

COMMUNICATIONS

III Congreso Latinoamericano de Equinodermos, Costa Rica

by Juan José Alvarado^{1,2,*} and Chantal Conand

The third Latin American Echinoderm Congress was organized in San José, Costa Rica, from 18 to 22 July, at the University of Costa Rica, by the Centro de Investigación en Ciencias del Mar y Limnología, and by the Biology School, with the coordination of Juan José Alvarado Barrientos, with the help of a local team and a scientific committee from several countries (México, Spain, Brazil, Ecuador and Argentina). Financial support was offered by Institut Français Amérique centrale and Vicerrectoría de Investigación from the University of Costa Rica which are sincerely thanked.

The congress was attended by 74 participants from 13 countries (Spain, USA, Mexico, El Salvador, Costa Rica, Colombia, Ecuador, Chile, Venezuela, Brazil, Uruguay, Argentina and France). There were a total of 93 presentations, 53 oral and 40 posters, with a participation of 37 students (undergraduate and graduate). Four plenary lectures were given: 1) “Recent trends in world sea cucumber fisheries: Captures, markets, management and the problem of the illegal” by Dr Chantal Conand, La Reunion University, France; 2) “Human influence on the population fluctuations of sea urchins: Implications for management of marine ecosystems” by Dr Jose Carlos Hernandez, University of La Laguna, Tenerife, Spain; 3) “Ethical reflections on the use of echinoderms in scientific studies” by Dr Tamara Rubilar, Patagonian National Center, Argentina; and 4) “Molecular studies of echinoderms across the Atlantic-Mediterranean area: From population genetics to gene expression”, by Dr Rocío Pérez Pórtela, University of Miami, United States. The proceeding from this congress will be published in a special issue of the Journal of Tropical Biology in 2017. A week before the congress, three courses were developed and held at the Biology School: 1) “Echinodermata physiology” by Dr Tamara Rubilar; 2) “Experimental design in marine ecology” by Dr Jose Carlos Hernandez; and 3) “Application of molecular markers to ecological and evolutionary studies” by Dr Rocio Perez Portela.



¹ Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica

² Escuela de Biología, Universidad de Costa Rica; 11501-2060, San José, Costa Rica

* juanalva76@yahoo.com; juan.alvarado@ucr.ac.cr

The following presentations focused on sea cucumbers:

- Effects of different diet types on the growth, survival and regeneration of the sea cucumber *Isostichopus fuscus* induced by a transverse cutting experiment.
Sonnenholzner J.I., Searcy-Bernal R. and Panchana-Orrala M.
- The genus *Synallactes* (Echinodermata: Holothuroidea: Synallactidae) revisited.
Solís-Marín F.A. and Laguarda-Figueras A.
- Caracterización del ciclo gonádico del pepino de mar café (*Isostichopus fuscus*, Ludwig 1875) en la costa oriental de Baja California.
Pañola-Madrigal A. and Calderón-Aguilera L.E.
- Phylogeny of echinoderms. including *Xyplopax*.
Janies D.A.
- Hermafroditismo en *Isostichopus fuscus* (Holothuroidea) en el norte del Golfo de California, México.
Herrero-Pérezrul M.D., Pañola-Madrigal A., Calderón-Aguilera L.E. and Reyes-Bonilla H.
- Marsupial brooding in the sea cucumber *Cladodactyla crocea* (Lesson, 1830) (Holothuroidea: Cucumariidae) from southwestern Atlantic Ocean.
Martínez M.I., Alba-Posse J.E. and Penchaszadeh P.E.
- Revisión de los ejemplares de las especies de la familia Cucumariidae Ludwig, 1894 (Holothuroidea: Dendrochirotida) depositados en la Colección Nacional de Equinodermos "Dra. Ma. E. Caso M" del ICML, UNAM.
Sánchez-Alonzo D.M., Solís-Marín F.A. and Laguarda-Figueras A.
- Revisión taxonómica del género *Paroriza* Hérouard, 1902 (Echinodermata: Holothuroidea: Synallactidae).
Laguarda-Figueras A., Solís-Marín F.A., Cervantes-Aguilar I.P. and Méndez-Loyola K.
- Morphological phylogeny of the phylloporid dendrochirotids.
Martins L., Souto C. and Tavares M.
- Avances sobre la acuicultura del pepino de mar *Isostichopus fuscus* en Ecuador con visión hacia la repoblación.
Sonnenholzner J.

Posters on holothurians were exhibited throughout the congress:

- Inventory of the Echinodermata from Reunion Island, Western Indian Ocean.
Conand C., Boissin E., Mulochau T., Trentin F. and Ribes S.
- Densidad de equinodermos del litoral rocoso de Punta Amapala y el arrecife de coral de Los Cabanos, El Salvador.
Segovia J., Ramos F., Guerra G., Lopez G. and Solorzano S.
- Invertebrados asociados a equinodermos en costa del estado Sucre, Venezuela.
Gomez-Maduro M., Diaz-Diaz O. and Lira C.
- The genus *Synallactes* revisited.
Solís-Marín F.A. and Laguarda-Figueras A.
- Revisión de los ejemplares de las especies de la familia Cucumariidae Ludwig, 1894 depositados en la Colección Nacional de Equinodermos "Dra. Ma. E. Caso" del ICML, UNAM
Sánchez-Alonzo D.M., Solís-Marín F.A. and Laguarda-Figueras A.
- Holothuroideos de Mar Profundo del Caribe y Golfo de México.
Duran-Gonzalez A., Laguarda-Figueras A., Cervantes-Aguilar P. and Solís-Marín F.A.
- La colección de Equinodermos del Museo de Zoología de la Universidad de Costa Rica.
Alvarado J.J., Chacon I. and Solano-Rivera S.
- First record of Ypsilothuriidae in the south Atlantic.
Martins L. and Tavares M.
- Caracterización del ciclo gonádico del pepino de mar café (*Isostichopus fuscus*, Ludwig 1875) en la costa oriental de Baja California.
Pañola-Madrigal A. and Calderón-Aguilera L.E.
- Hermafroditismo en *Isostichopus fuscus* en el norte del Golfo de California, México.
Herrero-Pérezrul D., Pañola-Madrigal A., Calderón-Aguilera L.E. and Reyes-Bonilla H.
- Marsupial brooding in the sea cucumber *Cladodactyla crocea* (Lesson, 1830) from the southwestern Atlantic Ocean.
Martínez M., Alba-Posse J.E. and Penchaszadeh P.E.
- Comparison of the reproductive cycle of the sea cucumber *Holothuria arguinensis* at three different habitats in the Algarve coast (southern Portugal).
Marquet N., Conand C., Power D.M., Canario A.V. and Gonzalez-Wanguemert M.

- Distribucion de tallas y reproduccion de *Hemiodema spectabilis* en el Noroeste des Golfo San Matias, Patagonia, Argentina.
Lazari C., Carignano A., Morsan E., Kroeck M. and Rubilar T.
- Morphological phylogeny of the phyllophotid dendrochirotid.
Martins L. Souto C. and Tavares M.
- Pruebas de marcaje en los pepinos de mar *Isostichopus fuscus* y *Holothuria theeli* en condiciones de laboratorio.
Sonnenholzer J., Herrera M.A., Arriega-Ochoa J. and Panchana M.
- Digestive enzymes in gut and respiratory tree of adult sea cucumber *Isostichopus badionotus*.
Martinez-Milian G. and Olvera-Novoa M.A.

Note:

The national newspaper *La Nacion* published a long article on sea cucumber exploitation “Expertos alertan sobre explotación de pepino de mar”, (Experts warn about exploitation of sea cucumbers) following the plenary session.

Communications on holothurians at the Ninth European Echinoderm Conference – Sopot, Poland 2016

Compiled by *Thomasz BORSZCZ* (tomaszborszcz@gmail.com)

- The variety of interactions between symbiotic gastropods and echinoderms [talk]
Dgebuadze and Kantor
- “Cool” sea cucumbers! Biodiversity of Bransfield Strait in Antarctica [poster]
Cánovas et al.
- Does space matter? Optimizing stocking density of the sea cucumber *Holothuria arguinensis* in tanks [poster]
Domínguez-Godino and González-Wangüemert
- Sea cucumbers: New marine resource for fisheries and aquaculture in the Mediterranean and the Atlantic [talk]
González-Wangüemert et al.
- New target species of sea cucumber for aquaculture development in Angola [poster]
González-Wangüemert et al.



Photo of participants (image: Kajetan Deja).

Conference “Protection and Sustainable Utilization of Sea cucumbers”, organized by the Chinese Society of Echinoderm, under the 2016 Annual Conference of Chinese Society for Oceanology and Limnology

Communication by *Francisco Solís-Marin*

Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México – November 2016

Conference date and location: 6–9 November 2016, Haikou, Hainan Province, China

Principal organizer: Dr Hongsheng Yang, Professor / Deputy Director of Oceanology, Chinese Academy of Sciences.

The conference “Protection and Sustainable Utilization of Sea cucumbers” featured technical sessions and workshops covering nearly all aspects of biology, ecology, physiology, aquaculture and stock enhancement of sea cucumbers, especially *Apostichopus japonicus*, around the world.

Articles published on the web

Sea cucumber makes its way in Nicaragua (in Spanish)

During the last three years, the production and export to Asian markets of sea cucumbers have increased sharply in Nicaragua

<http://www.laprensa.com.ni/2016/08/02/economia/2077131-pepino-de-mar-impulsa-a-nicaragua>

The “espartdenya”, a treasure of Ibiza

<http://www.estorrent.net/en/2016/02/01/the-espartdenya-a-treasure-of-ibiza/>

Conferences announcements

Welcome to the 16th International Echinoderm Conference, Nagoya, Japan

It is our great pleasure to announce that the 16th International Echinoderm Conference (IEC) will be held in Nagoya, Japan from 28 May to 1 June 2018. This is the second IEC in Japan since the 7th conference was held in Atami in 1990. We have already received inquiries and comments about this conference, for which we are very thankful.

Nagoya is a big city located between two megalopolises, Tokyo and Osaka, and is located in the central part of Japan. The Chubu International Airport is convenient to Nagoya, connected in less than 1 hr by train to the city centre. There are direct flights from many Asian cities, Europe and USA. Nagoya is also connected to Tokyo, Osaka and other cities by Shinkansen (bullet trains, JR system). Therefore, you can easily plan to extend your stay in Japan and visit Tokyo or Kyoto.

The conference will include scientific sessions held in parallel in two or three rooms, poster sessions, as well as plenary sessions in a large hall. These will be held in the Noyori Conference Hall of Nagoya University.

The details of the 16th IEC (First Circular) is scheduled to be announced on the conference webpage in April 2017. For questions and comments, please send an email to the address below.

I look forward to your participation to the 16th IEC in Nagoya, Japan!

Tatsuo Oji (Organizing Committee): oji@num.nagoya-u.ac.jp

World Aquaculture 2017 - June 26-30, 2017 Cape Town International Convention Centre, South Africa

Georgina Robinson and Cathy Hair, session chairs for the Holothurian session

The deadline for abstract submission and for oral or poster presentations at World Aquaculture 2017, which will be held in Cape Town, South Africa from 26–30 June 2017 ended on 1 February 2017. However, it will still be possible to submit revised abstracts up until 30 April 2017. For abstract submission details, please see: <http://www.was.org/meetings/default.aspx?code=WA2017>

Invited speaker profiles can be viewed at: <https://www.was.org/view/world-aquaculture-2017-keynote-speakers.aspx>

Tenth WIOMSA Scientific Symposium

The Western Indian Ocean Marine Science Association (WIOMSA), the Institute of Marine Science (IMS) and the Department of Aquatic Sciences and Fisheries [both of the University of Dar es Salaam] and the Tanzania Fisheries Institute are pleased to announce the Tenth WIOMSA Scientific Symposium which will be held in Dar es Salaam on the 30 October–4 November 2017.

The week will be divided into the following components:

1. The Tenth WIOMSA Scientific Symposium – 30 October to 1 November 2017. This component will include: keynote presentations, oral and poster presentations.
2. Specially convened sessions and roundtable discussions – 2 November 2017
3. WIOMSA General Assembly – 3 November 2017
4. Excursions and tours to different places of interest – 4 November 2017

Next North American Echinoderm Conference dates and information

Information provided by Roberta Challener (roberta@nzdiary.com)

Sunday, 9 July 2017: welcome reception in the evening.

Thursday, 13 July 2017: the next NAEC will be held at the College of the Holy Cross in Worcester, MA.

PhD Dissertations

Biological and economic characteristics associated with the body size of commercially important Aspidochirotida sea cucumbers

M. Dumestre (Swire Institute of Marine Science, University of Hong Kong. Email: marielle.dumestre@gmail.com)

As a delicacy, the processed body-wall of sea cucumbers, beche-de-mer, is among the most high-valued of seafood commodities harvested globally to supply, almost exclusively, demand from the Chinese market. Prompted by unsustainable fishing practices targeting more than seventy species, predominantly from the order Aspidochirotida, fisheries management is increasingly being implemented, with mixed success and ongoing difficulties of implementation. Knowledge gaps regarding holothuroids life-history traits are a common constraint, especially due to the dearth of methodologies suitable when studies need to consider their high morphological plasticity. This thesis investigated interdisciplinary aspects of size in holothuroids, from pricing of beche-de-mer to methodological approaches for determining reproduction and growth of *Holothuria leucospilota*, used as a model species, in Hong Kong waters.

In Hong Kong, the global hub of the beche-de-mer trade, a dozen high-value species were identified in the local market. A hedonic analysis revealed that prices varied mainly according to species, size and physical damage attributable to inappropriate post-harvest processing. Higher prices were significantly associated with larger beche-de-mer, except for the temperate *Apostichopus japonicus*. As many beche-de-mer were in their sexually immature size-ranges, effective application of minimum size-limits regulations would benefit from economic incentives derived from species-specific relationships between size and price.

Reproduction in *Holothuria leucospilota* was determined in Hong Kong, which could be studied in a non-exploited state. The relationship between body size and gonad index was examined in detail. Risks associated with the misinterpretation of the gonad index are rarely considered in holothuroids research, so this work explored the problems that arise when different body sizes are sampled over time and an allometric relationship holds between gonad and body weights. An innovative gonad index was successfully applied, removing the confounding effect of body size, and describing the same reproductive cycle as histological gonad analysis.

To validate the use of fluorochromes to batch-mark *Holothuria leucospilota*, experiments were conducted in outdoor tanks. Preliminary calcein marking could be detected for a year in microscopic ossicles extracted non-lethally from dermal samples. Four fluorochromes, calcein, calcein blue, xylenol orange and tetracycline, successfully marked ossicles of juveniles and adults *H. leucospilota* for one year. Marked ossicles were detected after a year with 4% error in tag detection. Growth of holothuroids was not affected by fluorochrome marking, although consistent weight loss occurred under experimental conditions.

Several methods, from enclosure experiments and modal progression analysis to batch-tagging mark-recapture experiments, were investigated to determine growth of *H. leucospilota*. Although an effect of captivity was suspected, the variation in weight of *H. leucospilota* in the enclosure experiment appeared to be seasonal. Consistent negative growth rates during winter were confirmed.

Finally, as size is an important characteristic of the economic value of beche-de-mer, further investigation on growth, longevity and reproductive capacity is essential for assessing stock renewal and potential for aquaculture. Based on life-history strategies exhibited by *H. leucospilota* in Hong Kong, further recommendations were proposed for fisheries management of Indo-Pacific species in the Asian subtropical area.

Chemical communication in marine symbioses: Characterization of the kairomones in two crustacean-echinoderm association models

Guillaume Caulier (Biology of Marine Organisms and Biomimetics, 6 Av. Champ de Mars, University of Mons, 7000 Mons, Belgium. Email: guillaume.caulier@umons.ac.be)

Chemical sensing is considered as the most ancient and the most ubiquitous mode of communication in the biosphere; all living organisms are able to detect chemical cues (or ecomones) in their environment to establish intra or interspecific interactions. In marine ecosystems, chemical communication is particularly involved in the host selection and the maintain of symbiotic associations. However, marine chemical ecology is a recent science and there is a lack of knowledge about the identification of the secondary metabolites allowing symbionts recognition. The main aim of the thesis presented by Guillaume Caulier in October 2016 is to characterize the nature and the effects of the molecules (i.e. kairomones) detected by crustaceans to select their echinoderm hosts. Two obligatory symbiotic models were investigated: the Harlequin crab *Lissocarcinus orbicularis* (Dana, 1852) associated with different species of holothuroids and the snapping shrimp *Synalpheus stimpsoni* (De Man, 1888) associated with different species of crinoids.

The study is divided into five chapters, each corresponding to a particular question: i) What are the population characteristics of *L. orbicularis* and the holothuroids on the Great Reef of Toliara (Madagascar)? (Caulier et al.

2012); ii) What is the diet of the Harlequin crab? (Caulier et al. 2014); (iii and iv) Which chemicals are involved in host selection for *L. orbicularis* (Caulier et al. 2013) and *S. stimpsoni*?; v) Do symbionts and predators (i.e. *Thalamita crenata*) rely on the same kairomones to elicit host/prey selection? Do chemodetection behaviors change when the host/prey is diseased?

Evidences provided within this work allow us to better understand the symbiotic association between the Harlequin crab and holothuroids in terms of host selection and symbiont feeding strategy. Results show that holothuroid saponins and crinoid anthraquinones, initially described as chemical defenses, play the role of kairomones attracting the symbiotic crustaceans because they act as chemical signatures. Moreover, this work describes the “diagnosis ability” of predatory and parasitic crabs detecting holothuroids with skin ulceration disease thanks to their olfaction.

Microbial – deposit feeder aquaculture bioremediation systems

Georgina Robinson (School of Marine Science and Technology, Newcastle University, September 2016)

Land-based intensive aquaculture produces large volumes of particulate organic waste that can be upcycled into high value secondary biomass. In this research, the application of two key principles underpinning low-cost bioremediation technologies, namely the addition of rate limiting (i) electron acceptors (oxygen), and (ii) donors (carbon) is investigated in a sediment-based aquaculture effluent treatment system integrating the sea cucumber, *Holothuria scabra*. Growth trials of *H. scabra*, combined with next generation sequencing (NGS) technologies, were used to examine the response of sea cucumbers and sediment bacterial communities under contrasting redox regimes, describing fully oxic and redox-stratified sediments. The oxic system resulted in high taxonomic and functional diversity of bacteria with a range of dissimilatory metabolisms required for successful bioremediation of aquaculture wastes; however, the final biomass of *H. scabra* was significantly lower than the redox-stratified sediments ($449.22 \pm 14.24 \text{ g m}^{-2}$ versus $626.89 \pm 35.44 \text{ g m}^{-2}$). Improving the resource quality of aquaculture waste through carbon supplementation was investigated. Increasing the carbon/nitrogen ratio from 5:1 to 20:1 with soluble starch significantly increased the biomass production of *H. scabra* on redox-stratified sediments compared to controls ($1011.46 \pm 75.58 \text{ g m}^{-2}$ versus $702.12 \pm 35.93 \text{ g m}^{-2}$). A benthic flux incubation study, combined with NGS, demonstrated that carbon supplementation did not change the pathway of nitrogen cycling by mediating a shift from net release of ammonium to net assimilation, as hypothesised. A final study elucidated the critical role of the sea cucumber microbiome during aquaculture waste bioremediation, demonstrating that endogenous bacteria are primed, at ecological and genomic levels, to respond to nitrogen — a key nutrient limiting deposit feeder growth. Deposit feeder–microbial aquaculture bioremediation systems have the potential to rectify current inefficiencies of nitrogen use in the aquaculture production chain by offering a more economically and environmentally sustainable alternative to closing the nitrogen cycle loop.

Canaries in the coal mine: using model echinoderm species to address anthropogenic impacts on the Great Barrier Reef

Kennedy Wolfe (The University of Sydney, 2017)

Many beche-de-mer holothuroids are in a perilous state of conservation. *Stichopus herrmanni*, listed as Vulnerable by the International Union for Conservation of Nature (IUCN), is currently a major fisheries target on the Great Barrier Reef (GBR) and elsewhere. However, there remains a paucity of data on the biology and ecology of this species to inform management – an issue for bêche-de-mer holothuroids globally. This thesis bridges fundamental knowledge gaps for *S. herrmanni*, a model species used to represent other exploited tropical holothuroids, information critical to their conservation biology. The population biology, recruitment and ecological roles of *S. herrmanni* were examined across several years on protected zones on the southern GBR (Heron Island, One Tree Island). Population surveys showed distinct spatial variation in the size and density of *S. herrmanni* across Heron Island. The smallest individuals found (10 cm in length) are some of the only juvenile *S. herrmanni* documented in nature. The presence of juveniles in the consolidated crustose coralline algal habitat each year in autumn following the summer spawning period, and the absence of small individuals several months later in spring, suggests an ontogenetic migration or displacement of *S. herrmanni* to deeper lagoon areas as they grow. Across three years, *S. herrmanni* exhibited decreased feeding activity and gonad development in winter, with gonad development peaking in summer. Spawning observations indicate that gametes are released across new moon events during summer on the GBR. Adult *S. herrmanni* were calculated to turn over an estimated $100\text{--}250 \text{ kg ind}^{-1} \text{ y}^{-1}$, the highest contribution to sediment bioturbation reported for an aspidochirotid. Sediment analyses suggest *S. herrmanni* is a generalist feeder that consumes benthic microalgae and infauna, influencing trophic interactions in its sediment habitat. Using lagoon sediment mesocosms, the potential for *S. herrmanni* to alter reef carbonate dynamics under present-day and near-future (+570 ppm) ocean acidification scenarios was examined. The ability for this species to alter benthic communities and modulate carbonate chemistry dynamics in lagoon environments suggests that large tropical holothuroids may serve an important role in mitigating the impacts of ocean acidification on coral reefs. This unappreciated feature of the feeding biology of tropical holothuroids indicates major concerns for reefs where bêche-de-mer species are exploited.