios Fisicoquímicos del Atún *Katsuwonus pelamis* Congelado, durante su Almacenamiento
Industrially, Is Making Good Use Of Tuna? Study of the Physicochemical Changes of Frozen Tuna *Katsuwonus pelamis*, In Storage
Industriellement, Fait Un Bon Usage de Thon? Etude des Modifications Physico-Chimiques de *Katsuwonus pelamis* Thon Congelé, Dans Le Stockage

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RESUMEN

Industrialmente en la actualidad, con la tecnología usada, los almacenes en frío de los puertos marítimos para la conservación de alimentos marinos, poseen temperaturas entre -10ºC y -12ºC, por debajo de las temperaturas recomendadas para el almacenaje de especies como el atún (-18ºC). Estas temperaturas producen un proceso lento de congelamiento, lo que trae como consecuencia un efecto de desecación por la liberación de agua que fluye a través de los intersticios celulares al exterior desde el centro del pescado, debido a que este centro necesita más tiempo para pasar al estado sólido. Por ello, se realizó el estudio de los cambios fisicoquímicos (humedad, pH, nitrógeno básico volátil total e histamina) que sufre la especie *Katsuwonus pelamis* de dos diferentes tamaños (+3 y +10), al inicio y al final, sometidos a condiciones de refrigeración en cavas frigoríficas del Puerto Pesquero en Cumaná, Venezuela a temperaturas entre los -15ºC y los -10ºC durante 4 meses, bajo los efectos de liberación de agua de merma. El estudio arrojó valores de un tiempo de congelamiento de 12 y 30 días, liberándose 0,91% y 3,89% de masa de agua, con un aumento de 0,51% y 0,36% en los valores de pH, un aumento de 1,65% y 0,72% en los valores de nitrógeno básico volátil total y un

aumento de 6,00% y 2,50% en los valores de histamina para el *K. pelamis* +3 y el *K. pelamis* +10 respectivamente. A pesar del aumento de estos valores, los cambios ocurridos no afectan la calidad de la especie, siendo aún aptos para su ingreso a procesos de industrialización, ya que los valores se encuentran dentro de los límites permitidos para su consumo.

PALABRAS CLAVES: *Katsuwonus pelamis*, atun, almacenamiento, refrigeracion,

Fisheries Enforcement in the OECS in the Context of Fishermen's Drivers
Cumplimiento de Pesca en la Oeco Dentro de un Contexto Como Impulsor de los Pescadores
La Mise en Vigueur de Pêcheries dans l'Oeco dans le Contexte des Mobilisateurs de Pêcheurs

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ABSTRACT

The State of marine capture fisheries is cause for concern. The United Nations General Assembly has implied that traditional management approaches employed in fisheries have not ensured the viability or sustainability of stocks. The issue is particularly poignant for the Member States of the Organisation of Eastern Caribbean States, since their fisheries play an important and sometimes underrated part in their economies: providing full-time, part-time and seasonal employment, and contributing significantly both to domestic food security and national GDP. Given the diversity of issues impacting on the sustainable development of the fisheries sector, there is need to consider the terms and conditions pertaining to cooperation with or membership in international organisations, such as ICCAT and WTO, as well as enforcement requirements pursuant to the UN Fish Stocks Agreement, the FAO Compliance Agreement, and the Code of Conduct for Responsible Fisheries. Currently, management measures of OECS Member States address reduction in fishing effort and speak to issues related to the size of fish caught. Compliance with the management measures proposed in the fisheries management plans would require that fishermen alter their fishing gear; but management measures may only have effect if consumers' preferences can be changed consistent with the measures. This contribution considers the implications of this as it impacts on the sustainability of fishers' livelihoods.

KEYWORDS: Organisation of Eastern Caribbean States, marine capture fisheries, enforcement, sustainability of livelihoods,

Comparing Populations of Coral Reef Fishes from Two Marine Protected Areas in Puerto Rico to Assess the Effects of Fishing Intensity
Una Comparación de Poblaciones de Peces de Arrecifes de Coral en Dos Áreas Marinas Protegidas de Puerto Rico para Medir los Efectos de la Intensidad Pesquera
En Comparant les Populations de Poissons des Récifs Coralliens de Deux Aires Marines Protégées à Porto Rico pour Évaluer les Effets d'Intensité de la Pêche

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ABSTRACT

Fishing has been shown to affect fish populations by reducing spawning stock density and average length of fish. We compared population metrics of coral reef fishes from two marine protected areas (MPA) with different exploitation levels in Puerto Rico. Due to its remoteness and no-take zoning within the MPA, Mona Island has experienced less fishing intensity than La Parguera. We analyzed fishery-independent, visual census data from surveys of fish distribution and abundance based on a stratified random sampling approach across all submerged habitats. Both datasets encompass large spatial scales (~10 km) and include 1,202 census stations in La Parguera and 613 in Mona Island. The density, average length and size class distributions were examined for common fishery target species. The mean density of adult individuals varied between locations with most species densities significantly higher at Mona Island. For example densities of *Balistes vetula, Haemulon flavolineatum, Lutjanus apodus, Sparisoma rubripinne,* and *Sparisoma viride* were significantly higher at Mona Island; however that of *Ocyurus chrysurus* was higher at La Parguera, which may be explained by limited nursery habitat. The average length for the five most common species was greater at Mona Island, while at La Parguera smaller individuals made up a greater proportion of the size class distributions. These results demonstrate the feasibility in using visual census data in quantifying population patterns for adaptive management. This study suggests that the low proportion above spawning size for some populations may undermine fisheries sustainability.

KEYWORDS: Fishing-intensity, Coral-reef, Reef-fish, MPA, Puerto-Rico

Interactions among Three Species of Sharks and Grouper Spawning Aggregations in the US Virgin Islands
Las Interacciones entre Tres Especie de Tiburones y Mero que Desovan las Agregados en US Islas Vírgenes
Les Interactions Parmi Trois Espèce de Requins et de Mérou Frayant Agrégations dans les Iles Vierges d'Etats-Unis

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ABSTRACT

Grouper spawning aggregations along deep reefs of the US Virgin Islands represent a large potential prey source for large predators including sharks. To examine the relationship between grouper spawning aggregations and sharks, we tagged three species of sharks with acoustic transmitters and monitored their movements over several years using an array of receivers deployed at spawning sites and at locations spanning a stretch of deep reef approximately 100 km in length between the US Virgin Islands and Puerto Rico. Each species of shark demonstrated different behavioral patterns, with temporal and spatial patterns of movement of one species closely associated with spawning events, but little connection between spawning aggregations and behavior of the other two species of sharks. Lemon sharks (*Negaprion brevirostris*) were present at the spawning sites at a much higher frequency during the spawning season, but largely absent during non-spawning months. Caribbean reef sharks (*Carcharhinus perezi*) moved little throughout the year and were detected on receivers in proximity to spawning sites almost continuously. Tiger sharks (*Galeocerdo cuvier*) were detected on receivers throughout the year along the entire extent of the array of receivers and showed no obvious movement patterns associated with spawning activities and little consistency among individuals. Our findings illustrate variable interactions that may occur between different species of sharks and grouper spawning aggregations and that prey availability may influence the spatial and temporal patterns of activity of co-occurring species of sharks in different ways.

PALABRAS CLAVES: grouper spawning aggregations, migration patterns, predator-prey interactions, shark movements

Fecundidad y Frecuencia de Desove de la Cuna Gata *Mycteroperca tigris* (Serranidae, Epinephelinae) en el Sureste del Golfo de México
Fecundity and Spawning Frequency of the Tiger Grouper *Mycteroperca tigris* (Serranidae, Epinephelinae) from the Southern Gulf of Mexico
Fecondité et Fréquence de Ponte de la Badèche Tigre *Mycteroperca tigris* (Serranidae, Epinephelinae) dans le Sud-Est du Golfe du Mexique

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RESUMEN

Las estimaciones de fecundidad en combinación con las de producción de huevos en el mar permiten estimar la biomasa del stock reproductor, parámetro fundamental para la evaluación del estado de las poblaciones y el manejo de las pesquerías de peces. La cuna gata, Mycteroperca tigris, es un mero de importancia comercial, presente en el Atlántico Centro-Occidental. Poco se conoce de su biología reproductiva y en particular para los stocks del Golfo de México. El propósito del presente trabajo fue de proporcionar información original sobre la fecundidad y la frecuencia de desove de M. tigris de la Península de Yucatán (Banco de Campeche). Un total de 32 hembras en fase de desove (40.0-63.5 cm longitud furcal, FL) fueron colectadas, entre abril y junio de 2008, en una zona de arrecifes coralinos ubicada en el noroeste del Banco de Campeche. La fecundidad por lote y la frecuencia de desove fueron estimadas utilizando el método del ovocito hialino. Las estimaciones de fecundidad por lote fluctuaron entre 84,014 y 989,526 ovocitos por hembra (promedio ± D.E. = 400,464 ± 192,227 ovocitos). Las relaciones entre fecundidad por lote y la talla o el peso de las hembras y el peso de las gónadas fueron positivas, siendo este último el mejor parámetro predicador de la fecundidad por lote de la especie. La frecuencia de desove estimada por hembra fue de 11, con 29% (48/163) de hembras con ovocitos hialinos desovando en promedio todo los 3.4 días. La fecundidad anual estimada fluctuó entre 0.89 y 10.49 millones de ovocitos por hembra (4.24 ± 2.04 millones de ovocitos) y la fecundidad relativa entre 557 y 3,987 ovocitos g-1(2,512 ± 889 ovocitos g-1).

PALABRAS CLAVES: Fecundidad, frecuencia de desove, Mycteroperca tigris, sureste del Golfo de México

Ghost Fishing by Lost and Derelict Fish Pots in the Commonwealth of Dominica
La Pesca Fantasma por Trampas Perdidas y Abandonadas en Commonwealth de Dominica
Pêche fantôme par Piège de Poissons Perdus ou Abandonnés dans le Commonwealth de la Dominique

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ABSTRACT

Over 4500 fish pots were lost in the Dominican pot fishery during the passage of Hurricanes Lenny in 1999, Dean in 2007and Omar in 2008. Additionally, it is estimated that fishers lose on average five percent of the pots deployed annually through theft, relocation due to changes in tides and currents, encounters with marine traffic and conflict with other fishing operations.

These pots which retain full capture function will continue to fish well in excess of twelve months.During continues observation 7 months fin fish were entrappedan average of 189fish per pot. The experiment was conducted on the West Coast of Dominica using ten (10) Antillean Z-type pots, straight funnel entrance to demonstrate the Ghost Fishing function of lost traps by observing them using SCUBA, and other underwater observation of fish behavior and condition. It was also observed that even after one year, the capture function was still present in some pots. The research revealed micro and macro estimation of mortality in the ten pots as well as affected organisms in those pots

KEYWORDS: Ghost Fishing, Antillean Z-Type pots, Straight funnel entrance

Aspectos sobre la Ecología y a Pesquería Recreativa de *Donax striatus* (Bivalvia, Donacidae) en Playa Las Balsas, Gibara, Cuba
Aspects of the Ecology and Recreational Fishery of *Donax striatus* (Bivalvia, Donacidae) in Las Balsas Beach, Gibara, Cuba
Aspects au Sujet de l'Ecologie et Pêche de *Donax striatus* (Bivalvia, Donacidae) dans la Plage Las Balsas, Gibara, Cuba

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RESUMEN

Una población de *Donax striatus* fue muestreada mensualmente desde febrero de 2008 a enero de 2009 en playa Las Balsas, Gibara, Cuba. La población mostró fluctuaciones estacionales de la densidad presentándose los mayores valores en los meses de mayo y octubre de 2008 y enero de 2009. Se observan tres picos de reclutamiento: abril-mayo, agosto de 2008 y enero de 2009. Se observó una distribución estratificada por grupos de tallas: los reclutas fueron encontrados en los estratos superiores de la playa y los adultos fundamentalmente en los estratos bajos. La mayor abundancia se encontró en el estrato intermedio. No hubocorrelación entre los cambios mensuales de densidad con las temperaturas, ni con las precipitaciones, sin embargo parece que los cambios en el régimen habitual del oleaje y la elevación del nivel medio del mar tienen influencia sobre el comportamiento de la abundancia de esta especie. La mayor talla reportada fue de 28.24 mm y la relación entre las variables morfométricas es altamente significativa, presentando un crecimiento alométrico positivo. La estabilización del crecimiento ocurrió a los 15.48 mm, indicando indirectamente que esta es la primera talla de madurez sexual. La pesquería es una actividad poco lucrativa en la que solo el 23% de los pescadores venden la captura. Las colectas se realizan manualmente, existiendo una selección de los individuos. La CPUE alcanzó un valor promedio de 2.5 kg/hombres-día y no existe asociación entre los niveles de captura y la estacionalidad. Esta pesquería recreativa puede considerarse como una actividad sostenible

PALABRAS CLAVES: *Donax striatus*, bivalvos, ecologia, playa, pequeria

Using LEK to Investigate the Historical Ecology and Cultural Heritage of the USVI Fishery
Usando El Conocimiento Ecológico Local (LEK) para Investigar la Ecología Histórica y el Patrimonio Cultural de la Pesquería de las Islas Vírgenes EE.UU. (USVI)
Utilisation de Savoirs Naturalistes Locaux (LEK) pour Enquêter sur L'écologie Patrimoine Historique et Culturel de la Pêche Îles Vierges Américaines (USVI)

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ABSTRACT

Fishermen's knowledge is increasingly recognized as an important source of knowledge and information that can help society to understand environmental changes such as

those that result in both increases or declines in fish populations for example. It can highlight the importance of natural events such as fish migrations and fish spawning aggregations to the past and present fishery. The objective of this study is to gather and communicate local social-ecological knowledge on the USVI fishery from as early as the pre-colonial era and to document the historical heritage of the USVI fishery. We use open-ended, snowballing qualitative interview methodologies that facilitate the free flow of informational and dialogical content, references and judgments of community participants. The local knowledge and historical information gathered is used to develop a web-based educational resource for the USVI fishing community, their families, and future generations. This project aspires to provide a "voice" for the local fishing community with regards to the sustainability of decision making and the fishing community heritage; demonstrating that science and communities can work together in alternative ways of managing the local and regional fisheries resources from a community-based perspective that is culturally appropriate and scientifically sound. Finally, the project anticipates collecting and analyzing a wealth of anecdotal data such as photographic evidence, geographical and spatially-explicit data, as well as historical ethnoecological accounts of social-ecological interactions and transformations. Funding for this research project is provided by NSF's VI-EPSCoR Incubator Grant No. 203045.

KEYWORDS: local ecological knowledge, participatory management, ethnoecology, social science , fisheries management

Definition of Benthic Seascapes and their Temporal Characterization in Sisal Yucatán Mexico
Definición de Paisajes Bentónicos y su Caracterización Temporal en Sisal, Yucatán México
Determination du Paysages Benthiques et Caractérisation Temporaire sur Sisal Yucatán Mexique

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ABSTRACT

Ecological information on the seascapes on the northern coast of the Yucatan Peninsula is scarce at best. Given the local focus on fisheries associated to bottom characteristics (i.e. groupers, octopus), this information is needed towards the future implementation of enhanced fisheries management policies. A relatively small area of 1,240 km^2 in the north-western portion of Yucatan was selected because of its importance as local fishing grounds. Its seascapes were defined and characterized through three climatic seasons (dry, rainy, northerly-winds) from 2009 to 2010 using SCUBA and videotransect methodology. Significant differences in benthic covers were found between seasons using ANOSIM, and a classification scheme of six constant seascapes was obtained using hierarchical clustering. SIMPER analysis highlighted similitude and differences between seascapes on each season. The relationship between different benthic cover types and the substrates was explored using CCA and MDS analyses. The main driving factors to the benthic composition of the seascapes are depth and the substrata proportions (sand, mud, limestone). The main drivers of the variability of benthic categories appear to be waves and currents energy, water turbidity and nutrients.

KEYWORDS: benthic Cover, Temporal Variability, Multivariate Analysis, Marine Habitats

Use of Small ROV Systems to Survey Mesophotic Ecosystems
Uso de Sistemas Compactos de ROV para la Evaluación de Ecosistemas Mesofóticos
Utilisation de Petits Systèmes de ROV d'Examiner des Écosystèmes de Mesophotic

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ABSTRACT

Mesophotic coral ecosystems (MCEs) are challenging to assess due to both depth and geomorphology, but their characterization is important for the assessment of fisheries resources, habitat health and threatened species. Surveys based on rebreather and mixed-gas diving are costly and limited in bottom time. Patchy distributions and depth variations further complicate MCE assessments. We report on use of small Remotely Operated Vehicles (ROVs) to characterize habitats and resources to depths of 130m, primarily off La Parguera and Ponce , Puerto Rico. Our ROV is equipped with parallel laser beams for size estimation, and a sampling claw, and the system can be deployed off of small boats using a portable generator. Preparation times for ROV dives are shorter than other methods. All video images are recorded on digital tape using a camcorder, which provides a permanent record and allows for subsequent analyses by experts in various taxonomic or scientific disciplines. These surveys allow for baseline observations of fish communities and benthic cover, habitat use (including nursery areas) and behavior. Results to date include (1) the documentation of new areas of MCE development, (2) the abundance and distribution of threatened species, (3) the deep occurrence of commercially shallow species, (4) documenting the depth and spatial extent of spawning aggregations, (5) the apparent deep refugia for overfished shallow species, (6) the occurrence of deeper commercially important species, (5) the impacts of sedimentation on MCEs, and the colonization of MCEs by invasive lionfish. ROVs are excellent companions to any mesophotic research diving program.

KEYWORDS: mesophotic, ROV, habitat

Including Ecological Function into Habitat Networks using Numerical Modeling: Assessing Performance and Cost
Incluyendo las Funciones Ecológicas en las Redes de Hábitats Utilizando Modelos Numericos: Determinación de su Resultados y Costo en Incluant les Fonctions Écologiques dans les Réseaux D'Habitats en Utilisant des Modèles Numériques: Détermination son Résultats et de Coût

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ABSTRACT

Numerical models are tools used to identify areas of complex biodiversity or potential hotspots of fisheries production that then can be targeted for priority protection. On a larger scale these can be linked to form potentially self-sustaining habitat networks. Traditionally, models have used habitat as a surrogate for species or community representation, but have not addressed the more difficult task of ensuring that ecological function is incorporated into model results. We have identified an approach to structuring habitat data that facilitates the incorporation of ecological function into model outputs, as well as developing connectivity-based guidelines for assessing results. These were applied to data from Puerto Rico using Marxan. Model runs were made under two levels of clustering, with the "conservation target" arbitrarily set at 30 %. Results showed that only with higher clustering did priorty areas meet the connectivity criteria, but at the cost of requiring about 50% more area to be selected. To further assess results, we constructed a "null" model composed of the four basic habitats (reef, sand, SAV, mangrove), which assumes that all patches within habitat type are equal. Results show little correlation between priority areas chosen by the two models, and patterns of frequency count, indicated that significant adjustments in area selection were made to incorporate ecological function. Again, additional costs were evident. Compared to the null model, the resulting number of planning units selected under the ecological function approach increased by 30%, regardless of the degree of clustering. The benefits are worth such costs.

PALABRAS CLAVES: Marxan, habitat, ecosystem-based-management, coral reef ecosystems, MPA's

Integrating Time-Series of Community Monitoring Data
La Integración de las Series Temporales de Datos de Vigilancia de la Comunidad
L'Intégration des Séries Chronologiques de Données de Surveillance Communautaire

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ABSTRACT

Assessing population trends, evaluating management actions, and identifying community responses to anthropogenic impacts all require an accurate time-series of populations. In practice, such data are often scarce or of varying quality due to the limited resources of managing agencies. In such situations, analyses that integrating multiple data sources (e.g. agency monitoring programs, citizen science observations, fisheries catch records) can yield dramatic improvements in the estimation of population trajectories. To do so effectively, however, such integrative models must account for differences in observation errors across data sources. We used multivariate state space models (MSSMs) to assess the population trajectories of reef fish species from the Florida Keys National Marine Sanctuary based on data from 1) point count surveys conducted through academic institutions and 2) citizen-science monitoring surveys conducted by volunteer Scuba divers. By developing competing models and applying information theory, we demonstrate how MSSMs can be used to compare and integrate multiple monitoring time series, and ultimately improve estimates of the true states of populations though time. Additionally, we demonstrate that by combining multiple time series, it is possible to recover method-specific observation error estimates even for very short time series of data.

KEYWORDS: state space model, volunteer, REEF, coral reef fish, Florida Keys

Effect of Circle Hook Size on Reef Fish Size Distribution and Catch Rate in the Northern Gulf of Mexico Recreational Fishery
Efecto de Tamaño Círculo Gancho de Distribución del Tamaño de Los Peces de Arrecife y la Tasa de Captura en el Norte del Golfo de México de la Pesca de Recreo
Effet de la Taille Hameçon Circulaire Concernant la Distribution Granulométrique Poissons de Récif et les Taux de Capture dans le Nord du Golfe du Mexique de Pêche Récréative

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ABSTRACT

The effect of circle hook size on reef fish catch rates and species composition was tested in the northern Gulf of Mexico recreational fishery. Sixty-one natural and artificial reef sites were sampled during 2009-10 with a micro remotely operated vehicle (ROV) equipped with a laser scale to estimate the community structure and size composition of reef fishes. Fishing then commenced with two-hook bottom rigs that had either 9/0, 12/0, or 15/0 Mustad circle hooks as terminal tackle. Fork length was estimated for 1,463 fish scaled with the ROV's laser scale and 1,642 fish were captured during hook selectivity experiments. Red snapper, *Lutjanus campechanus*, constituted 40.2% of total fish abundance in video samples, but 45.7%, 76.1%, and 86.4% of fish caught with 9/0, 12/0, and 15/0 circle hooks, respectively, were red snapper. The size distribution of red snapper estimated with the laser scale indicated 66.5% of individuals were less than the legal size limit of 406 mm total length, while 66.4%, 45.2%, and 26.2% of red snapper caught with 9/0, 12/0, and 15/0 circle hooks, respectively, were sub-legal fish. While the size of fish caught increased with hook size, the catch rate for red snapper did not decrease with increasing hook size, as was observed for all reef fishes combined. Results of this work demonstrate that hook size could be regulated to affect selectivity, but tradeoffs may be diminished catch rates for some species, as well as a decline in numbers of species caught, with increasing hook size.

KEYWORDS: selectivity, circle hook, reef fish

Importance of a Marine Protected Area in the Mexican Caribbean on the Conservation of the Endangered Species of Queen Conch, *Strombus gigas*
Importancia de Una Área Natural Protegida en el Caribe Mexicano en el la Conservación de Una Especie Amenazada (Caracol Rosa; *Strombus gigas*)
Importance d'Une Aire Marine Protegée dans la Conservation d'Une Espece Menacée, Le Lambi *Strombus Gigas*

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ABSTRACT

The effect of the closure in this fishery is difficult to assess, due to continued illegal fishing. Since 2001, *S. gigas* in Xel-Ha, is monitoring to determine the impact of a MPA on the recovery of population of this species without extraction. Results of time-space variation of abundance and size from 2002 to 2010 by the mark-recapture method were showed. The population structure was determined by the monthly distribution of length-frequencies. *S. gigas*population in Xel-Ha remained stable from 2002 to 2008, with an average density of 0.0056 organismos.m-². From 2009 to 2010 the abundance increased significantly, with a maximum density in "The Cave" in 0011 organismos.m-² and "Bocana" of 0.0074 organismos.m-². The shell length average was 174.74 mm, for the conchs at "La Cueva" was 159.85 mm and at "La Bocana" of 199.22 mm. The presence of adults is low (21.2%) and decreased from 2002 to 2010, however the youth conchs population has increased, which indicates that Xel-Ha park is functioning as a "nursery" for this endangered species and it requires at least seven years to observe a significant increase in the density of this population, as a result of the protection afforded by a MPA as Xel Ha park.

KEYWORDS: conservation, MPA, growth, queen conch, *Strombus gigas*

Institutional Arrangements for Local Management of Marine Areas in the Eastern Caribbean
Los Arreglos Institucionales para la Gestión Local de las Zonas Marinas en el Caribe Oriental
Les Arrangements Institutionnels pour la Gestion Locale des Zones Marines dans les Caraïbes Orientales

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ABSTRACT

There is interest in MPAs in the eastern Caribbean and efforts to establish them. These initiatives have mainly been government led, but some have been participatory,

resulting in government sharing management authority. Such initiatives have aimed for consultative or collaborative co-management (as in Grenada to date), but seldom delegated or community-based co-management (as attempted in Saint Lucia and Dominica). In the Pacific region locally managed marine areas (LMMAs) are commonplace and key to biodiversity conservation and sustainable livelihoods. Eastern Caribbean fisheries legislation provides for local area management authorities (LAMAs), but if and how these provisions are used differs among countries. LAMAs may potentially be alternative or supplementary marine governance arrangements in relation to MPAs, similar to LMMAs in the Pacific. This paper reports on institutional and governance aspects ofCERMESLocal Area Management Project (LAMP). The aims were to provide a SWOT analysis of existing LAMAs, identify strategies for addressing sustainable fisheries by improving existing LAMAs and establishing others, and develop a strategy for establishing LAMAs or another management mechanism to allow community management of resources to reduce fishing pressure in and around MPAs. From January to September 2010 field research, workshops and communication took place in the study sites - Dominica and Grenada - using participatory methods. Lessons learned from the LAMA in Dominica, the potential for improvement there, and the application of lessons to Grenada were examined to help advance the governance of coastal and marine resources in these and other countries in the eastern Caribbean.

KEYWORDS: institutions, LAMA, marine resource governance

Evaluación Espacio-Temporal De Los Ensamblajes de Peces en el Sistema Lagunar de Ría Lagartos, México
Spatial and Temporal Evaluation of Fish Assemblages in the Lagoon System Ria Lagartos, Mexico
L'Evaluation Spatiale et Temporelle des Peuplements de Poissons dans la Lagune Ria Lagartos, Mexique

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RESUMEN

Se estudió la composición de los ensamblajes de peces a lo largo de dos ciclos anuales (2004 -2005 y 2007 – 2008) en una red de 10 estaciones dentro de la Reserva de la Biosfera Ría Lagartos, México. Se registraron parámetros fisicoquímicos (temperatura, salinidad y oxígeno disuelto) y peces (chinchorro playero 15 m largo x 2.5 cm abertura malla). Temporalmente se registraron diferencias significativas en la temperatura y el oxígeno disuelto; mientras que espacialmente, las diferencias significativas se registraron en la salinidad. Espacialmente se registró un gradiente salino con valores marinos en la zona de la boca, hasta más de 100 al interior de la laguna. Se colectaron un total de 11,187 individuos con un peso de 138 kg, de los cuales se identificaron un total de 32 familias y 63 especies. Las especies más abundantes numéricamente fueron *Floridichthys polyommus* y*Cyprinodon artifrons (55%)*, mientras que *Sphoeroides testudineus* fue la que aportó mayor biomasa (71.5%). La composición de especies estuvo integrada por especies estuarinas y marinas eurihalinas. Ocho especies resultaron dominantes mediante el IVI y en conjunto aportaron más del 75%. La salinidad fue la variable que mejor se relacionó con la abundancia de las especies (0.861, CCA). La estructuración de los ensamblajes de peces para la laguna de Ría Lagartos fue principalmente espacial. El hábitat hipersalino fue el que aportó mayor densidad de organismos. Se concluye que la riqueza del sistema lagunar es debida a la variedad de hábitats presentes y a la protección con que cuenta el sistema.

PALABRAS CLAVES: Ría Lagartos, ictiofauna, ensamblajes, espacial, temporal

Expansion of the Soft Crab Fishery in Mississippi using Cultured Blue Crabs
Expansion de la Industria de Jaiba Blanda en Mississippi Usando Jaibas Azules Cultivadas
Développement de la Pécherie de Crabe Mou dans le Mississippi à l'Aide de Crabes Bleus Produits par Aquaculture

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ABSTRACT

The Gulf Coast Research Laboratory in Ocean Springs, MS has successfully operated a hatchery for blue crabs (*Callinectes sapidus*) for over five years. The ability to reliably produce "seed" crabs has great potential for expanded development of soft crab fisheries in the northern Gulf of Mexico and Caribbean. Hatchery-reared blue crabs are stocked as juveniles into non-vegetated one-quarter acre ponds and fed a diet of manufactured feed and scrap fish. When crabs reach 40 to 50 mm carapace width, bushlines constructed of wax myrtle are placed across the pond in close proximity to provide shelter for pre-molt and molting crabs. Peeler crabs collected in the bushlines are harvested and maintained in recirculating shedding systems until they molt. Small soft-shell swimming crabs are currently imported into the U.S. for sale as "cocktail" or "appetizer" crabs and demand exceeds supply. Pond culture of soft crabs would greatly reduce pressure on natural populations and would allow for expansion of the fishery independent of wild stocks. Continuing market demand, profitability to the fishermen, and regional familiarity with pond cultured products all suggest that blue crab aquaculture for soft shell production would be an economically viable enterprise and would provide a measure of conservation to the fishery.

KEYWORDS: blue crab aquaculture, Mississippi, soft crabs

Distribution and Aspects of the Life History of the Deepwater Geryonid Crab, *Chaceon quinquedens* in the Northern Gulf of Mexico
Distribucion y Aspectos de la Historia de Vida del Cangrejo Gerionide de Aguas Profundas, *Chaceon quinquedens* en el Norte Del Golfo de Mejico
Répartition Géographique et Aspects de l'Histoire de Vie du Crabe Geryonid, *Chaceon quinquedens* dans le Nord du Golfe du Mexique

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ABSTRACT

Red crabs occupy a remarkably narrow band along the continental slopes of the Gulf of Mexico (GOM) at depths from 500-2000 m with the majority found at around 900 m, the maximum depth of light penetration (<1%). While widely distributed through the GOM, greatest abundance of red crabs is in the north-central Gulf off Alabama and Mississippi in close association with the recent Deep Water Horizon oil discharge. Bathymetric distribution of adult red crabs cannot be explained by any of the environmental factors collected to date. Neither sediment type nor temperature nor competition with other geryonid species explain observed distribution. Distribution of red crabs may be related to reproductive strategies and mechanisms of larval transport. Females brood their eggs for 9 months with spawning occurring in late fall/early winter. Females carrying eggs comprise about 20% of the total population of females in the northcentral GOM in spring, summer and fall. Recruitment is poorly understood and locations of postlarval settlement areas are unknown. Megalopae have never been captured in the wild and only a few zoeal stages have been identified from plankton samples. Captured larvae were found in the upper 200 m of the water column where currents can disperse them far from suitable habitat. In this study we use archived nowcast/forecast numerical model data to examine dispersal and retention mechanisms. We also estimate the potential impact of the recent oil discharge on the northern Gulf population.

KEYWORDS: *Chaceon quinquedens*, life history, Gulf of Mexico

The 50 Year History of the "Other" Gulf and Caribbean Journal
La Historia de 50 Años de la "Otra" Revista del Golfo y Caribe
Les 50 Ano d'Historie de "L'Autre" Journal du Golfe et des Caraïbes

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ABSTRACT

The Gulf Coast Research Laboratory (GCRL) has a 50 year history of annual publication of the peer-reviewed journal *Gulfand Caribbean Research* (GCR, 2000-present; formerly *Gulf Research Reports* (GRR) from 1961 - 1999). Other extant journals serving the region during this time include *Contributions in Marine Science*(since 1945), *Proceedings of the Gulf and Caribbean Fisheries Institute* (since 1948), *Bulletin of Marine Science* (since 1951) *Revista de Biologica Tropical* (since 1953), and *Caribbean Journal of Science* (since 1961). In the early years of GCR publication, papers were primarily concerned with research in Mississippi and the northern Gulf of Mexico (GOM), and the majority of authors were from GCRL or the GOM region. However, in the past 15 years, studies from Mexico and the Caribbean have dramatically increased, with a concurrent increase in the geographical diversity of authors. Overall, surveys and inventories, taxonomy, and life history studies have been most common, and taxa have been dominated by fish and crustaceans. Offshore, benthic and marsh habitats have been most commonly studied during GCR's 50 year history. In general, publications during the last 15 years are more similar to each other (> 65% similarity based on CLUSTER analysis) than to earlier publications for geography, taxon, habitat and subject areas. The journal is well cited in peer-review literature, with 72% of the papers published in GRR and 65% of those published in GCR cited at least once. GCR provides an important outlet for peer-reviewed publications from the GOM and Caribbean region.

KEYWORDS: journals, Gulf and Caribbean Research, peer-review, publication history, citation history

Preliminary Investigation of the Movements and Habitat Use of Juvenile Queen Conch Aggregations
La Investigación Preliminar de los Movimientos y uso del Hábitat de las Agregaciones de Juveniles de Concha Reina
L'Enquête Préliminaire de l'Utilisation de l'Habitat et les Mouvements des Agrégations de Strombes Géants pour Mineurs

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ABSTRACT

Conservation and sustainable use of queen conch (*Strombus gigas*) is a topic of considerable importance in the Caribbean and is supported by international (CITES) and regional (SPAW Protocol) treaties. Barbados, a conch range state with a small artisanal conch fishery and a signatory to both legally binding treaties has recently begun investing in research and development of management plans for this species. To date the fishery has been described, an island-wide conch abundance survey has been completed and on-going research examines the reproductive characteristics and movement patterns of adult conch. The current study compliments these efforts by examining the spatial ecology of juvenile queen conch in Barbados. Three juvenile conch aggregations have been selected for study and over 100 individuals (shell length 16-20 cm) from each aggregation have been tagged using numbered disc tags (Floy Tag and Manufacturing Inc). A 'key informant' animal in each aggregation has also been tagged with a Lotek MM-S-8-SO acoustic tag to assist in relocating the group. Animals are being acoustically tracked and visually re-located bi-weekly for 3 months. Position (depth, habitat, and GPS co-ordinates) and density (number of individuals within 5m radius) data are collected for key informants and any tagged conch found within a methodical sweep of the area. These data will be used to examine the extent of individual movements (distance, speed, home-range) and track the cohesiveness and movement patterns of the aggregation. This preliminary study will inform a larger scale study of the connectivity of juvenile and adult conch aggregations.

KEYWORDS: queen conch, *Strombus gigas*, acoustic telemetry, home range , GIS

Importance of seascape complexity for resilient fish habitat and sustainable fisheries
Importancia de la complejidad del paisaje marino para el hábitat resistente de peces y las pesquerías sostenibles
Importance de complexité de paysage marin pour l'habitat résilient de poissons et la pêche soutenable

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ABSTRACT

New research in seascape ecology indicates that the spatial arrangement of habitat types and the topographic complexity of the seascape are major environmental drivers of fish distributions and diversity. Impairment of one component of an ecologically functional habitat mosaic and reduction in the architectural complexity of coral reefs is likely to lower the quality of habitat for many fish including important fished species. We explain how declining seascape complexity will lead to declines in biodiversity, contractions in the local spatial distribution of fish and lower resilience to disturbance. Examples are generated from a decade of long-term coral reef ecosystem monitoring in SW Puerto Rico coupled with benthic habitat maps and remotely sensed high resolution bathymetry. We propose that a shift in perspective is needed towards a more holistic and spatially-explicit approach to ecosystem-based management and that a seascape approach can help guide targeted restoration efforts and ecologically relevant spatial prioritization in marine spatial planning.

KEYWORDS: habitat complexity, residence, sustainable fisheries

Early Life History of Dolphinfishes in the Northern Gulf of Mexico
Historia de Vida Temprana de Dorados en el Norte del Golfo de México
Histoire des Premiers Stades de Vie de Coryphènes Communes au Nord du Golfe de Mexique

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ABSTRACT

Common dolphinfish (*Coryphaena hippurus*) and pompano dolphinfish (*Coryphaena equiselis*) are economically and ecologically valuable pelagic fish found in tropical and subtropical oceans worldwide. Although they support both commercial and recreational

fisheries, knowledge of their habitat use and ecology during early life is limited. Dolphinfishlarvae were collected during ichthyoplankton surveys of surface waters in the northern Gulf of Mexico (Gulf) in waters off of Texas and Louisiana (27 – 28° N 87 - 93° W)during June and July of 2007 and 2008. Dolphinfish larvae were relatively common in our sampling area (frequency of occurrence 63.2% and 55.3% in 2007 and 2008, respectively) and more than 700 larvae were collected during this two year study. Mean density (larvae/1000 m^2) of dolphinfishes was higher in frontal zones (1.5) and anticyclones (1.0) compared to the open ocean (0.7) and cyclones (0.5), suggesting that these features may represent important habitats for dolphinfish larvae. Mean standard length varied between seasons with smaller larvae observed in June (7.5 mm) compared to July (15.4 mm). A published age-length key was used to calculate hatch-date distributions, which suggested that spawning times of larvae collected in our surveys ranged from late May to late July with the majority of larvae from June spawning events (54%). Results of this study indicate that dolphinfish larvae are abundant throughout the northern Gulf and that this region may represent important spawning/nursery grounds for these species.

KEYWORDS: *Coryphaena*, dolphinfish, fish larvae, distribution, Gulf of Mexico

Biologia Pesquera del "Yellowtail" *Ocyurus chrysurus* (Bloch, 1791) en San Andres Isla, Caribe Colombiano
Fishing Biology of the "Yellowtail" *Ocyurus chrysurus* (Bloch, 1791) on San Andres Island, the Colombian Caribbean
Biologie de la Pêche du "Yellowtail"*Ocyurus chrysurus* (Bloch, 1791) Sur L'Île San Andres, Caraïbes Colombienne

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RESUMEN

En la Isla de San Andrés, que forma parte del Departamento Archipiélago de San Andrés, Providencia y Santa Catalina el "Yellowtail" *Ocyurus chrysurus* es de gran importancia comercial. En la isla y en los cayos del este sur este (ESE) y sur-sur oeste (SSW), su captura es realizada exclusivamente por pescadores artesanales. Con el fin de determinar algunos aspectos biológicos pesquero de éste recurso, se analizaron datos de 1037 individuos obtenidos de embarcaciones artesanales de la isla. El rango de talla osciló entre 25,2 y 66,7 cm de longitud total (Lt) con una talla media de captura de de 42,4 cm. La relación talla peso arrojó un crecimiento alométrico (b= 2.71), manteniendo esta tendencia por sexo. Se obtuvieron individuos con gónadas maduras durante todos los mese de muestreo, presentándose los mayores porcentajes de julio a agosto. La relación entre las hembras y los machos fue de 1:1. La talla media de madurez sexual (Lm) fue de 40,8 cm de Lt. En el año 2009 la captura reportada fue de 25438. Kg la cual corresponde al 8.75% de la captura total de la isla. Los individuos son desembarcados y comercializados sin vísceras. Las profundidades de pesca van desde los 30 a 100 metros de profundidad, utilizando nylon de 60 y 70 libras de presión y anzuelos Nos. 7, 8 y 9.

PALABRAS CLAVES: Yellowtaill, *Ocyurus chrysurus*, biología, San Andrés Isla, Colombia

Evaluating the Needs of the Fishing and Associated Livelihoods in the Coastal Fishing Sector of Trinidad and Tobago
Evaluación de las Necesidades de los Medios De Subsistencia de la Pesca y Actividades Similares en el Sector de la Pesca Costera de Trinidad y Tobago
Evaluer les Besoins de la Pêche et Gagne-Pain Associés dans le Secteur de Pêche Côtier de Trinité et Tobago

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ABSTRACT

This paper presents the results of a project undertaken to increase the understanding of the importance of the coastal and marine fisheries in Trinidad and Tobago. The authors administered 519 questionnaires to respondents and conducted thirteen focus group meetings in both islands. Among other things, stakeholders articulated their needs at each of the landing sites around the islands. Many different stakeholders with varying needs were encountered. The authors evaluated these needs by considering the government's priorities for the sector including profitability, governance and empowerment. Evaluation criteria were also applied namely: sustainability, representativeness, compliance and feasibility. Arising out of the study high impact recommendations were proposed for growth and development of the fishing sector of Trinidad and Tobago.

KEYWORDS: fisheries, stakeholder, evaluation criteria, UTT, IMA, Trinidad and Tobago

Age and Growth of Lionfish, *Pterois volitans*, from the Western North Atlantic
Edad y crecimiento del Pez Leon *Pterois volitans del Atlantico Norte Occidental*
Âge et croissance de Lionfish, *Pterois volitans*, de l'Atlantique Nord Oues

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ABSTRACT

An age and growth study of lionfish, *Pterois volitans*, was conducted using sagittal otoliths collected from 2004-2009 from Onslow Bay, North Carolina. Sagittal otoliths (n = 814) were removed from lionfish ranging in size from 90 – 464 mm total length (TL). When viewed whole, the sagittal otoliths were relatively thick and highly opaque. Otoliths were small and required embedding in epoxy to be sectioned. Lionfish ranged from calendar age 0 to 8 years, and most of the fish (90%) were age 3 or younger. Growth was rapid during the first and second year of life, attaining on average 150 mm TL within the first year, but also reaching up to 220 mm TL. During the second year, lionfish averaged 230 mm TL, but are as large as 318 mm TL. The von Bertalanffy growth equation based on observed TL at age is $L_t = 455.1(1 - e^{-0.32(t + 1.22)})$. Based on this assessment, the earliest back-calculated spawning year is 1998 (n = 1) which corresponds well with the first report of lionfish in Onslow Bay, NC which was in 2000. Lionfish otoliths from more tropical waters (the Bahamas) were also examined but appear to be more difficult to age due to a lack of annuli clarity. This research suggests that the lifespan of lionfish is approximately a decade and that lionfish can reach sexual maturity within one year. These characteristics may partly explain the rapid establishment of lionfish in the Atlantic.

PALABRAS CLAVES: lionfish, age, growth, invasive, *Pterois*

Strategies to Confront Illegal, Undocumented and Unreported Fishing within The Seaflower Biosphere Reserve, Western Caribbean
Estrategias para Afrontar la Pesca Ilegal, No Declarada o No Reglamentada en la Reserva De Biosfera Seaflower, Caribe Occidental
Stratégies Contre la Pêche illicite, Non déclarée et Non Déclarée dans la Réserve de biosphère de Seaflower, l'Ouest des Caraïbes

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ABSTRACT

In the Seaflower Biosphere Reserve the growing problem of illegal fishing was prioritized at local, national e international level and between commercial fishers to define participative strategies for its control. As a result, a plan to prevent, mitigate and reduce the illegal, unreported and undocumented (IUU) fishing based on FAO guidelines will be generated. The IUU fishing has been recognized as one of the major threats for the sustainable use and conservation of marine ecosystems. Activities such as fishing without a permit, out-of-season, falsified reports and captures of protected species as well as the use of prohibit fishing gears are IUU fishing. Therefore, they varied in intensity and participants depending on the type of fishery and demand adaptive and participative actions. Special treat will be given to those species subjected to international protection or those fishing are highly regulated. With the recent technologies there are new tools available for enforcement and surveillance, but it is necessary to improve the communication and networking among neighboring countries allowing for adoption of localized agreements. This planning process have included the analysis of scientific information, workshops for making proposals and reach agreements and identification of the main policies which in this case would include: co-management and exchanges, biodiversity recognition, improving legality and education and outreach. The implementation of this plan will be successful only in the way it is adapted simultaneously from the local to the regional levels, thus allowing integration of resources and strategies for regional sustainable fisheries.

KEYWORDS: illegal fishing, co-management, sustainable fisheries

Using Otolith Shape Analysis to Identify Different Stocks of *Epinephelus morio* from the Campeche Bank
Identificación de Diferentes Stocks de *Epinephelus morio* del Banco de Campeche Mediante la Forma del Otolito
Utilisation de l'Analyse de la Forme de l'Otolithe pour la Identification des Différents Stocks d' *Epinephelus morio* du Banc de Campeche

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ABSTRACT

Otolith shape analysis was used for discriminating stocks of *Epinephelus morio* (red grouper) from the Campeche Bank. Since red grouper is the most commercially exploited specie in Yucatan, to identify different stocks becomes a major issue for fishery management. From a total of 420 red groupers sampled between 1996 and 1998 by commercial fleet, 363 individuals were analyzed. Both otoliths (sagittae) were removed through the gill arch, alcohol cleaned and stored dry in small paper bags. Each left otolith was measured to obtained otolith length (OL; 0.001cm), otolith width (OWi; 0.001cm) and both otoliths were weighed to obtained the weighted average (OW; 0.0001 g). Each left otolith was consistently oriented at a 45°position (sulcus side down, rostrum upwards)and digitally photographed using a stereomicroscope at 5X and 4X equipped with a videocamera. Otolith shape was determined through Age & Shape software (Infaimon S.L. â) using wavelets descriptors (WLT), and then compared by principal components (PCA) and stepwise canonical discriminant (CDA) analysis. Red grouper standard length ranged from 33.0 cm to 83.0 cm and gutted weight 650.0 g to 13200.0 g. Otoliths meristics varied from 0.6679 - 1.1340 cm OWi, 1.2875 – 1.9992 cm OL and 0.0823 – 0.9516 g OW. Through the shape analysis, 512 random measurements for each of 10 WLT descriptors were calculated. Nevertheless, the PCA established WLT5, WLT6 and WL7 as the best descriptors and were only considered for subsequent discriminating analysis. A hierarchical cluster analysis (WPGMA) showed three distinct groups (r= 0.807).

KEYWORDS: red grouper, otolith shape, discriminating stocks

Preliminary Results on the Growth and Feeding of Wild-Caught *Epinephelus morio* in Captivity
Resultados Preliminares de Crecimiento y Alimentación de *Epinephelus morio* en Confinamiento
Les Résultats Préliminaires sur la Croissance et l'Alimentation des *Epinephelus morio* en Captivité.

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ABSTRACT

Red grouper (*Epinephelus morio*) fishery is the most important one in Yucatan Mexico. This study gives an insight on rearing conditions for red groupers that could provide alternatives to fishing. Using hook and line, 141 red grouper were caught at Sisal Yucatan in 2007. All individuals were kept alive in an aired 0,5 m^3container, vented if needed, and carried to the UMDI-UNAM facility, where they were weighted and placed in tanks. Groupers were fed with trash fish for two months, until adapted to captivity. Then, they were graded into three size groups: Small: 27.3 (±3.06 cm);Medium: 34.3 (±1.74 cm)and Large: 45.9 (±3.42 cm), and reared for a year, in eight 19.63 m^2 tanks with constant seawater and airflow. Fish densities varied from 15.47 to 83.03 g/m^2 depending on the size group. After the adaptation period, all individuals were fed a balanced humid pellet (55.6% protein, 4.9% lipids, 34.5% carbohydrates), 3 times a week. In order to determine the growth rate each grouper was tagged using VIE (Visible Implant Elastomer tags) and measured and weighted every 39 days. Mean individual weight at the beginning of the study was 0.57 kg attaining 1.9 kg per fish. There were significant differences in weight between sampling periods (*Kruskal- Wallis;* H= 143.111; p <0.05), between rate growth in time (*Kruskal- Wallis*; H = 46.39, p <0.05) and between the amounts of food consumed (t = 2.58006; p <0.05).

KEYWORDS: Red grouper, growth rate, reared conditions

The Simpson Bay Lagoon: Towards an Internationally Managed Marine Area
Le Lagon de Simpson Bay: Vers une Aire Marine Protégée Internationale
La Laguna de Simpson Bay: Hacia un Espacio Marina Protegida Internacional

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In the last 40 years, the population of the island of St. Martin/ St. Maarten has increased almost sevenfold. The wider environmental impacts of this population boom has had serious consequences on the marine ecosystems of the island. One of these ecosystems, The Simpson Bay Lagoon, which is the second most significant inland lagoon in the Lesser Antilles and which is approximately 1/10th the size of the island, has seen rapid degradation of its ecosystems due to its importance to the regional marine industry and numerous industrial activities, which are often haphazardly installed. The border separating Dutch St. Maarten and French St. Martin bisects the Simpson Bay Lagoon and thus both sides of the island have a shared interest in its environmental protection. The field investigations and literature reviews show that the surface of the natural environment continues to decline in favour of unrestrained development. The lagoon's ecological balance is disturbed by the decline in seagrass beds and mangroves, which have seen an almost 60% linear decline from 1990 to 2010. These environments, however, play a significant role in maintaining water quality and are degraded by various influencing factors (waste water runoff, urban development, the installation of polluting industries etc.). It is therefore essential to limit these threats which can ultimately have a negative effect on the island's tourism, which remains the mainstay of the economy. Currently, no environmental protection protect the lagoon, either French side or Dutch side. However, the recent change of status for Dutch St. Maarten suggests that this situation will improve and some protection can be put in place. On the same time, the French Collectivity has more and more regulatory powers. It seems now necessary to work on an action plan for a real environmental management of the lagoon. This program will encompass all the actors, all the activities, starting with a zoning of the marine space, and defining the actions to protect natural sites and to reduce sources of pollution.

Processing Sea Cucumber, *Isostichopus badionatus*, in along the Coast of the Yucatán México
Proceso del Pepino De Mar, *Isostichopus Badionatus* en las Costas Del Estado De Yucatán, México
Procedure du Beche-De-Mer, *Isostichopus baniodatus*, dans la Côte Du Yucatan, au Mexique

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ABSTRACT

Sea cucumber fishery in the state of Yucatán, México, started 2006 with a few fishermen in order to evaluate its impact. Nevertheless, the dried sea cucumber processing is very rudimentary. A sample of 35 organisms was taken, mean initial total weight was 434.6g (s=156.7). After cleaning a loss of 28% was registered, the sea cucumbers were boiled in 50 l of tap water around 2 h in a metallic container using 50 kg of non-sorted by size, a 15.3% from de initial weight was registered, with a moisture content of 84.7%. After cooking, the sea cucumber are placed in salt beds to reduce the free water in the tissues and kill micro-organism during 48 h, a loss of 87.7% from initial total weight was observed with a moisture content of 57.5%, then they are washed, rinsed and reboiled in tap water for 30 min, reaching a 8.72% from the initial weight and moisture content of 46.1%. Finally, the sea cucumbers are place on the ground and sun dry for 16 days, to achieve a final moisture content of 5% and a loss of 91.2% from the initial total weight.

KEYWORDS: Seacucumber, *Isostichopus*, Processing

Estimation du Nombre de Sorties de Pêche dans le Contexte Insulaire des Petites Antilles: Comparaison de Trois Méthodes Utilisées en Guadeloupe et Martinique
Estimation of the Number of Fishing Trips in Insular Context of The Lesser Antilles: Comparison Between Three Methods Used in Guadeloupe and Martinique
Estimacion del Numero de Salida de Pesca en el Contexto de las Islas de las Antillas Menores Comparación de Tres Métodos Utilizados en Guadalupe y Martinica

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RESUMÉ

Comme dans la majorité des petites Antilles, les embarcations de pêche des Antilles françaises se retrouvent sur une centaine de sites autour de chaque île. Cette situation rend difficile l'évaluation du nombre de sorties de pêche, indispensable à l'élévation à l'ensemble de la flottille des données par sortie collectées sur quelques ports par des observateurs. Trois méthodes sont utilisées simultanément en Guadeloupe et Martinique et leurs résultats comparés de façon à évaluer l'intérêt de chacune d'elle en termes de qualité des données, coût et faisabilité. La première consiste à recenser les navires d'un port et à en compter le nombre de sorties pendant une journée complète. La seconde, met en œuvre des enquêtes téléphoniques portant sur 7 jours. La troisième, utilise des données de consommation de carburant et d'enquêtes exhaustives sur les calendriers d'activité des unités de pêche.

MOTS CLÉS: Statistiques de pêche, effort de pêche, petites Antilles, Antilles françaises

Detection of Mona Island and Abrir la Sierra, Puerto Rico Red Hind (*E. guttatus*) 1 M Off the Bottom with Hydroacoustic Techniques
Detección de Meros Cabrilla (*E. guttatus*) en Isla de Mona y Abrir La Sierra, Puerto Rico a 1m del Fondo con Técnicas de Hidroacústica
Détection de Mérou Couronné (*E. guttatus*) À l'Île de Mona et Abrir La Sierra, Puerto Rico 1 M du Fond avec Hydroacoustique Techniques

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ABSTRACT

Quantifying fish abundance at spawning aggregation sites is critical for assessing stock status, but methods must overcome limitations posed by weather and labor-intensive diver-based surveys. This study attempts to quantify red hind (*E. guttatus*) utilizing hydroacoustic techniques. Here we summarize the preliminary results for hydroacoustic surveys conducted at spawning aggregations at Mona Island (MI) and Abrir La Sierra (ALS), PR during January 7 and February 3-4, 2010, where we targeted fish within 1 m off the bottom only. A total of 14.519 km at MI and 3.465 km at ALS of hydroacoustic transects were collected. Fish in the 30-35 cm size class and larger were absent during January, but their abundance increased during February at both MI and ALS. This suggests the arrival of larger fish, which correlates with the data obtained by divers, except that the hydroacoustic data show an influx of fish sizes > 45 cm whereas divers observed an increase in fish below this size The proportion of fish in the size classes 35-40 and 40-45 cm observed by divers seems to be skewed right when compared to the hydroacoustic data. The number of fish (n) per hydroacoustic survey is very similar for the month of February both for MI and ALS (n=92, 114, 98, and 132, respectively). At ALS, fish target strengths (TS) values that coincide with calibration TS values for *E. guttatus* were detected within 1 m off the bottom, showing that the hydroacoustic system used can detect TS of fish close to the bottom.

PALABRAS CLAVES: hydroacoustics, *E. guttatus*, SPAGS

Mitochondrial DNA Evidence for a Natural Intergeneric Hybrid between *Ocyurus chrysurus* and *Lutjanus jocu* (Perciformes: Lutjanidae)
ADN Mitocondrial como Evidencia de un Hibrido Intergenérico Natural entre *Lutjanus jocu* y *Ocyurus chrysurus* (Perciformes: Lutjanidae)
ADN Mitocondrial comme Preuve d'un Hybride Intergenérico Naturel entre *Lutjanus jocu* et *Ocyurus chrysurus* (Perciformes: Lutjanidae)

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ABSTRACT

Species from the family Lutjanidae, commonly known as snappers, represent one of the major resources for marine fisheries. This family consists of 5 subfamilies, 21 genera and nearly 120 species. They represent most important components of the reef fisheries in tropical and subtropical latitudes. Despite the importance of the family, the high number of species and its worldwide distribution, exploration of the taxonomic identification, early life history and phylogenetic relationships of lutjanids is far from complete and continually under review. New species have been identified recently and species previously described as valid have been recognized as natural intergeneric hybrids of lutjanids. The high similarity of morphology and crossbreeding within lutjanids increases taxonomic uncertainty. Conventionally, phylogeny, ontogenetic descriptions and species identification of lutjanids relied on morphological features. Molecular methods, proven to be useful when morphological methods do not succeed, are becoming useful tools for taxonomic identification. We used DNA sequence data of the 12S rRNA mitochondrial gene to generate a molecular identification key for 15 species of lutjanids. DNA data from a sample of a lutjanid with morphological descriptions suggestive of a hybrid between *Lutjanus jocu* and *Ocyurus chrysurus* was compared to our molecular key. DNA from this specimen shared 100% identity with adult voucher consensus sequences for *Lutjanus jocu*.The validity of the genus *Ocyurus* has been discussed and investigated, leading some authors to propose the synonymization of *Ocyurus*with the genus *Lutjanus*. The data obtained in this study reinforce the proposal to synonymize *Ocyurus* with *Lutjanus*.

KEYWORDS: snapper, Lutjanidae, mtDNA, hybrid, *Ocyurus*

Effect of Red Tides and Hurricanes on the Fishery of the Octopus on the Coast of the Yucatan State
Efecto de la Marea Roja y los Huracanes sobre la Pesquería del Pulpo en la Costa del Estado de Yucatán
Effet de Marées Rouges et des Ouragans sur la Pêche de la Pieuvre sur La Côte de l'État de Yucatán

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ABSTRACT

The bloom of harmful algae have increased their prevalence, duration and geographical spread as hurricanes with greater intensity and frequency, greatly affecting the economy, the environment and human health. The coast of the Yucatan State has not been the exception and have these events since 1948, being the latest 2001,2003 summers and 2008 that resulted in heavy losses in the fishing and tourism sector. On the coast of Yucatán, major fishery resources are: Grouper, Octopus and lobster, which support high pressure of fishing and alteration of habitats due to accelerated urbano-turístico development in the coastal area of this region. In the State of the "red tide" Yucatán and Hurricane affected more than 80% of the coast of the State with 378 km. from shoreline, affecting mainly the market of the Octopus (main producer and exporter of Mexico). Fishing this composed of Red Octopus *Octopus maya* and Octopus common or patón *O. vulgaris* occupying the third national site for his commercial capture by the tuna and shrimp. In this situation, the objective of this paper is to analyze Octopus capture statistics in the last ten years and estimation of biomass that is earlier than the capture with the result that the red tide and hurricanes affect capture of Octopus and consequently economically affects 15,000 fishermen lower 3,330 minor permit fishing and more with 500 boats fleet boats fleet. In this situation the State Government supports temporary employment and foodpantries

KEYWORDS: red tide, hurricane, *Octopus maya*, *Octopus vulgaris*

Biologia Pesquera del "Bonito" *Thunnus atlanticus* (Lesson, 1831) en San Andres Isla, Caribe Colombiano
Fishery Biological of the "Bonito" *Thunnus atlanticus* (Lesson, 1831) in San Andres Island, Colombia Caribbean
Biologie de la Pêche du "Bonito" *Thunnus atlanticus* (Lesson, 1831) sur l'Île San Andres, Caraïbes Colombienne

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RESUMEN

En el Archipiélago de San Andrés, Providencia y Santa Catalina el "Bonito" *Thunnus atlanticus* es la especie de mayor desembarco por parte de los pescadores artesanales. Esta especie constituye la principal carnada para la captura de otras especies y a la vez es de gran importancia comercial en la región. Con el fin de determinar algunos aspectos biológicos pesquero de éste recurso, se analizaron datos de 1260 individuos obtenidos de embarcaciones artesanales de la isla de San Andrés, muestreados entre mayo a noviembre de 2009 y febrero a mayo de 2010. El rango de talla osciló entre 21,0 y 72,0 cm de longitud total (Lt) con una talla media de captura de de 44.5 cm (± 2.9). La relación talla arrojó un crecimiento alométrico positivo (b= 3.06), manteniendo esta tendencia por sexo. Los mayores porcentajes de individuos con gónadas maduras se presentaron entre los meses de junio y agosto. El factor de condición oscilo entre 0.91 y 1.03, no encontrando diferencias significativas a lo largo de los meses de muestro. La relación entre las hembras y los machos fue de 1:1. La talla media de madurez sexual (Lm) fue de 40 cm de Lt. En el año 2009 la captura reportada fue de 79934 Kg la cual corresponde al 25.7% de la captura total de la isla. Su captura se hace mediante el trolling(troleo) utilizando nylon entre 80 y 150 libras de presión y dos anzuelos No. 6.

PALABRAS CLAVES: *Thunnus atlanticus*, Bonito, Biologia, San Andres Islas, Colombia

Use of Passive Acoustics to Map Grouper Spawning Aggregations, with Emphasis on Red Hind, *Epinephelus guttatus*, off Western Puerto Rico
El Uso de Acústicas Pasivas para Trazar Mapas de Agregaciones de Desove de Meros, Con Énfasis en El Mero Cabrilla, *Epinephelus guttatus*, en el Oeste de Puerto Rico
L'Utilisation des Acoustiques Passives pour Tracer des Chemins des Méroux Frayères, en Mettant L'Accent sur le Mérou Couronné, *Epinephelus guttatus*, á la Côte Ouest de Porto Rico

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ABSTRACT

Most large groupers form spawning aggregations at predictable locations and times, resulting in their susceptibility to overfishing and other ecological threats. Research, management, and enforcement of such aggregations could be enhanced if their exact locations were known. Traditional detection methods of diver and catch surveys are time consuming, especially when considering multiple species and sites. Many groupers such as red hind, *Epinephelus guttatus*, are soniferous and increase sound production at specific locations during periods of courtship and spawning, permitting the use of passive acoustics to locate and map these aggregations more efficiently. During January and February 2010 on days and hours known to have high call rates, passive acoustics were used to map a spawning aggregation of red hind off western Puerto Rico. A hydrophone attached to a mobile digital audio recorder was lowered from a boat as the vessel drifted over a suspected spawning aggregation area, while the global positioning system (GPS) coordinates were simultaneously recorded. After listening to the audio recordings, occurrences and intensities of red hind calls were charted with their GPS locations in GIS. The northern, eastern, and western boundaries of the aggregation were successfully mapped and the site verified by divers. The southern boundary was not defined due to aberrant drift patterns and the end of the spawning period, which resulted in the cessation of red hind calls. These time-saving methods and technologies can be expanded to other soniferous groupers, and potentially can be automated so that results can be determined in near-real time.

KEYWORDS: spawning aggregation, passive acoustics, mapping, red hind

From Habitat Mapping to Ecological Function: Incorporating Habitat into Coral Reef Fisheries Management
De la Cartografía de Hábitats a la Función Ecológica: Incorporando el Hábitat en el Manejo de las Pesquerias de Arrecifes de Coral
De la Cartographie d'habitats á La Fonction Ècologique: En Incorporant l'Habitat dans le Maniement des Pêcheries de Récifs de Corail

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ABSTRACT

Ecosystem-based fisheries requires management to consider habitat functions, but how this can be accomplished is often not clear. While habitats represent species and life-stage distributions, more important is how knowledge of habitat abundance, distribution and spatial arrangement can be used to identify, spatially explicit, key ecological functions necessary for sustaining fisheries production. Multivariate numerical models are tools for identifying potential production centers, but ecological function can only be incorporated if input data are appropriately designed and scaled, and outputs are appropriately evaluated. We address key functions related to connectivity (ecological flows) using a two-part approach. First, habitats are subdivided to reflect differences in represented fauna, but with particular emphasis on differential habitat use across both species and ontogenetic stages within species, thus ensuring that the habitats needed to support all ontogenetic stages will be represented. Resulting habitats should be in near proximity to enhance the probability of connectivity at the local scale. Second, the known limits of connectivity are defined in terms of distance or locations. These limits are then used to assess the suitability of results. For Puerto Rico, habitats were divided into 22 subcategories [reef/colonized hard bottom (8), uncolonized hard bottom (4), unconsolidated substrate (2), seagrass (5), macroalgae (3), mangroves (3)], with subcategories relating benthic and/or fish community structure to habitat type, geomorphology and cross-shelf position. For example, mangroves were subdivided into lagoonal, shoreline edges and mangrove keys to account for both community differences and nursery functions. Larval connectivity was 40 km; ontogenetic connectivity requires full cross-shelf representation.

KEYWORDS: ecosystem-based management, Puerto Rico, coral reef ecosystems, Marxan, MPAs

The Simulation of the Interaction among Sea Fan Colony, Its Immune System, and a Potential Pathogen
Una Simulacion de la Interaccion entre Abanicos de Mar, Su Sisteme Inmune y Un Potencial Patogeno
La simulation de l'interaction entre colonie des fan de la mer, Son système immunitaire, et un potentiel pathogène

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ABSTRACT

We present a mathematical model using ordinary differential equations that describe the interaction among Gorgonia ventalina under different immune conditions (optimal, intermediate, and immune-compromised), and a potential endo-pathogen. The model has the following assumptions: 1) The polyps are the main unit of the coral; 2) the population of polyps is homogonously distributed through the colony, and thus is considered as single and 3) the immune system is activated by a signal. When the endosymbiont exceeds a density threshold, it becomes pathogenic, decreasing the birth rate of new polyps or increasing their death rate. As a consequence, the colony emits a signal to its stem cells (immune cells) to differentiate into humoral and phagocytic cells, both of which combat the pathogen. Under the optimal immune condition the pathogen is rapidly eradicated by the immune cells and the coral polyp population returns to its equilibrium state. Under the sub-optimal immune condition, polyps and pathogen co-exist, and the maximum capacity of new polyp formation is never reached. In contrast, when coral is immunologically compromised, immune cells cannot stop the pathogen growth, and the number of polyps tend to zero.

PALABRAS CLAVES: mathematical model, gorgonia ventalina, Immune System

Reef Fish Management and The Great Barrier Reef
Gestión de Pez de Arrecife y La Gran Barrera De Coral
La Direction de Poisson de Récif et La Grande Barrière

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ABSTRACT

Over 30% of the Great Barrier Reef is protected from fishing. Fish spawning season closures protect many reef fish especially coral trout, and there are catch and size limits. However, these management arrangements have been implemented over many years through stakeholder discussions and compromise, and rely on acceptance and compliance. Recent changes to spawning season closures were made due to stakeholder pressure to reduce management complexity. An overview of the management arrangements will be provided, and how we got here, with lessons learnt on research, stakeholder outreach, using the precautionary approach, and pros and cons of public support.

KEYWORDS: spawn, reef fish, management, marine protected area, Great Barrier Reef

Mating Aggregations In Need Of 'Makeover'
Agregaciones de Desove Requiere Una Imagen Nueva
Les Agrégations de Ponte ont Besoin D'Une Image Nouvelle

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ABSTRACT

Fish spawning aggregations host a critical component of the reproductive biomass of many commercially important fish species. Indeed such aggregations have long formed the very basis of many major fisheries globally. Given the fundamental, and undisputed, need to maintain sufficient spawning biomass for the persistence of fish populations, as enshrined in fishery science and applied in good conservation planning, it is a matter of serious concern that few spawning aggregations are managed or explicitly incorporated into marine protected areas. This is despite overwhelming evidence of their vulnerability to overfishing. Reasons for such omission range from their key role in fishery landings through seasonally high abundances of fishes, to the illusion such bounty inevitably creates that all is well and that management is not a high priority. Spawning aggregations need a 'makeover' – a change of image in public perception, improved policies and a greater understanding of their overall importance in fisheries. These issues will be discussed both specifically in relation to spawning aggregations, and as symptomatic of an inability to address overfishing problems of reef fish fisheries in general.

KEYWORDS: spawning, aggregation, reef fisheries, perception, policy

Genetic Management of Aquaculture Based Marine Stock Enhancement – Main Issues and Current Developments in Mississippi
Manejo Genético del Aumento de las Poblaciones Marinas a Través de la Acuicultura - Aspectos Principales y Desarrollos Actuales en Mississippi
Gestion Génétique des Programmes de Repeuplement pour les Espèces Marines – Principaux Problèmes et Développements Actuels dans le Mississippi

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ABSTRACT

Stock enhancement is the release of cultured juveniles into the wild to augment the natural population and optimize harvests by overcoming recruitment limitation. A responsible and scientifically-based approach to stock enhancement was proposed by Blankenship and Leber [American Fisheries Society Symposia 15**:**167–175 (1995)] and includes the development and refining of production and stocking plans in conjunction with a thorough process of evaluation and monitoring of the success and impacts of programs. Management of genetic resources is an essential component of stock enhancement and aims to conserve genetic diversity and avoid deleterious genetic effects on wild stocks. Development of a genetic program to achieve those goals requires assessing and monitoring genetic diversity in the hatchery and in the wild populations being supplemented, understanding the structure of wild populations and local adaptation to develop adequate broodstocks to produce offspring for stocking, and also evaluate and mitigate possible impacts of the program on fitness. We will review and discuss the main current issues related to the management of genetic resources during marine stock enhancement in the context of on-going enhancement efforts for Mississippi spotted seatrout (*Cynoscion nebulosus*).

KEYWORDS: marine stock enhancement, marine aquaculture, genetic diversity, spotted seatrout, genetic management

Testing for Genetic Isolation between Gulf of Mexico and U.S. Atlantic East Coast Gray Triggerfish using a Mitochondrial DNA Molecular Marker

Prueba de Aislamiento Genetico del Peje Puerco del Golfo de Mejico y de la Costa Este ee Los Estadoss Unidos Usuando Un Marcador Molecular de ADN Mitocondrial

Un Test de l'Hypothèse d'une Isolation Génétique entre les Populations de *Balistes caprins* du Golf du Mexique et Celles de la Côte est des Etats Unis à l'Aide d'un Marqueur Moléculaire de l'ADN Mitochondrial

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ABSTRACT

The gray triggerfish (*Balistes capriscus*) is a reef fish that occurs along the Western Atlantic coast from Nova Scotia to Argentina. In the United States the species is exploited mostly by recreational fisheries in the northern Gulf of Mexico and South Atlantic regions. Recent stock assessments indicated that the species is being overfished and a rebuilding plan is in progress. The fishery is currently managed as a single stock for the southeast United States region in the absence of reliable information on stock structure. We developed a sequencing assay for a 617 base pairs fragment of the ND4 gene encoded by mitochondrial DNA. Thirty samples from South Texas (off Port Isabel) and 29 from South-East Florida (off Jupiter) were assayed and the data used to conduct a preliminary assessment of genetic variation and stock structure of gray triggerfish in the southeast United States. Results revealed that the gene surveyed was variable in the species with 14 and 17 haplotypes found in the South Texas and South-East Florida samples respectively. Analysis of molecular variance did not indicate significant genetic heterogeneity between the two geographic populations. Inference power in the study was reduced due to the small sample sizes and the use of only one genetic locus. Because of these limitations, subtle genetic differences, as is commonly observed in marine fishes, may not be revealed by the present dataset. Further study employing larger sample sizes, additional locality samples and additional loci including hypervariable-nuclear-encoded microsatellites is warranted and in progress.

KEYWORDS: Balistes capriscus, Gray triggerfish, Stock structure, Conservation genetics, Mitochondrial DNA

Estrategia para el Control del Pez León (*Pterois sp.)* en el Archipiélago de San Andrés, Providencia y Santa Catalina, Colombia: Lineamientos y Experiencias.

Strategy for the Control of the Fish Leon (*Pterois* sp.) in the Archipelago of San Andres, Providence and Santa Catherine, Colombia: Approaches and Experiences

Stratégie pour le contrôle de la Poission de Leon (*Pterois* sp.) Dans l'Archipel de San Andres, Providence et Santa Catalina, de la Colombie: approches et expériences

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RESUMEN

La invasión de la especie introducida *Pterois volitans/miles* en el Caribe ha generado una gran preocupación por los efectos que pueda llegar causar sobre la diversidad íctica arrecifal, el recurso pesquero, la salud humana y el turismo. En el año 2008 se reportó por primera vez en el Archipiélago de San Andrés, Providencia y Santa Catalina, Colombia el primer individuo, siendo el primer registro para el país. Aunque se desconocen los efectos que pueda causar, desde el año 2009 se ha observado un alarmante incremento en la frecuencia de avistamientos de la especie en las islas, así como en su distribución y abundancia; generando una alarma entre la comunidad y las instituciones ambientales. La Corporación para el Desarrollo Sostenible del Archipiélago de San Andrés, Providencia y Santa Catalina, CORALINA, considerando la necesidad de velar por la biodiversidad de los ecosistemas marinos, limitar la dispersión de *Pterois volitans/miles* y reducir sus poblaciones a generado una estrategia para el control de las poblaciones de la especie en el Archipiélago la cual ha empezado a ser implementada en conjunto con la comunidad de las islas. Con el objetivo aportar al conocimiento de la especie en el Caribe Colombiano mediante socialización de la estrategia de control de la especie en el Archipiélago y el flujo de información sobre las experiencias observadas, se presentan los lineamientos generales de la estrategia así como los resultados hasta la fecha generados.

PALABRAS CLAVES: Lionfish, *Pterois* sp., Reserva de Biosfera Seaflower, Management, Colombia

Trophic and Reproductive Aspects of the Lion Fish *Pterois volitans*, In San Sandrés Island, Biosphere Reserve - Seaflower, Colombian Caribbean

Aspectos Tróficos y Reproductivos del Pez León *Pterois volitans*, en San Sandres Isla, Reserva de Biosfera - Seaflower, Caribe Colombiano

Approches Trophiques et Reproductives du *Pterois volitans* Rascasses, a l'Île de San Andres, Reserve de la Biosphere-Seaflower, Caraïbes Colombiennes

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RESUMEN

El pez león *Pterois volitans* (Linnaeus, 1758), es una especie originaria del Indo-Pacífico que ha invadido y colonizado los arrecifes del Gran Caribe. Representa un alto riesgo ambiental por ser depredadora y ponzoñosa. En Colombia se ha registrado en el Caribe; en el Archipiélago de San Andrés - RB *Seaflower* desde noviembre de 2008. En el 2009 se inició la investigación de ésta especie, con el estudio de su población y estimar su impacto en Seaflower, para contribuir al manejo sostenible. Los aspectos tróficos se analizaron mediante métodos numéricos y gravimétricos, incluyendo índices. De los aspectos reproductivos se analizaron el sexo y estado gonadal en cuatro categorías a nivel cualitativo. De acuerdo con los censos visuales, alrededor de San Andrés entre noviembre 2009 y junio 2010, se estimóla presencia de 500 individuos. De estos, se han analizado un 10%, entre 5 a 28 cm de longitud total y con peso de entre 2 a 306 gramos, siendo juveniles el 52%, hembras 20% y machos 28%, de los cuales el 60% estaban inmaduros y el 40% madurando. El contenido de grasa II, se encontró en el 52% de los individuos, el grado de repleción fue casi vacío en el 45% y medio lleno 40%. La especie es carnívora, cuya dieta principal son los juveniles de peces y crustáceos; en diez individuos, se encontraron 28 peces. Existe una población creciente en el área, con presencia de juveniles y adultos madurando sexualmente a menos de 30 m de profundidad. Se proponen medidas de manejo para controlar la población en Seaflower.

PALABRAS CLAVES: Pez León , *Pterois volitans*, especie invasora, aspectos trófico y reproductivo de peces, Reserva de Biosfera Seaflower, Caribe Colombiano

Reproductive Cycle of *Busycon perversum* (Mollusca:Gastropoda) From The Gulf of Mexico.
Ciclo Reproductivo de *Busycon perversum* (Mollusca:Gasteropoda) en el Golfo de México
Cycle Reproductif de Busycon Perversum (Mollusca:Gastéropode) au Golfe du Mexique

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ABSTRACT

The Lightning whelk, Busycon perversum is an important fishing resource of the coast of Campeche, at Yucatan Peninsula. It represents near 40% of the estate commercial catch, considered in 6,500 t. In order to have some scientific bases for the management of existing populations, the reproductive cycle was studied to determine the reproductive periods. Twenty adult B. perversum were sampled monthly from April 2008 to Mars 2009 at Seybaplaya, on the Campeche Bank. The sex ratio was constant through the year with proportion 4:1 (female: male). The maturity stages in females were established depending by the amount of ovarian tissue, ovarian ducts and, the presence of oogonias and oocytes. Five development stages were identified: 1) ovogenesis, 2) maturation, 3) spawning 4) pos spawning, and 5) resting stage. Sexually active females were observed year-round from mayo 2008 to February 2009, with a maturity pick from September to November.

KEYWORDS: reproductive cycle, gastropod, *B. perversum*, Gulf of Mexico, Campeche

Underwater Audio and Video Recorders to Assess Reproductive Behaviors of Groupers during Spawning Aggregations
Grabadoras de Audio y Vídeo Subacuático para Evaluar los Comportamientos Reproductivos de los Meros durante Agregaciones Reproductivas
Enregistreurs Audio et Vidéo Sous-Marine à Évaluer les Comportements en Matière de Reproduction de l'Agregation de Mérou

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ABSTRACT

Reproductive behaviors associated with spawning aggregations provide important cues to identify this critical phase in the life cycle of reef fishes. Some of these behaviors are rarely documented due to the inherent difficulties and limitations of underwater research. *In-situ* audio and video recorders allowed us to describe and quantify these for three grouper species within a multi-species spawning aggregation. Fish behaviors and passive acoustic signals were recorded continuously with a low-light video camera and two hydrophones connected to a digital recorder. These units were deployed between February and May from 2008 to 2010, although not all months were surveyed in all years. Behaviors associated with spawning aggregations were observed for *Epinephelus guttatus*, which included territorial displays such as changes in coloration patterns, posing, chasing, and sound production ('whoot-woo'). Courtship behaviors of *Mycteroperca tigris* and *M. venenosa*, included quick changes in coloration patterns, body twitching and posing, but only *M. venenosa* produced sounds associated with these behaviors. Greater numbers of *M. venenosa* were observed in spawning groups with video recorders than in diver surveys, and spawning was recorded on three occasions, minutes before and after sunset, which would have been difficult to observe by divers. The combination of underwater audio and video recording technology was essential for linking species-specific, passive acoustic signals with reproductive behaviors. The continuity of recordings and lack of diver interactions allowed us to identify changes in abundance patterns, pinpointing the best hours of the day to conduct surveys, and determine peak spawning days.

KEYWORDS: Spawning-Aggregation, Reproduction, Groupers, Technology, Passive-Acoustics

Enhancing Condado Lagoon's Essential Fish Habitat with an Artificial 'Taíno' Reef Trail
Mejorando el Hábitat Esencial para Peces en la Laguna del Condado con la Vereda 'Taína' de Arrecifes Artificiales
Amélioration de Condado Lagoon l'Habitat du Poisson Essentielles d'un Parcours Artificiel 'Taíno'

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ABSTRACT

The Condado Lagoon is an important part of the San Juan Bay Estuary as it holds a link between the marine waters of the Atlantic Ocean and the estuary. The lagoon is important both in ecological function and economic potential to local tourism enterprises. As part of a fish habitat enhancement program a submarine snorkeling trail with artificial reef modules was created. In addition to providing habitat for coral reef and estuarine fishes the area provides an attraction that can be used to reduce intensive human impacts on nearby reefs. Forty-four artificial 'Taíno' reef modules deployed in near-shore sandy habitats have been colonized by a variety of corals, motile invertebrates and fishes. This study compares the fish community over time by conducting stationary underwater visual surveys (point counts) before modules were deployed and quarterly during a year afterwards. Fishes were numerated to the lowest possible taxonomic level and length was estimated to the nearest cm. The number of species increased throughout the study period with a triplication after deployment and at least 40 that were previously undetected. Grunts and surgeonfishes showed a consistent increase in the size distribution towards the end of the study period. The enhancement of fish habitat is a step towards the conservation of coral reef species affected by environmental degradation. The Condado Lagoon Taíno Reef Trail provides a useful tool for enhancing fish habitat while providing a recreational attraction.

KEYWORDS: Artificial-reef, Habitat, Coral, Reef-fish, Puerto Rico

Environmental and Anthropogenic Drivers to Basin Wide Patterns in Caribbean Reef Fish Diversity
Medio Ambiente y Factores Humanos a los Patrones de Toda la Cuenca del Caribe en la Diversidad de Peces de Arrecife
L'Environnement et les Pilotes Anthropiques De Modèles Vaste Bassin De La Diversité Poissons De Récif Des Caraïbes

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ABSTRACT

Mounting evidence suggests that reef fish diversity mediates reef resilience through functional redundancy and complementarily. Managing and preserving coral reef fish diversity requires an understanding of the mechanisms and environmental correlates of such diversity. Developing this understanding first requires detailed, spatially-explicit data on biotic, abiotic, and anthropogenic features of reef fish communities.We used the Atlantic and Gulf Rapid Reef Assessment (AGRRA) database in conjunction with freely available anthropogenic and abiotic geographic data to develop a broad assessment of associations between site characterisitics and reef fish communities. Rather than attempting to construct a function that defines the species-abundance relationship across sites based a short list of explanatory variables, we first fit a nutral model of species diversity to the data, and subsequently modeled the site-specific residuals from this relationship. Results indicated that latitudinal gradients, fishing pressure and interactions across tropic levels play an important role in shaping site-specific reef fish diversity. By isolating the influence of site characteristics from the region-wide pattern of community assembly, we were able to directly assess site-specific correlates to marine biodiversity.

KEYWORDS: reef fish, diversity, neutral model, AGRRA, fishing pressure

Recent Improvements in the Scientific SEDAR-CIE Peer Review Process For Fisheries Stock Assessments in the Gulf of Mexico and Caribbean Regions
Recientes Mejoras en la Actividad Científica SEDAR-CIE del Proceso de Evaluación de Asesorios de Pesca en el Golfo de México y el Caribe
Les Améliorations Récentes dans la Pêche Scientifique CIE Évaluation Consultation SEDAR Processus Dans le Golfe du Mexique et des Caraïbes

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ABSTRACT

Under the Magnuson Stevens Act National Standard 2, the National Marine Fisheries Service (NMFS) is to incorporate the best scientific information available (BSIA) in formulating fishery management plans and other fishery management products implemented through a regional council process. Within the three councils in the southern United States – the Caribbean, Gulf of Mexico, and South Atlantic Fishery Management Councils – the Southeast Data, Assessment, and Review (SEDAR) process is charged with developing BSIA in the form of fishery assessments. Since its formation in 2002, SEDAR has utilized a three-step workshop process to complete such assessments. The Center for Independent Experts (CIE), a NMFS-wide independent peer review program, has supported the SEDAR process by providing independent experts to evaluate the BSIA presented at the SEDAR workshops and the SEDAR process through independent peer review reports. Since 2002, the CIE has provided peer review in 24 SEDAR workshop cycles, ranging from species such as queen conch, spiny lobster, and yellowtail snapper in the US Caribbean, king mackerel, red grouper, and tilefish in the Gulf of Mexico, and menhaden, red porgy, and red snapper in the South Atlantic, among many others. Most recently, the SEDAR process adopted CIE independent peer reviews in each of its three workshop series, allowing consideration of independent critiques at the data, assessment, and review steps of the process. This process is exemplified in SEDAR 24, which considered South Atlantic red snapper in 2010 and in which the CIE provided input in all steps of the process.

KEYWORDS: Fishery management, Caribbean, Gulf of Mexico, South Atlantic, peer review

Spatial Characterization of Artisanal Fisheries in Puerto Rico: Geographic Information Systems (GIS) Approach for Assessing The Regional Effort and Landings
Caracterización Espacial de la Pesca Artesanal en Puerto Rico: Sistemas de Información Geográfica (SIG) Enfoque para Evaluar el Esfuerzo y Captura Regional
Caractérisation Spatiale de la Pêche Artisanale à Puerto Rico: Systèmes d'Information Géographique (SIG) Approche pour Évaluer l'Effort et Capture Régional

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ABSTRACT

Commercial fisheries in Puerto Rico are dominated by small-scale fishing operations that deploy a variety of gear types in multiple, tropical fisheries across the island's diverse oceanic and benthic habitats. While past fishery censuses and targeted studies have evaluated the demographic, economic, and social characteristics of these fisheries, less effort has focused on the spatial dimensions of the fisheries, namely the port-fishing ground linkages and the regional distribution of fishery effort. This project conducted over 350 in-person interviews with commercial fishers across coastal municipalities in Puerto Rico, and it collected data on spatial use profiles by species, gear, and effort. The project, completed over five months in 2009, evaluated how fishers in different regions distribute their effort by gear and species, as well as how socio-demographic and economic characteristics are linked to areas fished. The project's spatial findings are expected to provide important insights on the geographic organization of landings and effort and to assist in the identification of key fishing area-port linkages.

KEYWORDS: commercial fishing, Puerto Rico, GIS, benthic habitats, socioeconomics

Patrones Ontogénicos de Peces Loro Según el Uso de Hábitat en San Andrés Isla (Reserva De Biósfera *Seaflower*), en Época de Lluvias
Ontogenetic Patterns of Parrotfishes According to Use of Habitat in San Andres Island (Biosphere Reserve Seaflower), during the Rainy Season
Des Patrons Ontogénétiques des Poissons Perroquets Selon l'Utilisation d'Habitat en San Andres Île (Réserve De Biosphère Seaflower), en Époque de Pluie

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RESUMEN

Se estudió la importancia de los enlaces ecológicos entre manglares, pastos marinos y arrecifes de coral para la ontogenia de scáridos en San Andrés isla, Caribe colombiano,en temporada de lluvias (octubre-diciembre) de 2009. En sitios donde los arrecifes están próximos a manglares y/o pastos, y sitios donde están aislados, se evaluó composición, abundancia y estado de desarrollo de los peces en cada hábitat mediante censos visuales con transeptos de banda. Estadísticamente se compararon estas variables entre hábitats y se correlacionaron con atributos fisicoquímicos y fisiográficos. Adicionalmente, usando análisis de similitud se relacionó la estructura íctica entre hábitats.Se observó una riqueza de 29 especies, una abundancia de 322 individuos, y un índice de Shannon de 1.73. La riqueza media en praderas y manglar fue similar, y en arrecifes próximos a estos hábitats fue mayor al igual que la diversidad. Las densidades de adultos fue mayor en arrecifes conectados al manglar y/o praderas para *Scarus iseri, Sparisoma rubripinne ySparisoma viride*, evidenciándose patrones de distribución ligados a la ontogenia. Los análisis de similitud agruparon praderas y manglar, mostrando a los arrecifes relativamente independientes. La profundidad varío entre manglares y praderas aproximadamente un metro, y para arrecifes entre 5 y13 m. La longitud de hojas de *Thalassia testudinum* entre praderas, y la cobertura de coral blando, esponjas y macroalgas, y la complejidad topográfica entre arrecifes variaron significativamente. Se constató la función como hábitats de cría de manglares y praderas para algunos scáridos y la influencia de la complejidad del biotopo sobre la composición íctica. Los resultados concuerdan con la literatura, enriquecen esta con nuevas observaciones y son insumo para la gestión ambiental.

PALABRAS CLAVES: Conectividad ecosistémica, Peces loro, Manglar, Pastos marinos, Reserva de Biosfera Seaflower

Artificial Structures Facilitate Lionfish Invasion into Marginal Atlantic Habitats
Las Estructuras Artificiales Facilitan la Invasión del Lionfish en Habitat Atlánticos Marginales
Les Structures Artificielles Facilitent l'Invasion de Lionfish dans les Habitats Atlantiques Marginaux

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ABSTRACT

Artificial structures can facilitate non-indigenous marine invasions by providing unoccupied habitat for colonization. I assessed the distribution and colonization of lionfish *Pterois volitans/miles* in nearshore waters of the Bahamas where artificial structures are prevalent. I hypothesized that artificial structures may promote lionfish range expansion by providing sites for colonization, particularly if lionfish are superior colonizers relative to Atlantic taxa. Using an observational survey, I examined how the type of artificial structure and habitat influence invader abundance. I also used a manipulative experiment to determine if lionfish were faster colonizers than natives. I found that lionfish abundances were similar between habitats dominated by sand-seagrass, hard bottoms and patch reefs. However, nearly 100% of lionfish were associated with artificial structures in sand-seagrass, 25% in hard bottoms, and zero in patch reefs. Lionfish were poor colonizers of experimental reefs relative to most Atlantic taxa, although their colonization rate was not different from the most ecologically similar native species in my study. Artificial structures are a consequence of coastal development and illegal dumping, but are also often added intentionally to create reef fish habitat. My results suggest that lionfish are capable of invading natural reefs in the absence of artificial structures, but that their presence facilitates colonization of marginal habitats. Removing or preventing the dumping of debris may slow the spread of lionfish and thus, decrease the risk of envenomation in areas where lionfish and humans co-occur in relatively high abundances. Nonetheless, such actions are unlikely to prevent their expansion throughout the Atlantic.

KEYWORDS: lionfish

Specialization Characterization of Texas Inshore Fishing Guides: Associated Perceptions and Attitudes of Recreational Fisheries Management
Caracterización Especialización de la Guía de Pescas en Cuerpos de Agua Costeros del Estado de Tejas: Percepciones y Actitudes Relacionadas a la Administración de Pesca Recreacional
Spécialisations Caractérisations des Guides sur la Pêche Côtière au Texas: Perceptions et Attitudes Associées aux Gestions des Pêcheries Récréative

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ABSTRACT

Maintenance of a productive and sustainable recreational saltwater fishery is contingent on providing a variety of satisfying experiences for anglers. As recreational fishing demand and pressure increases, identification and assessment of the perceptions and attitudes of various angler user groups toward recreational fisheries management provides a proactive method for assessing the quality of experiences available. Awareness of current issues, trends and concerns affords agencies valuable insight to address angler concerns before these issues culminate in economic, ecologic or social impacts. A spatio-temporal perspective of recreational fisheries through the eyes of recreational inshore fishing guides provides an invaluable longitudinal method for monitoring perceptions and attitudes toward management and regulations. Eighteen revered recreational fishing guides were identified and participated in semi-structured in-depth interviews. Participants were selected based on home fishing waters to ensure representation of Texas' entire 367 mile Texas coast from Louisiana to Mexico including all major and minor bays. The recreational specialization framework was employed to categorize the different types, or styles of participation, of inshore fishing guides. Although as guides the participants might all be considered highly specialized, subworlds emerged based on styles of participation that could be placed on a experience continuum of those focused on product to those focused on process. Interviews revealed that perceptions of current issues and attitudes toward current management strategies and regulations differed according to specialization level of the guide. Understanding differences among specialization subworlds provides recreational fisheries managers an effective tool for ensuring satisfactory experiences are available for Texas anglers.

KEYWORDS: specialization, social worlds, recreational fishing,, guide perceptions, fisheriesmManagement

Bycatch of an Economically-Important Grouper and its Prey in a Sub-Tropical Trawl Fishery
Basura de un impotante economicamente mero y sus presas en una pesqueria de Arrastre sub-Tropical
Capture Accessoire d'un Mérou Économiquement Important et de sa Proie dans une Pêche de Chalut Subtropicale

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ABSTRACT

The unintentional capture of non-targeted species (i.e., bycatch) can be extremely high in trawl fisheries and understanding its ecological impacts on food-web dynamics is important to management from an ecosystem-based approach. In Florida, a bottom trawl fishery operates in shallow seagrass beds and primarily targets juvenile penaeid shrimps (especially pink shrimp, *Farfantepenaeus duorarum*) which are sold to bait houses that supply recreational fishermen. Juvenile gag grouper (*Mycteroperca microlepis*) settle to and inhabit the same seagrass habitats in which the bait-shrimp fishery occurs, and survival of gag during this life stage is crucial for the long-term sustainability of their populations. Using the same rollerframe trawling equipment and techniques employed by the fishery, I measured bycatch of both juvenile gag and their prey across the northeastern Gulf of Mexico. Bycatch of gag (measured as capture efficiency, hereafter *E*) was high shortly after they settled to seagrass (E_{JUNE}= 0.65), but was negatively correlated with gag size (r = -0.89), and decreased through the summer months (E_{JULY}= 0.19, E_{AUG}= 0.05, E_{SEPT}= 0.02). On average, the number of non-targeted animals captured per sampling event was 4.65 times greater than the number of bait-shrimp landed, and the former included several species identified as important prey of juvenile gag. Changes to the structure of these prey communities may have important indirect effects on the growth of juvenile gag, thereby possibly extending the period of time gag are themselves most susceptible to capture by the rollerframe gear.

KEYWORDS: bycatch, grouper, trawl, food web, field study

Sponge Mortality in the Florida Keys, USA: Patterns of Species Response and Population Recovery
La Mortalidad de Esponjas en los Cayos de Florida, EE.UU.: Los Patrones de las Especies y Respuesta Rápida Recuperación de la Población
La Mortalité Éponge dans les Florida Keys, Etats-Unis: Les Modes de Rétablissement des Populations d'Espèces

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ABSTRACT

In the early 1990s, widespread mortalities decimated sponge populations over hundreds of square kilometers of shallow lagoonal waters in the middle and upper Florida Keys, USA. Sponge community surveys were initiated prior to the mortalities and the recovery of the sponge populations was monitored through 2006. Consequently, we can now provide an unprecedented long-term and detailed view of sponge population dynamics following a set of environmental conditions that caused a widespread mortality. Due to the co-occurrence of several hurricanes in the study area over the study period, we are now also able to provide insight into how hurricanes affect sponge population dynamics. Our long-term results document that species respond in different ways at different sites, and population change is dynamic, sometimes dramatic and sometimes unpredictable. We were able to document that a relatively small number of large, long-lived, species dominate the sponge community in terms of volumetric biomass and that restoration of sponge population biomass in our study area was at least a 10-15 year process. If such mortality events re-occur on even a decadal time scale (which may be happening) the result could be chronic reduction of sponge community biomass. We saw a very different population response to hurricanes. The massive strongly attached and long-lived sponges were more resistant to damage from hurricanes than smaller opportunistic species. Hence sponge community biomass will recover from the affects of hurricanes much more rapidly than from the affects of mortalities induced by the blooms.

KEYWORDS: sponge mortality, sponge population response to HABs, sponge population response to hurricanes, sponge population recovery

The MSC Certification Process of the Bahamian Lobster Fishery: The Quest to Quantify Illegal, Unregulated and Unreported (IUU) Fishing
El Proceso de Certification del Marine Stewardship Council Para La Pesquería de la Langosta de las Bahamas: Como Cuantificar la Pesca Ilegal, No Regulada y No Registrada
Le processus de certification MSC de la pêche au homard Bahamas: La quête pour quantifier la pêche illicite, non réglementée et non déclarée (INN)

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ABSTRACT

The Department of Marine Resources has partnered with the World Wildlife Fund (WWF) scientists to carry out a preliminary assessment of the Bahamian Spiny Lobster Fishery to evaluate its sustainability. Many fisheries around the world are regarded as in danger of collapse from overfishing, resulting in more consumers looking to purchase "certified sustainable" products. Fishing and fisheries processing creates about 10,000 jobs throughout The Bahamas, so is important beyond the export value. However, there is much anecdotal information about lobster fishing during the closed season, the landing of undersized lobsters, fishermen using illegal gear or destructive fishing, and foreign nationals fishing in Bahamian waters. The challenge to establishing measures of success and benchmarks for a sustainable fishery is to be able to document and quantify illegal, unregulated and unreported (IUU) catches. A project in the Bahamas now looks at several methods to document IUU catches, and assign priorities to different areas and types of IUU fishing throughout the archipelago. New information on total removals will be included within the stock assessment process to ensure the results are robust. If independent methods using fisheries and fisheries independent surveys can document IUU catches, strategies can be developed to reduce these landings.

PALABRAS CLAVES: lobster, sustainable, fisheries

Predation Affects on Juvenile Red Snapper, *Lutjanus campechanus*, in the Northern Gulf of Mexico
Depredación Afecta sobre Menores Pargo, *Lutjanus campechanus*, en el Norte del Golfo de México
Prédation Affecte sur Juvénile, *Lutjanus campechanus*, dans le Nord du Golfe du Mexique

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ABSTRACT

Artificial reefs (1.1 x 1.0 x 1.2 m) were built in July 2008 (n = 20) and 2009 (n = 20), 28 km south of Dauphin Island, Alabama, USA, in the northern Gulf of Mexico. Each reef consisted of a polyethylene pallet, with 10 concrete blocks (10 x 20 x 41 cm) and a plastic crate (65 x 35 x 28 cm). We also built 20 larger artificial reefs (8 m^3; steel cages 2.5 x 2.6 x 1.2 m). Each year 10 small reefs were placed at 15 m and 10 were placed at 500 m from the larger cage reefs. Each set of reefs (2 small and 1 large) were placed 1 km apart. All reef fishes were visually counted, videotaped, photographed and sizes estimated in August 2008, and August and September 2009, by two SCUBA divers. In the lab, all fish in the photographs were identified to species and counted with Image-pro software. There were significantly ($p < 0.05$) higher abundances of age-0 red snapper, *Lutjanus campechanus*, on the small reefs placed 500 m (46.1/ m^2 ± 8.3) from the larger reefs compared to small reefs placed 15 m away (3.4/ m^2 ± 1.8) on all three surveys. We suggest that the typically larger fish (> 300 mm TL) of several species (red snapper, gag *Mycteroperca microlepis*, gray triggerfish *Balistes capriscus*, greater amberjack *Seriola dumerili*) that had colonized the larger reefs resulted in a predator avoidance response by the age-0 red snapper.

KEYWORDS: age-0 fish, competition, habitat, nursery, recruitment

Ecological Differences between Natural versus Artificial Reefs in the Northern Gulf Of Mexico
Ecológico Natural Contra las Diferencias entre los Arrecifes Artificiales en El Norte Del Golfo de México Contra Las Diferencias Entre Los Arrecifes Artificiales En El Norte Del Golfo De México
Différences Écologiques entre Naturelles contre des Récifs Artificiels dans le Nord du Golfe du Mexique

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ABSTRACT

We examined the community, size, and trophic structure of reef fishes at 61 reef sites in the northern Gulf of Mexico as part of an ongoing study to examine ecological differences between artificial and natural reefs. There were significant differences in fish community structure between reef types and depths (ANOSIM; $p < 0.001$), with large piscivores being more abundant at artificial reefs while planktivores and invertivores were more abundant at natural reef sites. Species diversity was greater at natural sites, which was mostly due to the myriad small fishes present there but not on artificial reefs. Overall, fish density was an order of magnitude greater at artificial reefs, although natural reefs covered more expansive areas. There was a significant difference in fish size between reef types (ANOVA; $p < 0.001$), with some fishery species, such as red snapper, gray triggerfish, and greater amberjack, being larger at artificial reefs, and others, such as vermillion snapper, scamp, and red porgy, being larger at natural reefs. Too few stomach samples were available for most species to test diet differences between natural and artificial reefs, with an exception being red snapper (n = 336). Red snapper displayed a clear ontogenetic shift in feeding at higher trophic levels with increasing size, but fish in natural habitats also displayed broader diets than fish on artificial reefs. Ongoing stable isotope analysis (CNS) of muscle samples (n = 308 samples among 33 species) should provide greater resolution of trophic structure of reef fish trophic structure.

KEYWORDS: reef fish, community structure, ROV, stable isotopes

Mapping Coral Reef Ecosystems: Advances in Automated Techniques for Mapping Habitats and Habitat Use by Reef Fishes
Cartografía De Los Ecosistemas de Arrecifes de Coral : Los Avances en Técnicas Automatizadas para los Hábitats de Mapas y Uso de Hábitat de Los Peces de Arrecife
Ecosystèmes Cartographie des Récifs Coralliens: Les Progrès des Techniques Automatisées pour les Habitats de Cartographie et de l'Utilisation de l'Habitat par les Poissons De Récif

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ABSTRACT

Characterizing coral reef ecosystems informs marine spatial planning, marine reserve design and serves additional management and stakeholder needs. Advances in automated habitat mapping using underwater acoustic technologies has increased efficiency and accuracy in producing management-relevant products in a timely fashion. Further advances in underwater acoustic methods has also provided a means to rapidly map the spatial distribution of reef fishes at resolutions and scales that are comparable to imagery or sonar-derived habitat maps and at extents that are orders of magnitude greater than existing diver methods. From recent cruises in the US Caribbean, we show how using these methods in concert can significantly increase our understanding of the spatiotemporal distribution and habitat use of fishes and aide in identifying important seascape drivers of fishery habitat use in reef systems. We further highlight specific examples where these methods have aided in the identification of critical components of reef fish ecology and management such as locating and monitoring reef fish spawning aggregations.

KEYWORDS: Spawning aggregations, Fishery sonar, grouper and snapper, reef ecosystems, habitat mapping

Habitat Fragmentation and Genetic Variability in Two Populations of *Crassostrea rhizophorae* Guilding 1828, in Adjacent Regions of the Laguna de Términos, Campeche, Mexico
Fragmentación del Hábitat y Variabilidad Genética en dos Poblaciones de C*rassostrea rhizophorae* Guilding 1828 en Regiones Adyacentes a la Laguna de Términos, Campeche México
Fragmentation de l'Habitat et la Variabilité Génétique de Deux Populations de *Crassostrea rhizophorae* Guilding 1828 dans les Régions Voisines de la Laguna de Termines, Campeche au Mexique

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ABSTRACT

The impact of habitat fragmentation on the populational genetic structure was studied in two oyster populations of *Crassostrea rhizophorae* Guilding 1828 from two regions of the Laguna de Terminos, Campeche Mexico by means of the electrophoretic expression

of 10 enzymatic systems of muscle. Genic frequencies data were processed by using the TFPGA 1.3 program. Samples of the muscle of fifty organisms of each population were used in order to characterize the genotypic expression revealed. The protein polymorphism value was 36.35% (p95) and of 90.90% (p99). The heterozygosis values ranged from 0.2491 for Idh1 to 0.01 for Pt1 with a mean value of He = 0.1044. Fis value average was 0.1574 and Fit value average 0.1727 suggested a heterozygote deficiency. The value average of Fst = 0.0181 indicates that the observed genetic differences correspond to a inter populational variation with moderate endogamy. The number of migrants obtained by the Slatkin equation was of 13.5621 for generation indicates a certain degree of variability among the populations it is consistent with the values of Nei genetic distance. It is concluded that the two populations of *Crassostrea rhizophorae* here studied reflect sensibility to the adaptive processes that take place due to the genetic discontinuity promoted by the fragmentation of the habitat but still without detriment of their levels of genetic variability and in consequence, they do not reflect at present populational fragility that exposes them to habitat fragmentation .

KEYWORDS: Oysters, Crassostrea rizophorae, metapopulations, genetic variability, habitat fragmentation

Reproduction in Yellowtail Snapper O*cyurus chyrsurus* B. 1790, from the Campeche Bank, Southeastern Gulf of Mexico
La Reproducción de la Rabirrubia *Ocyurus chyrsurus* B. 1790 del Banco de Campeche, Sureste del Golfo de México
La Reproduction du Vivaneau Queue Jaune, *Ocyurus chyrsurus* B. 1790 du Banc de Campeche, Sud-Est du Golfe du Mexique

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ABSTRACT

In the southern Gulf of Mexico, due to deteriorated red grouper (*Epinephelus morio*) catch volumes some species of snappers such as yellowtail snapper, *Ocyurus chrysurus*, is now being targeted by commercial fishers, causing recent increments in catches. Thus, constant catch increments in recent years, lack of information on the biology of the species and the non-existence of a management plan that regulates commercial exploitationnow generate uncertainty on the state of this resource. In this study a total of 1,657 yellowtail snappers that ranged from 11.9 cm to 45.5 cm, fork length (FL) were captured monthly, by small-craft fleet in Campeche Bank waters, between February 2008 and January 2009. Gonads were fixed in Bouin's liquid for histological examination. Microscopic observations determined 50% females (n=832) and 49.8% males (n=825). Females measured from 13.4 cm to 45.5 cm and males 11.9 cm to 41.8 cm FL. The overall chi-square analysis for sex ratios (M:F) and sex ratios for respective size classes, indicated no significant differences from the expected 1:1 ratio. The smallest mature female (L_{min}) was obtained at 14.1 cm FL, and length at first maturity (L_{50}), was 21.3 cm FL, whilst males (L_{min}) was 14.2 cm FL and (L_{50}), 19.4 cm FL. Yellowtail snapper from Campeche Bank had a protracted spawning season extending from January to September, with spawning concentrated during spring (March to May) and fall (September). Therefore, yellowtail snapper from the southeastern Gulf of Mexico exhibits the 'insular' reproductive pattern.

KEYWORDS: Snapper, reproduction, *Ocyurus chrysurus*, Campeche Bank, Gulf of Mexico

Investigations into the Dynamics of a Black Grouper Spawning Aggregation in Bermuda
Investigaciones en la Dinámica de una Agregación de Freza del Cuna Bonací en Bermudas

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ABSTRACT

In 2004, the Marine Resources Division was made aware of a possible black grouper (*Mycteroperca bonaci*) spawning aggregation located between two seasonally protected areas at the eastern end of Bermuda. Legislation was enacted the following year to afford protection to the site by incorporating it into a single, reconfigured seasonally protected area. However, it was unclear whether the closure period (May – August), which was based on the spawning season of the red hind (*Epinephelus guttatus*), encompassed the full reproductive period of the black grouper. In order to better understand the dynamics of the aggregation, an acoustical tagging program was implemented in 2008. Vemco acoustic transmitter tags were surgically implanted in the body cavities of 37 black groupers during the summers of 2008 and 2009. With the uncertainty about the spawning seasonality of black grouper, there was concern that tagged fish would be vulnerable to capture if they continued to aggregate at the site after August 31st, so the immediate area around the aggregation was closed to fishing until the end of November using a provision in the Fisheries Act 1972. Data downloaded from receivers moored in the aggregation area have confirmed that tagged black grouper are present at the site between the full and new moons from May through November. Activity levels were high from June through October with moderate activity observed in May and November. These results suggest that black grouper have a more protracted spawning season than that of red hind and validate the extended site closure.

KEYWORDS: spawning aggregation, Black grouper, *Mycteroperca bonaci*, Bermuda

Efforts to Enhance Protection of the Sargasso Sea
Esfuerzos para Realzar la Protección del Mar del Sargasso
Efforts d'Augmenter la Protection de la Mer de Sargasso

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ABSTRACT

The Sargasso Sea is a distinctive area of open ocean situated within the North Atlantic Subtropical Gyre, bounded on all sides by major ocean currents. Named for the floating *Sargassum* seaweed, it contains the world's only self-sustaining community of holopelagic algae, dominated by *Sargassum natans* and *S. fluitans*. The ecology and life-history patterns of many oceanic species are adapted to the unique habitats provided by the *Sargassum*. The Sargasso Sea is a critical spawning site, migratory route and feeding ground for commercially important pelagic fishes such as dolphinfish (*Coryphaena hippurus*), jacks (family Carangidae) and various tuna species, as well as a number of other threatened and endangered species. Many of these species are critical to the commercial fisheries, sport fisheries and eco-tourism industries of Gulf and Caribbean communities. Primary threats to the Sargasso Sea are unsustainable and destructive fishing practices and commercial collection of *Sargassum* weed for use as fertilizer, cattle feed and biofuel. Indirect threats include vessel traffic and pollution

from ship discharges, tar and plastics. Recognizing the importance of this area and the need to protect it, the government of Bermuda with international partners is leading an international initiative to explore ways to enhance protection of the Sargasso Sea. Most of the Sargasso Sea is in the high seas, and only a small portion is under national jurisdiction, within the Exclusive Economic Zone of Bermuda. International cooperation and action within the framework of the United Nations Convention on the Law of the Sea are thus essential.

KEYWORDS: Sargasso Sea, high seas conservation, marine protected areas, *Sargassum*

Search For Bio-Indicators to Monitor the Evolution of Coral Reef Habitats
Investigación sobre los Bio-Indicadores para Monitorear Evolución de los Arrecifes Coralinos
Bio-Indicateurs pour le Suivi de l'Évolution des Communautés Coralliennes Récifales

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ABSTRACT

Corals represent the main key species for coral reefs. Coral-built structures shelter numbers of Invertebrate and fishes representing the major part of the stock of species harvested by coastal tropical fisheries. Caribbean coral communities have presented increasing signs of decay since nearly 30 years due to a conjunction of natural and anthropogenic factors. It is urgent to develop indicators able to characterize the state of health of coral communities and to provide a tool for monitoring the dynamics of their evolution. In the present study we tested two bio-indicators on the reefs of Guadeloupe Island submitted to different levels of threat: 1) the measurement of the rate of necrosed tissues on the adult corals. This indicator is both related to the instantaneous state of health of the coral community and to the potential mortality rate of adult corals; 2) the recruitment of young corals that represents the potential of regeneration of communities. On reefs with low anthropogenic pressure, coral communities are characterized by a higher abundance of adults presenting a minimal rate of necrosis in comparison with reefs submitted to higher stress. Species richness and abundance of young corals are also higher on less threatened reefs. Necrosis affects more specifically massive reef-building species (*Montastrea faveolata, M. cavernosa, Colpophyllia natans, Diploria strigosa*). The most resistant species are r strategy (*Favia fragum, Siderastrea radians, Agaricia agaricites, Porites astreoides*…). These species tend to predominate in the coral communities of the most degraded reefs in the adult as well as in the juvenile populations.

KEYWORDS: Corals, Caribbean, bio-indicators, Monitoring, degradation

Estado de Salud de las Lagunas Costeras de Yucatán, México: Índice de Integridad Biótica
Health Status among Coastal Lagoons of Yucatan, Mexico: Index of Biotic Integrity
L'État de Santé des Lagunes Côtières du Yucatan, Mexique: Indice d'Intégrité Biotique

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RESUMEN

En los sistemas lagunares de la costa de Yucatán, se realizan diversas actividades generadas por su productividad pesquera y biodiversidad. No obstante su carácter de reservas de la mayoría de ellas, se desconoce su estado de salud. Se integra la información ictiofaunística obtenida de varios años de estudio en localidades de Celestún, Chelem, Bocas de Dzilam y Ría Lagartos con el objetivo de proveer una medida de integración de la información de los atributos biológicos (métricas) que reflejen su condición y permita utilizar a los peces como indicadores ambientales. Las métricas seleccionadas se clasificaron en medidas de riqueza, abundancia, composición, espectro trófico, condición y tolerancia. Se observó un patrón ambiental con las condiciones de mayor perturbación en Chelem y zona interna de Río Lagartos (Cuyo), con la presencia y alta abundancia de varias especies oportunistas o tolerantes (Floridichthys polyommus y Cyprinodon artifrons). Por el contrario, se registró un incremento consistente en la abundancia de especies marino-eurihalinas en Celestún (Eucinostomus spp. Sphoeroides testudineus), Bocas de Dzilam y zona marina de Río Lagartos con los valores más altos del índice. Las clases de integridad biológica obtenidas coincidieron con el grado de alteración antropogénica/natural que presentan los sistemas lagunares en su conjunto.

PALABRAS CLAVES: Ictiofauna, áreas protegida, sistemas lagunares, costa Yucatán, Mexico

Fish Aggregation Devices...Not *That* Simple: Considering Various Factors for the Implementation of a FAD Network
Dispositivos de Concentración de Peces ... No Es Tan Simple: Teniendo en Cuenta Diversos Factores para la Implementación de Una Red FAD
Dispositifs de Concentration de Poisson ... Pas Si Simple: Compte Tenu de Facteurs Différents pour la Mise en Ouvre d'un Réseau de FAD

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ABSTRACT

The use of Fish Aggregation Devices (FADs) has become widespread internationally, and their effectiveness has made their presence off of the Eastern Seaboard (Continental U.S.) seem inevitable. The aim of this study was to determine the most vital factors in a network of moored FADs, and analyze how those factors interact with each other. The research consisted of a thorough literature review and personal communication with various sources who have experience with FADs. Each of the twelve factors identified were broken down to determine their influence over each of the other factors. Case studies of the Mid-Atlantic region, South Florida, and the United States Virgin Islands (USVI) were explored to demonstrate how some areas are better suited for FADs than others. Successful FAD systems from Hawaii and Australia were also examined to provide a model for other governments and institutions to follow. This study demonstrated the complexity of FAD networks and their varying potential in areas with different characteristics. Certain conditions must be present for a FAD network to be successful. Otherwise, FADs may be counterproductive to a region's fisheries. Undoubtedly, a network's long-term success is dependent on an array of factors and the level of institutional or governmental support.

PALABRAS CLAVES: FAD, aggregation, aggregating, factor, network

Reef Fishes of The South Texas Banks, U.S.A.
Peces Coralinos de los Bancos Sureños De Texas, EE.UU
Poissons de Récifs des Hauts-Fonds du Sud du Texas, États-Unis d'Amérique

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ABSTRACT

We present the results of three research cruises documenting the species richness, faunal diversity, and habitat association of reef fishes occuring on the South Texas Banks in the western Gulf of Mexico, USA. Visual transects were conducted using a drop camera system and the Phantom S2 ROV. Fourteen (14) new species were documented, including commercially and recreational fishery species such as gray snapper, black grouper, warsaw grouper, and yellowedge grouper. Smaller reef fishes including neon goby, bigtooth cardinalfish, sunshinefish, and yellow goatfish were abundant in the reef fish community. We used the Benthic Terrain Modeler module (ArcGIS 9.3) to characterize three banks (Southern, North Hospital, Baker) at reef crest, mid-level terrace, and base depth strata. Six (6) randomized, replicate 50 m belt transects were conducted within each strata using the ROV. Reef fishes, invertebrates (hard coral, soft coral, black coral, large sponge), topographic complexity, and substratum type were counted/scored and recorded for each transect and tested with univariate and multivariate analyses. Random drop camera transects provided supplemental data on fish abundance, invertebrate distribution, and habitat characteristics. Reef crest communities have significantly higher species diversity and abundance when compared to mid terrace or base habitat strata. Fish abundance and species richness decrease exponentially with depth, primarily due to a turbid nepheloid layer and thick silt layer blanketing the features, reducing invertebrate diversity and habitat complexity. Preliminary results suggest these features support a much more diverse tropical fauna than previously described, warranting more detailed investigation of the region.

KEYWORDS: Reefs, Banks, Texas, Grouper, Snapper

Characterization of Cross-Shelf Trophic Connectivity of Mesoamerican Reef Fish Populations in Belize
Caracterización de la Conectividad Trófica de Poblaciones de Peces del Arrecife Mesoamericano a lo Largo de la Plataforma Continental de Belice
Caractérisation de la Connectivité Trophique de Populations de Poissons du Récif Mésoaméricain au Long de la Plateforme Continentale du Belize

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ABSTRACT

In recent years, increasing concern over habitat degradation and over-fishing has led to the development of conservation strategies designed to preserve the integrity of nearshore ecosystems and their associated fisheries. The establishment of marine protected areas (MPAs) is often an integral component of these strategies, and identifying essential fish habitat (EFH) to designate for protection is necessary for these MPAs to be effective. Understanding the sources of primary production and characterizing trophic connectivity are critical to identifying EFH, as the importance of externally subsidized nutrient sources often exceeds local primary productivity; however, these aspects have received limited attention in current evaluations of habitat value and connectivity. The current study addresses the issue of large-scale trophic connectivity in nearshore back-reef systems by evaluating sources of organic matter for three species of juvenile snappers in Belize: schoolmaster (*Lutjanus apodus*), gray snapper (*L. griseus*), and dog snapper (*L. jocu*). Primary producers and consumers through these juvenile snappers were collected during both the dry (February-May) and rainy season (June-September) in Belize to investigate the effects of seasonal variations in freshwater inflow on regional (northern [high inflow] vs. southern [low inflow]) and ecotonal (inner-middle-outer shelf) production and trophic connectivity. Stable isotope ratios ($d^{13}C$ and $d^{15}N$) of producers and consumers were used to identify the main sources of nutrients for juvenile snappers and quantify the relative contributions of locally primary production vs. externally subsidized nutrient import for each site and collection period.

KEYWORDS: reef fish, stable isotopes, trophic connectivity, essential fish habitat, snappers

Using Tagging and Mapping Technologies for Effective Fisheries Conservation: Application of Acoustic Telemetry with Viewshed in Spatial Analyst
Uso de Técnicas de Cartografía y Marcaje para el Manejo Efectivo de las Pesquerías: La Aplicación de Telemetría Acústica con "Viewshed" en "Spatial Analyst"
L'utilisation des Techniques de Cartographie et de Marquage pour la Conservation de Pêches Efficace : L'Application de Télémétrie Acoustique avec "Viewshed" dans "Spatial Analyst"

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ABSTRACT

An emerging tool for the designation of Marine Reserves, Essential Fish Habitat and Effective Juvenile Habitat is the use of acoustic telemetry to interpret habitat connectivity and distribution. The present study investigated acoustic telemetry capabilities with the use of a Vemco V-7 transmitter and VR2/VR2-W receivers at 12 selected sites from a previous tracking study on white grunts (*Haemulon plumierii*) in La Parguera,southwestern Puerto Rico. Sites reflected location-type: open sand, reef-sand interface, on reef slope, and mixed habitat on reef crest. At each site, 4 transects were performed by guiding a transmitter to simulate fish movement within the 250-m radius of optimal detection range established by Vemco, Ltd.. To elucidate potential presence/absence areas, each GPS-tracking history was combined with a detailed habitat map and the output of Spatial Anaylst application, Viewshed. Using bathymetry as an input, Viewshed focuses on line-of-sight from a given point within a specified range. Data from the range testing show a strong positive correlation between the detections within predicted visible area vs. total detections (r= 0.936), thus proving Viewshed's accuracy. Correlations were higher in open areas of sand than areas of variable reef structure, where the probability of interference is greater. Technology limitations include environmental parameters, such as current flow and turbidity, properties of sound vs. vision, and behavioral, ecological and social characteristics of tagged species. The combination of these technologies ultimately proved beneficial and may further be investigated at varying temporal and spatial scales for more effective habitat and fisheries management.

KEYWORDS: acousticTelemetry, viewshed, mapping, fisheries, habitat connectivity

A Framework for Good Governance: Increasing the Economic Gains of Small-Scale Fishers Through Participation in Fish Marketing
Un marco de referencia para un buen gobierno: Aumentando las ganancias económicas de los pescadores de pequeña escala atraves de la participación en la comercialización de los pescados
Un Système de Bonne Gouvernance: l'Accroissement des Gains Économiques des Pêcheurs à Petite Échelle par la Participation à la Commercialisation du Poisson

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ABSTRACT

Small-scale fisheries are essential to maintaining the socio-economic security of fishers and fishery-dependent communities, but they are the most vulnerable to the changing dynamics of the market due to their low competitive advantage, low bargaining power and limited political power to influence decisions. Many countries have a mandate to assist fishers to compete in fisheries, but often this does not extend to marketing aspects, and does not include fishers in decision making. This paper will introduce and apply a framework for assessing and evaluating the administrations of the State in providing assistance to small-scale fishers in marketing, as a measure of good governance. In particular, this requires evolving from a production-oriented approach in fisheries towards contemporary marketing approaches – market-oriented and relationship marketing.

KEYWORDS: marketing , small-scale fishers , governance , market orientation , competitive advantage

Evidence of Multiple Paternity in *Strombus gigas* Using Two Microsatellite Loci
Evidencia de Multiple Paternidad en *Strombus gigas* Empleando Dos Loci Microsatelites
Preuve de la Paternité de Plusieurs *Strombus gigas* À L'aide De Deux Loci Microsatelites

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ABSTRACT

The pink conch Strombus gigas is characterized by slow growth rate, low fecundity, and late maturity and are thus considered to be vulnerable to exploitation. Although understanding mating systems and behavior are important for long-term conservation and fisheries management, this aspect of life history is poorly understood in this species. Using two polymorphic microsatellite loci, we analyzed larvae from a single egg mass collected in the wild to for multiple paternity and identified two parental alleles in sixteen offspring for each microsatellite. This first evidence regarding the mating system in S. gigas confirms that multiple paternity is common in mollusk species and that the observed frequency of multiple paternity is among the higher values reported in marine mollusk species. Application the analysis of multiple paternity is important to estimates of effective population size (Ne) in populations of Yucatán peninsula and continued monitoring of population dynamics is recommended to ensure that future changes in the coast can be detected.

Habitat Impact in the Reproductive Cycle of *Strombus pugilis* in the Campeche Bank and Analysis of Apicomplexa and Urospherule-Like Granules
Efecto Del Habitat en la Determinación del Ciclo Reproductivo y Análisis de Esferocristales de *Strombus pugilis* en el Banco de Campeche
Effect de l'Habitat sur les Variations du Cycle Reproductive de *S. pugilis* du Banck de Campeche Mexico et l'abondance de Apicomplexa et Euroesferulas

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ABSTRACT

Reproductive cycle of *Strombus pugilis* was studied at Banco de Campeche, Mexico in Ténabo, Campeche, Seybaplaya and Champoton at 3 depths. 20 organisms were monthly sampled in each site. Sediments were analyzed and temperature and salinity were reported. Four reproductive stages were used. Occurence of Coccidea, Apicomplexa was determined. Some samples were dehydrated in acetone to be processed for SEM, through critical point drier and sputter coater. They were observed in the SEM Hitachi 2500 of the SIMAG, Université des Antilles et de la Guyane. Urospherule-like granules do not present any kind of metal. Statistical analysis of GLM was realized between stages of gonad maturity versus sediments, temperature, salinity and abundance of Apicomplexa. Reproductive cycle of S. *pugilis* does not show significant difference between sites but it was different during the period studied. Spawn stage showed 2 peaks and it was different in males and females. All organisms observed are infested by Apicomplexa parasites which have been found in the digestive gland of every sampled organism. Occurrence of Apicomplexa has not effect in the reproductive cycle and urospherule-like granules have not exhibit any kind of metal analyzed. Various stages of the parasite were identified using histology, TEM and SEM.

KEYWORDS: reproduction, conchs, habitat, *Strombus pugilis*, Campeche Bank

NGOs and Fishers: Meeting in the Middle
Las ONGs y los Pescadores: Un Encuentro a Medio Camino
Les ONGs et les Pêcheurs: Une Rencontre a Mi-Chemin

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ABSTRACT

Fisheries management is not exclusively about the management of the fish, but perhaps more importantly, it is also about the management of all people involved in fishing and the consequences of their actions. Left to their own devices, the fish will survive. It's how we go about fishing, trading and eating them that determines whether or not we

will continue to have them, and have them in abundance. Effective, successful management for sustainable fisheries requires collaboration and capacity among many actors. Fishers are of course one of the key protagonists. NGOs and governments are others. NGOs often use fishers' knowledge and skills, usually with good intentions, but sometimes with no long-term benefits to fishers. This may leave fishers feeling that more has been taken than given, and inequity continues. The Nature Conservancy's (TNC) Caribbean Programme is developing a regional Sustainable Fishing strategy and is seeking to ensure the Strategy includes and enlists fisher networks and fishers as essential and active partners. This presentation outlines a number of objectives, issues and activities within the Strategy and highlights potential challenges for implementation. The presentation also identifies areas where TNC would like to consider engaging with fisher networks and fishers such as the Caribbean Network of Fisherfolk Organisations (CNFO).

PALABRAS CLAVES: Caribbean, sustainable fisheries, capacity building, fisheries management, partners

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