

# Abstracts and new publications...

## Meetings 2014 and communications on sea cucumbers

### 1) 47<sup>th</sup> North American Echinoderm Conference, University of West Florida, Pensacola, Florida, 1–6 June 2014

- Paulay Gustav, Scott Smiley, David L. Pawson, Mandy Bemis — Echino-WoRMS and beyond: Tracking sea cucumber nomenclature from 1765 to the future.
- Mike Reich — On the relationships of early holothurians and ophiocistoids: A question of wheels?
- Tanja R. Stegemann, P. Mark O'Loughlin, Mike Reich — Hard part morphology of some living *Taeniogyrus* species (Holothuroidea: Apodida: Chiridotidae).
- John Starmer, Gustav Paulay — Evolutionary relationships within *Stichopus* (Holothuroidea: Stichopodidae): A combined approach using genetics and morphology.
- Julio Adrián Arriaga-Ochoa, Francisco A. Solís-Marín, Mariano Martínez — *Psolus squamatus* (Müller, 1776): A species complex (Echinodermata: Holothuroidea).
- François Michonneau, Gustav Paulay — Cryptic and not-so-cryptic species in sea cucumbers.
- Liliane Veras Leite, José de Sousa Junior, Renata Vieira do Nascimento, Maria Eduarda Magalhães de Souza, Júlia Trugilio Lopes, Carminda Sandra Brito Salmito-Vanderley, Annie Mercier, Jean-François Hamel — Reproductive seasonality of *Holothuria grisea* in northeastern Brazil.
- Vladimir S. Mashanov, Olga R. Zueva, José E. García-Arrarás — Differential gene expression during neural regeneration in a sea cucumber.
- Vladimir S. Mashanov, Olga R. Zueva, José E. García-Arrarás — Myc regulates programmed cell death and radial glia dedifferentiation after neural injury in sea cucumbers.
- Allison K. Miller, Alexander M. Kerr, Greg W. Rouse — Higher level systematics of the walking, swimming, and burrowing Holothuroidea (Echinodermata): A six-gene molecular phylogenetic approach.
- Sun W. Kim, Allison K. Miller, Alexander M. Kerr — Holothuroid fauna of Chuuk (Federated States of Micronesia).
- Luciana Martins, Camilla Souto, Marcos Tavares — Revision of the western Atlantic “*Ocnus*” species (Dendrochirotida: Cucumariidae).
- Camilla Souto, Luciana Martins — Morphology of the *Dendrochirotida* calcareous ring: *Phyllophorus occidentalis* Ludwig (Phyllophoridae) as a Sclerodactylid.
- Jing Wen, Chaoqun Hua, Sigang Fana — Chemical composition and nutritional quality of sea cucumbers (wileyonlinelibrary.com) doi:10.1002/jsfa.4108.

### 2) 2<sup>nd</sup> World Small-Scale Fisheries Congress, Mérida, México, 21–26 September 2014

Congress run by Too Big to Ignore Network: <http://toobigtoignore.net>; <https://2wsfc.files.wordpress.com/2013/10/congress-schedule-final.pdf>

Communicated by Marc Léopold, IRD, U227 COREUS2, BP A5, 98848 Nouméa cedex, New Caledonia; Fisheries Department of Vanuatu, Private Bag 9045, Port-Vila, Vanuatu, marc.leopold@irf.fr; and Jim Prescott, Australian Fisheries Management Authority, PO Box 131 Darwin, NT 0801 Australia Jim.Prescott@afma.gov.au.

#### Oral presentations in which sea cucumbers featured

- Léopold Marc, Ham Jayven, Kaku Rocky, Moenteapo Zacharie — Putting spatial management into practice: A case study of sea cucumber fisheries in New Caledonia and Vanuatu (Southwest Pacific).
- Bennett Abigail, Basurto Xavier — Cooperatives, fish buyers, and pepineros: Geographically differentiated effects of neoliberal policy reform on local responses to contemporary market pressures in Mexican small-scale fisheries.
- Rodríguez Luis Alfonso, Reyes Sosa Carlos Francisco, Dzib Sara Nahuat — Diagnose, distribution and a SWOT analysis of the economic benefits generated by sea cucumber fisheries in a fishing cooperative in the Yucatán, Mexico.

- Guarneros Pável Galeana, Gurri Francisco — Depletion of sea cucumbers in Isla Arena may have enhanced local governance to promote resilience in the social-ecological system.
- James Riwu, James Prescott, Natasha Stacey, Andhika Prasetyo, Dian Oktaviani, Anthony Pangbean — An unlikely partnership: Data collection in a small scale fishery in the Timor Sea.

#### Sea cucumber discussions

As part of the congress a field trip was taken to the nearby fishing port of Progreso, on the Yucatán Peninsula, Mexico, where one group of 27 participants (including local fishermen) held a "sea cucumber discussion circle". Discussion was moderated by Dr Alvaro Hernandez (Mexico) and M.Sc. Juan Carlos Murillo (Ecuador). The moderators explained the organisation of the circle and presented the common problems of sea cucumber fisheries, followed by a discussion period. This was reported:

#### Galapagos

Juan Carlos Murillo spoke on the status of the sea cucumbers, *Isostichopus fuscus*, in the Galapagos, Ecuador. He noted that exploratory fishing operations started in 1995 and legal fishing began in 1999. High catches were observed (about 5 M sea cucumbers per year). However, in 2003 catches began to decline. Since 1998 there has been a scheme of co-management, but it was not fully effective. The first management plan was established in 2008 and included the first fishery reference point (established on historical data), which required a minimum density of 11 sea cucumbers per 100 m<sup>2</sup> for the fishery to be opened. Since 2009 the fishery has been opened only one year because the reference point was not met during the other years. The low densities can be explained by the density-dependent reproductive success for these species. Recent densities were seven and eight sea cucumbers per 100 m<sup>2</sup> in 2012 and 2013, respectively. It is believed that illegal fishing is not significant and the management goal is to recover the population to a level of 15 cucumbers per 100 m<sup>2</sup> by 2017. The fishery has not experienced an economic collapse due to the high prices received now (prices increased from USD 0.80 to USD 4.00 per kg (wet weight) between 1999 and 2011). Recommended fisheries policies include alternative livelihoods for the fishers during periods of closures, which could include remunerated monitoring, research and conservation activities. Also recommended are: a public auction to improve the prices of sea cucumber; stock restoration; and longer closures.

#### Yucatán

Alvaro Hernandez spoke on sea cucumber fishing in the Yucatán Peninsula where there is a small-scale fishery. As with other such fisheries, the high demand in Asia drives prices high and stocks are very vulnerable to overfishing. In 1990 Zetina et al. performed the first study of sea cucumber in Yucatán, and in 2005 a high demand for Yucatán sea cucumber was documented by Cervera-Cervera (2007).

In May 2006 five fishing licenses were issued. In 2008 low abundance was reported due to a red tide event. In 2010, a prospective analysis began in Yucatán and nearby Campeche followed by catch quotas; however, it is estimated that the catch is five times greater than the quota. Estimated earnings from one fishing trip for traditional species (fish, octopus, etc.) is 1,500 pesos, but a sea cucumber fishing trip produces 11,500 pesos, which makes this fishery very attractive. There is a serious social problem because many fishermen are requesting fishing licenses for sea cucumber; there have even been protest marches.

The species caught in Yucatán is *Isostichopus badionotus* while the species in Campeche is *Holothuria floridana*. The status of *Isostichopus badionotus* stocks on the coast of Yucatán in 2013 is shown in Table 1.

**Table 1.** Yucatán fishing zones and biomass (t) estimates for *Isostichopus badionotus* and associated density estimates in 2013.

Zone	Biomass (t)	Density (ind. m <sup>-2</sup> )
I	3,261	0.027
II	714	0.026
III	5,667	0.152
IV	3,697	0.110
V	437	

In recent years in the Campeche port of Isla Arena fishing has been closed due to a conflict between large licensed vessels and other local fishermen who cannot compete during the open season. A total of 200 fishing licenses were issued to catch sea cucumber (for 200 boats and 600 fishermen). However, it is estimated that there are about 1,000 boats and 3,000 fishermen actively involved in catching sea cucumbers. The fishery's problems were even reported in the New York Times, revealing the violence, decompression accidents and the social problems.

**3) CUMFISH WORKSHOP, Faro, Portugal, 14–15 May 2014**

*CUMFISH — Sea cucumbers: The new resource for a hungry fishery*

Communicated by Mercedes Wangüemert, CCMAR, University of Algarve, Faro, Portugal

The over-exploitation of sea cucumber fisheries has resulted in fishing for new target species from Mediterranean Sea and the North Atlantic Ocean, where fisheries are in the process of development. The main problem of these new fisheries is the existence of several sea cucumber species living in the same region with similar external morphology, very difficult identification and about which there is scarce information on life stages, population dynamics and evolution history.

Therefore, the main goals of the CUMFISH project are to study the incipient sea cucumber fisheries of the Mediterranean Sea and Atlantic Ocean and to assess the genetic structure of these species, including the selection effects of fisheries. To reach these aims we have carried out studies on ecology, reproduction, genetics, behaviour, growth and fisheries of six target species from the Mediterranean Sea and North Atlantic Ocean.

*Presentations*

- Mercedes González-Wangüemert — CUMFISH Project. Sea cucumbers: the new resource for a hungry fishery.
- Chantal Conand — International, regional and local efforts during the last decade to promote the conservation of commercial sea cucumbers.
- Sara Valente — West versus East Mediterranean Sea: origin and genetic differentiation of the sea cucumber *Holothuria polii*.
- Filipe Henriques — Genetic connectivity patterns in *Holothuria mammata* considering different spatial scales.
- Camilla Maggi — Population and genetic structure of *Parastichopus regalis* (Cuvier, 1817) from the Mediterranean Sea and its commensal *Carapus acus* (Brünnich, 1768).
- Mercedes González-Wangüemert — Sea cucumber in the Aegean Sea (Turkey): Assessment of fishery protection on growth and genetic structure.
- Luisa Custodio — Nutritional profile and antioxidant activity of sea cucumbers from the Mediterranean Sea and north-eastern Atlantic.
- Silke Bossers — The sea cucumber microbiome project.
- Nuno Vasco — CUMFISH in Peniche, West of Portugal.
- Tiago Braga — CUMFISH, get involved as a volunteer!
- Nathalie Marquet — The reproductive cycle of the sea cucumber *Holothuria arguinensis* in the Algarve (Southern Portugal): Preliminary results.
- Julian Olaya — Ecology of *Holothuria arguinensis*: Estimation of population parameters and relation with substrate types.
- Chiara Magliozzi — The analysis of the ecological niche of *Holothuria arguinensis* for conservation purposes.
- Jorge Domínguez — Sea cucumbers: New perspectives for Integrated multi-trophic aquaculture (SECUMTA).
- Matthew Slater — Integrated aquaculture research with sea cucumbers in Europe, Africa and Oceania.
- Colin Hannon — Developing sea cucumber aquaculture: Spawning and larval rearing of *Holothuria forskali*.

*Visit to the field laboratory at Ramahete*





Workshop participants.



Visit to the Ramahete laboratory: Participants looking at *Holothuria arguinensis*.

**4) Meeting summary, co-hosted by the governments of Fiji, Tonga and Republic of the Marshall Islands: Pacific beche-de-mer and the future of coastal fisheries, Nadi, Fiji, 6–8 August 2014**

Communicated by A. Lovatelli, [Alessandro.Lovatelli@fao.org](mailto:Alessandro.Lovatelli@fao.org); S.W. Purcell, [steven.purcell@scu.edu.au](mailto:steven.purcell@scu.edu.au); C. Conand, [conand@univ-reunion.fr](mailto:conand@univ-reunion.fr); and H. Govan, [hgovan@gmail.com](mailto:hgovan@gmail.com).

The Pacific Islands region is reaching a critical point in the management of its coastal fisheries, especially sea cucumbers. Coastal fisheries are the lifeblood of coastal communities, underpinning subsistence and livelihoods across the region. Sea cucumbers have been fished in the Pacific Islands as a subsistence food and export commodity for more than 150 years (Conand 1990; Kinch et al. 2008). For many Pacific Island nations and countless communities, sea cucumbers are the most valuable invertebrate fishery. To coin the words of an ex-director of the SPC Fisheries Division, if sea cucumber fisheries cannot be managed properly, there is

little hope for other coastal fisheries. Sadly, management of most sea cucumber fisheries of Pacific Islands has been failing miserably.

The past decade has seen overfishing force the hand of fishery managers to close the largest sea cucumber fisheries in the Pacific Islands: Papua New Guinea and Solomon Islands. Sea cucumber fisheries in Vanuatu and Tonga have also been closed for many years due to depletion of stocks (Pakoa and Bertram 2013). Of the few countries that have not yet had moratoria on fishing, Fiji and Kiribati, have seen stocks dwindle to worrying levels. Smaller sea cucumber fisheries in the Pacific are experiencing intense pressure to exploit resources and face increasing incidence of illegal fishing (Pakoa and Bertram 2013).

In addition, ten sea cucumber species from Pacific waters were recently listed on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species as vulnerable or endangered (Conand et al. 2014). This recent listing shows that biodiversity loss is an additional threat to declining catches and weakened fishery productivity. The reality is that the management measures and approaches used in Pacific Island sea cucumber fisheries have been insufficient, and often inappropriate.

In response to the urgent need for improved approaches to managing sea cucumber fisheries, a meeting of ministers was held in Fiji in 2014, organised by IUCN. The meeting aims were as follows:

- to obtain a common understanding of status and socio-economic benefits of sea cucumber fisheries and other coastal fisheries to Pacific Island countries, and the urgent need to take action;
- to discuss constraints and opportunities to collectively and effectively address threats and challenges to sea cucumber fisheries and coastal fisheries management; and
- to obtain political will and ministerial-level commitments to an effective national and regional approach to sea cucumber fisheries and coastal fisheries management that can better support actions at the national and local levels.

The following key statements were given:

- Economically, sea cucumber fisheries are the second-most important of fisheries in the region in economic terms, after tuna, and provide around USD 50 million per year to coastal communities trading the dried products (beche-de-mer) to Asian markets.
- Harvesting of sea cucumbers is still widely unregulated and unsafe, with people diving at depth without appropriate diving equipment or certification. This jeopardises the health of individuals, in extreme cases causing death.
- Shifting to sustainable management of these resources has been the main topic of discussion at the *Pacific Beche-de-mer and the Future of Coastal Fisheries* meeting in Nadi, Fiji. It aimed at building collective will in the region in managing these resources appropriately, so that they remain available for future generations.
- Regional fisheries meetings in the Pacific have predominantly focussed on tuna but local coastal communities depend on inshore fisheries, which are increasingly under threat.
- Shortcomings needing to be addressed are the inadequate allocation of resources for management at all levels, lack of political will to approve new management measures and weak community-based management.

A few potential solutions and ideas were generated during the discussions, drawing on presentations and also inputs from researchers and recent projects (Carleton et al. 2013; Purcell et al. 2014):

- Implementation of a regional certification or branding scheme for products that have been grown or fished sustainably. Pressure would then be placed on the consumption end of the market to encourage the purchase of certified beche-de-mer.
- Creation of a region-wide database of beche-de-mer export companies, and blacklisting companies that encourage unsustainable practices. Conversely, companies could also be white-listed if they support sustainable management of the resources.
- Sharing of regional information on pricing, to ensure that countries and communities are receiving their rightful economic return for their resources.
- Regional training courses on specific marketing aspects to ensure that countries have the expertise to manage the value chain, including the acquisition of proper processing techniques.
- Coordination of fishing seasons and moratoria across the region, so that any trade outside of the fishing season would be illegal, without the need to identify its origin.

During the meeting, the Australian Government announced it would be providing important funding to the Secretariat of the Pacific Community (SPC) to provide Pacific Island countries with science-based technical support and information for the sustainable management and conservation of their coastal fisheries.

At the conclusion of the meeting, the ministers representing Cook Islands, Fiji, Marshall Islands, Papua New Guinea, Samoa, Tonga and Vanuatu signed an agreement calling for action on threats to beche-de-mer and other coastal fisheries in the region. The key elements of the agreement included:

- i. taking political leadership and urgent action to implement more robust coastal fisheries management regimes at a national and sub-national level by ensuring that effective, practical and enforceable policies are in place and are implemented, targeting essential capacity at national and sub-national levels, reviewing budgetary commitments and strengthening coordination of implementing partners;
- ii. harmonising the regional framework for coastal fisheries, including the role of current regional and international institutions, agencies and NGOs to promote collaboration and integration in order to ensure that countries receive strong, coordinated and effective support on coastal fisheries management;
- iii. improving structures and processes for sharing data and information on buyers, markets and best practices at a regional level, with SPC and interested partners; targeting research on opportunities and market mechanisms that will improve the value of beche-de-mer to Pacific Island nations and other areas to improve knowledge and management of sea cucumbers; and
- iv. having a follow-up coastal fisheries ministerial meeting in 2015.

We recall that the Food and Agriculture Organization of the United Nations (FAO) in coordination with SPC, ACIAR and Southern Cross University organised a training workshop on sea cucumber fisheries management for many Pacific Island nations in 2011 (FAO 2012; Purcell et al. 2014). We hope that those efforts will help the countries implement their agreement, also taking into account the guidance provided in the publication synthesising the workshop results (Purcell et al. 2014).

## References

- Carleton C., Hambrey J., Govan H. and Medley P. 2013. Effective management of sea cucumber fisheries and the beche-de-mer trade in Melanesia: Bringing the industry under rational control. A report prepared by Nautilus Consultants on Behalf of the Secretariat of the Pacific Community (SPC).
- Conand C. 1990. The fishery resources of Pacific island countries. Part 2. Holothurians. FAO Fisheries Technical Paper No. 272.2. Rome, Italy: Food and Agriculture Organization of the United Nations. 143 p.
- Conand C., Polidoro B.A., Mercier A., Gamboa R.U., Hamel J.-F. and Purcell S.W. 2014. The IUCN Red List assessment of aspidochirotid sea cucumbers and its implications. SPC Beche-de-mer Information Bulletin 34:3–7.
- FAO. 2012. Report on the FAO Workshop on Sea Cucumber Fisheries: An Ecosystem Approach to Management in the Pacific (SCEAM Pacific). Nadi, Fiji, 15–18 November 2011. FAO Fisheries and Aquaculture Report. No. 1003. Rome, Italy: Food and Agriculture Organization of the United Nations. 43 p.
- Kinch J., Purcell S., Uthicke S. and Friedman K. 2008. Population status, fisheries and trade of sea cucumbers in the Western Pacific. p. 7–55. In: Toral-Granda V., Lovatelli A. and Vasconcellos M. (eds). Sea cucumbers: A global review on fisheries and trade. FAO Fisheries Technical Paper No. 516. Rome, Italy: Food and Agriculture Organization of the United Nations. 317 p.
- Pakoa K. and Bertram I. 2013. Management state of Pacific sea cucumber fisheries. SPC Beche-de-mer Information Bulletin 33:49–52.
- Purcell S.W., Lovatelli A. and Pakoa K. 2014. Constraints and solutions to managing Pacific sea cucumber fisheries with an ecosystem approach. Marine Policy 45:240–250.

## **5) Latin American and Caribbean countries meet to discuss how to improve the management and sustainability of the exploitation of sea cucumber, Havana, Cuba, 30 April 2014**

Communicated by A. Lovatelli.

Over 50 experts from 14 countries met in Havana, Cuba, to share experiences and move forward on the sustainable management of sea cucumber exploitation. The situation of sea cucumber fisheries in the region



was presented, paying special attention to the fact that the sea cucumber trade is the driver of over-exploitation and is usually carried out illegally. The geographical development of the sea cucumber trade and its expansion from an area closer to the main consuming markets (namely China) to other producing regions was addressed. The Caribbean was noted as the last region remaining to develop trade. However, in the last two years, this region has also been reached by international traders, resulting in sea cucumber over-exploitation. Given the sedentary nature and life-history characteristics of the species make sea cucumber vulnerable to overexploitation. The importance of developing management plans that are appropriate to the capacity of the responsible agency and the role of enforcement were underscored as the key drivers of sustainability.

The recent developments of sea cucumber aquaculture were presented. In particular, the challenges faced by aquaculture facilities, the possibilities for multi-species aquaculture and the need to set realistic goals before venturing into sea cucumber aquaculture in the Caribbean were addressed.

Finally, the workshop adopted the “Resolution on sea cucumber fisheries management and aquaculture”, which will be submitted to WECAFC for its consideration. This resolution recommends the following:

- i. biological research on the life cycle characteristics and the reproductive biology of the commercially interesting species, including size at sexual maturity, longevity, recruitment and growth rate;
- ii. development of aquaculture technologies of native species applying a precautionary approach;
- iii. study of the socio-economic aspects of the fishing communities and the stakeholders in the value chain;
- iv. monitoring the sea cucumber fisheries and combating illegal fishing and trade;
- v. research on the development of new products, including pharmaceutical uses, and the utilisation of by-products;
- vi. marketing research and monitoring of international sea cucumber trade dynamics;
- vii. strengthening the monitoring and controls by international, regional, national and local authorities;
- viii. preparation and implementation of management plans applying the ecosystem approach on fisheries; and
- ix. data collection on captures, prices, processing and foreign trade;
- x. capacity building on all the above mentioned topics;
- xi. joint coordination of the efforts in the framework of WECAFC; and
- xii. identification of funding from governments, regional and international organisations, for the implementation of effective actions on the points of this resolution.



Group photo of participants of the workshop.

#### **6) Portugal CUMFISH: Mares Conference on Marine Ecosystems Health and Conservation, Olhão, Portugal, 17–21 November 2014**

##### *Posters on sea cucumbers*

- Domínguez-Godino J.A., Slater M., Serrão E.A., González-Wangüemert M. — Seagrass as new potential food resource for sea cucumber aquaculture.
- González-Wangüemert M., Aydin M., Maggi C., Valente, S., Conand C. — Sea cucumbers in the Mediterranean Sea: Effects of their fishery on growth and genetic structure.

- Valente S., Borrero-Pérez G., Serrão E.A., González-Wangüemert M. — Genetic patterns and growth parameters of two new target sea cucumber species of the Mediterranean Sea fishery.
- González-Wangüemert M., Cánovas F., Valente S., Henriques F., Rodrigues F., Maggi C., Erzini K., Gonçalves J., Serrão E., Conand C. — CUMFISH project. Sea CUCumbers: the new resource for a hungry FISHERy.

**7) Lionfish and sea cucumber workshop, Havana, Cuba, 29–30 April 2014**

<http://www.infopesca.org/content/taller-sobre-pep-le%C3%B3n-y-pepino-de-mar-0#Publicaciones%20y%20materiales>

**8) Second International Training Courses on marine molecular taxonomy, Mostaganem, Algeria, 18–25 October 2014**

Prepared by Abdelouahab Chouikhi, Inter-Islamic Science and Technology Network on Oceanography, Izmir, Turkey; and Karim Mezali, University of Abdelhamid Ibn Badis, Mostaganem, Algeria

The courses included many practical and theoretical examples about sea cucumbers developed by invited speakers: Ahmed S. Tandar, Alexander Kerr and Igor Eeckhaut.

## Meetings 2015

**1) BEM Society — 44<sup>th</sup> Annual Benthic Ecology Meeting, Quebec City, Canada, 4–8 March 2015**

Registration: 15 January 2015, <http://www.bemsociety.org/>

**2) Aquaculture 2015 — Cutting Edge Science in Aquaculture, Montpellier, France, 23–26 August 2015**

[www.aquaculture-conference.com](http://www.aquaculture-conference.com)

**3) ICCB and ECCB, Montpellier, France, 2–6 August 2015**

Registration: 1 December 2014, <http://iccb-eccb2015.org/content/about-meeting>

**4) Progress in Echinoderm Palaeobiology, 2015 (PEP'15) in honour of Dr Andrew B. Smith, Zaragoza, Spain, 14–21 June 2015**

**5) Ninth WIOMSA Scientific Symposium, Durban, South Africa, 26–29 October 2015**

WIOMSA secretariat ([secretary@wiomsa.org](mailto:secretary@wiomsa.org)) for more details

**6) IEC Mexico 2015, Playa del Carmen, Mexico, May 25–29 May 2015**

Contact: Francisco A. Solís-Marín, [iec15th@gmail.com](mailto:iec15th@gmail.com)

**7) China Fisheries and Seafood Expo, Qingdao, China, 4–6 November 2015**

<http://www.chinaseafoodexpo.com/>

## Movies on sea cucumbers

**1) L'or noir du Pacifique**

*Film makers:* Dominique Roberjot / Christine Della-Maggiore (Communicated by C. Conand)

Beche-de-mer or holothurians are not generally well known. It is, nevertheless, the second largest fishery export product of South Pacific after tuna. They have been fished since the 19<sup>th</sup> century for Asian markets. Recently, with the economic growth of China, the demand has been so high that several countries in the Pacific have over-exploited their resources. In New Caledonia several initiatives are under way to protect the beche-de-mer, ensure sustainable exploitation for the fishermen and protect the health of the lagoons. This film *The black gold of the Pacific* will help to discover issues around this strange animal, from New Caledonia to Vanuatu, through Hong-Kong and Fiji.

52 min.; Format HD 1920 x 1080; Sound AIFF; Documentary; All public; Beche-de-mer; Original language French, English, Chinese, Bislama, Fijian; Subtitles French; Production year 2014, New Caledonia (France); Producing society: Latitude 21 Pacific, 1768 rue du pic Kou, la Coulée, 98809 Mont-Dore, Nouvelle-Calédonie, Phone: +687 446827 or +687 504938; Distributed by Latitude 21 Pacific; First TV diffusion on NC 1ère in March 2014; Non-commercial diffusion by IRD Calédonie, Service des pêches de la province Nord de Nouvelle-Calédonie; Selected at Festival Les ÉCRANS DE LA MER 2014. The film was presented on October 11th at Marseille, Palais Longchamp (France) for “La fête de la Science” and commented on by C. Conand, on behalf of IRD.



## 2) *Massive antibiotics use found in sea cucumber farming*

CRJ English.com (Communicated by S. Purcell)

A media article about antibiotics use in aquaculture of sea cucumbers in China.

<http://english.cri.cn/12394/2014/09/10/3781s843618.htm>

## 3) *Hunt for sea cucumber leads to black market*

CCTV America on Youtube

New video about the sea cucumber fishery on the Yucatán, Mexico. Nicely filmed and tells a good story from the perspective of the fishers. <https://www.youtube.com/watch?v=XUWtMZpBov4>

## Books

### 1. The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture

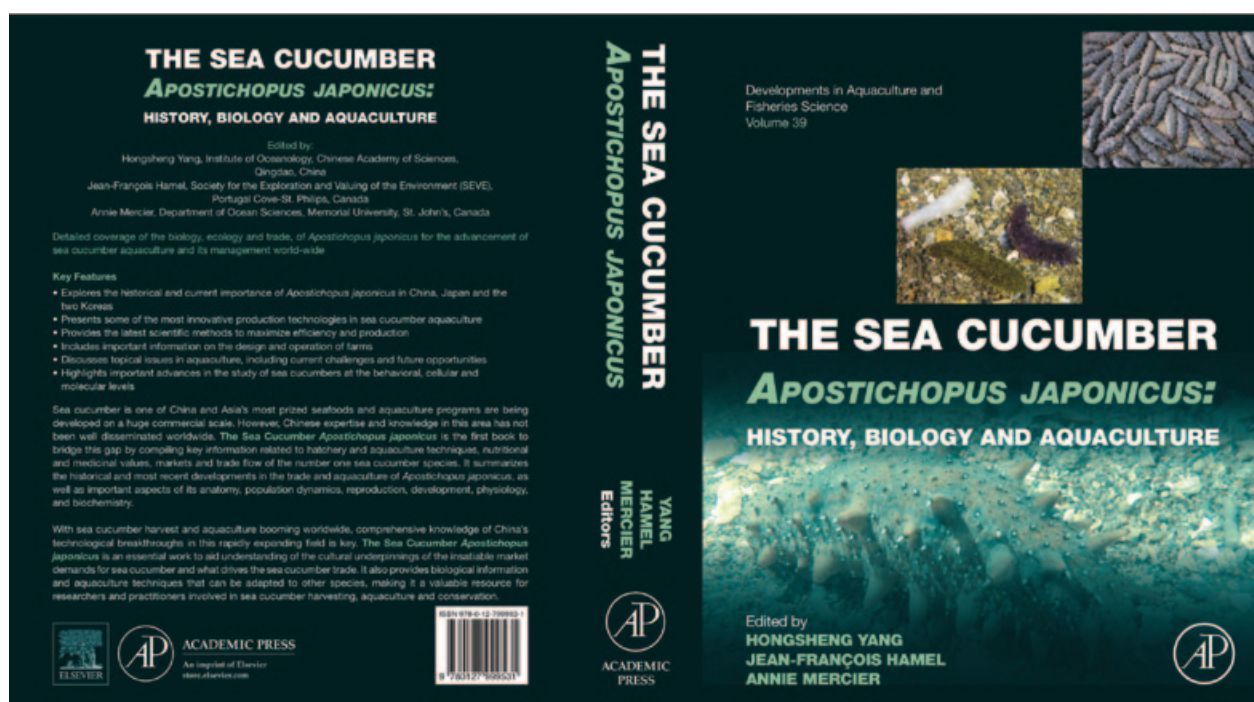
Yang H., Hamel J.-F. and Mercier A.

2015 – Academic Press. 454 p.

Included chapters:

1. Yang H. and Bai Y. 2015. Chapter 1. *Apostichopus japonicus* in the life of Chinese people. p. 1–23. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
2. Liu G., Sun J. and Liu S. 2015. Chapter 2. From fisheries toward aquaculture. p. 25–36. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
3. Zhao H. 2015. Chapter 3. Taxonomy and identification. p. 37–52. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
4. Gao F. and Yang H. 2015. Chapter 4. Anatomy. p. 53–76. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
5. Liu J. 2015. Chapter 5. Spatial distribution, population structures, management, and conservation. p. 77–86. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
6. Wang Q., Zhang T., Hamel J.-F. and Mercier A. 2015. Chapter 6. Reproductive biology. p. 87–100. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
7. Liu S., Sun J., Ru X., Hamel J.-F. and Mercier A. 2015. Chapter 7. Broodstock conditioning and spawning. p. 101–110. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
8. Qiu T., Zhang T., Hamel J.-F. and Mercier A. 2015. Chapter 8. Development, settlement, and post-settlement growth. p. 111–132. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
9. Zhang L., Pan Y. and Song H. 2015. Chapter 9. Environmental drivers of behaviour. p. 133–152. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
10. Xu Q., Hamel J.-F. and Mercier A. 2015. Chapter 10. Feeding, digestion, nutritional physiology, and bioenergetic. p. 153–176. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
11. Wang T., Sun L. and Chen M. 2015. Chapter 11. Aestivation and regeneration. p. 177–210. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
12. Zhao H., Chen M. and Yang H. 2015. Chapter 12. Albinism. p. 211–228. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
13. Gao F. and Yang H. 2015. Chapter 13. Tissue biochemistry. p. 229–241. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.

14. Yu Z., Yang H., Hamel J.-F. and Mercier A. 2015. Chapter 14. Larval, juvenile, and adult predators. p. 243–256. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
15. Chen M., Wang F., Xing K., Zhu A. and Zhang S. 2015. Chapter 15. Immunology and diseases. p. 257–287. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
16. Zhang L., Song X., Hamel J.-F. and Mercier A. 2015. Chapter 16. Aquaculture, stock enhancement, and restocking. p. 289–322. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
17. Yuan X., Zhou Y. and Mao Y. 2015. Chapter 17. *Apostichopus japonicus*: A key species in integrated polyculture systems. p. 323–332. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
18. Lin C. and Zhang L. 2015. Chapter 18. Habitat enhancement and rehabilitation. p. 333–352. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
19. Xia S. and Wang X. 2015. Chapter 19. Nutritional and medicinal value. p. 353–366. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
20. Mao Y., Huang Y. and Liu Q. 2015. Chapter 20. Processing and cuisine. p. 367–382. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
21. Xu D., Su L. and Zhao P. 2015. Chapter 21. *Apostichopus japonicus* in the worldwide production and trade of sea cucumbers. p. 383–398. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
22. Akamine J. 2015. Chapter 22. *Apostichopus japonicus*: Fisheries, trade and foodways in Japan. p. 399–422. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
23. Park S., Hong S., Yoon I. and Lovatelli, A. 2015. Chapter 23. *Apostichopus japonicus*: “Dolgi Haesam” in the Republic of Korea (South Korea). p. 423–432. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.
24. Yong Ho J., Lovatelli A. and Hamel J.-F. 2015. Chapter 24. *Apostichopus japonicus* in the Democratic People’s Republic of Korea. p. 433–438. In: Yang H., Hamel J.-F. and Mercier A. (eds.). The sea cucumber *Apostichopus japonicus*: History, biology and aquaculture. Academic Press. 454 p.



## 2. ACIAR project produces book, training video and village-based workshops on sea cucumber processing

Sea cucumbers are one of the most important fishery resources for Pacific Island fishers. Critical issues facing sea cucumber fisheries are the poor quality of postharvest processing by fishers, and inadequate or ineffective management frameworks, enforcement and governance. Recent initiatives are focussing on reforming fisheries management but need to progress in tandem with improved postharvest processing if fishers are expected to harvest less yet still earn sufficient income for their families.

A four-year project funded by the Australian Centre for International Agricultural Research (ACIAR) began in 2013 with the overall goal: *to improve the income of village fishers in Kiribati, Tonga and Fiji through support to improve the quality of postharvest processing of sea cucumbers*. The researchable questions concern evidence of economic and sociological impacts to small-scale fishers.

The primary outputs comprise the following:

- i. a village-level manual and training DVD on processing methods, translated into local languages;
- ii. training workshops for fisheries officers and village fishers in postharvest processing; and
- iii. a quantitative analysis of economic and livelihood impacts.

The manual on processing sea cucumbers was produced in English, Fijian, Tongan and Kiribati. These versions can be downloaded at: <http://aciargov.au/publication/cop026>. Hard copies are available on request.

Purcell S.W. 2014. Processing sea cucumbers into beche-de-mer: A manual for Pacific Island fishers. Southern Cross University, Lismore, and the Secretariat of the Pacific Community, Noumea. 44 p.



The training video has been produced in English, and the three island language versions are being finalised. A limited number of DVD copies will be distributed. The video versions will be available from the ACIAR website and can also be accessed from YouTube: <https://www.youtube.com/watch?v=P4KdY68ktsk>.

The village-based training workshops are currently being rolled out by the project collaborators in Fiji, Tonga and Kiribati. These comprise a one-day hands-on workshop with fishers to demonstrate all methods of processing various species of sea cucumber, and a short follow-up session a couple of days later.

The research will provide proof-of-concept of impacts for future investments in similar interventions in other countries. The impact testing will also show whether such support to fishers results in them spending more time on value-adding of wild captures and less time fishing — thus, indirect impacts on resource sustainability.

The project is led by Southern Cross University, and carried out in collaboration with Partners in Community Development Fiji, the Ministry of Agriculture and Food, Forests and Fisheries Tonga, the Ministry of Fisheries and Marine Resources Development Kiribati, James Cook University and the Secretariat of the Pacific Community.



Village-based training workshops on postharvest processing in Fiji (left), Tonga (centre), and Kiribati (right).



## Scientific articles

- Bahrami Y., Zhang W., Franco C. 2014. Discovery of novel saponins from the viscera of the sea cucumber *Holothuria lessoni*. *Marine Drugs* 12(5):2633–2667.
- Bahrami Y., Zhang W., Chataway T. and Franco C. 2014. Structural elucidation of novel saponins in the sea cucumber *Holothuria lessoni*. *Marine Drugs* 12(8):4439–4473.
- Díaz-Balzac C.A., Vázquez-Figueroa L.D. and García-Arrarás J.E. 2014. Novel markers identify nervous system components of the holothurian nervous system. *Invertebrate Neuroscience* 14(2):113–125.
- Dolmatov I.Y. 2014. New data on asexual reproduction, autotomy, and regeneration in holothurians of the Order Dendrochirotida. *Russian Journal of Marine Biology* 40(3):228–232.
- Eriksson H., de la Torre-Castro M., Purcell S.W. and Olsson P. 2014. Lessons for resource conservation from two contrasting small-scale fisheries. *Ambio*. doi:10.1007/s13280-014-0552-5.
- González-Wanguemert M., Aydin M. and Conand C. 2014. Assessment of sea cucumber populations from the Aegean Sea (Turkey): First insights to sustainable management of new fisheries. *Ocean and Coastal Management* 92:87–94.
- González-Wanguemert M., Valente S. and Aydin M. 2015. Effects of fishery protection on growth and genetic structure of two target sea cucumber species from the Mediterranean Sea. *Hydrobiologia* 743:65–74.
- Jinadasa B.K.K.K., Samanthi R.I. and Wicramsinghe I. 2014. Trace metal accumulation in tissue of sea cucumber species; North-Western Sea of Sri Lanka. *American Journal of Public Health Research* 2(5A):1–5.
- Jontila J.B.S., Balisco R.A.T. and Matillano J.A. 2014. The sea cucumbers (Holothuroidea) of Palawan, Philippines. *AACL Bioflux* 7(3):194–206.
- Kazanidis G., Tyler P.A. and Billett D.S.M. 2014. On the reproduction of the simultaneous hermaphrodite *Paroriza prouhoi* (Holothuroidea: Synallactidae) in the Porcupine Abyssal Plain, north-east Atlantic. *Journal of the Marine Biological Association of the United Kingdom* 94(4):847–856.
- Kim S.W., Miller A.K., Brunson C., Netchy K., Clouse R.M., Janies D., Tardy E. and Kerr A.M. 2014. Shallow-Water Holothuroids (Echinodermata) of Yap, Federated States of Micronesia. *Pacific Science* 68(3):397–420.
- Lane D.J.W. and Limbong D. 2014. Catastrophic depletion of reef-associated sea cucumbers: Resource management / reef resilience issues for an Indonesian marine park and the wider Indo-Pacific. *Aquatic Conservation: Marine and Freshwater Ecosystems*. doi: 10.1002/aqc.2421.
- Martinez M.I., Solís-Marín F.A. and Penchaszadeh P.E. 2014. *Benthodytes violeta*, a new species of a deep-sea holothuroid (Elasipodida: Psychropotidae) from Mar del Plata Canyon (south-western Atlantic Ocean). *Zootaxa* 3760(1):89–95.
- Massin C., Robar-Matheson A., Hamel J.-F. and Mercier A. 2014. First records of *Thyone inermis* and *Labidoplax buskii* (Echinodermata, Holothuroidea) in Canadian waters. *Marine Biodiversity Records* 7:1–5.
- Mercier A. and Hamel J.-F. 2015. Lunar periods in the annual reproductive cycles of marine invertebrates from cold subtidal and deep-sea environments. p. 99–120. In: Numata H. and Helm B. (eds). *Annual, lunar and tidal clocks: Patterns and mechanisms of nature's enigmatic rhythms*. Japan: Springer. 360 p.
- Mezali K. and Thandar A. 2014. First record of *Holothuria* (*Roweothuria*) *arguinensis* (Echinodermata: Holothuroidea: Aspidochirotida: Holothuriidae) from the Algerian coastal waters. *Marine Biodiversity Records*. doi:10.1017/S175526721400043.
- Michonneau F. and Paulay G. 2014. Revision of the genus *Phyrella* (Holothuroidea: Dendrochirotida) with the description of a new species from Guam. *Zootaxa* 3760:101–140.
- Navarro P.G., García-Sanz S. and Tuya F. 2014. Contrasting displacement of the sea cucumber *Holothuria arguinensis* between adjacent nearshore habitats. *Journal of Experimental Marine Biology and Ecology* 453:123–130.
- Prata J., Pereira Dias T.L. and Christoffersen M.L. 2014. Occurrence of *Holothuria* (*Holothuria*) *dakarensis* (Holothuroidea: Echinodermata) in the south-western Atlantic, with notes on distribution and ecology. *Marine Biodiversity Records*. doi:10.1017/S1755267214000049.
- Purcell S.W., Lovatelli A. and Pakoa K. 2014. Constraints and solutions to managing Pacific sea cucumber fisheries with an ecosystem approach. *Marine Policy* 45:240–250.
- Purcell S.W., Polidoro B.A., Hamel J.-F., Gamboa R. and Mercier A. 2014. The cost of being valuable: Predictors of extinction risk in marine invertebrates exploited as luxury seafood. *Proceedings of the Royal Society B: Biological Sciences*. doi: 10.1098/rspb.2013.3296.



- Purcell S.W. 2014. Value, market preferences and trade of beche-de-mer from Pacific Island sea cucumbers. PLoS One 9: e95075.
- Purcell S.W. and Eriksson H. 2014. Echinoderms piggybacking on sea cucumbers: Benign effects on sediment turnover and movement of hosts. Marine Biology Research. doi:10.1080/17451000.2014.962544.
- Rowe M.I., Achhala S., Maurice R. and Elphick M.R. 2014. Neuropeptides and polypeptide hormones in echinoderms: New insights from analysis of the transcriptome of the sea cucumber *Apostichopus japonicus*. General and Comparative Endocrinology 197:43–55.
- Skewes T., Plagányi É., Murphy N., Pascual R. and Fischer M. 2014. Evaluating rotational harvest strategies for sea cucumber fisheries. Brisbane, Australia: Commonwealth Scientific and Industrial Research Organisation. 176 p.
- Smirnov A.V. 2014. Sea cucumbers symmetry (Echinodermata: Holothuroidea). Paleontological Journal 48(12): 1215–1236.
- Solis-Marin F.A., Komatsu M., Soliman T., Uchida K., Shimotani T. and Nozaki M. 2014. *Scoliorhapis dianthus*, a new species of sea cucumber (Apodida: Chiridotidae) from the Sea of Japan. Proceedings of the Biological Society of Washington 127(2):323–327.
- Valente S., Serrao E.A. and Gonzalez-Wanguemert M. 2014. West versus East Mediterranean Sea: Origin and genetic differentiation of the sea cucumber *Holothuria polii*. Marine Ecology. doi:10.1111/maec.12156.
- Xia J., Zhang I., Yu Z., Chen T. and Hu C. 2014. First record of *Holothuria (Theelothuria) notabilis* (Holothuroidea: Aspidochirotida) from the Beibu Gulf: Northward range expansion in the South China Sea. Marine Biodiversity Records. doi:10.1017/S1755267214001067.
- Wamukota A., Brewer T.D. and Crona B. 2014. Market integration and its relation to income distribution and inequality among fishers and traders: The case of two small-scale Kenyan reef fisheries. Marine Policy 48:93–101.
- Ziegler A., Mirantsev G.V., Jangoux M. and Kroh A. 2014. Historical aspects of meetings, publication series, and digital resources dedicated to echinoderms. Zoosystematics and Evolution 90(1):45–56.

### PhD Thesis

- Michonneau F. 2014. Species limit and diversity in sea cucumber (Echinodermata Holothuroidea). PhD Thesis, University of Florida. 163 p.
- Plotieau T., Baele J.-M., Vaucher R., Hasler C.-A., Koudad D. and Eeckhaut I. 2013. Analysis of the impact of *Holothuria scabra* intensive farming on sediment. Cahiers de Biologie Marine 54:703–711.

### Masters Thesis

- Miller A.K. 2014. The Higher-Level Systematics of Holothuroidea: A Six-Gene Approach. Masters Thesis, University of Guam. 120 p.
- Maggi C. 2013. Population and genetic structure of *Parastichopus regalis* (Cuvier, 1817) and its commensal *Carapus acus* (Brünnich, 1768). Masters Thesis, CCMAR, Universidade do Algarve (Portugal) and Università Politecnica delle Marche (Italy). 95 p.
- Olaya Restrepo J. 2014. Ecology of *Holothuria arguinensis*: Estimation of population parameters and relation with substrates types. Masters Thesis, CCMAR, Universidade do Algarve (Portugal). 60 p.

---

© Copyright Secretariat of the Pacific Community, 2015

All rights for commercial / for profit reproduction or translation, in any form, reserved. SPC authorises the partial reproduction or translation of this newsletter for scientific, educational or research purposes, provided that SPC and the source document are properly acknowledged. Permission to reproduce the document and/or translate in whole, in any form, whether for commercial / for profit or non-profit purposes, must be requested in writing.

Original SPC artwork may not be altered or separately published without permission.

The views expressed in this Bulletin are those of the authors and are not necessarily shared by the Secretariat of the Pacific Community.

Original text: English

Secretariat of the Pacific Community, Fisheries Information Unit, BP D5, 98848 Noumea Cedex, New Caledonia  
Telephone: +687 262000; Fax: +687 263818; cfpinfo@spc.int; http://www.spc.int/coastfish