

# Proceedings of the 10th International Coral Reef Symposium, Okinawa (2006)

## Table of Contents

### Session 1: Evolution of coral reef ecosystems

<i>T P HUGES</i> [Keynote] Biogeography, climate change and evolution of coral reefs	1
-----------------------------------------------------------------------------------------	---

### 1-1. Coral Taxonomy and Phylogeny Integrating Molecular and Morphological Approaches

1-1 Session Summary	2
<i>Jean Francois FLOT*</i> , <i>Catherine OZOUF-COSTAZ</i> , <i>Makoto TSUCHIYA</i> , <i>Robert VAN WOESIK</i> Comparative coral cytogenetics	4
<i>Yukimitsu IMAHARA*</i> , <i>Kazunari OGAWA</i> Rediscovery of <i>Virgularia juncea</i> (Octocorallia, Pennatulacea) from a tidal marsh in Okinawa, with a short note on its peculiar behavior	9
<i>Zac H FORSMAN*</i> , <i>Cynthia L HUNTER</i> , <i>George E FOX</i> , <i>Gerard M WELLINGTON</i> Is the ITS Region the solution to the "species problem" in corals? Intragenomic variation, and alignment Permutations in <i>Porites</i> , <i>Siderastrea</i> and outgroup taxa	14
<i>Jean Francois FLOT*</i> , <i>Simon TILLIER</i> Molecular phylogeny and systematics of the scleractinian coral genus <i>Pocillopora</i> in Hawaii	24

### 1-2. Reproduction and Recruitment of Corals

<i>Carlo Nike BIANCHI*</i> , <i>Carla MORRI</i> , <i>Michel PICHON</i> , <i>Francesca BENZONI</i> , <i>Paolo COLANTONI</i> , <i>Giuseppe BALDELLI</i> , <i>Massimo SANDRINI</i> Dynamics and pattern of coral recolonization following the 1998 bleaching event in the reefs of the Maldives	30
<i>Andrew H BAIRD*</i> , <i>James P GILMOUR</i> , <i>Takayuki M KAMIKI</i> , <i>Masanori NONAKA</i> , <i>Morgan S PRATCHETT</i> , <i>Hiromi H YAMAMOTO</i> , <i>Hideo YAMASAKI</i> Temperature tolerance of symbiotic and non-symbiotic coral larvae	38
<i>Alina M SZMANT*</i> , <i>Margaret W MILLER</i> Settlement preferences and post-settlement mortality of laboratory cultured and settled larvae of the Caribbean hermatypic corals <i>Montastraea faveolata</i> and <i>Acropora palmata</i> in the Florida Keys, USA	43
<i>Eric Hugo BORNEMAN</i> Reproduction in aquarium corals	50
<i>Susan B COLLEY*</i> , <i>Peter W GLYNN</i> , <i>Anita S MAY</i> , <i>Juan L MATÉ</i> Species dependent reproductive responses of eastern Pacific corals to the 1997-98 ENSO event	61
<i>David A KRUPP*</i> , <i>Lea L HOLLINGSWORTH</i> , <i>Jacqueline PETERKA</i> Elevated temperature sensitivity of fertilization and early development in the mushroom coral, <i>Fungia scutaria</i> Lamarck 1801	71

## Papers Title

<i>Peter L HARRISON</i>	78
Settlement competency periods and dispersal potential of scleractinian reef coral larvae	
<i>Norman J QUINN*</i> , <i>Barbara Louise KOJIS</i>	83
Invertebrate recruitment patterns inside and outside Discovery Bay, Jamaica	
<i>Shuya OOKA*</i> , <i>Seizou HANASHIRO</i> , <i>Ryouta GUSHI</i> , <i>Shinichi URABE</i> , <i>Naoki HAYASHI</i> , <i>Yoshihiro TAKAHASHI</i> , <i>Hidekazu YAMAMOTO</i>	91
Growth of coral assemblages on artificial structures and surrounding natural substrates	
<i>Lea L HOLLINGSWORTH</i> , <i>Teresa D LEWIS</i> , <i>David A KRUPP*</i> , <i>Jo-Ann C LEONG</i>	99
Early onset and expression of fluorescent proteins in the larvae of the mushroom coral <i>Fungia scutaria</i> Lamarck 1801	
<i>Sangeeta MANGUBHAI</i> , <i>Peter L HARRISON</i>	106
Seasonal patterns of coral reproduction on equatorial reefs in Mombasa, Kenya	
<b>1-3. Emergent Properties of Coral Reefs: Linking Local Mechanisms with Large-Scale Spatial Patterns</b>	
1-3 Session Summary	115
<i>Mark J A VERMEIJ*</i> , <i>Stuart A SANDIN</i>	116
Coral species complexes through space and time: an illustration of their dynamics using <i>Madracis</i> in the Caribbean	
<i>Jameal F SAMHOURI*</i> , <i>Stuart A SANDIN</i>	122
Can density-dependent fecundity regulate coral reef fish populations?	
<b>1-4. Diseases of Coral Reef Organisms: Evolutionary Aspects, Current Status and Prognosis</b>	
1-4 Session Summary	132
<i>Chellaram C</i> , <i>Jamila PATTERSON</i> , <i>Patterson JK EDWARD*</i>	133
Distribution of Red-band disease and effect of boring sponges on solitary corals in Tuticorin coastal waters of Gulf of Mannar, Southeast coast of India	
<i>Shawn W POLSON*</i> , <i>Mats L LUNDQVIST</i> , <i>Cheryl M WOODLEY</i>	138
Systematic approach to a disease investigation: case example	
<i>Eric Hugo BORNEMAN</i> , <i>Gerard M WELLINGTON</i>	142
Apoptosis in diseased reef corals	
<i>Diego L GIL-AGUDELO*</i> , <i>Lanna ALI-HASSAN</i> , <i>Kiho KIM</i> , <i>Garriet W SMITH</i>	149
Characterization of coral surface microbiota using metabolic profiling	
<i>Eric Hugo BORNEMAN</i>	153
Coral reef Guinea pigs: Culture of research clonal lines	

- Naoko YASUDA\**, *Yoshikatsu NAKANO*, *Hideyuki YAMASHIRO* 159  
 Pathological studies on coral tumors of *Porites* spp. Okinawa, Japan

**1-5. Anthropogenic Impacts on Rates of Bioerosion and Consequences for Coral Reefs**

1-5 Session Summary 165

- Christine Hanna Lydia SCHÖENBERG* 168  
 Growth and erosion of the zooxanthellate Australian bioeroding sponge *Cliona orientalis* are enhanced in light

**1-6. Biodiversity and Diversification in the Indo-West Pacific**

- Lyndon DEVANTIER\**, *Emre TURAK*, *Posa SKELTON* 175  
 Ecological assessment of the coral communities on Bunaken National Park: Indicators of management effectiveness

- Nicole GRAVIER-BONNET*, *Chloé A-F BOURMAUD* 188  
 Hydroids (Cnidaria, Hydrozoa) of coral reefs: Preliminary results on community structure, species distribution and reproductive biology in the Glorieuses (southwest Indian Ocean)

- Shin KUBOTA* 197  
 Hydromedusan fauna in the Nansei Islands

- Chloé A F BOURMAUD\**, *Lucas LECLERE*, *Perrine MANGION*, *François MICHONNEAU*, *Gwenaëlle PENNOBER* 202  
 Biodiversity of Reunion coral reefs

**1-7. Functional Roles of Sponges in Coral Reefs**

- Carlo CERRANO\**, *Barbara CALCINAI*, *Silvia PINCA*, *Giorgio BAVESTRELLO* 208  
 Reef sponges as hosts of biodiversity: Case from North Sulawesi

**1-8. Changing Coral Communities: What are the Consequences for Reef Fishes?**

1-8 Session Summary 214

- Lorenzo ALVAREZ-FILIP*, *Héctor REYES-BONILLA* 216  
 Comparison of community structure and functional diversity of fishes at Cabo Pulmo coral reef, western Mexico between 1987 and 2003

- Jeffrey S SHIMA\**, *Craig W OSENBERG*, *Colette M ST MARY*, *Lock ROGERS* 226  
 Implication of changing coral communities: Do larval traits or habitat features drive variation in dentistry-dependent mortality and recruitment of juvenile reef fish?

- Russell J SCHMITT\**, *Sally J HOLBROOK* 232  
 Developmental delays, recruitment storage and adult attrition rates in local populations of a tropical damselfish

## Papers Title

*Sally J HOLBROOK\**, *Andrew J BROOKS*, *Russell J SCHMITT* 241  
Relationships between live coral cover and reef fishes: Implications for predicting effects of environmental disturbances

*Peter W GLYNN* 250  
Fish utilization of simulated coral reef frameworks versus eroded rubble substrates off Panama, eastern Pacific

*Craig W OSENBURG\**, *Jeffrey S SHIMA*, *Colette M ST MARY* 257  
Habitat degradation and settlement behavior: Effects on fish settlement, survival, and recruitment

### 1-9. Flexibility and Specificity in Algal-Invertebrate Symbiosis: Diversity, Stability, and Physiological Capacity of Symbiosis Dinoflagellates (Special Session)

1-9 Session Summary 264

*Michio HIDAKA\**, *Ryota SUWA* 267  
Mechanism of zooxanthellae expulsion by corals: Exposure to high temperature in darkness induces zooxanthellae expulsion by coral hosts

*Jodi SCHWARZ\**, *Peter BROKSTEIN*, *Chitra MANOHAR*, *Mary Alice COFFROTH*, *Alina SZMANT*, *Mónica MEDINA* 274  
Coral reef genomics: Developing tools for functional genomics of coral symbiosis

### Session 2: Environmental factors controlling coral reef formation in space and time

*John CHAPPELL* 282  
[Keynote] Quaternary climate and coral reefs: Expansions, contractions and shocks

### 2-1. Reef Ecosystems in Space and Time

2-1 Session Summary 285

*Adrian FLYNN\**, *Sandra ROTMANN*, *Chris SIGERE* 286  
Long-term monitoring of coral reefs subject to sediment stress in Papua New Guinea

*Chiaki BENA\**, *Akiyuki IRIKAWA* 293  
Distribution pattern of small coral colonies after the 1998 bleaching event (Okinawa, Japan)

*S PINCA\**, *M BEGER*, *B MULLER*, *E REEVES*, *M WHITE* 300  
Community analysis of reef habitats in the Marshall Islands

*Yoshimi FUJIOKA\**, *Hideo OHBA*, *Takuro SHIBUNO*, *Yoshitake TAKADA*, *Kazumasa HASHIMOTO*, *Atsushi SUZUKI*, *Kaiho TOTTORI* 306  
Self-sustaining resilience of hermatypic coral communities following disturbance at the reef flat of Urasoko Bay, Ishigaki Island, southern Japan

<i>Mehdi ADJEROUD</i>	310
Zonation of coral assemblages in the Ryukyu Islands (southern Japan): The importance of land-ocean gradients and reef habitats	
<i>Hideo OHBA*, Takuro SHIBUNO, Yoshitake TAKADA, Atsushi SUZUKI, Masayuki NAGAO, Kaiho TOTTORI, Naoko MORIMOTO, Yoshimi FUJIOKA</i>	319
Subtropical marine vegetation under the influence of rivers at Miyara Bay in Ishigaki Island, Ryukyus (southern Japan)	
<i>Leanne J HEPBURN, Chris PERRY, Paul BLANCHON</i>	327
Distribution of macroborers in reef rubble, Puerto Morelos, Mexican Caribbean	
<i>Kathleen L SEMON*, Kathleen SULLIVAN SEALEY, Vanessa L NERO</i>	335
The influence of habitat selection and density on the population dynamics of stony coral species of the Bahamian Archipelago	
<i>Miledel Christine C QUIBILAN*, Porfirio M ALIÑO</i>	341
Coral community structure of western Philippines reefs I: Spatial patterns	
<i>James P GILMOUR*, Andrew H BAIRD, Morgan S PRATCHETT, Luke D SMITH</i>	351
The maintenance of populations of the mushroom coral <i>Fungia fungites</i> under different disturbance regimes: Sexual versus asexual recruitment	
<i>Hazel ARCEO*, Cleto NAÑOLA, Porifirio ALIÑO</i>	359
Spatio-temporal juvenile community structure: Deriving recruitment patterns of coral reef fishes in the Philippines	
<i>jamie D BECHTEL*, Peter GAYLE, Les KAUFMAN</i>	367
The return of <i>Diadema antillarum</i> to Discovery Bay: Patterns of distribution and abundance	
<i>M Bernadette BEZY*, Carlos JIMENÉZ, Jorge CORTÉS, Alvaro SEGURA, Alberto LEÓN, Juan José ALVARADO, Carolina GILLÉN, Esteban MEJÍA</i>	376
Contrasting <i>Psammocora</i> - dominated coral communities in Costa Rica, tropical eastern Pacific	

## 2-2. The Influence of Storms and Floods on Coral Reef Development

<i>M James C CRABBE, David J SMITH</i>	382
Storm and stress: Modelling strategies for recruitment and survival of corals in Discovery Bay, Jamaica, and in the Wakatobi Marine National Park, S.E. Sulawesi	
<i>P L JOKIEL</i>	390
Impact of storm waves and storm floods on Hawaiian reefs	
<i>Norman John QUINN*, Barbara Louise KOJIS</i>	399
Subsurface salinity variation on an off shore reef during a period of heavy rainfall at St. Thomas, U.S. Virgin Islands	

**2-3. Connectivity in Coral Reef Systems - Scientific Challenges and Management Consequence**

- Michael J KINGSFORD\**, *Megan J LIDDELOW* 403  
The attraction of presettlement reef fish to FADs with live and dead coral
- Yasushi HONDOU*, *Kazuhisa HAMADA*, *Keiichi MUSHIAKE*, *Takashi NISHIDA*, *Akinobu NAKAZONO\**, *Kumiko OKAMOTO* 409  
Survival and growth of hatchery reared kelp grouper, *Epinephelus bruneus*, released on an artificial rocky reef of the Goto Islands, northwestern coast of Kyushu, Japan
- Amy D ATCHISON\**, *Paul W SAMMARCO*, *Daniel A BRAZEAU* 414  
Genetic similarities of coral populations between the Flower Garden Banks and oil/gas platforms, northern Gulf of Mexico
- Andrew S HOEY\**, *Mark I McCORMICK* 420  
Effects of subcutaneous fluorescent tags on the growth and survival of a newly settled coral reef fish, *Pomacentrus amboinensis* (Pomacentridae)
- Mark I MCCORMICK\**, *Andrew S HOEY* 425  
Biological and physical correlates of settlement and survival for a coral reef fish, *Pomacentrus amboinensis* (Pomacentridae)
- Alina M SZMANT\**, *Melissa G MEADOWS* 431  
Developmental changes in coral larval buoyancy and vertical swimming behavior: Implications for dispersal and connectivity
- Jeffrey M LEIS\**, *Rebecca FISHER* 438  
Swimming speed of settlement-stage reef-fish larvae measured in the laboratory and in the field: A comparison of critical speed and in situ speed
- Yohei NAKAMURA\**, *Masahiro HORINOUCI*, *Takuro SHIBUNO*, *Hiroyuki KAWASAKI*, *Mitsuhiko SANO* 446  
A comparison of seagrass-fish assemblage structures in open oceanic and coastal bay areas in the Ryukyu Islands, Japan
- Paul W SAMMARCO*, *Amy D ATCHISON*, *Greg S BOLAND* 453  
Geographic expansion and limits of corals in the NW Gulf of Mexico: Colonization of offshore oil and gas platforms

**2-4. Environmental Gradient in Coral and Coral Reefs along the Northwestern Margin of the Pacific**

- Takashi NAKAMURA\**, *Toru NAKAMORI* 460  
Population dynamics of hermatypic coral communities on reef slope vs. reef flat at Shiraho, Ishigaki Island, southwest Japan

**2-5. The Coral Triangle: Global Center of Coral Reef Richness**

- Sara A LOURIE* 478  
Spatial genetic patterns in the *Hippocampus barbouri* species group (Teleostei: Syngnathidae) across the Coral Triangle

**2-6. One Billion Years of the Reef Ecosystem**

2-6 Session Summary	485
<i>Toru NAKAMORI*</i> , <i>Kyoko KITAMURA</i> , <i>Shinpei NAKATA</i> Organic Reef abundance and its geochemical and oceanographic controls since Cretaceous	486

**2-7. Coral Reefs and Global Change I: Reef - Sea Level - Climate Interaction through Time**

2-7 Session Summary	492
<i>Hironobu KAN*</i> , <i>Toshio KAWANA</i> 'Cathch-up' of a high-latitude barrier reef by back-reef growth during post-glacial sea-level rise, Southern Ryukyus, Japan	494
<i>Paul S KENCH</i> Morphology and formation of Dhakandhoo Island, South Maalhosmadulu Atoll, Maldives	504
<i>Kunio OMOTO</i> Radiocarbon ages and $\delta^{13}\text{C}$ isotopes of beach rocks from the Okinawa Islands, southwest Japan	511
<i>Shigeru OHDE*</i> , <i>Mervyn GREAVES</i> , <i>Harry ELDERFIELD</i> Strontium isotope stratigraphy of Funafuti Atoll: Reef development, dolomitization and sea-level change	519
<i>Kazuhiko FUJITA*</i> Identification of coral reef environments based on foraminiferal death assemblages from Ishigaki Island, Okinawa, Japan	528
<i>Tsutau TAKEUCHI*</i> , <i>Yasufumi IRYU</i> , <i>Tokiyuki SATO</i> , <i>Shun CHIYONOBU</i> , <i>Tsutomu YAMADA</i> , <i>Kei ODAWARA</i> , <i>Eiichi ABE</i> Pleistocene reef development and stratigraphy on Ie-jima, the Ryukyu Islands, southwestern Japan	536

**2-8. Coral Reefs and Global Change II: Corals as Recorders of Past Climate**

<i>Atsushi SUZUKI*</i> , <i>Kohei HIBINO</i> , <i>Akihiro IWASE</i> , <i>Hodaka KAWAHATA</i> Influences of metabolism and growth variations on skeletal oxygen and carbon isotope ratios in cultured <i>Porites</i> corals: Temperature-controlled experiments	547
<i>Tamano OMATA*</i> , <i>Atsushi SUZUKI</i> , <i>Hodaka KAWAHATA</i> Kinetic and metabolic isotope effects in coral skeletons	557
<i>Phong X DANG*</i> , <i>Takehiro MITSUGUCHI</i> , <i>Hiroyuki KITAGAWA</i> , <i>Tetsuo UCHIDA</i> , <i>Yasuyuki SHIBATA</i> Sr/Ca ratios of <i>Porites</i> coral from Con Dao Island, South of Vietnam	567
<i>Andréa G GROTTOLI*</i> Monthly resolved stable oxygen isotope record in a Palauan sclerosponge <i>Acanthocheatetes wellsi</i> for the period of 1977-2001	572

*Christopher S MOSES\**, *Peter K SWART* 580  
 Stable isotope and growth records in corals from the island of Tobago: Not simply a record of the Orinoco

*C Mark EAKIN\**, *Peter K SWART*, *Terrence M QUINN*, *Kevin P HELMLE*, *Jennifer M SMITH*, *Richard E DODGE* 588  
 Application of paleoclimatology to coral reef monitoring and management

**2-9. Coral Reefs and Global Change III: Corals, Carbon and Climate**

*Mirza M M HOSSAIN \**, *Shigeru OHDE* 597  
 Calcification of cultured *Porites* and *Fungia* under different aragonite saturation states of seawater

*Anne MÜELLER\**, *Helen V MCGREGOR*, *Michael K GAGAN*, *Janice M LOUGH* 607  
 The effects of early marine aragonite, Mg-calcite and vadose-zone calcite diagenesis on reconstructions of coral calcification rate and the oceanic Suess effect

**2-10. Coral Reefs and Global Change IV: Community Responses to Bleaching: Recovery or Degradation?**

2-10 Session Summary 615

*Kamla R MOOTHEN PILLAY\**, *Hiroaki TERASHIMA*, *Hiroyuki KAWASAKI*, *Vishwamitra CHINEAH* 617  
 Recovery of massive poritid corals from bleaching at Albion, Mauritius

*Peter W GLYNN\**, *Peggy FONG* 624  
 Patterns of reef coral recovery by the regrowth of surviving tissues following the 1997-98 El Nino warming and 2000, 2001 upwelling cool events in Panama, eastern Pacific

*Jean C KENYON\**, *Greta S AEBY*, *Russell E BRAINARD*, *Joseph D CHOJNACKI*, *Matthew J DUNLAP*, *Casey B WILKINSON* 631  
 Mass coral bleaching on high-latitude reefs in the Hawaiian Archipelago

*Michael L BERUMEN\**, *Morgan S PRATCHETT* 644  
 Effects of resource availability on the competitive behaviour of butterflyfishes (Chaetodontidae)

*Luke D SMITH\**, *James P GILMOUR*, *Andrew J HEYWARD*, *Max REES* 651  
 Mass-bleaching, mortality and slow recovery of three common groups of scleractinian corals at an isolated reef

*Helmut SCHUHMACHER\**, *Karen LOCH*, *Wolfgang LOCH*, *Wolf R SEE* 657  
 Post-bleaching development of a Northern Maldivian Reef (1998-2004)

*Nigel DOWNING*, *Ben STOBART\**, *Raymond BUCKLEY*, *Kristian TELEKI* 664  
 Recovery of coral and fish following the 1998 El Nino event at Aldabra Atoll, southern Seychelles: A site of minimal anthropogenic influence

*Annelise B HAGAN\**, *Thomas SPENCER* 676  
 Reef recovery at Alphonse Atoll, western Indian Ocean, following the 1997-98 ocean warming event



*Bernhard M RIEGL\**, *Samuel J PURKIS*, *Kevin E KOHLER*, *Richard E DODGE* 683  
 Spatial patterns in Arabian Gulf coral assemblages (Jebel Ali, Dubai, U.A.E.) in response to temperature-forcing

*Timothy R MCCLANAHAN* 688  
 Interaction between fisheries management and a coral bleaching disturbance on coral reef fish in Kenya

*Lisa J RODRIGUES\**, *Andréa G GROTTOLO* 696  
 Lipids and chlorophyll in bleached and recovering *Montipora capitata* from Hawaii: An experimental approach

**2-12. Coral Reefs and Global Change VI: Understanding the Interactive Roles of Light, Sea Temperature and Carbon-Dioxide in Coral Bleaching, Growth and Coral Recruit Health**

*Erik STABENAU\**, *James HENDEE*, *Louis FLORIT* 702  
 Techniques for the automated assessment of intense light and high sea temperature on coral response

*Derek MANZELLO\**, *James C HENDEE*, *Dave WARD*, *Zandy HILLIS-STARR* 709  
 An evaluation of environmental parameters coincident with the partial bleaching event in St. Croix, U.S. Virgin Islands 2003

*Ronald HOEKE\**, *Russell BRAINARD*, *Russell MOFFITT*, *Jean KENYON* 718  
 Oceanographic conditions implicated in the 2002 Northwestern Hawaiian Islands bleaching event

*Lance W SMITH* 724  
 Influence of water motion on resistance of corals to high temperatures: Evidence from a field transplant experiment

*Pamela HALLOCK\**, *Dana E WILLIAMS*, *Strawn K TOLER*, *Elizabeth M FISHER*, *Helen K TALGE* 729  
 Bleaching in reef-dwelling foraminifera: implications for reef decline

*Ya-Hsuan TUNG*, *Chang-Feng DAI*, *Tung-Yung FAN\** 738  
 Comparison of temperature effect on growth and survival of reef corals, *Stylophora pistillata* and *Seriatopora hystrix*: A mesocosm study

*Anya SALIH\**, *Guy COX*, *Ron SZYMCZAK*, *Steve L COLES*, *Andrew H BAIRD*, *Andrew DUNSTAN*, *Giordana COCCO*, *Jacqui MILLS*, *Anthony LARKUM* 746  
 The role of host-based color and fluorescent pigments in photoprotection and in reducing bleaching stress in corals.

*Mark EAKIN*, *Hajime KAYANNE* 757  
 Special Session Summary

**Session 3: The relationship between ecosystem stability and biogeochemical cycles**

*Loïc CHARPY* 775  
 [Keynote] Importance of cyanobacteria in coral reef

**3-1. Integrating Marine Microbiology, Aqueous Chemistry, and Ecology to Track the Development and Spread of Disease in Coral Reef Ecosystems**

*Jorge FRIAS-LOPEZ\**, *James S KLAUS*, *Bruce W FOUKE* 785  
 Cytotoxic activity of Black Band Disease (BBD) extracts against the symbiotic dinoflagellate *Symbiodinium* sp.

*Ariel KUSHMARO\**, *Esti KRAMARSKY-WINTER*, *Itzik BRICKNER*, *Yossi LOYA* 789  
 Microorganisms and coral nutrition

*James S KLAUS\**, *Jorge FRIAS-LOPEZ*, *Bruce W FOUKE* 794  
 The effect of temperature and aquaria conditions on bacterial communities inhabiting healthy tissues of *Diploria strigosa*

*Norman J QUINN\**, *Deborah GOCHFELD*, *Mark T HAMANN*, *Marc SLATTERY*, *Larry WALKER*, *Barbara L KOJIS* 800  
 Documenting and conserving biodiversity on Jamaican coral reefs while exploring for pharmacologically interesting natural products

**3-2. Using Instrumented Arrays and the CREWS Modeling System Bioregulation of Physiological Processes in Reef Organisms and Potential for Disruption by Chemical Contaminants**

*Yukio KITADA*, *Hodaka KAWAHATA*, *Atsushi SUZUKI*, *Tamotsu OOMORI* 810  
 Concentrations of Nonylphenol and Bisphenol A in the Okinawa Island using liquid chromatography-electrospray tandem mass spectrometry

*Takayuki KAMIKI*, *Yutaka SAGARA*, *Gaku TOKUDA*, *Hideo YAMASAKI\** 819  
 Morphological variation of the zooxanthella *Symbiodinium microadriaticum* CCMP829 caused by difference of nitrogen source

**3-3. Effects of Pollutants on Corals and Coral Reef Organisms**

*Michael B MORGAN\**, *Terry W SNELL* 822  
 Expression of a ceruloplasmin homolog in corals: An informative biomarker of stress

*Daniel J BUCHER\**, *Esther FISCHER* 831  
 A possible role for urea in mediating coral responses to external ammonium supply

*Mathews G, J K Patterson EDWARD\** 837  
 Effect of sedimentation and pollution in the reefs of Tuticorin coast of Gulf of Mannar, Southeast coast of India

**3-4. Primary Production in Coral Reef Environments with Special Reference to Picoplankton, its Role and Significance**

3-4 Session Summary 842

*Beatriz E CASARETO\**, *Loic CHARPY*, *Jean BLANCHOT*, *Yoshimi SUZUKI*, *Katsuhiko KUROSAWA*, *Yoshio ISHIKAWA* 844

Phototrophic prokaryotes in Bora Bay, Miyako Island, Okinawa, Japan

*Tyler B SMITH* 854

Benthic algal production in an upwelling coral reef environment (Gulf of Panamá): Evidence for control by fish herbivores

**3-5. The Physical and Hydrodynamic Environments: Their Effects on Coral Reef Processes**

3-5 Session Summary 862

*Satoshi NAKADA\**, *Yasufumi ISHIHARA*, *Akira HARASHIMA* 864

A numerical simulation of sea-surface currents in the Sekisei Lagoon and the coral egg and larvae transport

*Takashi NAKAMURA\**, *Hideo YAMASAKI* 872

Morphological changes of pocilloporid corals exposed to water flow

*Satoquo SEINO*, *Takaaki UDA*, *Susumu ONAKA*, *Masumi SERIZAWA*, *Toshiro SAN-NAMI* 876

Large-scale excavation and land reclamation on reef flat and coral mining on Turtle Island in Bali, Indonesia

*Jaap A KAANDORP\**, *Rolf P M BAK*, *Mark J A VERMEIJ* 882

Modelling of nutrient gradients in three-dimensional images - and simulated morphologies of a branching coral.

*Vassiliki H KOURAFALOU\**, *Rolando S BALOTRO* 890

Connecting the U.S. Florida Keys coral reef ecosystem to the hydrodynamics

*Eizo NAKAZA\**, *S M B RAHAMAN*, *Seikoh TSUKAYAMA*, *Yasushi KITAMURA* 896

Wind driven currents in Shiraho coral reef area of Ishigaki Island, southwest Japan

*Eizo NAKAZA\**, *S M B RAHAMAN*, *Seikoh TSUKAYAMA*, *Yasushi KITAMURA* 905

Temperature distributions in a coral reef area and the influences of cross-shore internal waves

**3-6. Toward a Stable Coral Reef Ecosystem: The Dynamics of Nutrients and Organic Matter (Special Session)**

3-6 Session Summary 912

*Yoshio ISHIKAWA, Yoshimi SUZUKI, Beatriz E CASARETO, Tamotsu OOMORI* 913  
Organic production and calcification in coral reef communities in Bora Bay, Miyako Island, Okinawa, Japan

*Yasuaki TANAKA\*, Toshihiro MIYAJIMA, Yu UMEZAWA, Hideki FUKUDA, Isao KOIKE, Hiroshi OGAWA, Takeshi HAYASHIBARA* 925  
Effect of nitrate enrichment on release of dissolved organic carbon and nitrogen from zooxanthellate coral, *Acropora* nitrogen from zooxanthellate coral, *Acropora pulchra* and *Porites cylindrica*

**Session 4: Towards a system where humans and coral reefs coexist**

*Makoto TSUCHIYA* 932  
[Keynote] Toward integrated coral-reef science: A new challenge for the conservation and restoration of coral reefs

**4-1. Status of Coral Reefs of the World 1994, 2004 and 2014: Recommendations from 80 Nations for Remediation**

*Subhashni Devi APPANA, Veikila Curu VUKI* 938  
Bioerosion patterns and abundance and spatial distribution of *Echinometra* sp. A (green white tip) ecomorph on Nukubu Reef, Fiji

*Norman John QUINN\*, Barbara Louise KOJIS, Rebecca SAMUEL* 946  
Empowering Papua New Guineans with environmental monitoring skills through participation in a Reef Check survey

*Krishnamoorthy VENKATARAMAN, Kosalai Pargunam RAGHURAM* 954  
Status of Gulf of Mannar Coral Reefs, India

*Zelinda M A N LEÃO, Ruy K P KIKUCHI, Leo X C DUTRA, Marília D M OLIVEIRA* 959  
The status of eastern Brazil coral reefs during the last 5000 years

*Francesca BENZONI\*, Michel PICHON, Shaker AL HAZEEM, Paolo GALLI* 969  
The coral reefs of the Northern Arabian Gulf: Stability over time in extreme environmental conditions?

*Alberto RODRÍGUEZ-RAMÍREZ, María Catalina REYES-NIVIA, Raúl NAVAS-CAMACHO, Sonia BEJARANO, Jaime GARZÓN-FERREIRA, Fernando ZAPATA* 976  
Status of the coral reefs of Colombia in 2003

*Sonia BEJARANO\*, Nelson MANRIQUE-RODRÍGUEZ, Jaime GARZÓN-FERREIRA* 982  
Recent partial mortality and other health conditions of the sea fan *Gorgonia ventalina* Linnaeus 1758 in the Santa Marta area, Colombian Caribbean, 15 years after a mass mortality event

## Papers Title

---

- Carolina BASTIDAS\**, *Aldo CROQUER*, *David BONE* 989  
Shift of dominant species after a mass mortality on a Caribbean reef
- Abigail MOORE*, *Andi Sofyan YOTOLEMBAH*, *Harto DARWINTO* 994  
Coral reef monitoring for management in Central Sulawesi, Indonesia
- David OBURA\**, *Olof LINDEN*, *Rolph PAYET*, *Matthew RICHMOND*, *Charles SHEPPARD*, *David SOUTER*, *Dan WILHELMSSON* 1000  
Coral reefs of Cosmoledo Atoll in the Aldabra group of southern Seychelles: Status and prospects in a changing world
- Beatrice Padovani FERREIRA\**, *Mauro MAIDA*, *Clóvis B CASTRO*, *Débora O PIRES*, *Tâmara M D'AMICO*, *Ana P L PRATES*, *Danilo MARX* 1011  
The status of coral reefs in Brazil
- Robert E SCHROEDER\**, *Michael S TRIANNI*, *Kate A MOOTS*, *Joseph L LAUGHLIN*, *Brian J ZGLICZYNSKI*, *R Brent TIBBETTS* 1016  
Status of fishery target species on coral reefs of the Marianas Archipelago
- Ana Paula Leite PRATES*, *Beatrice P FERREIRA* 1028  
Programs and legal instruments for the conservation of coral reefs in Brazil
- Suharsono*, *Giyanto*, *Agus BUDIYANTO*, *Nurul DHEWANI* 1033  
Status and monitoring of coral reefs in Kaledupa Islands, South East Sulawesi, Indonesia
- Mohammed Suleiman MOHAMMED\**, *Haji MACHANO*, *Carol DANIELS*, *Elizabeth TYLER*, *Narriman JIDDAWI*, *Saleh YAHYA* 1039  
Status of some coral reefs in Tanzania
- Si Tuan VO*, *Xuan Ben HOANG*, *Van Long NGUYEN*, *Kim Hoang PHAN* 1045  
Coral reefs of Vietnam: Recent status and conservation perspectives
- Cleto NAÑOLA Jr\**, *Porfirio ALIÑO*, *Hazel ARCEO*, *Wilfredo LICUANAN*, *Andre UYCHIAOCO*, *Miledel QUIBILAN*, *Wilfredo CAMPOS*, *Angel ALCALA*, *Alan WHITE*, *Edgardo GOMEZ* 1055  
Status report on coral reefs of the Philippines-2004
- Thamasak YEEMIN*, *Makamas SUTTHACHEEP*, *Nipat SOMKLEEB* 1062  
Status of coral reefs in Thailand
- Tadashi KIMURA\**, *Hitoshi HASEGAWA*, *Takeshi IGARASHI*, *Makoto INABA*, *Kenji IWAO*, *Fumihito IWASE*, *Kenji KAJIWARA*, *Takashi MATSUMOTO*, *Tatsuo NAKAI*, *Satoshi NOJIMA*, *Keiichi NOMURA*, *Masanori NONAKA*, *Katsuki OKI*, *Kazuhiko SAKAI*, *Kazuyuki SHIMOIKE*, *Kaoru SUGIHARA*, *Mitsuhiro UENO*, *Shinpei UENO*, *Hiroya YAMANO*, *Hiroyuki YOKOCHI*, *Minoru YOSHIDA* 1068  
Status of coral reefs in Japan
- David OBURA\**, *Nsajigwa MBIJE*, *Julie CHURCH*, *Redfred NGOWO*, *Anthony KING*, *Mohammed NUR* 1077  
Ecological status of coral reefs of the Mnazi Bay - Ruvuma Estuary Marine Park, Tanzania

**4-2. Diagnostic Monitoring & Assessment of Coral Reefs: Studies from Around the World**

4-2 Session Summary	1087
<i>Leo X C DUTRA*</i> , <i>Ruy K P KIKUCHI</i> , <i>Zelinda M A N LEÃO</i> Todos os Santos Bay coral reefs, Eastern Brazil, revisited after 40 years	1090
<i>Dana E WILLIAMS*</i> , <i>Margaret W MILLER</i> Importance of disease and predation to the growth and survivorship of juvenile <i>Acropora palmata</i> and <i>Acropora cervicornis</i> : A demographic approach	1096
<i>David J EVANS*</i> , <i>Robert NAWOJCHIK</i> , <i>Ken J P DESLARZES</i> The status of coral reef fish populations off former military ranges at the Islands of Culebra and Vieques, Puerto Rico: Preliminary data	1105
<i>Put O ANG Jr*</i> , <i>MeiMei CHOI</i> , <i>Tze Wai TAM</i> , <i>Man Cheong TAM</i> , <i>Li Si CHOI</i> Biological monitoring of coral communities in Tung Ping Chau Marine Park, Hong Kong SAR, China: Changes before and after marine park designation	1110
<i>Melanie D MCFIELD*</i> , <i>Patricia R KRAMER</i> The healthy Mesoamerican reef ecosystem initiative: A conceptual framework for evaluating reef ecosystem health	1118
<i>George P SCHMAHL*</i> , <i>Emma L HICKERSON</i> McGrail Bank, a deep tropical coral reef community in the northwestern Gulf of Mexico	1124
<i>Stephani R HOLZWARATH*</i> , <i>Brian J ZGLICZYNSKI</i> , <i>Robert E SCHROEDER</i> Spatial distribution of large mobile predators in the Northwestern Hawaiian Islands	1131
<i>Luis Eduardo CALDERON-ÁGUILERA*</i> , <i>Héctor REYES-BONILLA</i> Can local oceanographic conditions in the Mexican Pacific buffer the El Niño-Southern Oscillation effects on coral reefs?	1138
<i>Steven HERZLIEB*</i> , <i>Elizabeth KADISON</i> , <i>Jeremiah BLONDEAU</i> , <i>Richard S NEMETH</i> Comparative assessment of coral reef systems located along the insular platform south of St. Thomas, US Virgin Islands and the relative effects of natural and human impacts	1144
<i>Ken J P DESLARZES*</i> , <i>Robert NAWOJCHIK</i> , <i>David J EVANS</i> , <i>Cheryl J MCGARRITY</i> , <i>Peter GEHRING</i> The condition of fringing reefs off former military training areas at Isla de Culebra and Isla de Vieques, Puerto Rico: Preliminary results	1152
<i>Cheryl J MCGARRITY*</i> , <i>Ken J P DESLARZES</i> Preliminary data on juvenile corals and coral maladies on reefs off civilian and former military locations at the islands of Culebra and Vieques, Puerto Rico	1160

**4-3. Smart Indicators for Environmental Impacts**

- 4-3 Session Summary 1165
- Bernardo VARGAS-ÁNGEL\**, *Bernhard RIEGL*, *David GILLIAM*, *Richard DODGE* 1168  
An experimental histopathological rating scale of sedimentation stress in the Caribbean coral *Montastraea cavernosa*
- Jacob SILVERMAN\**, *Boaz LAZAR*, *Murielle DRAY*, *Moshe LAZAROVICH*, *Tanya RIVLIN*, *Jonathan EREZ* 1174  
Monitoring the status of coral reefs using a simplified technique to measure community metabolism: A case study from the northern Gulf of Aqaba, Red Sea

**4-4. Ecological Injury Rapid Assessment Procedures for Coral Reefs**

- Fairoz MOHAMED\**, *Cumaranatunga RUCHIRA*, *Amarasinghe BANDU* 1182  
Impact from anthropogenic processes that affect two near shore coral reefs located in Matara and Weligama Southern Sri Lanka

**4-5. Sustainable Use of Coral Reef Resources: Emerging Approaches to Determining and Setting Limits on Extractive Use**

- Mecki KRONEN\**, *Samasoni SAUNI*, *Franck MAGRON*, *Lilian FAY-SAUNI* 1185  
Status of reef and lagoon resources in the South Pacific - the influence of socioeconomic factors
- Hiroshi NAWATA* 1194  
Human-camel relationships in coral reef and mangrove ecosystems: Resource patch accessibility and availability in the coastal zones of the arid tropics
- Jamrearn BUARUANG*, *Thamasak YEEMIN* 1204  
Basic information for sustainable use of a sea urchin, *Diadema setosum* from coral communities in the Gulf of Thailand
- Elizabeth WOOD\**, *Muhamad Saini SULIANS*, *Irwan Shah MUSTAPA* 1211  
Fishing practices, status of coral reef resources and tactics for reversing unsustainable use on the Semporna Island reefs (Sabah, Malaysia)

**4-6. Exploring the Utility of Integrated Coastal Management**

- James SPURGEON*, *Toby ROXBURGH* 1218  
A blueprint for maximising sustainable coastal benefits : The American Samoa case study

**4-7. Assessments of Coral Reef Management Effectiveness**

4-7 Session Summary	1227
<i>Nyawira A MUTHIGA</i> Assessing the effectiveness of management of marine protected areas in Kenya: Experiences from the Mombassa marine park and reserve	1231
<i>Nohora GALVIS</i> Effectiveness assessment of the national park Corales del Rosario and San Bernardo, Colombia	1243
<i>Nguyen Van LONG, Vo Si TUAN, Hoang Xuan BEN, Phan Kim HOANG</i> Conservation of marine biodiversity: A tool for sustainable management in Cu Lao Cham Islands, Quang Nam province	1249

**4-8. Critical Appraisal of Local, Customary, Participatory and Co-management**

<i>Annette MUEHLIG-HOFMANN*, Joeli VEITAYAKI, Nicholas V C POLUNIN, Selina STEAD, Nicholas A J GRAHAM</i> Community-based marine resource management in Fiji - from yesterday to tomorrow	1259
<i>Jane TURNBULL</i> The (dis)connection between international assessments of the state of coral reefs and local policymaking: A Fijian case study	1267
<i>Simon FOALE</i> Is coral reef conservation possible without science education in Melanesia? Is science education possible without development?	1274
<i>Seiji NAKAYA*, Asipeli PALAKI</i> Importance of involving landless villagers dependent on coastal resources in the management of marine protected areas in Tonga	1279

**4-9. Evaluating Effectiveness of Coral Reef Ecosystem Management**

<i>Ruth KELTY*</i> Monitoring to evaluate the effectiveness of coral reef ecosystem programs and policies: The NOAA National Coral Reef Monitoring Program as a case study	1287
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------

**4-11. Conservation and Management of Reef Fish Spawning Aggregations**

4-11 Session Summary	1292
<i>Adrian FLYNN*, Sébastien SARRAMEGNA, Michel KULBICKI</i> Coral reef fish spawning periodicity and habitat in New Caledonia: A multi-faceted approach in a data-deficient environment	1295



<p><i>Richard S NEMETH*</i>, <i>Steven HERZLIEB</i>, <i>Jeremiah BLONDEAU</i>                  Comparison of two seasonal closures for protecting red hind spawning aggregations in the US Virgin Islands.</p>	1306
<p><i>Michael L DOMEIER*</i>, <i>Don DEMARIA</i>, <i>Nicole NASBY-LUCAS</i>                  Behavior and habitat use of Goliath grouper (<i>Epinephelus itajara</i>) based upon acoustic telemetry</p>	1314
<p><i>Barbara Louise KOJIS*</i>, <i>Norman John QUINN</i>                  A census of US Virgin Islands commercial fishers at the start of the 21<sup>st</sup> century</p>	1326
<p><i>Melita SAMOILYS*</i>, <i>Julie CHURCH</i>, <i>Boaz KAUNDA-ARARA</i>, <i>Albogast KAMUKURU</i>, <i>Narriman JIDDAWI</i>                  Preliminary findings on spawning aggregations of reef fishes in East Africa</p>	1335
<b>4-12. New Approaches to Sustaining Coral Reef Ecosystems and their Fisheries</b>	
<p><i>Sapta Putra GINTING*</i>, <i>Bill MARSDEN</i>, <i>Charles GREENWALD</i>                  Incorporating coral reef conservation into integrated coastal management: The coral reef rehabilitation and management program (COREMAP) experiences</p>	1347
<p><i>Noël CONRUYT*</i>, <i>David GROSSER</i>, <i>Yannick GEYNET</i>, <i>Gérard FAURE</i>, <i>Michel PICHON</i>, <i>Florence TRENTI</i>, <i>Nicole GRAVIER-BONNET</i>, <i>Pascale CHABANET</i>, <i>Alain SENTENI</i>, <i>Virginie TORRENS</i>                  Virtual research and learning community: Co-design of knowledge bases in marine biology, applied to corals of the Mascarene Archipelago and to fish and hydroids of Reunion's coral reefs</p>	1354
<p><i>Francesca BENZONI*</i>, <i>Jennifer S ASHWORTH</i>, <i>Anna M ADDAMO</i>, <i>Fabrizio STEFANI</i>, <i>Ayman MABROUK</i>, <i>Paolo GALLI</i>                  Artisanal fisheries and No-Take Zones in Nabq, Egypt: Effects on molluscs and reef top benthic assemblages</p>	1362
<p><i>Jill ST JOHN</i>                  The ecology and fishery management of a high latitude West Australian coral reef</p>	1368
<p><i>Julie CHURCH*</i>, <i>David OBURA</i>                  Sustaining coral reef ecosystems and their fisheries in the Kiunga Marine National Reserve, Lamu, Kenya</p>	1381
<p><i>Lance KB JORDAN</i>, <i>Richard E SPIELER*</i>                  Implications of natural variation of fish assemblages to coral reef management</p>	1391
<p><i>Eric VERHEIJ*</i>, <i>Melita A SAMOILYS</i>, <i>Hassan W KALOMBO</i>                  Assessing the impact of a community-based network of marine protected areas through long term monitoring of coral reef resources</p>	1396

**4-13. Co-management of Reef Fisheries and Distribution of the Marine Products in Southeast Asia and Japan**

4-13 Session Summary	1405
<i>Shinichiro KAKUMA</i> Reef fisheries co-management in Okinawa	1407
<i>Jamila PATTERSON*</i> , <i>V Deepak SAMUEL</i> , <i>Dan WILHELMSSON</i> Role of fisherwomen in coral conservation and management - a report from the reef dependent fishing village (Tharuvaikulam) of Gulf of Mannar, Southeast coast of India	1416
<i>Akinori SATO</i> , <i>Akiko OKITSU</i> , <i>Yoichi IDE</i> , <i>Janny D KUSEN</i> , <i>Dennie MAMONTO</i> Community based artificial reef development in North Sulawesi Lesson learned from Pilot Project InteCoReef	1421
<i>Jun AKAMINE</i> Who is to be blamed? Socio-cultural notes on blast fishing in the Spratly Islands	1427

**4-14. Modeling and Decision Support**

<i>Eric L PETERSON*</i> , <i>Maria BEGER</i> , <i>Silvia PINCA</i> Three-dimensional model of atoll hydrodynamics	1434
<i>Wan-Hsu TSAI</i> , <i>Chang-Feng DAI*</i> , <i>Yi-Chen YANG</i> , <i>Ching-Pin TUNG</i> Using genetic programming to modeling spatial distribution of corals and the impacts of climatic changes: A case study from Taiwan	1440
<i>Maria BEGER*</i> , <i>Geoffrey P JONES</i> , <i>Hugh P POSSINGHAM</i> A method of statistical modelling of coral reef fish distribution: Can it aid conservation planning in data poor regions?	1445
<i>Rollan C GERONIMO</i> , <i>Andre Jon UYCHIAOCO</i> , <i>May T LIM</i> , <i>Robert M SEYMOUR</i> , <i>Johnrob Y BANTANG</i> , <i>Edgardo D GOMEZ</i> Assessing the impact of biodiversity changes on reef fisheries using an individual based model	1457

**4-15. Designing Effective Coral Reef Marine Protected Areas: Moving from Sites to Systems**

4-15 Session Summary	1463
<i>Alan T WHITE*</i> , <i>Anna Blesilda T MENESES</i> , <i>Melody OVENDEN</i> , <i>Sheryll TESCH</i> Sustaining marine protected areas through continued monitoring and evaluation: The MPA report guide and management rating system	1466
<i>Marites MAGNO*</i> , <i>Cesar VILLANOY</i> Quantifying the complexity of Philippine coastlines for estimating entrainment potential	1471

- Porfirio M ALIÑO\**, *Hiyas G ALANO*, *Miledel C QUIBILAN*, *Hazel O ARCEO*, *Joanne P TIQUIO*, *Andre T UYCHIAOCO* 1477  
 Moving towards a network of marine sanctuaries in the South China Sea: A View from the Philippine Shores
- Ben FITZPATRICK\**, *Janet LEY*, *Paul MCSHANE* 1483  
 Habitat heterogeneity of New South Wales Marine Protected Areas
- Sheila A MCKENNA* 1498  
 Use of surrogate taxa in coral reef surveys for Marine Reserve Design and Conservation
- Edmund GREEN\**, *Richard WOOD*, *Richard P STUMPF*, *Gene C FELDMAN*, *Norman KURING*, *Bryan FRANZ*, *Ashley HOLT*, *Corinna RAVILLIOUS*, *Jamie OLIVER*, *Julie A ROBINSON* 1504  
 All our eggs in one basket: The present state of coral reef conservation
- Leanne FERNANDES\**, *Jon DAY*, *Belinda JAGO*, *James HALL*, *Kirsti SAMPSON*, *Darren CAMERON*, *James INNES*, *John TANZER*, *Adam LEWIS*, *Dave LOWE*, *Kerrie GORMAN*, *Bruce KINGSTON* 1511  
 Weaving an “ideal” design of no-take Marine Protected Areas into the real world: The Great Barrier Reef case study
- Margarita LAVIDES*, *Jose Ma Antonio BRINGAS*, *Don Geoff TABARANZA*, *Chona May CUNANAN* 1517  
 The status of community-based marine protected areas in the Philippines: The case of the PAMANA member sites
- Aaron P JENKINS\**, *Carol L JENKINS*, *James B REYNOLDS* 1524  
 Successes and challenges of managing coral reefs in Papua New Guinea through locally managed marine areas.
- Risa Grace ORAM* 1531  
 Marine Protected Area Plan for American Samoa: Status, effectiveness, and future steps
- Sakanan PLATHONG\**, *Sasin CHALERMLARP*, *Somkiat SOONTORNPIITAKKOOL*, *Phongtheera BUAPET*, *Jintana PLATHONG* 1537  
 The Coral Reef Zoning Plan for Mu Ko Chumphon Marine National Park, Thailand
- Michael ROSS\**, *Nora ROSS*, *Mario AMORES*, *Alfonso AMORES*, *Dewey MONSANTO* 1544  
 Reef Check and SocMon: Cost-effective approaches to improve reef monitoring and management in the Central Philippines

#### **4-16. Land-Human Interaction in Atoll Islands**

- Toru YAMAGUCHI\**, *Masashi CHIKAMORI*, *Hajime KAYANNE*, *Hiroya YAMANO*, *Hiromune YOKOKI*, *Yayoi NAJIMA* 1549  
 Conditions and activities supporting early prehistoric human settlement on Majuro Atoll in Marshall Islands, Eastern Micronesia
- Hiroya YAMANO\**, *Toru YAMAGUCHI*, *Masashi CHIKAMORI*, *Hajime KAYANNE*, *Hiromune YOKOKI*, *Hiroto SHIMAZAKI*, *Masayuki TAMURA*, *Shinya WATANABE*, *Satoshi YOSHII* 1556  
 Satellite-based typology to assess stability and vulnerability of atoll islands: A comparison with archaeological data

*R JEYABASKARAN* 1567  
Human impact on Lakshadweep Atolls, India

*Hiromune YOKOKI\**, *Hiroya YAMANO*, *Hajime KAYANNE*, *Daisaku SATO*, *Hiroto SHIMAZAKI*, *Toru YAMAGUCHI*, *Masashi CHIKAMORI*, *Treger Albon ISHODA*, *Hiroshi TAKAGI* 1570  
Numerical calculations of longshore sediment transport due to wave transformation in the lagoon of Majuro Atoll, Marshall Islands

*Hiroto SHIMAZAKI\**, *Hiroya YAMANO*, *Hiromune YOKOKI*, *Toru YAMAGUCHI*, *Masashi CHIKAMORI*, *Masayuki TAMURA*, *Hajime KAYANNE* 1577  
Global mapping of factors controlling reef-island formation and maintenance

#### **4-17. Pacific Atolls Going under - Specific Coral Reef Conservation and Management Issues**

4-17 Session Summary 1585

*Chang-feng DAI* 1587  
Dongsha Atoll in the South China Sea: Past, present, and future

#### **4-18. Ecohydrology: Integrated Watershed-Coral Reef Ecosystem**

4-18 Session Summary 1593

*Miles FURNAS\**, *Alan MITCHELL*, *Michele SKUZA*, *Margaret WRIGHT* 1594  
Typological modelling of terrestrial sediment and nutrient inputs to the Great Barrier Reef

#### **4-21. Coral Reef Restoration and Remediation**

4-21 Session Summary 1603

*Alberto ACOSTA\**, *Andrea ACEVEDO M* 1605  
Population structure and colony condition of *Dendrogyra cylindrus* (Anthozoa: Scleractinea) in Providencia Island, Colombian Caribbean

*Kevin E KOHLER\**, *Richard E DODGE* 1611  
Visual\_HEA: Habitat Equivalency Analysis software to calculate compensatory restoration following natural resource injury

*Sayuko NINOMIYA*, *Shunsuke KURAHASHI*, *Takashi MASUMOTO*, *Tsutomu IWASHITA*, *Yoshikatsu NAKANO* 1617  
A study on comprehensive management of coral reef areas

*Go SUZUKI\**, *Takeshi HAYASHIBARA* 1627  
Inhibition of settlement and metamorphosis in *Acropora* (Anthozoa, Scleractinia) larvae by high-intensity light

- J Harold HUDSON\**, *Erik C FRANKLIN* 1631  
Coral reef restoration of a storm-disturbed vessel grounding site in the Florida Keys National Marine Sanctuary, USA
- Muriel SCHRIMM\**, *Bernard SALVAT*, *Yannick CHANCERELLE*, *Mehdi ADJEROUD*, *Michel PORCHER*, *Richard MORANCY*, *Annie AUBANEL* 1637  
Biological and physical restoration of a French Polynesian damaged reef site: Success and frustration
- Andrew W BRUCKNER\**, *Robin J BRUCKNER* 1645  
Survivorship of restored *Acropora palmata* fragments over six years at the M/V Fortuna Reefer ship grounding site, Mona Island, Puerto Rico
- Yasuhiro AKAKURA\**, *Seizou HANASHIRO*, *Shinichi URABE*, *Hiromi MAEHARA*, *Masahiro ONO*, *Tadahiro MIZOGUCHI*, *Hidekazu YAMAMOTO* 1651  
Various contrivances for restoration of coral assemblages in harbor development projects: A report
- Elizabeth Glynn FAHY\**, *Richard E DODGE*, *Daniel P FAHY*, *T Patrick QUINN*, *David S GILLIAM*, *Richard E SPIELER* 1657  
Growth and survivorship of scleractinian coral transplants and the effectiveness of plugging core holes in transplant donor colonies
- Jamie A MONTY*, *David S GILLIAM\**, *Kenneth W BANKS*, *David K STOUT*, *Richard E DODGE* 1665  
Coral of opportunity survivorship and the use of coral nurseries in coral reef restoration
- Shai SHAFIR*, *Jaap Van RIJN*, *Baruch RINKEVICH* 1674  
A mid-water coral nursery

#### **4-22. Coral Reef Aquarium Husbandry: A Tool for Science**

- Yutaka IKEDA\**, *Hiroshi HATA*, *Masaya TSUDA*, *Hajime KAYANNE* 1680  
Construction of coral reef ecosystem in the balanced aquarium, Monaco Aquarium
- Tohru HAYASHI*, *Fumihito IWASE* 1684  
Artificial breeding method of *Acropora hyacinthus* (Scleractinia, Cnidaria)

#### **4-23. Aquarium Trade Issues: Addressing Sustainability of the Ornamental Coral Reef Species Trade through Improved Management of Wild Harvest and Environmentally-Friendly Coral Farming and Aquaculture Approaches**

- 4-23 Session Summary 1689
- Andrew W BRUCKNER\**, *Eric H BORNEMAN* 1692  
Developing a sustainable harvest regime for Indonesia's stony coral fishery with application to other coral exporting countries

**4-24. Fostering Positive Change for Coral Reefs - Education Resources**

4-24 Session Summary	1698
<i>Judith C LANG, Janie L WULFF, Carol R FRETWELL*, Keith A ROBERSON</i> Coral reef conservation through outreach education	1699
<i>Tegan Churcher HOFFMANN</i> A survey to assess the needs of MPAs in building capacity for effective management and coral reef conservation	1703
<i>Hiroimi Hannah YAMAMOTO, Masanori NONAKA, Yoshiaki KAMEI, Senzo UCHIDA</i> Education and conservation of coral reefs at Okinawa Churaumi Aquarium	1713
<i>Sandra ZICUS, Justin MARSHALL</i> Coral colors: A reef monitoring program for high school students using CoralWatch Charts	1717
<i>Simon HARDING, Jean-Luc SOLANDT, Ryan WALKER, Nicola BARNARD, Joanna DOYLE, Jacqui TAYLOR, Tanya BLACKBURN*, Peter RAINES</i> The CCC Marine Environmental Education and Training Programme: A multi-sectoral approach to community awareness	1722

**4-25. Coral - Seagrass - Mangrove Interconnections; a Basis for Sound Coastal Management in the Tropics**

<i>Stacy JUPITER*, Stuart PHINN, Norman DUKE, Donald POTTS</i> Changing mangrove distributions in the Pioneer estuary (Queensland, Australia): Evaluating a technique for monitoring mangrove health	1727
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------

**Session 5: Remote sensing and others**

<i>Serge ANDRÉFOUËT*, Frank E MULLER-KARGER, Julie A ROBINSON, Christine J KRANENBURG, Damaris TORRES-PULLIZA, Steven A SPRAGGINS, Brock MURCH</i> [Keynote] Global assessment of modern coral reef extent and diversity for regional science and management applications: A view from space	1732
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------

**5-1. Remote Sensing of Coral Reefs**

<i>Mari YOSHIDA*, Hiroshi HANAIZUMI, Hiroya YAMANO</i> A method for extracting flow lines in coral reef field using aerial photographs	1746
<i>Samuel J PURKIS*, Bernhard M RIEGL, Richard E DODGE</i> Fractal patterns of coral communities: Evidence from remote sensing (Arabian Gulf, Dubai, U.A.E.)	1753
<i>Qamar SCHUYLER, Phillip DUSTAN*, Eric DOBSON</i> Remote sensing of coral reef community change on a remote coral atoll: Karang Kapota, Indonesia	1763

*Chris M ROELFSEMA\**, *Stuart R PHINN*, *Karen E JOYCE* 1771  
 Evaluating benthic survey techniques for validating maps of coral reefs derived from remotely sensed images

**5-2. Producing, Distributing, and Analyzing Global Coral Reef Maps - the State of the Art**

5-2 Session Summary 1781

*Gang LIU*, *Alan E STRONG*, *William SKIRVING*, *L Felipe ARZAYUS* 1783  
 Overview of NOAA Coral Reef Watch Program's Near-Real-Time Satellite Global Coral Bleaching Monitoring Activities

*Julie A ROBINSON\**, *Serge ANDRÉFOUËT*, *Jennifer GEBELEIN*, *Alan SPRAGGINS*, *Marco NOORDELOOS*, *Edmund P GREEN*, *Lauretta BURKE*, *Gene FELDMAN*, *Norman KURING*, *Richard P STUMPF*, *Kristine HOLDERIED*, *Frank MULLER-KARGER* 1794  
 Partnerships for global coral reef mapping and data distribution

**5-3. Underwater Monitoring of Coral Reef Ecosystems**

5-3 Session Summary 1800

*Yutaka TATEDA\**, *Kenichi IWAO*, *Hiroki TANIGUCHI*, *Nao MUKAE*, *Machiko WAKABAYASHI* 1801  
 Preliminary estimation of community production and respiration in coral reef of Aka island by underwater *in-situ* respirationmeter

*Emmanuel TESSIER\**, *Pascale CHABANET* 1807  
 Using video techniques for estimating fish post-larvae abundance after mass settlement on artificial reefs

**5-4. Deep-Water Corals**

*Juan Armando SÁNCHEZ\**, *Ashley A ROWDEN* 1812  
 Octocoral diversity on New Zealand seamounts

*Masanori NONAKA*, *Katherine MUZIK*, *Senzo UCHIDA* 1821  
 Capture, study and display of precious corals

*Pål B MORTENSEN\**, *Lene BUHL-MORTENSEN*, *Don C GORDON Jr* 1832  
 Distribution of deep-water corals in Atlantic Canada

*Pål Buhl MORTENSEN\**, *Jan Helge FOSSÅ* 1849  
 Species diversity and spatial distribution of invertebrates on deep-water *Lophelia* reefs in Norway

**5-5. The State of Cold-Water Coral Science**

5-5 Session Summary 1869

**5-6. Miscellany**

- Anchana PRATHEP\**, *Kanjanapaj LEWMANOMONT*, *Atchara CHOTITHAMMO*, *Piyalarp TANTIPRAPAJ* 1870  
 Population dynamics of *Caulerpa racemosa*, a siphonous green alga, in shallow subtidal reefs, Koh Kham, Songkhla Province, Thailand
- Dorothee TADDEI\**, *Patrick FROUIN* 1877  
 Short-term temporal variability of macrofauna reef communities (Reunion Island, Indian Ocean)
- Shigekazu MEZAKI\**, *Ken TOGUCHI* 1883  
 Historical maps and terms of coral reefs in the Shouho (Mid-seventeenth Century) National Atlas in Japan
- Norman John QUINN* 1888  
 Working to stem the tide of cultural erosion through the documentation of local aquatic knowledge and fishing practices by Melanesian youth
- A TAMURA*, *M KATSUMATA*, *K NAKAMICHI*, *A OHNISHI*, *T MAENOSONO*, *K IRIYAMA*, *M TSUCHIYA* 1894  
 Biological evaluation of planktons in drainage water treated with flocculants
- Ryan C J WALKER\**, *Daniel J PONCE-TAYLOR*, *Angus MCVEAN*, *Hanalore WASKA*, *Jacqui F TAYLOR*, *James COMLEY*, *Peter S RAINES* 1903  
 An environmental management plan for snorkel based tourism as a form of alternative livelihood - Sian Ka'an UNESCO Biosphere Reserve, Mexico
- Ryan C J WALKER\**, *Inge S SMITH*, *Peter S RAINES* 1911  
 The value of volunteers: A review of the role of British based volunteer NGOs in the establishment of Coral Reef Marine Protected Areas
- Alberto ACOSTA\**, *Silvia MARTINEZ* 1926  
 Continental and oceanic coral reefs in the Colombian Caribbean after a decade of degradation
- Eduard TITLYANOV\**, *Sergeyi KIYASHKO*, *Tamara TITLYANOVA*, *Irina YAKOVLEVA*, *Eitaro WADA* 1931  
 Coral-algal competition as determined from the rates of overgrowth, physiological condition of polyps of the scleractinian coral *Porites lutea*, and structure of algal associations within boundary areas
- Elizabeth WOOD\**, *Frances DIPPER*, *Ajirin ANGKAJI* 1943  
 Patterns of change in reef communities revealed by the monitoring programme for the Semporna Island reefs, Sabah, Malaysia

**Plenary Session**

- Kazuo NADAOKA* 1950  
 Plenary Session