



XI ICMAM **RIO 2012**

XI INTERNATIONAL CONGRESS ON MEDICAL AND APPLIED MALACOLOGY

**Crossing Boundaries: Integrative
Approaches to Malacology**

ABSTRACTS BOOK

Rio de Janeiro – Brazil
September 25-29th, 2012

Sociedade Brasileira de Malacologia



**XI International Congress on
Medical and Applied Malacology
Crossing boundaries:
Integrative Approaches to Malacology**

ABSTRACTS BOOK

Rio de Janeiro

Sociedade Brasileira de Malacologia

2012

XI International Congress on Medical and Applied Malacology, Rio de Janeiro, Brazil, 25-29th September, 2012.

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XI International Congress on Medical and Applied Malacology
Crossing boundaries: Integrative Approaches to Malacology

Sociedade Brasileira de Malacologia – SBMa

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WELCOME MESSAGE

Dear Colleagues,

It is a great honor to chair and organize in Rio de Janeiro the XI International Congress on Medical and Applied Malacology (XI ICMAM) jointly with the International Society for Medical and Applied Malacology (ISMAM) and the Brazilian Malacological Society (SBMa).

The theme of the XI ICMAM is “Crossing boundaries: Integrative Approaches to Malacology”, bearing Brazil as background is a proper and opportune choice. Holding the largest biodiversity of the world there are probably hundreds of undescribed mollusks in the country. Furthermore, the role mollusks play in ecosystems, impacting human welfare, as human and other animals disease vectors, as agricultural pests, as bioindicators, as invasive species that are replacing native biodiversity, etc, indeed crosses many boundaries. The XI ICMAM will hopefully provide an excellent opportunity to address those outstanding questions and discuss the most up to date knowledge and the challenges on this theme for the 21st Century.

I am deeply grateful to my friend, Professor Dr Sonia Barbosa dos Santos, Co-Chair of the XI ICMAM and to the Executive Committee, particularly Dr Lenita de Freitas Tallarico and Dr Gisele Orlandi Introíni, for their best efforts to organize a sound and profitable congress.

On the behalf of the Executive Committee we welcome the attendants of the XI International Congress on Medical and Applied Malacology and wish all of you a very fruitful and pleasant meeting in Rio de Janeiro, one of the most beautiful cities in the world.

Sincerely,



Silvana Carvalho Thiengo

Chair of XI ICMAM

Full Researcher

Instituto Oswaldo Cruz/ FIOCRUZ

Rio de Janeiro, Brazil



Logo was designed by Gisele Orlandi Introíni, Lenita de Freitas Tallarico and and Walter Costa Introíni with the suggestions of the organizing committee members from the union and inter-relationships of the study areas of Malacology that represents the theme of the congress which is *Crossing Boundaries: Integrative Approaches to Malacology*.

Each symbol at the mollusk shell represents a general area of knowledge that inspires this event: public health, parasitology, agricultural pests, pollution, reproduction, development, biotechnology, genomics, genetics and systematics.

Dr Toshie Kawano – Honorary President
In memoriam



Toshie Kawano was one of the most important Brazilian researchers in Malacology, being specialized in Embryology and Parasitology. At the end of her career she was coordinator of Malacology Laboratory at Butantan Institute and after her retirement she kept working with hard dedication.

There is possible to summarize their scientific production, number of students under her guidance and amount of money she obtained to improve malacological studies, however we prefer to stress their human being.

There is a plethora of adjectives that can define *Toshie*: gentle, genuine, spontaneous, generous, patient. She had a contagious joy and she was an optimistic towards life. She loved her work and the laboratory was an extension of her home.

In honor of her memory the Brazilian Society of Malacology decided to create **Toshie Kawano Award**. The prize will be given to a noted women researcher well-known by relevant scientific production, pronounced efforts in teaching also building new malacologist's generation besides high human qualities.

Schedule – XI ICMAM

MONDAY, September 24th

14:00-17:00 Registration

TUESDAY, September 25th

08:00-17:00 Registration

08:30-09:45 Short Courses

09:45-10:00 Coffee Break

10:00-12:30 Short Courses

12:30-14:00 Lunch

14:00-14:30 Opening Ceremony

14:30-15:15 Opening Conference – Dr John B. Burch (University of Michigan) –
History of ISMAM/ICMAM Brief

15:15-15:30 Coffee Break

15:30-16:15 Plenary lecture – Dr Robert Cowie (University of Hawaii) – Advancing
Malacological research: crossing boundaries to have a broader impact

16:15-17:00 Plenary lecture – Dr Takahiro Asami (Shinshu University) – Quantitative
variation and evolution of chirality in pulmonate snails

17:00-17:30 Discussion

17:30-18:30 Freshwater Bivalve Researchers Meeting

18:30-22:00 Icebreaker

Short Courses: 1. *Morphologic diagnostic of helminthes of medical and veterinary importance* –
Dr Henry S. Bishop (Parasitic Diseases Branch - Centers for Disease Control and
Prevention, USA)

2. *Bioinvasion ecology of freshwater mollusks in South America* – MSc Daniel
Pereira & Dr Janine Oliveira Arruda (Ceneco, UFRGS, LÓTICA)

3. *Relationship between genes and environment* – Dr Mauro de Freitas Rebelo
(Universidade Federal do Rio de Janeiro)

4. *Techniques and applications of molecular biology in biodiversity studies* – Dr
Elizeu Fagundes Carvalho & Dr Dayse Aparecida da Silva (Universidade do
Estado do Rio de Janeiro)

5. *Molecular Identification of Brazilian Parasites and Vectors* - Dr Karina
Alessandra Morelli- Instituto Oswaldo Cruz, Rio de Janeiro



WEDNESDAY, September 26th

09:00-10:00 Amphitheater 11 – Plenary lecture – Dr John B. Burch (University of Michigan) –
Malacological Research, Publications and Ethics

10:00-10:30 Coffee Break

10:30-12:30 Amphitheater 11 – Symposium I – Medical Malacology
Chair: Catalina Carmona
Co-chair: Jairo Pinheiro

10:30 10:45	Control of paragonimiasis in Colombia, snail or crab?	<u>Catalina Gómez</u> ; Iván Darío Vélez; Luz Elena Velásquez
10:45 11:00	Physiological changes in molluscs in response to trematode and nematode infections	Jairo Pinheiro
11:00 11:15	Distribution of <i>Lymnaea</i> Lamarck, 1799, intermediate host of <i>Fasciola hepatica</i> Linnaeus, 1758 in Brazilian territory	<u>Camilla Medeiros</u> , Ronaldo G. C. Scholte; Sthefane D'ávila; Roberta Lima Caldeira; Omar dos Santos Carvalho
11:15 11:30	An exotic <i>Schistosoma</i> species in Central Europe: what are their intermediate snail hosts?	<u>Gabor Majoros</u> ; Scott P. Lawton
11:30 11:45	Control of <i>Schistosoma mansoni</i> in Dhofar, Sultanate of Oman	<u>Mohamed A. Idris</u> ; <u>Hélène Moné</u> ; Gabriel Mouahid; Mahmoud A. Shaban; Ali A. Al Jabri; Andreas Ruppel
11:45 12:00	<i>Aelurostrongylus abstrusus</i> larvae (Nematoda; Metastrongyloidea) in <i>Achatina fulica</i> from Brazil: current situation	<u>Ana Paula M. Oliveira</u> ; Monica A. Fernandez; Silvana C. Thiengo
12:00 12:30	Discussion	

10:30-12:30 Amphitheater 13 – Symposium II – Systematic, Taxonomy and Anatomy of marine mollusks
Chair: José Henrique Leal
Co-chair: Carlo Magenta Cunha

10:30 10:45	The bivalve genus <i>Dilemma</i> (Bivalvia: Septibranchia): bizarre clams hint at hidden deep-sea diversity	José Henrique Leal
10:45 11:00	Taxonomic revision of the genus <i>Phyllaplysia</i> P. Fischer, 1872 from Western Atlantic	<u>Carlo Magenta Cunha</u> ; Luiz Ricardo L. Simone
11:00 11:15	Taxonomic revision of <i>Epitonium sensu lato</i> from Brazil (Mollusca, Caenogastropoda, Epitoniidae), except <i>Asperiscula</i>	<u>Bruno Garcia Andrade</u> ; Alexandre Dias Pimenta
11:15 11:30	Morphometric discrimination among four unnamed species of <i>Ledella</i> Verrill & Bush, 1897 from off Brazil	<u>Diniz Corrêa Paone Viegas</u> ; Natalia Pereira Benaim; Ricardo Silva Absalão
11:30 11:45	It is possible to publish just descriptive anatomy? Anatomy of <i>Concholepas concholepas</i> (Bruguière, 1789) (Prosobranchia Muricidae)	<u>Laura G. Huaquin</u> ; Patricio H. Manríquez; Patricio Sánchez; Clara Yáñez
11:45 12:00	A systematic approach to the genus <i>Buccinanops</i> d'Orbigny, 1841 (Mollusca: Gastropoda) from the South American coast	<u>Guido Pastorino</u> ; Luiz R. L. Simone
12:00 12:30	Discussion	

12:30-13:45 Lunch



WEDNESDAY, September 26th

- 14:00-15:00 Amphitheater 11 – Plenary lecture – Dr Uthaiwan Kovitvadhi (Kasetsart University) –
In vitro culture of freshwater pearl mussel from glochidia to adult
- 15:00-17:00 Amphitheater 11 – Symposium III – Advances in Biotechnology
Chair: Roberto Berlinck
Co-chair: Eliana Nakano

15:00 15:15	Brazilian nudibranchs as sources of bioactive natural products	<u>Roberto G. S. Berlinck</u> ; Vinicius Padula
15:15 15:30	Sea hares proteins – ecology, applications, and perspectives	Tallita Tavares
15:30 15:45	Screening for natural products of potential use in schistosomiasis control	Eliana Nakano
15:45 16:00	Primary culture and characterization of cells derived from different tissues of <i>Biomphalaria tenagophila</i> (Orbigny, 1835)	<u>Aristeu Silva-Neto</u> ; Luiz Carlos Alves; Fábio André B. dos Santos; Consuelo L. Fortes-Dias; Luciana M. Silva; Paulo Marcos Z. Coelho
16:00 16:15	Using conus venoms to learn drug design and understand the brain	Baldomero Olivera; <u>Mandë Holford</u>
16:15 16:30	Building a better M.O.U.S.E. (Marine Organisms Used in Shuttle Encapsulation) trap	Prachi Anand; Allison Oneil; Trevor Douglas; <u>Mandë Holford</u>
16:30 17:00	Discussion	

- 15:00-17:00 Amphitheater 13 – Symposium IV – Mollusks Diseases: effects and treatments
Chair: Mario Luis Fajardo Araya
Co-chair: Eliana Mesquita

15:00 15:15	Aquaculture development for small scale in Chile scallop	Mario Luis Fajardo Araya
15:15 15:30	Topics in sanitary aspects of brazilian shellfish farm: the key problem	Eliana de Fátima Marques de Mesquita
15:30 15:45	Diseases of marine bivalves cultured in Brazil	Aimê Rachel Magenta Magalhães
15:45 16:00	Parasitosis in mollusks in the Pará State (Brazilian Amazon)	<u>Edilson Matos</u> ; Michele Velasco; Patrícia Matos
16:00 16:30	Discussion	

- 16:30-17:30 Movie Exhibition – **Loco Fever** (La fiebre del loco)
- 17:00-17:15 Coffee Break

WEDNESDAY, September 26th

17:15-19:00 Amphitheater 11 – Symposium V – Systematic, Taxonomy, Ecology, Diversity of Land and Freshwater Mollusks
Chair: Kenneth A. Hayes
Co-chair: Maxim V. Vinarski

17:15 17:30	Assessing molluscan biodiversity through integrative taxonomy	Kenneth A. Hayes
17:30 17:45	Ancylinae (Gastropoda: Pulmonata: Planorbidae) taxa from Argentina: a taxonomic revision	<u>Ximena Maria Constanza Ovando</u> ; Luiz Eduardo Macedo de Lacerda; Sonia Barbosa dos Santos
17:45 18:00	The freshwater pulmonate snail family Physidae	<u>John B. Burch</u> ; Alex Moore
18:00 18:15	Preliminary phylogeography of <i>Lymnaea stagnalis</i> : are there cryptic species of the great pond snail?	<u>Maxim V. Vinarski</u> ; Katrin Schniebs; Peter Glöer; Anna K. Hundsdorfer
18:15 18:30	Recent changes in the continental malacofauna of Western Siberia	<u>Maxim V. Vinarski</u> ; Svetlana I. Andreyeva; Nikolay I. Andreyev; Maxim E. Grebennikov; Alfred V. Karimov; Ekaterina A. Lazutkina
18:30 18:45	Systematics of genus <i>Omalonyx</i> from sequences of the mitochondrial cytochrome oxidase subunit I gene and morphology	Daniel Coscarelli; Almir R. Pepato; <u>Teofânia Vidigal</u>
18:45 19:00	<i>Megalobulimus maximus</i> (Gastropoda, Strophocheilidae) is not a polytypic species	<u>Rina Ramírez</u> ; Víctor Borda; Jenny Chirinos
19:00 19:15	Discussion	

17:15-19:00 Amphitheater 13 – Simposium VI – Miscellanea Malacologica
Chair: Claudia Tasso Callil
Co-chair: Joel Christopher Creed

17:15 17:30	Morphological characterization of <i>Scutalus cotopaxiensis</i> (Pfeiffer, 1852) (GASTROPODA, PULMONATA, ORTHALIDAE)	Meire Silva Pena
17:30 17:45	Distinct immune fences in the apple snail <i>Pomacea canaliculata</i>	Cristian Rodriguez; Juan A. Cueto; Israel A. Veja; <u>Alfredo Castro-Vazquez</u>
17:45 18:00	Marine bivalve mollusks cultured in Brazil: actual species and biodiversity	<u>Aimê Raquel Magenta Magalhães</u> ; Jaime Fernando Ferreira
18:00 18:15	Strategies for conservation of freshwater mussels in central region of Brazil	Claudia Tasso Callil
18:15 18:30	Invaded invaders: is meltdown enhancing the invasion of non-indigenous marine molluscs in the southwest Atlantic?	Fabiana Barbosa dos Santos; <u>Joel Christopher Creed</u>
18:30 19:00	Discussion	

19:00-20:30 Poster Session I

THURSDAY, September 27th

- 09:00-10:00 Amphitheater 11 – Plenary lecture – Dr David Gwyn Robinson (Academy of Natural Sciences / USA) – Invasive Mollusks
- 10:00-10:30 Coffee Break
- 10:30-12:30 Amphitheater 11 – Symposium VII – Genetics and Genomics
Chair: Cristhian Clavijo
Co-chair: Joanna R Pieńkowska

10:30 10:45	Molecular systematics and phylogeography of Corbiculidae (Bivalvia) in Uruguay	<u>Cristhian Clavijo</u> ; Graciela García
10:45 11:00	Genetic variation in native apple snail <i>Pila conica</i> and introduced <i>Pomacea canaliculata</i> in the Philippines	Monica P. Mendoza; Karen Mae S. Serra; Jordan Ferdin A. Halili; <u>Ian Kendrick C. Fontanilla</u> ; Zenaida G. Baoanan
11:00 11:15	Molecular analysis of the complex <i>Olivella minuta</i> (Link, 1807), preliminary results	<u>Raquel M. A. Figueira</u> ; Thiago S. de Paula; Gisele Lôbo-Hajdu; Ricardo S. Absalão
11:15 11:30	Atlantic currents shaping the genetic diversity of brown mussel <i>Perna perna</i>	<u>Gabriel Bautz Dalbem</u> ; Victor Hugo Colombi; Mercia Costa Barcellos; Valéria Fagundes
11:30 11:45	Water channels in Mollusca: structure and location	<u>Joanna R Pieńkowska</u> ; Ewa Kosicka; Małgorzata Wojtkowska; Hanna Kmita; Andrzej Lesicki
11:45 12:00	Genetic diversity of <i>Achatina (Lissachatina) fulica</i> Bowdich, 1822 in Brazil"	<u>Joana Zanol</u> ; Elisson Romanel; Jéssica Caeiro; Silvana C. Thiengo; Claudia A. de M. Russo
12:00 12:30	Discussion	

- 10:30-12:30 Amphitheater 13 – Simposium VIII – Teaching, Education and Partnership
Chair: Guido Pastorino
Co-chair: Virginia Schall

10:30 10:45	Update and innovation in the teaching of medical malacology and its relevance to disease prevention, health promotion and environmental preservation	Virgínia Torres Schall
10:45 11:00	Applied Malacology: a different approach teaching a traditional topic	<u>Guido Pastorino</u> ; Gustavo Darrigran
11:00 11:15	Educational resources for teaching medical malacology in Brazil: the case of the intermediate host species of <i>Schistosoma mansoni</i> .	<u>Cristiano Lara Massara</u> ; Felipe Gomes Leão Murta; Virgínia Torres Schall
11:15 11:30	Presentation of the consortium: "Campus do Mar" knowledge in depth	Jesús Troncoso
11:30 11:45	AMPLIFIED: goals and achievements of a multidisciplinary collaborative international project on apple snails (Gastropoda: Ampullariidae)	<u>Fabrizio Scarabino</u> ; Cristhian Clavijo; Alvar Carranza; Mariana Meerhoff; Clementina Calvo; Ana Elisa Röhrdanz; Diego Barbitta; Fernanda Eugui; Katie Gibson; Allyson Plantz; Silvana Thiengo; Kenneth Hayes; Robert Cowie; Romi Burks
11:45 12:15	Discussion	

- 12:30-13:00 Official photography of the XI ICMAM

- 13:00-14:00 Lunch



THURSDAY, September 27th

- 14:00-15:00 Amphitheater 11 – Plenary Lecture – Dr Alejandra Rumi (Universidad Nacional de La Plata) – Neglected diseases: contributions from the continental malacology
- 15:00-17:00 Amphitheater 11 – Symposium IX – Systematic, Taxonomy, Ecology, Diversity of Land and Freshwater Mollusks
Chair: Maria Cristina Dreher Mansur
Co-chair: Janine Oliveira Arruda

15:00 15:15	Distribution and composition of freshwater bivalve species in Brazilian watersheds	<u>Maria Cristina Dreher Mansur</u> ; Daniel Pereira; Daniel Mansur Pimpão; Claudia Tasso Callil; Igor Christo Miyahira
15:15 15:30	The land malacofauna from Serra da Capivara National Park, Northeast of Brazil, Piauí, recognized as World Heritage Site by Unesco	<u>Norma Campos Salgado</u> ; Claudio José Fernandes da Costa
15:30 15:45	Diversity of land mollusk in Northern Minas Gerais state or: - what do we know about the Brazilian malacofauna?	Meire Silva Pena
15:45 16:00	Taxonomic review and cladistic analysis of <i>Omalonyx</i> (Gastropoda, Succineidae)	<u>Janine Oliveira Arruda</u> ; José Willibaldo Thomé; Luiz Roberto Malabarba
16:00 16:15	A historic overview of <i>Diplodon</i> Spix in Wagner, 1827 taxonomy as a base for future studies	<u>Igor Christo Miyahira</u> ; Maria Cristina Dreher Mansur; Sonia Barbosa dos Santos
16:15 16:30	Molecular phylogenetics and diversification of the Eastern Asian Cyclophoridae (Gastropoda, Mollusca)	Yan-Chen Lee; <u>Wen-Lung Wu</u>
16:30 17:00	Discussion	

- 15:00-17:00 Amphitheater 13 – Symposium X – Eosinophilic meningitis in the Americas
Chair: Robert Cowie
Co-chair: Carlos Graeff-Teixeira

15:00 15:15	Angiostrongyliasis: an emerging infectious disease in the Indo-Pacific, with a focus on intermediate hosts in Hawaii	<u>Robert H. Cowie</u> ; Jaynee R. Kim; Kenneth A. Hayes
15:15 15:30	Epidemiological, clinical and therapeutic aspects of cerebral angiostrongyliasis	Carlos Graeff-Teixeira
15:30 15:45	Global trends associated in angiostrongyliasis: insights about epidemiology, geographic distribution and advances in diagnostics	Alexandre J. da Silva
15:45 16:00	Transmission dynamic of <i>Angiostrongylus cantonensis</i> in <i>Rattus norvegicus</i> naturally infected in the state of Rio de Janeiro, Brazil	Arnaldo Maldonado Júnior
16:00 16:15	Molluscan intermediate hosts of <i>Angiostrongylus cantonensis</i> from Jamaica	<u>John F. Lindo</u> ; Cecelia A. Waugh; Ralph D. Robinson
16:15 16:45	Discussion	

- 17:00-17:30 Coffee Break
- 17:30-19:00 Poster Session II
- 20:00-24:00 Fellowship Dinner



FRIDAY, September 28th

- 09:00-10:00 Amphitheater 11 – Plenary lecture – Dr José Henrique Leal (The Bailey-Matthews Shell Museum) – Museums and Malacological Collections
- 10:00-10:30 Coffee Break
- 10:30-12:30 Amphitheater 11 – Symposium XI Schistosomiasis and other snail transmitted diseases
Chair: Paulo Zech Coelho
Co-chair: Fernando Bezerra

10:30 10:45	Transmission control of schistosomiasis mansoni by introduction of a resistant lineage of <i>Biomphalaria tenagophila</i> (Taim)	Paulo Marcos Zech Coelho
10:45 11:00	Construction of the "Base Line" of the affected municipalities by the San Francisco River Transposition of Waters in Ceara State and its implications on Schistosomiasis mansoni transmission	Fernando Schemelzer Moraes Bezerra
11:00 11:15	Situation of liver fasciolosis In Brazil	Nicolau Maués da Serra-Freire
11:15 11:30	Surveillance and control of intermediate hosts of schistosomiasis in Brazil	<u>Jeann Marie Rocha Marcelino</u> ; Rosa Castália França Ribeiro Soares
11:30 12:00	Discussion	

- 10:30-12:30 Amphitheater 13 – Symposium XII -Museums and Systematic Collections
Chair: Fabrizio Scarabino
Co-chair: Rina Ramírez

10:30 10:45	Scientific value of the Malacological Collection of Museo de la Plata (Argentina) and profiling as a tool for its management	Gustavo Darrigran; Cristina Damborenea; <u>Guido Pastorino</u>
10:45 11:00	The Museum of Natural History of San Marcos University as a center of both research and dissemination of Peruvian biodiversity	<u>Rina Ramírez</u> ; Betty Millán; Gabriela Bertone
11:00 11:15	The malacological collection of the Museo Nacional de Historia Natural (Montevideo): past, present and future	<u>Fabrizio Scarabino</u> ; Cristhian Clavijo
11:15 11:30	Type specimens of molluscs deposited in Museu Oceanográfico "Prof. E. C. Rios" - MOFURG, RS, Brazil	<u>Paula Spotorno</u> ; Isis Torales; Eliézer de Carvalho Rios; Joaber Pereira Jr.
11:30 11:45	Data base from the Malacological Laboratory collection of Museo Nacional de Historia Natural, Chile (MNHNCL)	<u>Sergio Letelier V.</u> ; Sergio Soto-Acuña; Andrea Rebolledo; Pedro Báez
11:45 12:00	Molecular Identification of parasites and vectors of Brazil	Fernando A. Monteiro
12:00 12:30	Discussion	

- 12:30-14:00 Lunch

FRIDAY, September 28th

14:00-15:00 Plenary lecture – Dr Gonzalo Giribet (Harvard University) – Advancing Malacology with the use of transcriptomic data

15:00-17:00 Amphitheater 11 – Symposium XIII – Molluscan Reproduction and Development
Chair: Helena Matthews-Cascon
Co-chair: Pablo Penchaszadeh

15:00 15:15	Evolution of reproductive patterns in marine caenogastropods; the western south atlantic experiment	Pablo E. Penchaszadeh
15:15 15:30	Reproductive patterns in Caenogastropoda and Neogastropoda (Mollusca, Gastropoda) in Northeast Brazil	Helena Matthews-Cascon
15:30 15:45	Spermatozoan ultrastructure, shell features and molecular analysis of <i>Crassostrea</i> cultured in Cananéia, Brazil	<u>Gisele Orlandi Introíni</u> , Dean Medeiros, Stenio Eder Vittorazzi, Luciana Bolsoni Lourenço; Shirlei Maria Recco-Pimentel
15:45 16:00	Temporal variation in gametogenesis and spawning of <i>Limnoperna fortunei</i> (Bivalvia) in the alluvial floodplain of the upper Paraná River (Brazil)	<u>Claudia T. Callil</u> ; Alice M. Takeda; Ana L. T. Gomes; Ana C. M. Pinillos
16:00 16:30	Discussion	

15:00-16:45 Amphitheater 13 – Symposium XIV – Amphitheater 13 – Molluscan as Bioindicators
Chair: Marcos Fernandez
Co-chair: Rebeca Cantinha

15:00 15:15	Endocrine disruption in marine mollusks along the Brazilian coast: recent findings and trends	<u>Marcos A. Fernandez</u> ; Ariane Carneiro Vieira; Camila de Leon Louzada Borges; Igor Araújo Pessoa
15:15 15:30	First record of the imposex and biphallia phenomenon in <i>Heleobia australis</i> (Gastropoda) from South America	<u>Raquel de Almeida Ferrando Neves</u> ; Jean Louis Valentin; Gisela Mandali de Figueiredo
15:30 15:45	Intraspecific variability in penial structure of <i>Heleobia australis</i> population from Guanabara Bay (Brazil)	<u>Raquel de Almeida Ferrando Neves</u> ; Jean Louis Valentin; Gisela Mandali de Figueiredo
15:45 16:00	Study of the protein HSP70 in <i>Biomphalaria glabrata</i> (Say, 1818) snail as a model of environmental biomarker	<u>Rebeca da Silva Cantinha</u> ; Sueli Ivone Borrelly; Nancy Oguiura; Marcela Manente Rigolon; Eliana Nakano
16:00 16:30	Discussion	

16:30-17:30 Movie Exhibition – **Loco Fever** (La fiebre del loco)

16:30-17:00 Coffee Break

17:30-19:30 Student awards disclosure, General Assembly and Closing

POSTER SESSION I

WEDNESDAY - September 26th

Chair: Laura G. Huaquin

Co-chair: Igor Christo Miyahira

Alien Species

ALIEN-01	<u>Aisur Ignacio Agudo-Padrón</u> ; Érico P. Filho; Kay Saalfeld	First confirmed occurrence record of <i>Limnoperna fortunei</i> (Dunker, 1857) in Santa Catarina State, Southern Brazil
ALIEN-02	<u>Anna Carolina P. Guañabens</u> ; Arnaldo Nakamura F ^o ; Renata B. Figueira; João Locke F. de Araújo; Thabata V. L. Azevedo; Eloá N. de A. Teodoro; Matheus de F. D. Miranda; Gabriela R. Andrade; Arthur C. de Almeida; Hernan R. E. Riera; Helen R. Mota; Marcela D. de Carvalho; Antônio V. Cardoso	Characterization of <i>Limnoperna fortunei</i> (Dunker, 1857) byssus by differential scanning calorimetry and optical microscopy
ALIEN-03	<u>Jaqueline Lopes de Oliveira</u> ; Sonia Barbosa dos Santos	Preliminary data on size and sexual maturity of <i>Achatina fulica</i> from Vila Dois Rios, RJ
ALIEN-04	<u>João Locke Ferreira de Araújo</u> ; Arnaldo N. Filho; Hernan R. E. Riera; Arthur C. de Almeida; Gabriela R. Andrade; Renata B. Figueira; Thabata V. L. de Azevedo; Anna C. P. Guañabens; Eloá N. de A. Teodoro; Matheus de F. D. Miranda; Helen R. Mota; Marcela D. de Carvalho; Antônio Valadão Cardoso	Foot surface characterization of the freshwater mussel <i>Limnoperna fortunei</i> (Dunker, 1857)
ALIEN-05	<u>Marcel S. Miranda</u> ; Ivan R. A. Laurino; Timóteo T. Watanabe, José H. Fontenelle; Iracy Lea Pecora	Populational parameters of <i>Achatina fulica</i> Bowdich, 1822 in Ilha Porchat, São Vicente, Brazil
ALIEN-06	<u>Rodrigo Pinheiro Crasto Amaral</u> ; Emanuelle F. Rabelo; Inês X. Martins; Helena Matthews-Cascon; Cristina de A. R. Barreira; Sérgio Mendonça de Almeida	<i>Isognomon bicolor</i> (MOLLUSCA: BIVALVIA: ISOGNOMONIDAE) in the Northeast of Brazil: current bioinvasion situation
ALIEN-07	<u>Rodrigo Borges</u> ; Cássio R. L. Peterka; Andréa A. P. de Castro; Juliane R. L. Viana; Débora S. Bandeira; Marta C. Pinto; Monica A. Fernandez; Silvana Carvalho Thiengo	<i>Achatina fulica</i> in Araguaína as natural intermediate hosts of nematodes of medical and veterinary importance
ALIEN-08	<u>Sthefane D'ávila</u> ; Camilla de M. de Carvalho; Roberta L. Caldeira; Cristiano L. Massara; Liana Janotti-Passos; Omar dos S. Carvalho; Carlota Oliveira; Thays de O. Dias; Ana Carolina R. Lamego; Bianca Sartini; Roberto J. P. Dias	New records of terrestrial and freshwater alien snails in the municipality of Juiz de Fora and Belo Horizonte, Minas Gerais state, Brazil
ALIEN-09	<u>Tomasz Kałuski</u> ; Marianna Soroka	The invasive slug <i>Arion lusitanicus</i> and the native slug <i>Arion rufus</i> in the context of genetic studies in Poland
ALIEN-10	<u>Daniel Pereira</u> ; Isabel C. P. Paz; Andressa S. Souza; Marise T. Suzuki; João L. de Azevedo; Maria C. D. Mansur; Arthur S. de Oliveira; Maria Teresa Raya Rodriguez	Toxicity of <i>Bacillus thuringiensis</i> sv. <i>israelensis</i> commercial products on <i>Limnoperna fortunei</i> (Dunker, 1857) and ecotoxicological indicators
ALIEN-11	<u>Daniel Pereira</u> ; Maria Cristina D. Mansur; Arthur S. de Oliveira; Maria T. R. Rodriguez	Determinant limnological variables of <i>Limnoperna fortunei</i> (Dunker, 1857) population: densities prediction and survival limiting factors

ALIEN-12	<u>Ximena M. Constanza Ovando</u> ; María Gabriela Cuezzo	Anatomical description of <i>Sinotaia quadrata</i> (Benson, 1842): first record of a living viviparid in South América
ALIEN-92	<u>Sergio Letelier V.</u> ; Gonzalo Collado I.; Andrea Rebolledo U.; Pedro Báez R.; Sergio Soto-Acuña; Douglas Jackson S.	Taxonomic identification of a new exotic species for Chile, Laguna Conchalí: <i>Pomacea</i> sp. (Gastropoda: Ampullariidae)

Aquaculture and Fisheries

AQUA-13	<u>Vitor de Souza Ferreira</u> ; Vanessa de M. Ferreira; Marcos Bastos Pereira	Shellfish culture in Sepetiba Bay: challenges with socioenvironmental problems and hazards to public health
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Breeding

BREED-14	Julieta Pujadas; <u>Lucila Prepelitchi</u> ; Cristina Wisnivesky-Colli	Does the presence of conspecific adults influence the embryonic development of <i>Lymnaea columella</i> ?
BREED-15	Ana Lúcia Teixeira Gomes; <u>Vinícius S. C. da Costa</u> ; Cláudia Tasso Callil	Gametogenic activity of golden mussel in the Cais do Porto, Porto Alegre, RS

Conservation

CONSERV-16	Roberto E. Vogler; Ariel A. Beltramino; Juana G. Peso; Carina F. Argüelles; <u>Alejandra Rumi</u>	Concerning genetic lineages and conservation units in <i>Aylacostoma</i> snails from High Paraná River (Argentina-Paraguay)
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Conchology

CONCH-17	<u>Ana Carolina Díaz</u> ; Ariel Beltramino; Roberto Vogler; Stella Maris Martín	Morphometric analysis of <i>Bulimulus bonariensis bonariensis</i> (Rafinesque, 1833) and <i>Bulimulus bonariensis sporadicus</i> (D'Orbigny, 1835) (Gastropoda, Orthalicidae)
CONCH-18	<u>Hilda Raquel Melo da Silva</u> ; Colin Robert Beasley; Claudia Helena Tagliaro; Ismael Sander da Silva Nunes	Habitat characteristics and morphology of two species of bivalves from the Irituia river, Eastern Amazon
CONCH-19	<u>Nicolás E. Tamburi</u> ; Pablo R. Martín	Effects of trophic availability on the shell morphology of the apple snail <i>Pomacea canaliculata</i>

Ecology and Biodiversity

ECO-20	Aisur Ignacio Agudo-Padrón	Continental molluscs occurring in the Santa Catarina's State, Southern Brazil: new contributions to regional inventory
ECO-21	<u>Bruno B. Batista</u> ; Mirgon C. Outeiral; Helena Matthews-Cascon	Reproductive Biology of <i>Octopus insularis</i> Leite & Haimovici, 2008 in Paracuru, Ceará
ECO-22	<u>Cristian Aldea</u> ; Sebastián Rosenfeld; Andrés Mansilla; Jaime Ojeda; Johanna Marambio; Marcela Ávila	Mollusc diversity in natural beds of <i>Gigartina skottsbergii</i> (Rhodophyta) in the Strait of Magellan, Chile
ECO-23	<u>Cristiane Xerez Barroso</u> ; Soraya G. Rabay; Helena Matthews-Cascon; Inês X. Martins; Marcelo de O. Soares	Mollusks of intertidal zone under influence of Terminal Portuário do Pecém, Ceará, NE Brazil

ECO-24	Soraya Guimarães Rabay; <u>Cristiane Xerez Barroso</u> ; Helena Matthews-Cascon	Mollusks of recruitment panels placed on Terminal Portuário do Pecém, Ceará, NE Brazil
ECO-25	<u>Débora de Sousa Bandeira</u> , Cássio R. L. Peterka, Rodrigo Borges, Andrea Azevedo, Juliane L. Reis, Eduardo B. Viana, Marta Chagas Pinto, Monica Ammon Fernandez, Silvana Carvalho Thiengo	Freshwater molluscs from the municipality of Araguaína, Tocantins State, Brazil
ECO-26	André Ampuero; <u>Dominique Maldonado</u> ; Diego Paredes; Sonia Barbosa dos Santos	Malacological freshwater fauna from the Bajo Madre de Dios River Basin, Peru.
ECO-27	<u>Dominique Maldonado</u> ; André Ampuero	Distribution of <i>Melanoides tuberculata</i> and <i>Corbicula fluminea</i> in Peru
ECO-28	<u>Gleisse Kelly Meneses Nunes</u> ; Sonia Barbosa dos Santos	Environmental factors influencing land snail diversity in a protected forest at Ilha Grande, RJ, Brazil
ECO-29	<u>Isabela Cristina Brito Gonçalves</u> ; Igor Christo Miyahira; Luiz Eduardo M. de Lacerda; Renata de F. Ximenes; Sonia Barbosa dos Santos	Interaction between <i>Biomphalaria tenagophila</i> and <i>Melanoides tuberculata</i> during six years on Ilha Grande, RJ, Brazil
ECO-30	Fernando Aneiros; Juan Moreira; <u>Jesús S. Troncoso</u>	Looking for new approaches for understanding the ecology of mollusc assemblages in muddy bottoms
ECO-31	Fernando Aneiros; Juan Moreira; <u>Jesús S. Troncoso</u>	Patterns of temporal variation of the marine soft-bottom bivalve <i>Thyasira flexuosa</i> (Montagu, 1803)
ECO-32	<u>Marcel Sabino Miranda</u> ; Ivan Rodrigo A. Laurino; Timóteo Tadashi Watanabe, José H. Fontenelle; Iracy Lea Pecora	Populational parameters of <i>Megalobulimus paranaguensis</i> (Pilsbry & Ihering, 1900) in Ilha Porchat, São Vicente, Brazil
ECO-33	<u>Renata Maia Ribeiro de Barros Braga</u> ; Igor Christo Miyahira; Luiz Eduardo Macedo de Lacerda; Sonia Barbosa dos Santos	Population dynamics and morphometry of <i>Pisidium punctiferum</i> in Ilha Grande, Rio de Janeiro, Brazil
ECO-34	<u>Selma Patrícia Diniz Cantanhede</u> ; Monica Ammon Fernandez; Silvana Carvalho Thiengo	First report of <i>Plesiophysa guadeloupensis</i> (Mollusca; Planorbidae) in the State of Maranhão, Brazil
ECO-35	<u>Seo Kyoung Park</u> ; Han Gil Choi; Joung-Soon Oh; Sang-Ok Chung; Kyoung-Ho An; Kwang-Jae Park	Primary productivity of microphytobenthos and condition index of <i>Ruditapes philippinarum</i> in Taean Peninsula, Korea
ECO-36	<u>Sérgio Mendonça de Almeida</u> ; Gledson F. A. Ferreira; Cristiane Xerez Barroso	First field record of predation of <i>Didemnum psammatores</i> (Sluiter, 1895) by <i>Lamellaria</i> sp. (Mollusca: Gastropoda: Caenogastropoda)
ECO-91	<u>Claudia Tasso Callil</u> ; Diones Krinski; Fabiana Aparecida da Silva	Synergetic effect of the environmental factors on the larval incubation of <i>Anodontites trapesialis</i> (Unionoida, Mycetopodidae)

Education and Teaching

EDU-37	Maria Eveline de Castro Pereira; <u>Elizangela Feitosa da Silva</u> ; Silvana Carvalho Thiengo; Cintia Moraes Borba	Academic production on malacology education published in proceedings of Brazilian malacology meetings (2001-2011)
EDU-38	Maria Eveline de Castro Pereira; <u>Elizangela Feitosa da Silva</u> ; Silvana Carvalho Thiengo; Claudia Jurberg; Cintia de Moraes Borba	Training specialist in medical malacology: education on biosafety questioning
EDU-39	<u>Patrícia do Socorro de Campos da Silva</u> ; Sonia Barbosa dos Santos; Nina Beatriz Bastos Pelliccione	Concepts of high school students residents in Ilha Grande, Rio de Janeiro, on exotic species

Mollusks as bioindicators

BIOIND-40	<u>Amanda Tosatte Granatelli</u> ; Eliana Nakano; Lenita de Freitas Tallarico	Establishment of the control chart to <i>Biomphalaria glabrata</i> (Mollusca: Gastropoda) using potassium dichromate
BIOIND-41	<u>Fayez A. Bakry</u> ; Hala A. Abdelsalam; Momeana B. Mahmoud; Salwa A. H.Hamdi	Effects of Atrazine and Roundup pesticides on Biochemical and Molecular aspects of <i>Biomphalaria alexandrina</i> snails
BIOIND-42	<u>Sai Malleswar Dharanikota</u> ; Srirama Krupanidhi	<i>Pila globosa</i> (Swainson, 1822): a sentinel organism to monitor climatic stress in the ecosystem

Others

OT-43	<u>Marjorie Cataneo Fernandes</u> ; João Emmanuel Vargas Ventura Vitonis; Flávio Dias Passos; Antônia Cecília Z. Amaral	The Museum of Zoology from UNICAMP (SP, Brazil): improving the scientific collection and training specialists on taxonomy of Mollusca”
OT-44	<u>Vinícius Soares Correa da Costa</u> ; Ana Lúcia Teixeira Gomes; Cláudia Tasso Callil; Celso de Arruda Souza	Malacological Collection from Federal University of Mato Grosso, Cuiabá, Brazil
OT-90	<u>Wen-Lung Wu</u> ; Wen-Cheng Chang	Taiwan Malacofauna Website – Shell, humanity and Database

POSTER SESSION II

THURSDAY - September 27th

Chair: Jesús Troncoso

Co-chair: Cristiane Xerez Barroso

Biotechnology

BIOTEC-45	Ana Rita de Toledo-Piza; Durvanei A. Maria	Clinical evaluation of healing process in mice wound skin treated with <i>Phyllocaulis boraceiensis mucus</i>
BIOTEC-46	Daniela Toma de Moraes; Michel Brienzo; Celso Sant'Anna; Wanderley de Souza	Teredinids cellulolytic enzymes: possible potential uses in biotechnology
BIOTEC-47	Maria Júlia Barbosa Bezerra; Mayara Queiroz de Santiago; Raniere da M. Moura; Bruno A. M. da Rocha; Kyria S. do Nascimento; Benildo Sousa Cavada	Crystallization of a lectin from the mucus of the snail <i>Achatina fulica</i>

Genomics and Genetics

GEN-48	Ariel Aníbal Beltramino; Roberto Eugenio Vogler; Verónica Nuñez; Diego Eduardo G. Gregoric; <u>Alejandra Rumi</u>	Molecular markers in <i>Megalobulimus sanctipauli</i> (Ihering & Pilsbry, 1900)
GEN-49	<u>Ewa Kosicka</u> ; Joanna R Pieńkowska; Andrzej Lesicki	New aquaporin isoform identified in the terrestrial snail <i>Helix pomatia</i> L.
GEN-50	<u>Tatiana Maria Teodoro</u> ; Liana Konovaloff Jannotti-Passos; Omar dos Santos Carvalho; Roberta Lima Caldeira	Study on <i>Biomphalaria amazonica</i> , <i>B. cousini</i> and their hybrids using molecular taxonomy
GEN-51	Elvis Silva Lima; Neidson G. V. Barros; Paulo R. F. Cunha; Claudia H. Tagliaro; <u>Hilda Raquel Melo da Silva</u> ; Nelane do Socorro Marques-Silva	Molecular studies in <i>Mytella guyanensis</i> (Lamarck, 1819): Comparisons between populations of northern coast of Brazil

Morphology

MORPH-52	Vinicius Marques Antunes Ribeiro; <u>Aristeu Silva-Neto</u> ; Luciana Maria Silva; Walter dos Santos Lima	Primary cell culture of tissues from <i>Pseudosuccinea columella</i> , (Say, 1817): preliminary data
MORPH-53	<u>João Emmanuel Vargas Ventura Vitonis</u> ; Cristiane Patrícia Zaniratto; Fabrizio M. Machado; Flávio Dias Passos	Standardization of the nomenclature of the siphonal muscular layers of Tellinidae, based on topological homology
MORPH-54	<u>Luiz Eduardo Macedo de Lacerda</u> ; Sonia Barbosa dos Santos	Comparative morphology among three species of <i>Gundlachia</i> Pfeiffer, 1849
MORPH-55	<u>Mariana Castro de Vasconcelos</u> ; Sonia Barbosa dos Santos	Morfometric variation of <i>Helicina</i> sp. in three localities in Ilha Grande, RJ, Brazil
MORPH-56	<u>Paola Visnardi Fassina</u> ; Paulo Vinicius Ferraz Corrêa; Flávio Dias Passos	Taxonomy; anatomy and distribution of a Chaetodermomorpha (Aplacophora) from Campos Basin, Rio de Janeiro, Brazil
MORPH-57	<u>Paulo Vinicius Ferraz Corrêa</u> ; Paola Visnardi Fassina; Flávio Dias Passos	Morphology; morphometry and distribution of two Chaetodermidae (Aplacophora) from Campos Basin, Rio de Janeiro, Brazil
MORPH-58	Sthefane D'ávila	Morpho-anatomy of the reproductive and renal systems and shell morphology of seven subulinid species (Gastropoda, Pulmonata, Subulinidae)
MORPH-59	<u>Janine Oliveira Arruda</u> ; Gary Barker; José Willibaldo Thomé	Reproductive system redescription and geographical distribution extension of <i>Omalonyx geayi</i> Tillier, 1980 (Gastropoda, Succineidae)

Parasitology

PARAS-60	<u>Alexandra Juhász</u> ; Gábor Majoros	Some observations on epidemiology on lungworm infection of hares
PARAS-61	<u>Alexandra Juhász</u> ; Gábor Majoros	A short review on snails and mussels as vectors of parasitic helminths in Hungary
PARAS-62	Abdel Rahman E. Bashtar; <u>Fayez A. Bakry</u>	Electrophoresis analysis, Biochemical and histological aspects of <i>Bulinus truncatus</i> snails infected with <i>Schistosoma haematobium</i>
PARAS-63	Laura Rocha Guerino; Reinaldo José da Silva; <u>Iracy Lea Pecora</u>	Occurrence of mollusks naturally infected with <i>Angiostrongylus cantonensis</i> in Santos's urban region, São Paulo State/Brazi
PARAS-64	Laura Rocha Guerino; Reinaldo José da Silva; <u>Iracy Lea Pecora</u>	Occurrence of <i>Achatina fulica</i> naturally infected with <i>Angiostrongylus cantonensis</i> in Santos's urban region, São Paulo state/Brazil
PARAS-65	<u>Juçara de Souza Marques</u> ; Pedro Paulo de A. Manso; Sthefane D'ávila	New morphological description of <i>Brachylaemus mazzantii</i> (Trematoda: Brachylaemidae) based on confocal laser scanning microscopy
PARAS-66	<u>Lângia Colli Montresor</u> ; Cynthia Paula Andrade; Lanuze Mozzer; Ester Mota; Marcelo Pelajo-Machado; Walter dos Santos Lima; Teofânia Vidigal	Comparative analysis of mollusks hemocyte response after <i>Angiostrongylus vasorum</i> experimental infection
PARAS-67	<u>Liana Konovaloff Jannotti-Passos</u> ; Tatiana Maria Teodoro; Roberta Lima Caldeira; Omar dos Santos Carvalho	The resistance of <i>Biomphalaria tenagophila</i> (Mollusca: Gastropoda) of Espírito Santo state to <i>Schistosoma mansoni</i> infection
PARAS-68	<u>Ludmila Nakamura Rapado</u> ; Lydia F. Yamaguchi; Massuo J. Kato; Alessandro de S. Pinheiro; Eliana Nakano	Obtention an evaluation of Piper compounds in biological models to <i>schistosomiasis mansoni</i> control
PARAS-69	<u>Mariana Silva Sousa</u> ; Gabrieli da Penha Bezerra; Joames Kauffmann Freitas Leal; Jarbas Lima de Carvalho; Nirla Rodrigues Romero; Fernando Schemelzer de Moraes Bezerra	Molluscicidal activity of <i>Hymenaea courbaril</i> L. against <i>Biomphalaria glabrata</i> , intermediate host of <i>Schistosoma mansoni</i>
PARAS-70	<u>Rodrigo Borges</u> ; Cássio R. L. Peterka; Andréa A. P. de Castro; Juliane R. L. Viana; Débora S. Bandeira; Marta C. Pinto; Monica A. Fernandez; Silvana C.Thiengo	First report of <i>Aelurostrongylus abstrusus</i> (Railliet; 1898) larvae infecting <i>Achatina fulica</i> from Araguaína, Tocantins, Brazil.
PARAS-71	Monica Ammon Fernandez; Eduardo Faraj Delmas; <u>Sergio Pereira Cunha</u> ; Cristina M. Giordano Dias; Marcelo Guarilha de Moraes; Igor T. Carvalho; Marcio da Silva Barbas; Silvana Carvalho Thiengo	Freshwater malacological survey in the municipality of Cantagalo, Rio de Janeiro state, Brazil
PARAS-72	<u>Vanessa Barreto Xavier</u> ; Hécio Resende Borba; Solange Viana Paschoal Blanco Brandolini	Chronic effects of aqueous extracts of <i>Solanum lycocarpum</i> in <i>Biomphalaria glabrata</i>

Physiology and Pathology

PHYS-73	<u>Ana Paula M. Oliveira</u> ; Silvana Thiengo; Andrea Natividade; Arnaldo Maldonado Jr; Juberlan S. Garcia; Ester Mota	Histological aspects of <i>Achatina fulica</i> experimentally infected with the nematode <i>Angiostrongylus cantonensis</i>
PHYS-74	<u>Hélio R. Alves</u> ; André W. V. Masseur Jr; Patrícia Golo; Vânia R.E.P. Bittencourt; Jairo Pinheiro	Changes in lipid content of <i>Bradybaena similis</i> (Férussac, 1821) infected with <i>Eurytrema coelomaticum</i> (Giard et Billet, 1892) Looss, 1907
PHYS-75	<u>Hélio R. Alves</u> ; André V. Masseur Junior;	Changes in the contents of organic acids

	Luiza D' Oliveira Sant'Ana; Rosane N. Castro; Jairo Pinheiro	<i>Bradybaena similaris</i> (Fèrussac, 1821) infected <i>Eurytrema coelomaticum</i> (Giard et Billet, 1892) Looss; 1907
PHYS-76	<u>Marcela Manente Rigolon</u> ; Rebeca da Silva Cantinha; Nancy Oguiura; Sueli Ivone Borrelly; Eliana Nakano	Sublethal stimuli induce resistance to cadmium and heat in <i>Biomphalaria glabrata</i> (Say, 1818) snails

Reproduction and Development

REP-77	<u>Amanda Bonini</u> ; Gisele Orlandi Introíni; Lenita de Freitas Tallarico; Fabrízio Marcondes Machado; Flávio Dias Passos; Shirlei Maria Recco-Pimentel	Spermatozoon ultrastructure of <i>Solen tehuechus</i> (Bivalvia, Solenidae)
REP-78	<u>Ariane Campos</u> ; Gisele Orlandi Introíni; Lenita de Freitas Tallarico; Flávio Dias Passos; Fabrízio Marcondes Machado; Shirlei M. Recco-Pimentel	Spermatozoon ultrastructure of <i>Diplodonta punctata</i> Say, 1822 (Mollusca: Bivalvia)
REP-79	<u>Ariane Carneiro Vieira</u> ; Fernando Luiz T. Bastos; Plínio Bueno Andrade Silva; Vitor Hugo de Souza Coutinho; Alexandre R. de Freitas; Marcos A. Fernandez	Contamination of mussels <i>Perna perna</i> on the south coast of the state of Rio de Janeiro – RJ: a possible danger to human health?
REP-80	<u>Ee-Yung Chung</u> ; Jae Seung Chung; Je- Cheon Jun	Oogenesis; Oocyte Degeneration and the Function of Follicle Cells in <i>Macra chinensis</i> Philippi, 1846
REP-81	<u>Ee-Yung Chung</u> ; Jin-Hee Kim; Jae Seung Chung; Ki-Young Lee	Spermatogenesis and Taxonomic Values of Sperm Morphology of <i>Atrina pectinata</i> (Pteriomorpha: Pinnidae)
REP-82	<u>Lucila Prepelitchi</u> ; Julieta Pujadas; Cristina Wisnivesky-Colli	Survival, fecundity and fertility of <i>Lymnaea columella</i> , intermediate host of <i>Fasciola hepatica</i> in northeastern Argentina
REP-83	<u>Renata de Freitas Ximenes</u> ; Igor Christo Miyahira; Sonia Barbosa dos Santos	Reproduction and parasitism of <i>Melanoides tuberculata</i> from Vila do Abraão; Ilha Grande, RJ, Brazil

Systematics (Taxonomy and Phylogeny)

SYS-84	<u>Aline Gondat Schilithz</u> ; Kenneth Hayes; Helene Barbosa; Silvana Carvalho Thiengo	Taxonomy of <i>Asolene meta</i> (Ihering; 1915) and <i>Asolene spixii</i> d'Orbigny; 1838 (Gastropoda: Ampullariidae)
SYS-85	<u>Cristian Aldea</u> ; Sebastián Rosenfeld; Andrés Mansilla; Jaime Ojeda; Johanna Marambio; Marcela Ávila	First inventory of Chilean molluscs housed at the Maggiorino Borgatello Museum (Punta Arenas; Chile)
SYS-86	<u>Fabrízio Marcondes Machado</u> ; Flávio Dias Passos	The importance of histology in the description of a new Brazilian microbivalve species of Cyamiidae
SYS-87	<u>Jéssica Beck Carneiro</u> ; Igor Christo Miyahira; Sonia Barbosa dos Santos	Morphometry as a tool in discrimination of <i>Diplodon</i> species (Unionoida, Hyriidae)
SYS-88	<u>Lenita de Freitas Tallarico</u> ; Gisele Orlandi Introíni; Flávio Dias Passos; Luciana Bolsoni Lourenço; Shirlei Maria Recco- Pimentel	Phylogenetic analysis of the Superfamily Tellinoidea (Mollusca: Bivalvia) based on partial mitochondrial gene sequences
SYS-89	<u>Leonardo Santos de Souza</u> ; Carlos Henrique Soares Caetano	Shell morphometry in Scaphopoda (Mollusca): discrimination power at species and genera level

PLENARY LECTURES



Advancing malacological research: crossing boundaries to have a broader impact

Robert H. Cowie

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In the past, people who labeled themselves malacologists were often museum taxonomists or researchers asking questions that address only the molluscs themselves, rather than using molluscs to ask more profound general questions of ecology, evolution, biogeography, etc. By definition, ‘Applied Malacology’ asks questions about molluscs not just for their own sake but in a context primarily of their role in impacting human welfare. Increasingly, these artificial boundaries are breaking down and many modern biologists working on molluscs do not see themselves as ‘malacologists’ but ‘evolutionary ecologists’, ‘biogeographers’, ‘invasive species biologists’. No longer do they target the malacological journals for their best publications but try to reach a broader audience. At the same time, malacological societies have declining membership and malacological meetings have declining attendance. Often, traditional malacologists bemoan these declines as well as the decline in grant support for purely malacological research with no broader implications. The US National Science Foundation has, as one of its two criteria for evaluating grant proposals ‘Broader Impacts’. Without significant broader impacts a grant proposal will fail. There is no question that, with some notable exceptions, molluscs do not get the research attention or funding that they deserve, be it as agricultural or environmental pests, parasite vectors, key players in ecosystems or as models in evolutionary biology. At the same time as we should be publishing in wide-reaching journals, there is also a clear trend for integration across traditional disciplines. My own research on Hawaiian land snail diversity, evolution and conservation, on invasive species that are replacing native biodiversity, agricultural pests and human disease vectors, and the role of molluscs in ecosystems, cross many boundaries. Yet traditional ‘Malacology’, especially taxonomic research, is critical; there are probably thousands of undescribed molluscs. And malacological publications and conferences remain important.



Quantitative variation and evolution of chirality in pulmonate snails

Takahiro Asami

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The polarity of left-right asymmetry that appears in early development (primary asymmetry) corresponds to that of visceral asymmetry in the Bilateria. This polarity can be reversed by mutation. However, few populations or species are fixed for polarity reversal. This homochirality in primary asymmetry suggests the general presence of mechanisms which eliminate mutants with reversed polarity. However, few studies have sought to answer why the left-right polarity of development is generally conserved. In gastropods that need to copulate for reproduction, physical difficulty in mating with the wild type selects against reversed mutants. This is supported by a fact that reversed species have more frequently evolved in snail groups that experience less difficulty in mating between the morphs of chirality. If positive frequency-dependent selection for the more frequent morph resulting from the difficulty of interchiral mating is only responsible for polarity conservation in snails, the evolution of reversal should be more enhanced in externally-fertilizing groups which need no copulation. However, the opposite is the case; almost all reversed species of snails internally fertilize. Our study suggests that the puzzle of frequent evolution of left-right reversal in internally-fertilizing gastropods may provide an avenue to understand the animal rule of homochirality. Most metazoans including spiralian are markedly different from coiled gastropods by being basically symmetric in their external body plan, and so their left-right reversal would not significantly affect their external functions. Moreover, reversed variants mate with the wild type with little difficulty by external fertilization or copulation with genitalia located close to the midline. Accordingly, unlike those in internally fertilizing snails, reversed variants in many metazoans should experience little exogenous advantage or disadvantage for surviving predation or copulation, regardless of their frequency. Therefore, they may only be eliminated by purifying selection, which our study shows in snails, but cannot be positively selected.



Malacological Research, Publications, and Ethics

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Malacological research is multinational in nature, and traditionally the outlets for the results of these various scientific endeavors are through research papers published in scientific journals—malacological journals—or in other less subject-restricted scientific journals, or in institutional publications. Examples of these malacological journal outlets are *Malacologia*, *Malacological Review*, *Archiv für Molluskenkunde*, *American Malacological Bulletin*, *Basteria*, *Bollettino Malacologico*, *Bulletin of the Russian Far Eastern Malacological Society*, *Comunicaciones Sociedad Malacologica del Uruguay*, *Haliotis*, *Iberus*, *Journal of Conchology*, *Journal of Shellfish Research*, *Korean Journal of Malacology*, *Mollusca*, *Molluscan Research*, *Novapex*, *Ruthenica*, *Schriften zur Malakozoologie aus dem Haus der Natur–Cismar*, *Soosiana*, *The Nautilus*, *Triton*, *Veliger*, *Venus*, and *Walkerana*, to give a partial list. Examples of non-journal institutional publications are *Miscellaneous Publications of the Museum of Zoology, University of Michigan*; *Proceedings of the Academy of Natural Sciences of Philadelphia*; publications of the Zoological Institute of the Academy of Sciences of the U.S.S.R.; publications of the Museu de Zoologia Universidade de São Paulo; *Occasional papers on Mollusks of the Museum of Comparative Zoology, Harvard University*; *Smithsonian Contributions to Zoology*; *Smithsonian Contributions to Paleobiology*; etc. Now, in addition to the normal venue for publication, *i.e.*, reviewed scientific journals—there are those non-traditional outlets enhanced by the worldwide web, *e.g.*, blogs, Twitter, etc., that are not peer reviewed, or open to editorial modification of unethical comments (*e.g.*, unsavory personal attacks on other malacologists). Unethical behavior is evident in other practices, *e.g.*, surveying non-marine molluscan faunas by foreigners without providing local institutions with adequate samples of the specimens collected—even though in some cases local institutions were funding the surveys. And then there is plagiarism, *i.e.*, taking other author’s published sentences, paragraphs or illustrations without permission, and not giving proper credit, *i.e.*, the theft of other’s work and presenting it as one’s own.



***In vitro* culture of freshwater pearl mussel from glochidia to adult**

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The culture of freshwater pearl mussels is divided into three steps, i.e. glochidia, juveniles and adults. Juvenile have been successfully cultured in the laboratory by attaching glochidia to fish until they could transform into the early juvenile stage. Furthermore, sterilized artificial media could be utilized for the culture of glochidia (to bypass the parasitic stage); the progress of this technique can be succeeded. Concerning *in vitro* culture of mature glochidia, they were cultured in artificial medium containing 10 ml of M199 medium, carp plasma (*Cyprinus carpio*), and antibiotics/antimycotic (100 µg/ml carbenicillin, 100 µg/ml gentamicin sulphate, 100 µg/ml rifampin, and 5 µg/ml amphotericin B) at a ratio of 2:1:0.5 (v/v/v), respectively. Approximately 5,000-6,000 mature glochidia were cultured in each dish under sterile conditions. Culture dishes were placed in a plastic box and incubated with a constant supply of air with 5% CO₂ at 25°C and ambient humidity. Culture of juvenile stage could be divided into 3 stages, namely first stage beginning from 0 days old juvenile until completely closed two shells mussel by closed recirculating aquaculture system. This system comprised of three filter cabinets (particulate filter cabinet, macrophytes filter cabinet and biological filter cabinet), one water resting cabinet and nine plastic culture units. Juveniles were fed twice daily (at 06:00 and 18:00 h) with a combination of *Chlorella* sp. and *Kirchneriella incurvata* in a ratio of 1:1 at a concentration of 1×10^5 cells/ml. Second stage, juveniles were transferred to culture units (width × length × height × water level = 50 × 100 × 120 × 80 cm) by recirculating aquaculture system. In this system, water flowed from an earthen pond through a sub-sand filter which cabinet floor contained a 6-mm-thick acrylic sheet bored with 3-mm-diameter holes all over the sheet. The upper shelf was filled with coarse sand (>4 mm grain size) at about 5 cm thick. Water flowed underneath the acrylic sheet from the cultured unit back to the earthen pond. Water was pumped from an earthen pond of about 2 acres, with water flowing at a rate of 3 L/min with 24 h air flow. Juveniles were released at 2,000 juveniles (0.4 juveniles/cm²). They were allowed to feed freely on natural food. Third stage, juveniles were transferred to culture into natural habitat or the earthen pond in a cylinder net cage (diameter 50 cm × height 50 cm) until adult. The net cage was hung under the raft at 1.5- 2 m deep from water surface which phytoplankton was plenty at this level. The cage was shaken every week for protecting biofouling attachment which could mass mortality. Then, adult mussels were sexed by microscopic observation of sperm and eggs in fluid removed from gonads with a sterile syringe. Female and male adult mussels were cultured together at a ratio of 1:1 in a cylinder net cage. At present, some freshwater mussel glochidia have been successfully cultured in artificial media could develop to adulthood as well as inducing gonadal development to sexual maturity and the marsupia could develop, namely *Hyriopsis (Limnoscapha) myersiana*, *H. (Hyriopsis) bialata* and *Chamberlainia hainesiana*.



The official USDA response to invasive pest snails in the USA: two recent case studies

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The Animal and Plant Health and Inspection Service (APHIS), part of the United States Department of Agriculture (USDA), together with the Department of Homeland Security (DHS), are tasked with the prevention of the introduction of agricultural and environmental pests into the USA. The responsibility to mitigate the risk of pest and disease introductions while adhering to obligations under international trade agreements is undertaken by the division of Plant Protection and Quarantine (PPQ). The agency uses a wide array of aggressive exclusion policies to prevent the introduction of potential pests. If a pest successfully penetrates established quarantine barriers, USDA APHIS PPQ then initiates measures to prevent the establishment of the pests, while minimizing the impact on native species and the environment; these can be very costly but the economic and environmental damage would be invariably far greater and usually irreversible if these measures were not applied. The recent introductions of two invasive snail species, *Lissachatina fulica* (Bowdich, 1822) and *Xerolenta obvia* (Menke, 1828) into the USA have triggered immediate and coordinated mobilization of resources and close cooperation between the federal, state and local authorities to apply a number of integrated methodologies. These include manual collection, the application of molluscicides that are relatively environmentally neutral and that minimally affect non-target species, and most importantly, various forms of public outreach.



Neglected diseases: contributions from the continental malacology

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Neglected tropical diseases (NTD), many parasitic, are prevalent in poor populations (with low or medium-low income) from rural areas and suburban neighborhoods which have little access to health services. NTD affect more than 100 million people worldwide. Children are the most vulnerable group, and they can suffer permanent disability, and even death. Poor water management, bad housing and sanitation conditions increase the likelihood of NTD transmission, including: dengue, Chagas, trypanosomiasis, leishmaniasis, trematodiasis, schistosomiasis, fasciolosis and helminthiasis. Comprehensive actions are required, as: supply of medicines, vector control, and preventive education (which reduce prevalence); and also improvement of access to water and sanitation services (e.g. wastewater, waste disposal). Schistosomiasis, fasciolosis and other helminthosis have increased their infective focus. Because of the association with other diseases, parasites cause 50% of world's deaths among immunodeficients. The prevention and control of neglected diseases require an integrated multidimensional multi-disease approach, with actions, initiatives and interventions aimed at reducing their negative impact on health, and in economic and social welfare; including a restructuring of international policy concerning drugs production and distribution, as well as community-based preventive actions. Continental mollusks serve as intermediate hosts of parasites affecting humans, production animals and pets. The development and updating of databases is essential for establishing local monitoring programs, identifying species groups of biomedical importance, and for contributing to the biodiversity knowledge, the assessment of regional fauna status -habitats and endangered species-, and for identifying exotic and invasive species introductions. The information generated allows planning and developing strategies for prevention and epidemiological control of established endemic diseases, either local or mobilized from different regions of Latin America or other continents. The Argentine Northeastern Region (NEA) presents areas of high species richness and diversity of mollusks, as well as diverse aquatic environments, constituting one of the pathways for austral spreading of these diseases.



Museums and Malacological Collections

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The author presents an overview of natural history collections (with an emphasis on mollusks), their origins, history, and how they eventually evolved to become an integral and much-needed component of modern life sciences. Although the formal study of natural sciences in Western Civilization dates back at least 2,400 years with the works of Plato and Aristotle, the formal and more extensive collecting of animals and plants only gained momentum with the inception of the “discovery” (=expansion) voyages in the 15th Century. The resulting “cabinets of wonders” of renaissance nobility in Europe, containing minerals and the remnants of animals and plants from distant lands, ultimately developed into the early institutional natural history collections. As the major branch of natural history evolved into biological science in the past two centuries, collections changed from simple assemblages of exotic life forms to become veritable reference libraries of natural specimens. Today, collections are increasingly regarded as depositories of crucial data on biodiversity through space and time and, potentially, of environmental change. There is also ample recognition for the value of collections in education in natural history museums and other institutions. The speed at which contemporary faunal inventories, studies in molecular biology, and biological research in general are generated presents challenges for the use of collections by, on one hand, malacologists who are not systematics-oriented, and, on the other hand, mollusc curators and collection managers. One of these challenges is the much-desired deposition of voucher specimens in institutional collections by ecologists, molecular biologists, geneticists, and researchers in other fields of science. The presentation includes discussions on technologies such as georeferencing, high-resolution imagery, barcodes, and issues specific to malacological collections and their future.



Advancing Malacology with the use of transcriptomic data

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Resolving long-standing phylogenetic and other evolutionary, functional and biological questions has been recently facilitated by the availability of genomic tools and the rapid development of next-generation sequencing techniques. Obtaining transcriptomic data of an array of non-model molluscs is now feasible for large numbers of species. We use such transcriptomic data to infer the phylogenetic history of the molluscan classes, perhaps one of the most recalcitrant animal phylogenetic questions. Here the phylogenetic relationships of molluscs to other spiralian phyla and the relationships among the molluscan classes are discussed using phylogenomic techniques. In addition, the new transcriptomic data can be used to understand key transitions in molluscan evolution, such as the acquisition and multiple losses of shells, or to investigate aspects of direct human relevance such as human developmental deficiencies, aquaculture or molluscan-transmitted diseases.



SYMPOSIUM I
MEDICAL MALACOLOGY



Control of paragonimiasis in Colombia, snail or crab?

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In control and prevention of schistosomiasis and fascioliasis is important the monitoring of the host mollusk. Control of paragonimiasis in Colombia emphasizes the management of crustaceans, second intermediate hosts. Paragonimiasis is a zoonosis caused by trematodes of the genus *Paragonimus*, this affects humans and animals in Africa, Asia and the Americas. The life cycle includes a mollusk and a crustacean as intermediate hosts and a wild or domestic mammal as definitive host. Humans usually become infected by eating raw or undercooked crustaceans, contaminated with parasites. Since 1981 cases of paragonimiasis have been registered in Colombia, especially in the department of Antioquia, where epidemiological studies have been conducted after diagnosis of patients. Both patients and studies are limited, because people do not have easy access to diagnostic centers. About mollusc hosts, in Antioquia have reported two morphotypes of Hydrobiidae, *Aroapyrgus colombiensis* and *Aroapyrgus* sp., with natural infestation. These are characterized by having an amber shell, and height less than 4 mm. Moreover, a study about the species of crabs of this department and its performance as intermediate hosts of *Paragonimus*, showed the highest distribution of the parasite and the low specificity of this by the second intermediate host. All above suggests designing control strategies to prevent paragonimiasis in local educational institutions, through which the community recognizes crabs and make a proper management of them. These programs do not include the snail host of *Paragonimus*, because of the difficulty to find it in their biotope.



Physiological changes in molluscs in response to trematode and nematode infections

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The molluscs, are an important group of organisms, once they are used as intermediate hosts in the larval development of all trematodes and some nematodes, which can infect humans, causing different types of diseases, as schistosomiasis and angiostrongyliasis. In our research group, we have analyzed the different physiological responses that occur in molluscs as a result of infection with larval trematodes and nematodes, using mostly the models *Echinostoma paraensei*/*Biomphalaria glabrata* and *Angiostrongylus cantonensis*/*B. glabrata*, and focusing on changes in the carbohydrates metabolism, nitrogen products of excretion and activity of enzymes involved in these metabolic pathways. Through years of studies, we observed the use of carbohydrates as primary energy source to ensure the maintenance of basal metabolism of the snails host and the larval intramolluscan development. However, as the moluscs very precisely regulate the glucose level in hemolymph, in response to this physiological stressor, they begin to use the deposits of carbohydrates stored as glycogen, mainly in the digestive gland, and to a lesser extent in the cephalopodal mass. But the terrestrial molluscs tend to use carbohydrates more extensively than those aquatic. Following the depletion of the glycogen stores, the snails begin to mobilize alternative sources for energy, this time, amino acids and proteins are degraded to, through gluconeogenesis, give rise to carbon skeletons that will generate new molecules of carbohydrates. At this point, we observe that the freshwater molluscs, proportionately, store less glycogen than the terrestrial molluscs and that, under conditions of stress, initiate the mobilization of proteins and amino acids much faster than the terrestrial molluscs. As a result of the use of nitrogenous substrates the excretory metabolism is altered, in terrestrial molluscs there is elevation of uric acid excretion, resulting in a change in the excretory pattern from ureotelic to uricotelic, the opposite occurring in aquatic molluscs.



**Distribution of *Lymnaea* Lamarck, 1799, intermediate host of
Fasciola hepatica Linnaeus, 1758 in Brazilian territory**

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Fasciolosis is a parasitic disease of medical importance for both humans and animals. The most critical areas where human fasciolosis represents a health problem are located in the North of Africa, Iran, Eastern Europe² and in Latin America. Snails of the genus *Lymnaea* act as intermediate hosts in the biological cycle of the trematode *Fasciola hepatica*, etiological agent of fasciolosis. The purpose of the present work was to update and map the spatial distribution of the intermediate host snails of *F. hepatica* in Brazil. Data on distribution of lymnaeids species were compiled from the Collection of Medical Malacology (Fiocruz-CMM, CPqRR) and through systematic surveys in literature. Lymnaeids snails were reported in 386 municipalities and 1 ecological reserve (Taim/RS) of 15 states, which corresponds to 6.9% of all municipalities in Brazil. Our maps of the distribution of lymnaeids snails shows that, *Lymnaea columella* is the most common species and it is widely spread in the South and Southeast with few records in the Midwest, North and Northeast regions, this species was reported in 380 (98.4%) municipalities. The distribution of the *L. viatrix*, *L. cubensis* and *L. truncatula*, showed a few records in the Southeast region, these species were reported in 10 (2.6%), 6 (1.6%) and 3 (0.78%) municipalities, respectively. Also, in the South region there are few records for *L. viatrix*, and one record of *L. rupestris* (0.26%). Our findings results in the first up to date map of the spatial distribution of *Lymnaea* species in Brazil and that might be useful to better understand the fasciolosis distribution and delineate priority areas for control interventions.



An exotic *Schistosoma* species in Central Europe: what are their intermediate snail hosts?

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The mammalian blood-fluke, *Schistosoma turkestanica* (syn. *Orientobilharzia turkestanica*) was discovered in red deer (*Cervus elaphus*) in a limited area of Hungary, Central Europe. This fluke had been thought to be a native Asian species, and no other mammalian blood-flukes had been known in Europe so far, the discovery caused a surprise. The close relationship of *S. turkestanica* to the human schistosomes is evident as the cercariae are able to penetrate human skin, causing the inflammatory condition cercarial dermatitis, which is now considered to be a zoonosis of public health concern in parts of Southern, Central and Western Asia. In Asia, *S. turkestanica* usually parasitizes horned ruminants (buffaloes, cattle, sheep), however to date in surveys from Hungary it has only been found in antlered game. Its larvae develop in the snail *Radix auricularia* in Hungary as in most parts of Asia. However, *R. auricularia* is not a very common species in Hungary and lives in marshy lakes and, to date, no other lymnaeid snails have been found that are able to transmit *S. turkestanica*. Mitochondrial DNA sequences of the Hungarian *S. turkestanica* indicate that the parasite has been living in Central Europe for a very long time and represents a very separate lineage to the Asian populations. They retained their original intermediate host in the new continent, but they found a new definitive host. It is unlikely that Hungarian *S. turkestanica* would be unable to infect horned ruminants, but *R. auricularia* snails only occupy a few natural foci which would restrict them to only encounter deer. This illustrates the parasite's high fidelity to its intermediate host and the adaptability to widen definitive host range. This situation resembles other fluke populations such as South American *Fasciola hepatica* only parasitizing the snail species *Galba truncatula* but establishing and maturing infections in llamas and guanacos as definitive hosts rather than cattle and sheep.



Control of *Schistosoma mansoni* in Dhofar, Sultanate of Oman

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Dhofar Province, the southern region of Oman, is affected annually by the summer monsoon during June to August. This region has numerous springs and fresh water bodies that favour the development of *Biomphalaria pfeifferi*. Although schistosomiasis was never a major health problem in Dhofar, a few endemic human cases were reported 32 years ago. An integrated control programme including treatment with Praziquantel, mollusciciding with Bayluscide, education and putting-up of cautionary notice boards seemed to be effective as no indigenous cases of schistosomiasis were detected during 1991 to 1995. However, during September to November 1999, few human cases of autochthonous schistosomiasis *mansoni* from Dhofar were diagnosed at Sultan Qaboos University Hospital. Parasitological and serological surveys among school children showed that *S. mansoni* occurs in Dhofar with very focal distribution (0.7 to 12.9 %) egg excretors and (3 to 43 %) seropositive in four localities. Five surveys were conducted in order to collect and screen *B. pfeifferi* from 28 fresh water bodies. The snail *B. pfeifferi* is ubiquitous in Dhofar. Snails naturally infected with *S. mansoni* were collected during each of four surveys, and three natural transmission sites were identified for the first time in Dhofar. The chronobiology of the Dhofari parasite identified two chronotypes of *S. mansoni* (diurnal and nocturnal). *Rattus rattus* was found naturally infected with *S. mansoni*. Using Random Amplified Polymorphic DNA (RAPD) technique and the cytochrome-c oxidase-1 gene sequencing, the nocturnal chronotype from Dhofar was identified as *S. mansoni*. Other five digenean parasites were detected in the snails. Education, serological screening, treatment with 60mg/kg, regular search for potential transmission sites and vigilant surveillance of schistosomiasis infections for the coming 6-8 years were proposed for control.



***Aelurostrongylus abstrusus* larvae (Nematoda; Metastrongyloidea) in
Achatina fulica from Brazil: current situation**


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Aelurostrongylus abstrusus (Railliet, 1898) is a nematode parasite of the lungs of domestic felids. The life cycle involves birds, reptiles, frogs, wild rodents and other small mammals acting as paratenic hosts and, several species of molluscs as intermediate hosts, including the African snail *Achatina fulica* Bowdich, 1822. As the infection caused by *A. abstrusus* seldom presents symptoms, it is probable that the infection is more frequent than the disease. Thus, the prevalence of this parasitosis is strongly associated with occurrence of appropriate intermediate and paratenic hosts. This paper deals with the current situation of the distribution of *A. abstrusus* in specimens of *A. fulica* in Brazil, based on material sent to the Laboratório de Referência Nacional em Malacologia Médica - IOC/FIOCRUZ and the literature. The snails were artificially digested by HCL 0,7% solution and the recovered third stage larvae of nematodes were examined under microscope for morphological diagnostic. From the 4.592 examined specimens of *A. fulica* from 12 Brazilian States, 89 (1.94%) were infected by *A. abstrusus* in nine States: Mato Grosso do Sul, Roraima, Amapá, Rio Grande do Norte, Santa Catarina, Paraná, Bahia, Pernambuco e Piauí. Co-infection with other nematodes was observed: *Rhabditis* sp., 36 specimens (0.78%); *Strongyluris* sp., 6 (0.13%); other metastrongylids, 16 (0.35%); and *Rhabditis* sp. and *Strongyluris* sp., 2 (0.04%). Elurostrongyliasis occurs in different countries with different climate and there is no evidence of sazonality or preference for age and sex of the definitive host. Although known as a parasitosis of low frequency the infection seems to be common in Brazil as *A. abstrusus* was observed in 17 out of 26 Brazilian States (Amazonas, Rio de Janeiro, Minas Gerais, Espírito Santo, Goiás, Mato Grosso, Sergipe and São Paulo, in addition to the nine ones above cited). We point out the importance of stool examination in the routine of pet clinical and services in order to detect *A. abstrusus* and control elurostrongyliasis as well as actions aiming to control *A. fulica* spread in Brazil.

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A close-up photograph of a mollusk's siphon and foot. The siphon is a long, translucent, light blue structure with fine longitudinal ridges. The foot is a shorter, thicker, yellowish-orange structure with a textured surface. Both are attached to a common base.

SYMPOSIUM II
SYSTEMATIC, TAXONOMY AND
ANATOMY OF MARINE MOLLUSKS

The bivalve genus *Dilemma* (Bivalvia: Septibranchia): bizarre clams hint at hidden deep-sea diversity

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In 2008, the author described the unusual bivalve genus *Dilemma*. The original description included two new species (from deep-water sites off Florida and Vanuatu) and the re-allocation of a previously described species from New Zealand to the new genus. Since then, the author collaborated on the description of yet another species from off Japan and a fifth, unnamed species has been found off SE Brazil. Atypical shell symmetry and form are the most striking features of *Dilemma*: There is strong antero-posterior compression and lateral expansion associated with rotation of dorso-ventral axis so that it is at about 30° to the antero-posterior axis. Its gross anatomy indicates that *Dilemma* falls within the septibranch family Poromyidae. Presence of ostracods and isopods in the digestive tracts of individuals of the two live-collected species (Florida and Vanuatu) is evidence that they are micropredators. The live-collected specimens were found attached to volcanic boulders by a robust byssus indicative probable attachment for life. Despite a lack of understanding of the precise means of prey capture, it is clear that the new taxon represents a rare instance of predation on motile invertebrates by a byssally attached mollusk. Given that chance encounters alone with motile prey might not provide sufficient nourishment for a sessile predator, it is possible (although supporting data are currently lacking) that representatives of the new taxa could use physical or chemical attractants to increase number of encounters and facilitate the entrapment of prey. That such an unusual body plan and mode of life in a marine mollusk with very broad geographic distribution was only discovered as recently as 2008 hints at the limited extent of our knowledge and the need for improvement in our methods of sampling deep-sea biota.



Taxonomic revision of the genus *Phyllaplysia* P. Fischer, 1872 from Western Atlantic

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The species of the genus *Phyllaplysia* P. Fischer, 1872 are poorly known and difficult to identify, in part because many species are based on descriptions of preserved animals, or with single diagnostic feature as “green”. Another problem is that many authors consider that species of *Phyllaplysia* lack a vestigial shell, while those of similar genus, *Petalifera* Rang, 1828, possess it. Living under algae on tidal level up to 5 m depth around the world, the genus possesses few species (~7 spp.). Actually just two species are known in the Western Atlantic, *P. engeli* Marcus, 1955 originally from Southeastern of Brazil; and *P. smaragda* Clark, 1977 off Florida, USA. As part of a larger project on the phylogeny of the Order Aplysiomorpha, a detailed morphological study of four species of genus *Phyllaplysia* is provided. Samples of different regions of Brazilian coast reveal the endemism of *P. engeli* to Southeastern Atlantic and the presence of three new species, one to same place and other two to Northwestern coast. These species are quite different by many aspects of their morphology, as a oval shape of body, absence of a flap in the penis tip, gonad lobate, hermaphroditic atrial enclosed in the wall cavity and statocysts visible above pleural ganglion, characters shared with *P. engeli* and *Phyllaplysia* sp.2; and long shape of body, presence of a flap in the penis tip, gonad compacted, hermaphroditic atrial gland free and pleural ganglion covering the statocysts, characters shared with *P. smaragda* and *Phyllaplysia* sp.1 and *Phyllaplysia* sp.3. The present study goal to bring new aspects of their morphology that could be important to systematic within Aplysiomorpha. The data will be present comparing the species analyzed.

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Taxonomic revision of *Epitonium sensu lato* from Brazil (Mollusca, Caenogastropoda, Epitoniidae), except *Asperiscala*

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The family Epitoniidae Berry, 1910 consists of worldwide distributed marine gastropods, found from intertidal zones to depths of about 3000 meters. With a typical conic shell, it is distinguished from other families by the combination of several characters, mainly the presence of an axially microstriated protoconch, and a teleoconch sculptured with lamellar costae. Comprehends about 800 recent species notoriously known for their ectoparasitary and predatorial habits upon cnidarians, especially anthozoans. The designation *Epitonium s.l.* Röding, 1798 comprises a broad diversity within the family, with about 350 species distributed through several conspicuously distinct subgeneric names that are commonly raised to rank of genus. Among Brazilian species, six of these subgeneric names are recognized: *Asperiscala* de Boury, 1909, *Boreoscala* Kobelt, 1902, *Cycloscala* Dall, 1889, *Epitonium* and *Gyroscala* de Boury, 1887. The group has never been the subject of revision on Brazil, being only reported in general catalogues of marine gastropods and isolated records, totalizing 20 species whereas seven belongs to *Asperiscala*. The current study is part of a project of taxonomic revision of Epitoniidae from Brazil, all the specimens herein studied are currently deposited in several national and international molluscs collections, the identifications were based upon shell morphology through comparisons with original descriptions and examination of the type-series. Beyond the 13 previously reported species, seven taxa are recorded as new occurrences, whereas three are known species from other locations: *Cycloscala semidisjuncta* (Jeffreys, 1884) and *Epitonium hispidulum* (Monterosato, 1874), both previously reported to the western Europe, including Azores and Madeira, and *Epitonium foliaceicosatum* (d'Orbigny, 1842) previously reported to Caribe, the remaining four morphotypes corresponds to unknown taxa in the literature, whereas *Epitonium* sp. 2 and *Epitonium* sp. 4 distributions are currently restricted to Campos Basin and north of Amapá State, respectively.



Morphometric discrimination among four unnamed species of *Ledella* Verrill & Bush, 1897 from off Brazil

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Benthic studies in deep water of Campos Basin, has showed a high diversity of protobranchiate Pelecypoda. A group of specimens that could represent as many as four unnamed species of *Ledella* was morphometrically analyzed to corroborate their species delimitation. The data set of the analyses included a total of 31 measurements (taken from shell and hinge plate) and 22 ratios between several of them. Two discriminant analyses were done, one for each group of valves (right and left valves). The resultant discriminant functions agreed with the traditional taxonomy in 95% of the cases for the right valves and 88% of the cases for the left valves. The most relevant morphometric variables were: total length; length of the line beginning near the shell center and radiating toward the antero-ventral corner of the rectangle delimiting the shell; length of the anterior part of the hinge plate; width of the anterior and posterior parts of the hinge plate; width of the valve; total length of the hinge plate; height of the highest tooth of the posterior part of the hinge plate; lengths between the center of the highest tooth of the anterior and posterior parts of the hinge plate to the respective margins of the valve; length of the rostrum; dorsal and ventral heights of the rostrum; and profundity of the rostrum's sinuosity. Therefore, the analyses corroborated the idea of distinct species, which will all be described in an upcoming publication. The addition of these four new species will almost double the number of known species of *Ledella* for Brazilian waters, which is 5 described species at the moment.



It is possible to publish just descriptive anatomy? Anatomy of *Concholepas concholepas* (Bruguère, 1789) (Prosobranchia Muricidae)

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For one reason or another some scientific work remains for decades, in the desk draw, unfinished. In Chile, this typically occurs with work started while working on a bachelor or master degree thesis. As time passes, a researcher is unable to return to the research because they have become involved in other activities. However, at some point they will have to stop working and think of retirement. The probability of communicating their research findings, were important, are now, considerably reduced. Then this original information cannot be found through conventional channels and becomes part of the grey literature. On the other hand, publishable scientific work requires the existence of a testable hypothesis, the existence of an original idea, and the ability to generate a manuscript with scientific merit that will necessarily be of interest to the journal's audience. The structural-descriptive investigation of marine invertebrate anatomy is no longer a topic that most scientific journals will find space for. In Chile, one of those unpublished studies left behind is the descriptive anatomy of *Concholepas concholepas* (Bruguère, 1789). This is a monophyletic species living along the Chilean and southern Peruvian coast, which in Chile represents an emblematic shellfish species. Haller published the preliminary information in 1888. In this presentation, a 1966 thesis for a teaching degree that included a detailed anatomical description of this species together with clear illustrations of most organs and systems will be discussed. Since this work never saw the light of day it can be considered as part of the grey literature. However, since *C. concholepas* is a target species that supports an important fishery, plays a role as a keystone species in intertidal ecology and is endemic along the coast of Chile, here this descriptive information that has spent 45 years in the vaults of the grey literature could finally be revealed.



A systematic approach to the genus *Buccinanops* d'Orbigny, 1841 (Mollusca: Gastropoda) from the South American coast

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The genus Buccinanops was introduced by A. d'Orbigny as a subgenus of *Buccinum* and considered as a member of the family Buccinidae. Geographic range of *Buccinanops* spans the state of Espírito Santo (Brazil) to Tierra del Fuego Island at the southernmost tip of the American continent. Being an endemic genus, Southwestern America is the geographic region with the highest abundance of recent species belonging to it. A number of phylogenetic hypotheses affirmed that the South African genera *Bullia* and *Dorsanum* have a common evolutionary history with *Buccinanops*. Shell characters are highly variable in species of these genera and – together with their widespread geographical range – have brought about the description of a large number of nominal species. Most works on the systematics of *Buccinanops* have been based on shell morphology. Herein we present the results of studies on the systematics of this genus based on detailed anatomy and shell morphology of all described forms including types and topotypical material. According these studies, this genus includes only six valid extant species and probably two fossil representatives from Neogene deposits in Argentina. We establish the diagnostic characters of each species together with their known geographic range. The type species of each of the genera into which *Buccinanops* species were previously included were compared, and we conclude that *Dorsanum* and *Bullia* are close related but not living nowadays in South American waters.





SYMPOSIUM III
ADVANCES IN BIOTECHNOLOGY

Brazilian Nudibranchs as Sources of Bioactive Natural Products

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Nudibranchs are shell-less mollusks which lost their physical protection in the course of evolution and acquired the ability to sequester or biosynthesize *de novo* their chemical defenses. Such chemicals include a variety of secondary metabolites, including complex polyketides, sesqui- and diterpenes, non-ribosomal peptides, as well as alkaloids, in addition to mixed-biosynthesis metabolites. Studies have shown that such secondary metabolites present a variety of roles, such as feeding deterrents, chemical signalers and as antibiotics. In Brazil very few investigations have been performed in order to know the occurrence of chemical defenses in nudibranchs, particularly from Brazilian endemic species. Therefore, we have been interested to find species of these animals and discover the chemistry which is sequestered or produced by these mollusks. Over the years we have investigated species of *Doris*, *Tambja*, *Hypselodoris* and *Pleurobranchus* which presented different classes of metabolites. The presentation will include the strategy we developed to discover such metabolites and the summary of the results we have obtained from the investigation of the chemistry of nudibranchs from the Brazilian Southeastern coastline.



Sea hares proteins – ecology, applications, and perspectives

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On shell-less or primitive shelled molluscs, like opisthobranchs, nudibranchs and cephalopods, there is a trend leading to the evolution of defense mechanisms based on the secretion or incorporation of bioactive molecules, probably due to the absence an effective external protection. These strategies are highly distributed among many phyla - interesting studying cases for chemical ecology. The conspicuous sea hares, nearly shell-less molluscs, use a complex repertoire of chemicals for defense and communication instead of a conventional gastropod shell. Moreover, they also exhibit the fascinating behavior of inking. Not only is the behavior itself attractive but also the many bioactive compounds that have been isolated from the inks. *De novo* synthesized proteins are excellent exemplars of these molecules, and are encountered on the ink of several sea hare species, particularly on the genus *Aplysia*. These proteins represent presumably derivate evolutive characters with a possible and poorly understood role on the defense of those animals. In the sense of understanding the functionality and irradiation of these proteins on the defense is very important the description of their biological activities and biochemical profiles, and more importantly, in a comparative point of view. Such proteins are also great candidates to biomedical applications as antibiotics, anticancer or anti-HIV drugs. Many belong to the L-amino acid oxidizers (L-AAOs) family of proteins, sharing biochemical, functional, and phylogenetic similarities to other proteins isolated from sea hares. This offers new insight into the evolution of these proteins and their roles in the chemical defense.



Screening for natural products of potential use in schistosomiasis control

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Schistosomiasis is an endemic disease caused by trematodes of *Schistosoma* genus affecting above 200 million people worldwide. *S. mansoni* is the most prevalent of the five major species, endemic in 54 countries, mostly in sub-Saharan Africa, but also in some parts of South America including Brazil, where mollusks of *Biomphalaria* genus are the intermediate hosts. Nevertheless, the arsenal of compounds for schistosomiasis treatment and control virtually rely on a single drug, praziquantel, and one molluscicide, niclosamide. Natural products can be an alternative, providing leading compounds to the development of new bioactive agents. Our group has been searching for natural compounds of potential use in schistosomiasis control for more than 30 years and since then, active products from diverse origins including plant, animal and marine organisms have been identified. The widely adopted bioassay methodologies with *Biomphalaria glabrata* and *Schistosoma mansoni* are performed in a first tier assessment and provide the basis for the development of new screening models. Species chosen for bioprospection are from genera known to have activity described in other models. From the data obtained from bioassays with crude extracts, the most promising species are selected for further testing. Alternatively, isolated compounds from chemical classes with known diverse biological activities are also tested. Bioprospection studies in the Piperaceae family have been conducted successfully, and generated so far, some isolated compounds with optimal molluscicidal and anti-schistosomal activity. Piplartine, an amide obtained from several species of Piperaceae, exhibited a remarkable activity both in *B. glabrata* and in *S. mansoni*, being a promising lead compound. *Piper diospyrifolium* bioguided fractionation in *B. glabrata*, in turn, led to the isolation of two active compounds, one of them with novel structure. Standardized bioassay methods, therefore, play a key role in bioprospection research on schistosomiasis, since high-throughput screening techniques to find new schistosomicidal or moluscicidal compounds are not available to date.



Primary culture and characterization of cells derived from different tissues of *Biomphalaria tenagophila* (Orbigny, 1835)

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Schistosoma mansoni, the etiological agent for schistosomiasis in Brazil, has an obligatory passage through *Biomphalaria* snails as intermediate hosts to complete the disease cycle. The mechanisms involved in the interaction mollusk-parasite have not been totally clarified yet and cell culture models appear as potential tools to help clarify specific issues. With that in mind, we devoted our study to establish primary cell cultures from different tissues of *Biomphalaria tenagophila* belonging to Taim strain, which is completely resistant to *S. mansoni* infection. Those tissues were selected based on their known or putative importance to the internal defense system of the mollusk. The cultures were maintained at two different medium and cell viability was evaluated for each condition. The cells in culture were characterized by optical inverted and transmission electronic microscopy. Primary cultures from ten out of twelve tissues of *B. tenagophila* were successfully obtained. Most of the cells were round, non-adherent, without pseudopodia or filapodia by optical microscopy. Under electronic microscopy we identified ten cell subsets in mantle culture and fifteen cell subsets in both saccular and tubular kidney sections. In digestive gland and pylorus six different cell subsets could be identified against five cell subsets in nidamental and prostatic gland, four in ovotesti and crop and three in albumen gland. Further studies are in progress to obtain a characterization of those cells after interaction with sporocysts of *S. mansoni*.

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Building a better M.O.U.S.E. (Marine Organisms Used in Shuttle Encapsulation) trap

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Marine snail neuropeptides are revealing new approaches to drug design and can be used to effectively test peptide drug delivery systems. Specifically, the peptide toxins found in the venom of Conoidean mollusks have led the way in therapeutic development from marine snails. Identified snail peptide toxins range in size from 10-80 amino acid residues and may contain 2-8 disulfide bonds that stabilize their 3-D structure. The relatively small size of these polypeptides, coupled with their structural integrity imposed by numerous disulfide bonds, facilitates their use as peptide drugs for manipulating ion channels and receptors. Presented here are results to develop a peptide-drug delivery system by utilizing photo-switchable viral capsids and promising Conoidean bioactive peptides. The better M.O.U.S.E (Marine Organisms Used in Shuttle Encapsulation) trap described combines Conoidean peptides with a modular viral capsid delivery system to investigate neuronal disorders such as pain. Viral capsids, such as the bacteriophage P22 capsid, range in size from ~10-100nm, have constrained interior spaces amendable for assembly and packaging bioactive cargo, and have large surface areas that are conducive to multivalent genetic and chemical modifications for cell recognition and attachment. The first peptide toxin-capsid chimera synthesized is ziconotide conotoxin MVIIA with the P22 capsid (P22-MVIIA). The *Conus magus* peptide drug MVIIA is used to alleviate chronic pain in patients by inhibiting N-type calcium channels. The diversity of snail neurotoxin molecular targets include sodium, potassium, and calcium channels, noradrenaline transporters, and nicotinic acetylcholine receptors, ensuring a significant impact on a broad range of biomedical problems related to neuronal function if a reliable drug delivery system is produced. Results presented highlight strategies for delivering peptide neurotoxins to their site of action in order to manipulate signaling in the neuronal circuit - a significant leap forward in alleviating neuronal disorders using bioactive snail neuropeptides.



Using Conus Venoms to Learn Drug Design and Understand the Brain

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A case study illustrating the biomedical implications of molluscan taxonomy and phylogeny will be presented. The particular group that will be discussed are the venomous gastropods in the superfamily Conoidea. This group, which is a significant segment of total molluscan biodiversity (present estimates suggest in excess of 12,000 species) has already contributed to an approved commercial drug for intractable pain, and at least 5 other compounds that are in clinical development and have achieved human clinical trials. Why accurate taxonomy and phylogeny are important for accelerating potential biomedical applications will be presented in the talk. The link between molluscan biodiversity and biomedical science should grow stronger as new methods are developed for gaining access to the pharmacologically active chemicals that molluscs have evolved to interact with their predators, prey and competitors. This will be the major theme presented, using work done on the Conoideans as an example.



SYMPOSIUM IV
MOLLUSKS DISEASES: EFFECTS AND
TREATMENTS



Aquaculture development for small scale in Chile scallop

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The technology transfer process in Chile's aquaculture industry generally refers to salmon and mussel farming, but very little has been said about technology transfer for small companies and organizations engaged in oyster farming (*Argopecten purpuratus*). This resource is very important in the Chilean aquaculture industry and 5 years ago, Chile became the world's third exporter of this product. The northern scallop farming technology, *Argopecten purpuratus* considers larval farming until the obtaining of adults species. The supplying of early juvenile in its most is obtained from natural recruitment, but in order to ensure sustained production it is required for the industry to produce early juvenile in a controlled environment or hatchery. In order to sustain the development of oyster farming in Chile, there has been permanent training and technology transfer work geared to small farming organizations in the northern area of our country (Regions I, III, and IV). This entails the transfer of technical know-how (hard technologies) and the transfer of soft technologies basically geared to strengthen the organization, administration, and marketing of the oyster product. In order to obtain the success and sustainability of this industry, diverse support plans for these groups have been designed. These programs have been applied by professionals that have developed an information transmission methodology based on the expertise obtained in the sector and the continuous work with these organizations. The artisan fishery groups of Tongoy that were able to develop a northern oyster farming based business are a clear example of these interventions. The artisan fishermen began their businesses with the aid of professionals and through government support programs. After a period of time (about 4 years), they were able to form associations to export their productions. Currently, they have yearly exports of close to 120 tons of this resource and invoice close to US \$1.2 million. "The growth potential of aquaculture is not only in large companies, but it rather lies in developing and delivering capacity to small farmers, so that these may be able to prepare sustainable projects throughout time. The foregoing perhaps may not occur in the short term, but the fruit will be reflected in the children of these entrepreneurs that will be able to have more and better opportunities by having access to a better education".



Topics in Sanitary Aspects of Brazilian Shellfish Farm: the key problem

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Infectious and non-infectious diseases of bivalves of commercial importance are the result of incorrect management and increasing of emergence pathogens. The purpose of many requests from shellfish farmers and industries for information on the risks, distribution, prevention and management of them is the development of an approach for the control of the diseases. The concept of management, diseases, training, diagnoses and laboratories must be reviewed by the researchers and authorities. Brazilian Ministry of Fisheries and Aquaculture (MPA – “Ministério da Pesca e Aquicultura” former SEAP/PR – “Secretaria Especial de Aquicultura e Pesca da Presidência da República”) decided to create an “Hygienic and Sanitary Program of Bivalves of Commercial Importance” in order to overcome the risks of clandestinely and to ensure quality standards for Brazilian species. Along these lines, a National Network of Laboratories of the MPA was created under the name of RENAQUA (“Rede Nacional de Laboratórios do Ministério da Pesca e Aquicultura”. Brasil. Diário Oficial da União, Instrução Normativa/MPA n° 3, April 18, 2012). This network will be based upon international standards by ISO 17.025. The objective of this system is to reduce costs and increase national production. Several researchers, experts, shellfish growers and consumers could be beneficiaries of the program and regulations.



Diseases of marine bivalves cultured in Brazil

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Marine bivalve culture in Brazil is a reality that supports a commercial productive arrangement, with great social and economic importance. The mussels *Perna perna* (Linné, 1758), Japanese oysters *Crassostrea gigas* (Thunberg, 1793) and the scallops *Nodipecten nodosus* (Linné, 1758) are cultured and commercialized, particularly at the south and southeast of Brazil. As every commercial culture the diseases caused by pathogens worry about and can be very dangerous to the commerce and the mollusk health. Samples of many soft tissues from these bivalves have been studied by groups of Brazilian investigators, from the south to northeast coast with constant technical and scientific advancements. Molecular biology, specific cellular cultures and electron microscopic, joining to traditional histology are applied today and began to give more detailed and precise information about bivalve pathologies. The results have showed that some species of Protozoa, Trematoda, Cestoda and Copepoda are in the bivalves, without serious damages to the mollusks tissues or to the meat quality that could be a problem to the cultures. The mean disease by now is the bucefalosis in mussels that infested till 100% of the natural stocks at some rocky shores and 80% of some high density culture sites at Santa Catarina. The results for the cultured bivalves until now are negative to the diseases listed by OIE as obligatory notification. A pathogen that causes one of them, the perkinsiosis, was founded in native oysters, not cultured, at several places of northeast littoral. The situation cause apprehension and demands preventive actions to avoid the transport of live bivalves from one Brazilian state to another to set in sea water. To prevent commercial and ecological problems is also important to improve the analyses, the regulations and control the introduction and reintroduction of mollusks of any development stage from other countries.

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Parasitosis in mollusks in the Pará State (Brazilian Amazon)

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Studies on mollusks diversity of used in neotropical aquaculture are being increasingly frequent and shows the importance of scientific analyses of diseases in which affect these animals. Our results are published in scientific journals more than 26 years, about aquatic microparasite fauna in Brazil, especially in the Amazon (Pará State) and presents species very varied and complex, present in different environments (freshwater, estuarine and marine). We highlight the microparasites found and described in mollusks, the Microsporidia and Apicomplexa phyla. Our work has been developed in microsporidia (*Steinhausia*) and apicomplexa (*Nematopsis*). Other discoveries, such as mites, turbellarian flatworms, bucephalides and polychaete worms deserve attention. In this presentation will be given a morphological and ultrastructural spore characterization on both genera studied. Additionally, one should take into consideration the importance of molecular analysis in new species determinations.



A close-up photograph of a large snail, likely a giant river snail, moving through a dense thicket of green plants. The snail's shell is a prominent feature, showing a series of concentric, slightly raised ribs in a warm brown or tan color. The body of the snail is a pale, almost white, translucent color. The background is a soft-focus mix of green leaves and stems, creating a natural, outdoor setting.

SYMPOSIUM V
SYSTEMATIC, TAXONOMY, ECOLOGY,
DIVERSITY OF LAND AND FRESHWATER
MOLLUSKS

Assessing molluscan biodiversity through integrative taxonomy

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Accurate assessments of taxonomy, particularly the largest, least studied and most impacted groups are critical to understanding the evolution and maintenance of global biodiversity. Molluscs are second only to arthropods with an estimated 100,000 described species, and another ~100,000 as yet undescribed. They are a diverse group dating back to the early Cambrian (~560 mya). Approximately 60% are marine, but they are also well represented in freshwater and terrestrial systems. Gastropods are the largest class molluscs (~60%) and the second largest animal class, and thus deserve great attention. Unfortunately, molluscs are also the group most impacted by extinction. Systematics is a vital discipline underpinning all of biology, including conservation. Yet despite their fascinating and significant diversity, molluscs, and gastropods in particular, remain understudied relative to their diversity. This taxonomic impediment is evident in the uneven number of US animal taxonomists working on vertebrates (43%), insects and spiders (32%) and all other invertebrates including molluscs (25%). This imbalance has far reaching consequences, particularly regarding biodiversity and conservation assessments: the status of only 3% of mollusc species has been assessed compared to nearly 90% of mammals. To begin filling this large gap in our knowledge it is paramount that we take an integrative approach to assessing molluscan biodiversity. Results from studies of three groups of gastropods, marine intertidal snails of Florida, USA (*Melongena* spp.), freshwater apple snails (Ampullariidae) from South America, and land snails of Hawaii, USA are presented to illustrate an integrative taxonomic approach that provides an accurate and comprehensive understanding of molluscan biodiversity. Combining data from phylogenetics, anatomy, population genetics, reproductive biology and behavior reveals shared patterns across groups indicating common evolutionary and ecological processes. Additionally, these data have also uncovered patterns unique to each group that give insights for interpreting their evolution.



Ancylinae (Gastropoda: Pulmonata: Planorbidae) taxa from Argentina: a taxonomic revision

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Ancylinae Bourguinat, 1815 are pulmonate snails small to medium size (5 to 15 mm) inhabitants of continental limnic environments. They are cosmopolitan, being more abundants in Australia, Africa, Pacific area and Neartic and Neotropical regions. Seven genera are recorded as present in the Neotropical region with a total number of 17 valid species names. In Argentina, from the total number of 101 species of freshwater gastropods recorded at the moment, only five correspond to Ancylinae: *Anisancylus obliquus* (Broderip & Sowerby, 1832); *Gundlachia ticaga* (Marcus & Marcus, 1962); *Hebetancylus moricandi* (d'Orbigny, 1837); *Laevapex* sp. and *Uncancylus concentricus* (d'Orbigny, 1835). Taxonomic studies on Ancylinae in Argentina are scattered and shows a degree of systematic confusion on the species identification. The aim of the present study was to broaden the information on morphology and clarified the taxonomic status and distributional areas of the species. Material from main institutional collections from Argentina and Brazil was used: Museo de La Plata, Buenos Aires (MLP), Museo Argentino de Ciencias Naturales, Buenos Aires (MACN), Instituto Miguel Lillo (IFML) and Museu de Zoologia da Universidade de São Paulo (MZUSP). Additionally field work was carried out in northwest region and central region of Argentina during the spring-summer seasons from 2008 to 2011. Shell measurements (total length, high, total weigh) were obtained for each species. Internal anatomy was analyzed from adult specimens. Radulas were extracted and together with shells were prepared for scanning electron microscope imaging (SEM). On the basis our results we recognized six Ancylinae species and propose new records for Argentina. *Ferrissia irrorata* (Guilding, 1828), a species originally described from Antilles, is now registered in Tucumán province (Northwestern Argentina). Characters on external morphology (muscle scars), inner anatomy (reproductive system, radulae), and shell apex sculpture are the more informative in the diagnosis of Ancylinae species.



The freshwater pulmonate snail family Physidae

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The Physidae are mainly a family of the Western Hemisphere, with only a few species occurring in Eurasia and Africa. In North America (north of Mexico, *i.e.*, in the United States and Canada), there are three native genera, *Physa* (with three native species), *Physella* (with 30 native species), and *Aplexa* (with one native species). An additional genus, *Stenophysa*, with a distribution that includes Brazil, Guatemala, Mexico, Uruguay, Venezuela, and West Indies, has two species introduced into Texas, USA. One species found in North America, *Physa acuta* Draparnaud 1805, originally named from France, has been widely distributed to many other parts of the world by human agency. In North America, the Physidae are the most abundant and widespread of the freshwater gastropods. They may be found in all types of aquatic habitats, and some species seem to be the most resistant to pollution of all the freshwater mollusks. There are currently disagreements between some workers regarding classification and nomenclature of North American physid snails. More intensive studies are needed to fully clarify the taxonomy and phylogenetic relationships of the nominal taxa of Physidae found in North America and elsewhere.



Preliminary phylogeography of *Lymnaea stagnalis*: are there cryptic species of the great pond snail?

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The great pond snail, *Lymnaea stagnalis* (L., 1758), is an aquatic gastropod with a Holarctic distribution. It is usually regarded as a single species with no subspecies (Jackiewicz, 1998; Glöer, 2002), but in the past there was a tendency to recognise several taxa of various rank. Kruglov & Starobogatov (1993) proposed splitting *L. stagnalis* into six distinct species. All works quoted above were based on morphology only. Remigio and Blair (1997) reported that there is a significant genetic divergence between European populations of *L. stagnalis*. Barges et al. (2001) stressed that geographically separated populations in Europe “show marked divergences”. We investigated the phylogeographic structure of *L. stagnalis* by using sequences taken from specimens corresponding to the morphotypes of *L. stagnalis* s.str. and *L. fragilis* (L., 1758) collected in Europe, Asia Minor, Siberia, and North America. Most specimens are distributed between two sister clades separated by a genetic distance of 0.085. This corresponds to the distances separating some ‘good’ (morphologically and genetically defined) species of lymnaeids, for example, *Radix balthica* (L., 1758) and *R. ampla* (Hartmann, 1821). It is more than twice higher than the genetic distance between lymnaeid subspecies (Vinarski et al., 2012). No conchological or anatomical characters to distinguish between these clades were so far revealed. The two large clades show almost clear geographic pattern of distribution. One of them includes all snails collected in Western and Central Europe apart from a few exceptions, whereas the second one comprises snails living in Ukraine, Western Siberia and Asia Minor. North American specimens of *L. stagnalis* belong to the ‘European’ clade. Specimens from Albania and Italy form a third branch that may indicate one more species, *L. raphidia* (Bourguignat, 1860). Possibly, it is a case of cryptic speciation, when two or three incipient species have still not diverged phenotypically enough to be discovered earlier on the basis of their morphology.



Recent changes in the freshwater malacofauna of Western Siberia

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The three main processes to cause faunistic changes are speciation, extinction, and migration. The first one is typically very durable and usually cannot be directly observed. However, one may detect species extinctions as well as biological invasions at the scale time of several decades. Most changes in the Western Siberian aquatic malacofauna registered by us since 1973 are result of establishment of non-indigenous species. In 2009, we reported findings of two *Unio* species in rivers of the western (Uralian) part of the Irtyshian basin. In 2010, *Unio* mussels have been found to occur far eastward – in vicinity of Tobolsk Town. Perhaps we observe a natural process of range expansion of this genus since no reliable records of *Unio* mussels in Western Siberia before 2000s are known. These mussels were thought to be utterly absent in the Western Siberian malacofauna, and may, probably, be designated as cryptogenis species. The aquarium trade is the main vector of non-indigenous mollusk species for Siberia. In the water reservoirs-coolers of electric power and metallurgical plants of this region several non-indigenous snails of tropical origin have been registered. These belong to the genera *Melanoides*, *Pomacea*, *Costatella*, *Ferrissia* and *Planorbella*. However it still is not clear if these species form stable and reproducing populations in the Western Siberian waterbodies. The only exception is the European prosobranchiate snail *Viviparus viviparus* that invaded the Novosibirsk water reservoir in the mid-1990s. In this locality, the species forms abundant populations with biomass reaching 6.3 kg/m². However, the way of its invasion is not known. *Viviparus* may have been introduced accidentally with fish from the European Russia although its aquarium origin is also probable. The only example of possible regional extinction in Western Siberia is disappearance of *Planorbis carinatus*. The last reliable findings of this snail date from the mid-1960s.



Systematics of genus *Omalonyx* from sequences of the mitochondrial cytochrome oxidase subunit I gene and morphology

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The genus *Omalonyx* (Pulmonata: Stylommatophora: Succineidae) comprises neotropical slugs with semiaquatic lifestyle. This genus is known as a plague of aquatic vegetables, such as watercress as well as intermediate hosts of *Leucochloridium* (Trematoda: Leucochloridiidae), a parasite of wild birds and *Angiostrongylus* (Nematoda: Protostrongylidae), a nematode of medical and veterinary importance. Currently the genus comprises five species: *O. unguis*, *O. matheroni*, *O. convexus*, *O. brasiliensis*, *O. geayi* and *O. pattersonae*. The sampling effort remains scarce since large Neotropical regions, like west central Brazil, have never been sampled. The northern species of the genus presents a very similar morphology, geographical variations and descriptions based upon few specimens. The present study was done over a new set of samples collected throughout South America leading to new occurrences in all Brazilian regions, including 20 of the 27 states. This makes the entire Brazilian territory a potential area for the occurrence of the genus, except for the northeastern Roraima State. A careful account of reproductive system characters was performed for species determination. A gene tree was then inferred from sixty sequences of the mitochondrial cytochrome oxidase subunit I gene employing three original sequences of *Succinea* along additional *Succinea* and *Athoracophorus* sequences obtained from GenBank as outgroup. The new data supported the *Omalonyx* monophyly, a basal position for *O. convexus*, and led to the revision of the northern species taxonomy.

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***Megalobulimus maximus* (Gastropoda, Strophocheilidae) is not a polytypic species**

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Megalobulimus maximus (Sowerby, 1825) is a species distributed in Western Amazonia (Peru, Bolivia and Brazil), characterized by having the largest shell (154 mm) in the genus, after *M. popelairianus* (Nyst, 1845) (163 mm). Based on analyses of shell morphology, *M. popelairianus* and two other taxa, *vestitus* (Pilsbry, 1926) and *huascari* (Tschudi, 1852), have been regarded as closely related species or subspecies of *M. maximus*. With the aim to evaluate the evolutionary relationships among *M. maximus* and related taxa, using also *M. capillaceus* (Pfeiffer, 1855), *M. lichtensteini* (Albers, 1854) and *M. separabilis* (Fulton, 1903), all of them from Peru, we extracted genomic DNA from foot tissue with a CTAB protocol and amplified a segment of the mitochondrial 16S rRNA by PCR. The amplicons were purified and both strands sequenced using the services of Macrogen Inc. The sequences in ABI format were edited using Chromas, and the consensus obtained with CAP3. The multiple sequence alignment obtained with ClustalX and the phylogenetic analyses were performed using both MEGA (Neighbor-Joining) and MrBayes (Bayesian Inference) softwares. We also carried out multivariate analyses (PCA) of the shells. As a result, in the molecular phylogenetic trees, *M. maximus* and its "subspecies" *huascari* and *vestitus* do not form a monophyletic clade, and *M. popelairianus* does not show close relationship to *M. maximus*. Instead, *huascari* is more related to *M. separabilis*. We found that *M. popelairianus*, not *M. maximus*, has the most variable shells, although this variation was not correlated at the molecular level. In conclusion, the phylogeny based on mtDNA (16S rRNA) does not support recognition of *M. maximus* as a polytypic species, and furthermore it is not even closely related to *M. popelairianus*; therefore, both *huascari* and *vestitus* should be reinstated as full species.



SYMPOSIUM VI
MISCELLANEA MALACOLOGICA

**Morphological characterization of *Scutalus cotopaxiensis* (Pfeiffer, 1852)
(GASTROPODA, PULMONATA, ORTHALIDAE)***

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The terrestrial malacofauna of Ecuador finds reference of uttermost importance in the works of ALBERS (1850), COUSIN (1887), HIDALGO (1869 and 1870), PILSBRY (1897), WEYRAUCH (1967a, b), and BREURE (1978, 1979 and 2008). The species *S. cotopaxiensis* was described by PFEIFFER (1852) in the genus *Bulimus* originally from Cotopaxi, Ecuador. In 1999, specimens and shells were found in a collecting expedition in Ecuador. With the purpose of enlarging morphological knowledge about the Bulimulinae from South America, the study of the shell, radula and soft parts of *S. cotopaxiensis* was then carried out. The material studied consists of shells and specimens manually collected in the so-called Portón Santa Isabel Municipality, Cuenca, Ecuador, under cultivated vegetation litter. Specimens were dissected under magnifying glass; digestive, reproductive and pallial systems were drawn using a WILD M20 camera lucida. Micrographs of radula and protoconch were made with a SEM Zeiss DMS950. Shell: Moderately thick; oval-elongated with profile slightly inclined; white-yellowish color; with 7 to 8 5/8 whorls slightly convex and twisted apex; umbilicated. Dimensions: height = 28.5 to 31.9mm; width=13 to 14mm. Roof of pallial cavity sparsely pigmented along the pneumostoma; veins prominent, really evident in the proximal region to the mantle border and pulmonary vein non-bifurcated. Kidney elongated in a triangle-like manner. Pericardium sparsely pigmented translucent and short in length in relation to the renal face adjacent to it. Radula with tricuspid central tooth featuring mesocone acuminate and ectocones short and symmetrical; lateral bicusps asymmetrical. Reproductive system: *ovotestis* with follicles gathered on five groups; fertilization complex tubular and C-shaped with seminal vesicle dilated. *Bursa copulatrix* oval-elongated with duct presenting regular diameter. Deferent duct emerging at the same height of bifurcation of bursa duct. Penian complex presents regular diameter, with long penian sheath and *flagellum*, the latter being as long as 1/6 of the total complex length. *Phallus* retractor muscle terminally attached to *flagellum*. The remaining characters presented in this work could not be compared to data of other species for the total absence of registers in the academic literature.

* Collection authorization number 001-IC INEFAN/DNANVS/VS 07-I-1999



Distinct immune barriers in the apple snail *Pomacea canaliculata*

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In its original range, *Pomacea canaliculata* may appear associated with a wide variety of symbiotic partners, including parasites. And even in China (where it is an invader), it has become associated as an alternative host to *Angiostrongylus cantonensis*, the causative agent of eosinophilic meningoencephalitis. How this snail manages to keep the equilibrium between self and non-self, while it coexists with all these symbiotic partners? The answers should be in hemocytes, i.e. the cells effecting innate immunity in snails. But what is the nature of hemocytes in this snail? How they behave, both *in vivo* and *in vitro*? How and where they reproduce? Are there hemocyte stem cells in the circulation of this snail? These have been the subjects of the PhD thesis and the postdoctoral work of some of us. But are there particular organs involved in immune surveillance because of their position in the circulation and of the hemocytes and stem cells they contain? Our work has disclosed that both the kidney and the lung may be playing that role in this animal. The kidney contains hemocyte islets in interstitial hemocoelic spaces between the epithelial cristae and crypts, and this organ receives the hemolymph from the head and foot. These islets may develop into hemocyte three-dimensional spheroids in response to infection. A novel finding we are reporting here is that the lung (which does not bear hemocyte islets and receives the hemolymph from the visceral hump) may also develop hemocyte three-dimensional spheroids in response to microorganisms instilled in the visceral hump. Similar three-dimensional spheroid formation by hemocytes has been reproduced *in vitro*. So, two organs (the kidney and the lung) appear to stand as barriers against microorganism invasion in *P. canaliculata*. The differential role of these barriers (and of 3D-spheroid formation in them) is currently under investigation.



Marine bivalve mollusks cultured in Brazil: actual species and biodiversity

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The aquaculture commercial production of marine bivalve mollusks at Santa Catarina State, southern Brazil, has about 22 years old. The production increased from 190 to 12.000 ton during 1990 to 2001, with prediction of 18.000 ton for 2012. This production is more than 90% of the total quantity produced in Brazil and is sustained by the mussel *Perna perna* (Linné, 1758), the Japanese oyster *Crassostrea gigas* (Thunberg, 1793) and the scallop *Nodipecten nodosus* (Linné, 1758). The improvement of the production depends of several factors as: to complete the legal processes of sea water exploit authorizations for the producers; the mechanization; to aggregate economic value, by processing operations of the mollusks after harvest; investments in marketing and commercialization to improve the consumption and the permanent sanitary control of all processes. Regarding the great Brazilian biodiversity, the research with others species must be stimulated to find new options for mollusk culture and to improve local business arrangements in other areas of the country. Some studies with promising results were done with the clams *Anomalocardia brasiliiana* (Gmelin, 1791), *Cyrtopleura costata* (Linné, 1758), the mangrove oysters of genus *Crassostrea* and the pearl oyster *Pteria hirundo* (Linné, 1758), that has very good taste too. Experiments of reproduction and growth of the cephalopod *Octopus vulgaris* (Cuvier, 1797) produced good results. More than these, Brazil has hundreds of others native species, that the knowledge are little more than the basic biology. Many of than with great importance as food for human communities have been collected from the natural stocks all along many years. Some of these mollusk stocks are in risk by the strong exploration. Aquaculture can be very helpful to improve our biological knowledge about them and to recuperate stocks. A primary list of these edible and tasty native mollusks species will be presented.



Strategies for conservation of freshwater mussels in central region of Brazil

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There's no doubt that the freshwater mussels are a crucial component of aquatic ecosystems. They are considered a metabolic reactor by transferring nutrients and energy from the water column to the sediments through their filtering activity. The expansion of the energy matrix with the construction of hundreds of large power plant, changes the hydrological dynamics and interfere in the pattern of heterogeneity of aquatic systems decreasing the diversity of these organisms. This proposal suggests to elaboration of a strategic plan for monitoring of populations and conservation patterns of distribution of community. Therefore we present the efforts being undertaken to see in order: i) to know the distribution patterns of diversity of freshwater mussels (considering composition and structure of communities and the environmental factors involved) and ii) to assess the functional process and population dynamics of some species more representative. Based on a database organized from a hierarchical sampling design, which enables communication with other sources of information available in GIS will be possible provide to the decision makers robust and consistent information to maintain the diversity of freshwater mussels and the ecosystem services provided by this group of organisms.



Invaded invaders: is meltdown enhancing the invasion of non-indigenous marine molluscs in the southwest Atlantic?

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Invasive species are considered a major threat to native communities as they can impact biodiversity and modify ecosystem functions and services. Invasive species may also enhance further invasions by modifying receptor communities, making them more susceptible to invasion by other non-indigenous species (NIS) in a positive feedback termed invasion meltdown. The tropical rocky shores of the southeast Brazilian coastline are currently being invaded by two Pacific NI corals *Tubastraea coccinea* Lesson, 1829 and *T. tagusensis* Wells, 1982. These corals were introduced by oil/gas platforms and as have modified receptor communities in invaded habitats. This study investigated the relationship between *Tubastraea* spp. and associated marine molluscs. Colonies of both species of *Tubastraea* and associated molluscs were collected at eight locations. The two most common marine molluscs were the bicolor purse-oyster *Isognomon bicolor* (C. B. Adams, 1845) (Isognomonidae) and the date mussel *Myoforceps aristatus* (Dillwyn, 1817) (Mytilidae); both are non-indigenous to the southwest Atlantic Ocean. *I. bicolor* (mean density 0.6-11.3 colony⁻¹) was found occupying the spaces between polyps and recesses on the coral colonies surfaces while *M. aristatus* (mean density 0.8-4.2 colony⁻¹) was a coral borer. The average number of individuals of *I. bicolor* per colony was higher in *T. tagusensis* than *T. coccinea* while the opposite was true of *M. aristatus*; the form of *T. tagusensis* offered the purse-oyster more cavities and crevices than *T. coccinea*, which in turn was favored by the date mussel, probably because it was more massive than its congener. From these observations it was concluded that the invasion of *Tubastraea* spp. is favoring the invasion of two non-indigenous marine molluscs into the southwest Atlantic. Invasion meltdown is, at least, a hypothetical mechanism that may explain the results so far found and is the focus of ongoing experimental studies.



A microscopic view of several plant cells, likely from a leaf or stem, showing a clear cell wall and a large central vacuole. The cells are stained with a brown pigment, possibly chlorophyll or a specific dye, which is concentrated in the cytoplasm and around the vacuole. The overall appearance is that of a cross-section of plant tissue.

SYMPOSIUM VII
GENETICS AND GENOMICS

Molecular systematics and phylogeography of Corbiculidae (Bivalvia) in Uruguay

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Two genera of Corbiculidae have been cited for Uruguay, *Cyanocyclus* (native) and *Corbicula* (exotic) both with presence in all the major basins of the country. Near of 15 species of the genus *Cyanocyclus* were described from Uruguay, but only two species are valid nowadays: *Cyanocyclus limosa* (Maton, 1809) and *C. paranensis* (d'Orbigny, 1835). Two species of *Corbicula* were recorded in Uruguay *Corbicula fluminea* (Müller, 1774) and *C. largillierti* (Philippi, 1844). The objective of this work is the genetic characterization of the species of Corbiculidae from Uruguay to understand the *Corbicula* invasion events in the Río de la Plata basin and contributing to the conservation of *Cyanocyclus* species. To perform the phylogeographic studies we use the cytochrome oxidase subunit I mitochondrial from 18 specimens belonging to 6 localities from Uruguay, and we retrieved sequences of Corbiculidae from the GENBANK. The phylogenetics analysis confirms the presence of two species of the genus *Corbicula* in Uruguay. In the genus *Cyanocyclus* three well supported monophyletic clades collapse in a basal politomy with other single individuals from different varieties of *Cyanocyclus*. The inclusion of new samples will allow to solve the *Corbicula* invasion scenarios in Uruguay (and probably in Río de la Plata basin) by means of single or successive multiple events, and to reconstruct the colonization process in Uruguay basins. Given the dramatic reduction in *Cyanocyclus* populations phylogeographic studies could contribute to propose conservation strategies in this genus.



Genetic variation in native apple snail *Pila conica* and introduced *Pomacea canaliculata* in the Philippines

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Pila conica, a native snail in the Philippines, is nearing its extinction due to the introduction of invasive *Pomacea canaliculata*. This study aimed to determine genetic diversity within and between populations of these two species through the COI barcodes and speculate the role these genetic variations play in the success of the species. Only two haplotypes were found in *Pila conica* samples from two populations (Dipaculao, Aurora and San Manuel, Pangasinan in the Philippines) one of which is identical to the haplotype from samples in Hawaii where the snail was introduced from the Philippines. On the other hand, seven distinct haplotypes were recovered from a single population of *Pomacea canaliculata* collected from San Manuel, Pangasinan, six of which are reported for the first time for the species and are distinct from the 54 other haplotypes found in GenBank. This high diversity in the COI of *Pomacea canaliculata* in the Philippines is most likely due to multiple introductions from different geographical origins. The high genetic diversity of *Pomacea* could contribute to its success as an introduced pest species while the lack of genetic variation in *Pila conica* could possibly play a role in its decline. The continuing assessment of *Pila* and *Pomacea* samples from different places in the Philippines will provide further evidence on the genetic variation of these two species.



**Molecular analysis of the complex *Olivella minuta* (Link, 1807),
preliminary results**

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The species *Olivella minuta* (Link, 1807) is characterized by smooth shells with zigzagging lines of variable color across their surface. It occurs from the Caribbean Sea to the South of Brasil. Subtle differences in the shells and anatomy have been observed between populations of different localities, indicating the possibility that more than one species is currently being classified under the same epithet. In order to elucidate the taxonomic situation of this taxon, we aimed to estimate the genetic variation of Brazilian and Caribbean populations of *O. minuta*, using the subunit I of Cytochrome c oxidase (cox1) from the mitochondrial DNA as molecular marker. Subsequent phylogenetic reconstructions conducted with the 22 sequences obtained so far revealed the existence of 17 different haplotypes, indicating a high genetic variability within the taxon. Although *O. minuta* is shown to be monophyletic, five distinct clades were found within Brazillian populations, with high bootstrap support, which localities are presented as follows: Clade A, Arraial do Cabo and Cabo Frio (RJ); Clade B, Cumbuco (CE); Clade C, Itaparica Isle (BA); Clade D, Itaparica Isle (BA); and Clade E, Cumbuco (CE). The genetic distances indicate the existence of at least two different species within the Brazillian populations, occurring in sympatry in Cumbuco. However, there is strong evidence in favor a higher species diversity within the *O. minuta* complex. A larger sampling, additional data from other molecular markers and a revision of morphological characters should clarify whether these groups represent different species or populations with some level of structuring.

Atlantic currents shaping the genetic diversity of brown mussel *Perna perna*

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The brown mussel *Perna perna* (Mytilidae) is originated in Africa but is recorded in South America, Europa and Caribbean regions. Having a pelagic larval stage, this species is a good model for genetic diversity studies to better understand how ocean currents shape the genetic distribution of marine species. We analyzed the mitochondrial haplotype diversity of 158 specimens from six seacoast sites, including Brazil (Espírito Santo/ES/n=1; São Paulo/SP/n=2; Santa Catarina/SC/n=2), South Africa (Port Elisabeth (Bay)/n=79; Port Elisabeth; (Open Coast)/n=79) and Venezuela (Cumaná/n=4). We used 400bp of the Cytochrome Oxidase c Subunit 1 gene and DNASP, MEGA and NETWORK softwares to calculate the haplotype (h) and nucleotide (n) diversities, genetic distance and the hierarchical relationships of the haplotypes. We found 59 haplotypes, high haplotype ($h=0,8629$) and low nucleotide ($n=0,01012$) diversities, a feature of invasion species. Two of three Brazilian haplotypes (0.5% of divergence) were shared between SP and SC. The four Venezuelan haplotypes diverged in 1%, and one of them was shared with South African's. 52 haplotypes were observed in African populations, with divergence varying from 0.3-3.6%. Divergences varied from 0.3-3.6% between Venezuelan-South African individuals, 3.1-3.6% between Brazilian-Venezuelan's, and 2.6-3.9% between Brazilian-South African's. The haplotype network indicates that Venezuelan haplotypes are more related to the African's than to the Brazilian's. These findings are in accordance with the path of currents in Atlantic: Benguella Current from South Africa goes towards Atlantic until became the South Equatorial Current/SEC, in the north of South America, nearby Venezuela. The SEC, around northeastern Brazil, splits into the Brazilian Current, moving to south along seacoast. It is reasonable to assume that Atlantic currents are the main features that shape the genetic divergence of brown mussel, wit ancestral lineages in Africa and divergent stocks in secondary ramifications.



**Water channels in freshwater snails (Basommatophora: Lymnaeidae):
structure and location**

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Water can cross biological membranes by simple diffusion or can be transported by special channels built of proteins called aquaporins. So far, hundreds of different aquaporins have been identified in numerous organisms. The best known are human aquaporins, as at least 13 aquaporin isoforms have been localized in human tissues. Aquaporins are divided into 2 groups: (1) “orthodox” aquaporins, which transport water molecules only; and (2) aquaglyceroporins, which transport water and other uncharged solutes, like glycerol or urea. All these proteins have the same 3-dimensional molecular structure. It consists of a single polypeptide chain which forms a single aqueous channel. A functioning water channel is a tetramer made of 4 such aquaporin monomers. Molluscan life is usually closely connected to aquatic or wet environments. Although they are one of the biggest animal groups, no data about water channels in their tissues are found in the literature, to the best of our knowledge. We assume that several processes, such as mucus secretion, osmoregulation or defense against desiccation, require the participation of aquaporins. In order to identify molluscan aquaporins, we focused our research on selected gastropod species representing freshwater pulmonates (*Lymnaea stagnalis* and *Catascopia occulta* of the Lymnaeidae) as well as terrestrial ones (*Helix pomatia* of the Helicidae). To date, we have sequenced cDNAs encoding 3 aquaporins: Ls-Aqp1, Co-Aqp1, and Hp-Aqp1. Our search for other isoforms is in progress. Ls-Aqp1 and So-Aqp1 are “orthodox” aquaporins, similar to human AQP4, and exhibit the greatest amino acid sequence similarity to aquaporins described for insects. Localization of the aquaporin identified in *L. stagnalis* with the use of human antibody against AQP4 showed the presence of water channels in the kidney, intestine, reproductive system, cerebral ganglia, and foot. This suggests that mollusk aquaporins are involved in excretion, digestion, reproduction, neural processes, and locomotion.

Genetic diversity of *Achatina (Lissachatina) fulica* Bowdich, 1822 in Brazil

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Achatina fulica is a snail native from East Africa. However, it is current present in most continents being considered one of the 100 world's worst invasive alien species. In Brazil, at least three introductions have been reported since 1970's, two had commercial interests. Farms established in different states were probably the main dispersal mean of *A. fulica* in Brazil. Despite the fact that retail and farming of *A. fulica* have been prohibited for many years, populations are rapidly spreading to different regions in Brazil. For instance, in Rio de Janeiro state, the number of counties with a reported *A. fulica* population has dramatically increased from 52 to 83 in the past six years. Such rapid dissemination calls for urgent and efficient control policies that will certainly be improved by reliable population dynamic studies, particularly, on preferential routes and connectivity rates. For this, we have analyzed partial mitochondrial 16S and COI sequences from 200 individuals from 25 different localities in Brazil. So far, we have identified five different haplotypes for 16S and seven for COI. Three of the 16S haplotypes (C, D, H) have been reported previously, others are currently under investigation. Haplotype C, reported as the most common worldwide, has the same pattern in Brazil, but in São Paulo State and the Middle West the most common is haplotype D. As expected, the small amount of divergence among Brazilian mitochondrial sequences precludes any in depth conclusions. For this reason, we are current characterizing nineteen polymorphic microsatellite loci in order to properly access critical connectivity parameters for this invasive snail.





SIMPOSIUM VIII
TEACHING, EDUCATION AND
PARTNERSHIP

**Update and innovation in the teaching of medical malacology and its
relevance to disease prevention, health promotion and environmental
preservation**

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Studies have revealed that the teaching of science in elementary and high schools in Brazil shows shortcomings both in content and in pedagogical strategies, with predominance of traditional classes which offer few contributions to the students' lives. The malacology, being a topic in school curricula, especially in the case of mollusks of medical importance, should receive greater attention, as it can be contextualized in the students' reality, giving opportunity to promote meaningful learning to their lives. At the undergraduate level, the presence of medical malacology in health courses also requires greater attention and a constant updating. Both health literature and clinical practice have indicated gaps in knowledge that result in delay or mistake in the diagnosis and treatment of diseases in which mollusks are part of the cycle. Schistosomiasis, an endemic and highly prevalent disease in the country, is an example. So, from some examples of faults in the construction of knowledge in the various levels of education in Brazil, it is discussed the need to implement strategies and more effective learning resources that could result in a permanently updated, contextualized knowledge in the diverse and broad Brazilian reality. Innovations in field activities and the use of classroom or distance learning with application of the problem-based learning (PBL) method in the Moodle virtual environment can be successful examples, since anchored in learning theories (such as meaningful learning). Public policies that promote permanent courses are other suggestions from pilot experiences that may be relevant for teachers and health professionals, as well as for students of all levels of education.



Applied Malacology: a different approach teaching a traditional topic

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Traditionally, Malacology was an optional course included in the curricular contents of the Zoology Department at the Facultad de Ciencias Naturales y Museo in the University of La Plata, Argentina. However, the last year in which this course was offered was 1987. Ever since that last course, we have believed that the long tradition of Malacology in the Museum should not be interrupted, especially because very few Universities offer courses specifically dealing with malacological topics. Finally, after unavoidable institutional delays the course was re-launched this year. It is geared towards providing advanced undergraduate and graduate students with in-depth knowledge and skills in malacological research and also practice in consulting abilities for control, prevention and exploitation of different groups of molluscs in Argentina. We believe that it is important to understand the taxonomy of the different groups, but also their relationship with the environment and society, their behavioral and trophic role (i.e. predators, scavengers, parasites, grazers, filter feeders, benthonic, pelagic, etc.), the importance of protecting species risking extinction, the management and breeding of commercial species (scallops, escargots, oysters, clams, octopi, squids, etc.), and controlling pest species (parasite related, agricultural plagues, macrofouling, etc.). Thus, the main objectives of this course are: to analyze the relationship of the different groups of molluscs with the environment, to understand the main mechanisms and processes involved in the evolution, to train human resources in the orientation of their research independently of the basic or applied nature of this research. The course is divided into two parts: traditional systematics of the whole group, including functional morphology and anatomy as well as geographic and temporal distribution; a second part will deal with the relationship of the different successful life-modes of particular mollusc groups. Labs will be carried out using material collected over the year in different parts of the country. Field-work will include different locations in which species can be observed in their natural. Visits are also programmed to farming areas and macrofouling invaded installations (dams, nuclear power plants, city water pumps, etc.) as well as local malacological collections, i.e. MLP and MACN.



Educational resources for teaching medical malacology in Brazil: the case of the intermediate host species of *Schistosoma mansoni*

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It is known that the information on schistosomiasis, a disease of high prevalence in Brazil and in several developing countries, is mainly transmitted by didactic materials distributed by the health and educative system of federal, state and municipal levels. There are two important sources of information on the subject, the didactic textbooks and the Internet, which are constantly used by professionals, students and general public. For this reason, the correct illustration and contextualization of the natural habitat of the intermediate hosts of *Schistosoma mansoni* (three *Biomphalaria* species) is an important element to identify them *in situ*. This identification can also help to develop scientific knowledge about the disease, collaborating in its control. From this perspective, some representative exemplars of these informative resources were investigated, to evaluate the quality of information about the species of intermediate hosts snails, including the identification of the environment where they live, associated with human social conditions. The analysis included a) leaflets and posters distributed by the Brazilian government, b) collections of textbooks listed by National Textbook Program (PNLD / MEC) for the school years of 2011/2013, related to Primary and Secondary Education and c) information available on the site search Google ®, using keywords “schistosomiasis, *Schistosoma mansoni* and biological cycle of *S. mansoni*”. The results show that the subject is treated with inadequacy and superficiality, verifying images of snails that do not correspond to the three intermediate host species of *S. mansoni* in Brazil, and the absence of contextualization of the environments where these mollusks are found. Also the disease is treated only with a biomedical emphasis, without considering the social, cultural and economic factors involved. The perspectives to improve the informative resources are discussed in order to achieve quality and effectiveness in the educational processes in which they are used.



Presentation of the consortium: “Campus do Mar” knowledge in depth

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Campus do Mar is the name of the marine consortium which includes an extensive wide network of Research & Development (R&D) related to the marine environment (Universities, Research Centres, Technology Centres, etc.). The idea flows because Galicia and Northern Portugal has more than 1500 km of coast, and an important part of their economy is based on marine activities. The goal is to become a dynamic force behind a transnational and integrated network of research, education and technology transfer units, which train and prepare the best professionals and researchers in the field of Ocean Science and Technology, to generate high quality research and international impact and to provide the industry with the most effective tools to improve competitiveness at a global scale. Basically our cluster is formed by the Galician universities (Vigo, Santiago and Coruña), CSIC and IEO, the Northern Portuguese universities, and research centres and technology platforms, to develop a Campus of International Excellence in the fields of the Sea. This talk describes the main lines of action and opportunities of collaboration with international partners.



AMPLIFIED: goals and achievements of a multidisciplinary collaborative international project on apple snails (Gastropoda: Ampullariidae)

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THE AMPLIFIED PROJECT (Ampullariidae Model using Phylogeography, Laboratory Integration with Field Investigations into Ecology and Diversity) represents a multidisciplinary, collaborative international project aimed at training students to develop into “global” scientists. Students from two institutions in the United States work closely with South American Host Scientists and students in Uruguay and Brazil. By using apple snails as a model system, the project focuses on three core areas: 1) Ecology, 2) Diversity and 3) Applied Malacology. A strong focus of the research emphasizes understanding the life history of these snails in their native ranges and incorporates sound knowledge of regional grey literature and museum records, comparative analyses as well as laboratory and field experiments. After the first year of the project, some preliminary outcomes include: 1) glossaries and pictorial keys of Uruguayan species; 2) on-going taxonomic and phylogeographic analyses; 3) species inventories in poorly studied regions including the record of *Felipponea* out of the Uruguay basin; 4) early warning on exotic species in aquariums; 5) development of GIS projects that incorporate past records of species in native ranges to identify areas of overlap and patterns in distribution; 6) description of the unknown egg clutches and hatching rates; 7) determination of the trophic position of *Pomacea* in relation to periphyton based on experimental approaches including competition; 8) impact of invasive macrofouling species (i. e. *Limnoperna fortunei*) on native populations, 9) medical malacological studies; 10) the links of ampullariids with higher trophic levels and 11) plans for public outreach. As intended by the International Research Experiences for Students program, all students will not only gain research experience but also networking skills, language development, international cultural awareness, and we hope a strong personal incentive to consider international research opportunities in their future.



SIMPOSIUM IX
SYSTEMATIC, TAXONOMY, ECOLOGY,
DIVERSITY OF LAND AND FRESHWATER
MOLLUSKS



Distribution and composition of freshwater bivalve species in Brazilian watersheds

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Based on bibliographic data and scientific collections examined in European, North and South American museums, 113 native limnic bivalve molluscs and 5 invasive species from Asia were recorded for Brazil. Natives were grouped in six families: Hyriidae (52 species) Mycetopodidae (33); Sphaeriidae (20), Corbiculidae (6), Dreissenidae (1) and Lyonsiidae (1). The invasive species are *Limnoperna fortunei* and four corbiculids, *Corbicula fluminea*, *C. largillierti*, *C. fluminalis* and *Corbicula* sp. Species were tabulated in accordance with the major Brazilian river basins. Richness of species was listed for the Uruguay, South Atlantic, and Amazon River basins. In order to recognize areas of endemism and priority for conservation the distribution and species composition in these basins was evaluated. Cluster analysis of the basins was based on distribution (presence/absence) of species and performed by means of a centroid method on a matrix of similarity (Jaccard coefficient). Ordering of basins was performed by means of principal components analysis (PCA). Cluster analysis formed three major groups of basins: 1) Amazon; 2) Tocantins-Araguaia, San Francisco, East Atlantic, and Atlantic North-northeast; and 3) South Atlantic, Uruguay, Paraguay and High Paraná. The ordination showed similar pattern: the Axis 1 explained 47.5 % of the distribution of species, already the axis 2 only 15 %. The axis 1 distinguished also the basins from the North (Amazonas, Tocantins-Araguaia, San Francisco, East Atlantic, and Atlantic North-northeast) from basins that drain in southern direction (South Atlantic, Uruguay, Paraguay and High Parana). Axis 2, differed the Amazon, Uruguay and Paraguay basins from the others. The basins in the North present a greater diversity of endemic genera and species, especially from the Amazon River. The South American continent since the upper Mesozoic period presents three separate large river basins, two located at the current Amazon River Basin and another draining to the South that originated Paraná-Paraguay rivers system. The diversification of aquatic biota and its endemic species are linked to the geological origin of these basins.



The land malacofauna from Serra da Capivara National Park, Northeast of Brazil, Piauí, recognized as World Heritage Site by Unesco

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In continuation with the researches included in the Project “Biodiversity of the Brazilian Land Malacofauna: discovering to know, knowing to preserve”, bibliographic research and examination of material deposited in collections were carried out aiming to promote the search for knowledge of this diversity and to identify the areas where landsnails could be found. Located in the Southeast of Piauí State, the region of the Park consists of high relief, formed by a plateau, whose more internal surface is flat (chapada) with edges eroded with irregularities (cuestas and cayons) and xerofila vegetation adapted to the semi-arid climate. Due to the droughts, the fauna is limited, but there is a strong endemism. Scientific studies conducted on the animal species present in this area are only focused on reptiles, birds and mammals. The material studied consists of shells, collected since 1995, and specimens captured alive – with more emphasis starting from 2005, when a great number of them started to be captured, registered with information on the environment and deposited in the malacological collections of Fundação do Homem Americano (FUDHAM), Raimundo Nonato, PI and Museu Nacional/ Universidade Federal do Rio de Janeiro (UFRJ), RJ. The thick shells of species that live in “caatinga” need larger protection against the direct effects of the radiation, they seek refuge during the lingering drought period, looking for the interior of rifts and caves (“tocas”) of rocks or burying close to the roots. Species met and characterized until now: *Orthalicus pulchellus* (Spix, 1827); *Rhinus durus* Spix, 1837; *Rhinus heterotricus* (Moricand, 1836); *Rhinus pubescens* (Moricand, 1846); *Rhinus tapuiensis* (Baker, 1914); *Anctus anglostomus* (Wagner, 1827); *Anctus laminiferus* (Ancey, 1888); *Tomigerus sp.*; *Megalobulimus conicus* (Bequert, 1948).



Diversity of land mollusk in Northern Minas Gerais state or: - what do we know about the Brazilian malacofauna?

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In order to broaden knowledge about the terrestrial malacofauna in our state, an inventory was carried out all over the River Peruaçu Valley, located in the Médio São Francisco region, regarded by the Biodiversity Atlas of Minas Gerais (Biodiversitas, 2005) as an “area of special biological importance” due to its transitional land of both Brazilian Savannah *phytophysiognomies* and deciduous forest seasonal areas. The National Park of the Cavernas do Peruaçu (X=582230 Y=8325760) was the main location of such inventory, featuring limestone outcrops, native vegetation along water streams, swampy areas, backlands, and deciduous forest, and therefore becoming a key inventory point of the biological diversity of Minas Gerais semi-arid lands. The analysis was accomplished by manual search on limestone rocks and leave’s ground during the rainy season between 2009-2011, covering areas of seasonal semideciduous forest over limestone outcrops, cerrado *strictu sensu* areas, and riverside jungle. Among a total amount of 21 points sampled out over three distinct rainy seasons, the following genera were found: *Helicina*, *Leptinaria*, *Synapterpes*, *Megalobulimus*, *Bulimulus*, *Naesiotus*, *Neopetraeus*, *Drymaeus*, *Orthalicus*, *Cyclodontina*, *Happia*, *Systrophia*, *Streptaxis*, *Psadara*, *Epiphragmophora*. Some specimens of the Urocoptidae family were also catalogued. Considering the catalogued genera of the region, the presence of *Neopetraeus* specimens and of those belonging to the Urocoptidae family was rather surprising due to the fact that there are no previous records in the specialized literature of such taxonomic groups in Brazil. The *Neopetraeus* genus according to Thiele (1931), Zilch (1960), and Breure (1978 and 1979) has its geographical distributions solely in Peru whereas the Urocoptidae had its concept and distribution strictly referred by Pilsbry (1901-1902; 1904) to the Southeastern North American species and the Caribbean circum region. Based on molecular data, De Weerd (2008) acknowledges a delimitation of the family concept to the clado composed by North American and Caribbean genera. In Brazil, Ferreira & Coelho registered a fossilized specimen of the family for the *Brachypodella* (Beck, 1837) in the limestone bay of São José de Itaboraí (Upper Cretaceous). Such register remained the sole reference to the family in South America up to now which reveals the deep lack of knowledge concerning our terrestrial malacofauna.

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Taxonomic review and cladistic analysis of *Omalonyx* (Gastropoda, Succineidae)

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Omalonyx encompasses species of hermaphrodite slugs with a reduced, flat and fingernail-shaped shell. They live on macrophytes and adjacent vegetation in swamps, marshes and floodplains of the Neotropical region. The taxonomic review of *Omalonyx* based on morpho-anatomic characters reduced the amount of valid species from 23 to six and four new species have been proposed. The phylogenetic analysis based on 26 morphoanatomic characters resulted in two most parsimonious trees with 69 steps, consistency index of 0.76 and retention index of 0.77. Both trees have completely resolved ingroup relationships. According to the results, we propose a new genus organization, dividing it into two subgenera, namely *Omalonyx* and *Supertholus*, which are mainly based on reproductive system characters. These results support *Omalonyx* as a monophyletic group. The relationships between *Omalonyx* species are [[*O. (S.) convexus* + *Omalonyx (S.) n.sp. 4*] [*Omalonyx (O.) n.sp. 1*] [*O.(O.) geayi* + *O. (O.) pattersonae*] [*Omalonyx (C.) n.sp. 2*] [*O. (O.) matheronii*] [*Omalonyx (C.) n.sp. 3*] [*O. (O.) unguis* + *O. (O.) brasiliensis*]]]]]]].

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A historic overview of *Diplodon* Spix in Wagner, 1827 taxonomy as a base for future studies

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Diplodon is a genus of freshwater mussels that occurs in all catchments of South America. The taxonomy and systematics of this genus have been studied by some authors but this is not a well resolved question yet. To evaluate the change of thoughts about the taxonomy of *Diplodon* we selected the five important works in this area: Simpson, 1914; Ortmann, 1921; Morretes, 1949; Haas, 1969; Simone, 2006 and Graf & Cummings, 2007. In each work we evaluated the characters used by each author and the species considered as valid. Great part of *Diplodon* species was described before 1900, thereby all the authors deal with the same universe of species. Simpson (1914) was the author that used the greater number of species, 85. He divided *Diplodon* in three subgenera, including also some Australian species as *Diplodon*. Ortmann (1921) was the first to use morphological information and recognize 28 species in two subgenera. Morretes (1949) compiled information from the literature suggesting 37 species and 2 subspecies in two subgenera. Haas (1969) presented 22 species and 13 subspecies, divided in four subgenera. Simone (2006) divide the formerly species of *Diplodon* in two genus: *Diplodon* s.s. and *Rhipidodonta* Mörch, 1853, listing a total of 22 species. Graf & Cummings (2007) accepted Simone interpretation and recognize 26 species. Sometimes the information of distribution given by the different authors is conflicting. These differences are a reflection of the interpretations of what is a species of *Diplodon*. It is not necessary to be a mussel specialist to realize that different authors have different opinions. Unfortunately, *Diplodon* remains a poorly known group, with several species known only from the original description. It is necessary to improve the knowledge for all the species in order to finally realize how many species really exist in *Diplodon*.



Molecular phylogenetics and diversification of the Eastern Asian Cyclophoridea (Gastropoda, Mollusca)

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The Cyclophoridea snails are a group of operculate landsnail, mostly ground dwellers, distributed worldwide. Phylogenetic relationships among Eastern Asian Cyclophoridea at all levels of divergence are uncertain, owing to lack morphology and molecular data. Here, we used 2 mtDNA gene (COI and 16S) and one nuclear gene (18S) comprising 1596 bp as marker to estimate phylogenetic relationships among 101 species from three major families of Eastern Asian Cyclophoridea: Cyclophoridae, Pupinidae, and Diplommatinidae. The relationships within Eastern Asian Cyclophoridea are evaluated here for the first time using molecular data. With nearly complete sampling of recognized genus, our analysis yielded a robust ML and MB tree with high support at almost all nodes. Diplommatinidae is monophyletic. However, it is surprise that genus *Chamalycaeus* of Cyclophoridae are clustered in Pupinidae clades. Two *Diplommatina* subgenera, *Benigoma* and *Sinica* are not monophyletic. Genus *Palaina* of Diplommatinidae are polyphyletic. Our results indicate that some Cyclophoridea taxa should be reclassified.



A scenic landscape photograph of a coastline. In the background, there are large, rugged mountains with some snow or light-colored patches. The middle ground shows a wide, calm body of water, likely a bay or a large lake, extending to the horizon. The foreground is dominated by a sandy beach that slopes down from the left. The water's edge is marked by gentle waves and some rocks or debris. The sky is overcast with soft, grey clouds, creating a muted, atmospheric light. The overall color palette is cool and desaturated, with blues, greys, and earthy tones.

SYMPOSIUM X
EOSINOPHYLIC MENINGITIS IN THE
AMERICAS

Angiostrongyliasis: an emerging infectious disease in the Indo-Pacific, with a focus on intermediate hosts in Hawaii

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The first recorded case of angiostrongyliasis was from Taiwan in 1944. By the early 1960s, after *Angiostrongylus cantonensis* had been found in Tahiti and Hawaii, the connection to the symptoms of eosinophilic meningitis had been established. The parasite has now been recorded widely in Asia, as well as on Indian Ocean islands and many islands across the Pacific. In Asia, it is of major and increasing concern especially in China and Thailand, where invasive apple snails (Ampullariidae) are eaten raw. Angiostrongyliasis is an important emerging infectious disease, probably as a result of increasing accidental transport of rats and snails through human activities. In Hawaii, there have been recent outbreaks with cases on four of the main islands. While some cases have involved deliberate ingestion of snails or slugs, the presumed more important pathway of infection is inadvertent ingestion of infected snails or slugs on vegetables and other produce. Therapeutic approaches to treating the disease are not well developed and not always successful, and the disease can be extremely debilitating. Therefore, steps to prevent infection are important. The first step is to identify the intermediate hosts of *A. cantonensis* and to determine its geographic distribution within the Hawaiian Islands. To do this over 1000 specimens of 37 terrestrial and freshwater snail and slug species (30 alien, 7 native) from the six largest Hawaiian Islands were screened using a molecular approach using *Angiostrongylus*-specific primers. The parasite was present in 18 (16 alien, 2 native) of these species, from five of the six largest Hawaiian Islands. These species represent 12 phylogenetically diverse terrestrial pulmonate families and 2 more distantly related caenogastropod families (one terrestrial and one freshwater). This broad phylogenetic representation confirms the extreme lack of host specificity.



Epidemiological, clinical and therapeutic aspects of cerebral angiostrongyliasis

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Angiostrongylid worms live inside arteries and have mollusks as intermediate hosts. Two species are relevant as causative agents of disease in humans: *Angiostrongylus costaricensis* in the Americas and *A.cantonensis* in Southeast Asia and Pacific Islands. *A. costaricensis* adult worms live inside mesenteric arteries and causes abdominal angiostrongyliasis, while *A.cantonensis* larvae migrate through CNS tissues and is the leading cause of eosinophilic meningoencephalitis. Most probably the rat (*Rattus norvegicus*) travelling within ships is the main reason for the current spread of this nematode throughout several continents. In the present review, we review some similarities and differences between the two species. First, there is a very interesting distribution of prevalence of infection and parasitic burden among mollusk species infected both by *A.costaricensis* and *A.cantonensis*. Most of infected mollusks present low larvae burden, what suggests very effective mechanisms for infection and low infective inocula. Focality of transmission and a minority of severe symptomatic human infection is a well known characteristic with *A.costaricensis* and probably the same occurs with *A.cantonensis*. The morbidity of angiostrongyliasis at population-based studies is not as severe as isolated clinical reports may suggest. Except for some severe cases, most of the cases of cerebral angiostrongyliasis do not manifest symptoms indicating encephalitic involvement; isolated meningitis is the rule. Severe headache is the most important clinical manifestation and may require special therapeutics measures for control. The lack of a effective antihelminthic medical treatment for both angiostrongyliasis should drive our attention to alternative approaches aiming at virulence modulation, like some trials in experimental murine infections with *A.costaricensis*. Better diagnostic methods and effective new therapeutic options require a better understanding of many aspects of *Angiostrongylus*-hosts-environment interactions.



Global trends associated in angiostrongyliasis: insights about epidemiology, geographic distribution and advances in diagnostics

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Eosinophilic meningitis caused by *Angiostrongylus cantonensis* also called cerebral angiostrongyliasis, is an acute inflammation of the central nervous system (CNS) caused by infection of the third stage larva of this nematode. To date more than two thousands cases of the disease were reported with the majority of them occurring in Southeast Asia. Nevertheless cases of angiostrongyliasis or findings indicating the presence of the parasite in the wildlife have been reported from around the world including countries where the disease had never been diagnosed before; i.e., Australia, Brazil, Ecuador and South Africa. This talk will discuss new trends of global angiostrongyliasis giving emphasis to aspects associated to its epidemiology, control measures, geographic distribution. The major emphasis will be given to recent scientific work that might impact diagnostics and detection of the parasite in environmental samples.



Transmission dynamic of *Angiostrongylus cantonensis* in *Rattus norvegicus* naturally infected in the state of Rio de Janeiro, Brazil

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Urban rodents pose risks to human health because they act as reservoirs and carriers of parasites that cause diseases in humans, as well as in domestic and wild animals, participating in the epidemiological chain of at least 30 species that cause infectious disease. Among these is the nematode *Angiostrongylus cantonensis*, a parasite of the pulmonary arteries of *Rattus norvegicus*. Humans become infected by eating the intermediate host (snail) or leafy plants that contain snail mucus contaminated with infective larvae. Due to the reports of human cases of eosinophilic meningitis caused by *A. cantonensis* in the Brazilian states of Pernambuco, Espírito Santo and São Paulo and the presence of naturally infected intermediate and definitive hosts in the country, the present study was conducted to learn the transmission dynamic, prevalence, average intensity and average abundance of the nematode *A. cantonensis* in the municipality of São Gonçalo, Rio de Janeiro state, as well as to verify the correlation between the parasite intensity on the one hand and the host sex and number of larvae found on the other, during the rainy (March and December) and dry (June and September) in 2010 and 2011. The viscera of 115 *R. norvegicus* specimens were examined for helminths and their feces were collected to count the number of larvae. Eight hundred and sixty adult worms were collected in the rats' pulmonary arteries and were identified by the characteristics of the caudal bursa as *A. cantonensis*. The prevalence of parasitism varied from 60 to 70% between the two seasons. The highest intensity and abundance occurred during the rainy season (18.4 ± 4.18 and 12.7 ± 3.75 , respectively). There was no correlation between the parasite intensity and the host sex, but there was a positive correlation between the parasite intensity and the number of *A. cantonensis* L1 found in the feces ($r = 0.528$, $P < 0.01$). The differences in the parasitological parameters observed during the seasons suggest that the parasitism in vertebrate hosts is related to the snail population, since this intermediate host is more abundant during rainy periods. Therefore, abiotic characteristics and the compatibility of the rodent *R. norvegicus* with *A. cantonensis* are determining factors in the nematode's transmission dynamic.

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Molluscan intermediate hosts of *Angiostrongylus cantonensis* from Jamaica

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The global spread of the zoonotic parasite *Angiostrongylus cantonensis* is generally associated with the giant East African land snail. In Jamaica we survey several snail species as potential intermediate hosts following emergence of eosinophilic meningitis caused by *A. cantonensis*. We collected 729 snails and 46 slugs comprising 17 species of snails and at least two genera of slugs from across Jamaica. The snails were identified as Anularid, *Anoma* sp., *Apoma* sp., *Bulimulus* sp., *Cyclophorus* sp., *Dentellaria* sp., *Drymeus* sp., *Lucidella* sp., *Megalobulimus oblongus*, *Orthalicus jamaicensis*, *Pleurodonte* sp., *Poteria* sp., *Sagda* sp., *Subulina octona*, *Thelidomus aspera* and *Tudora* sp., *Thelidomus aspera* and slugs included *Veronocellid* sp and an unidentified brown garden slug. Infected mollusks included *Thelidomus aspera* 18.2% (n = 369), *Pleurodonte* sp. 29.1% (n = 86), *Sagda* sp. 11.1% (n = 18), *Poteria* sp. (one of three) and the veronicellid slugs 5.9% (n = 34). This survey recorded new five new species of molluscan intermediate hosts involved in the transmission of the parasite in Jamaica. Furthermore, it showed that the emergence of this parasite as a cause of human disease was not associated with spread of the giant East African Land snail to Jamaica.



SYMPOSIUM XI
SCHISTOSOMIASIS AND OTHER SNAIL
TRANSMITTED DISEASES



Transmission control of schistosomiasis mansoni by introduction of a resistant lineage of *Biomphalaria tenagophila* (Taim)

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Schistosomiasis mansoni is an important human parasitosis occurring in various countries of the African continent and America. Transmitters of this disease are snails genus *Biomphalaria* and in Brazil, among three species found naturally infected, *Biomphalaria tenagophila* ranks second in epidemiological importance. The present approach is based on the finding of a geographical lineage (*B. tenagophila* – Biological Reserve of Taim/RS). This lineage showed to be resistant to *Schistosoma mansoni* on hundreds of challenges using different geographic lineages of the parasite and variable burdens of miracidia. Works published by our research group showed that resistance of this lineage to *S. mansoni* is related to a dominant character, according to the classic Mendelian genetics. It was also possible to determine that this lineage has a peculiar genetic marker, which is only found in this lineage of *B. tenagophila* from Taim. This marker presents also dominant character (350 bp – region ITS-1-ITS2/PCR-RFLP). Information on the internal defense system against the parasite, as described in dozens of papers published over 30 years of studies, led to the hypothesis about the introduction of this lineage in endemic areas, where transmission is maintained by *B. tenagophila*, aimed at the crossbreeding of this lineage with the local specimens, thus transmitting the character of resistance to the descendants. After creation of infrastructure in the town of Bananal/SP, for breeding of this lineage in mass scale, controlled introductions of the lineage were performed in water collections in Bananal/SP. It was verified that several months after introduction, the presence of the molecular marker (350 bp) from Taim lineage was successfully introduced in the offsprings of crossbreedings between the local lineage and lineage of Taim. It was also verified that the descendants were more susceptible to infection than the local ascendants (before introduction).



Construction of the "base line" of the affected municipalities by the san francisco river transposition of waters (sfrtw) in ceara state and its implications on schistosomiasis mansoni transmission.

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In Brazil the schistosomiasis is still a serious public health problem. It affects millions of people and causes a significant number of serious forms and deaths. The construction of water infrastructure projects usually causes changes in the fauna composition and its area of influence. Thus, the occurrence of schistosomiasis mansoni can be increased by spatial expansion resulting from population movements, as well as the construction of dams and the use of same for subsequent works such as irrigation. The integration Project of the San Francisco River Basin with the sententrional Northeast is a Federal Government action to ensure water supply, about 12 million inhabitants of the municipalities of 391 rural and Hinterland area of Pernambuco, Ceará, Paraíba and Rio Grande do Norte States. In Ceará state, two major water projects in construction phase involving 25 municipalities, will take water from the São Francisco River up to the Pecém Port-Industrial complex. We have built a "baseline", tracing the demographics, socio-economic and environmental profile of 25 municipalities affected as also described the epidemiological situation and the outline of schistosomiasis mansoni reporting the occurrence of the intermediate host. The resident population in the area is 15.7% of the total population of the State and 48% are municipalities with a population of less than 50,000 inhabitants. In relation to water supply, ten municipalities have coverage above 90% and 10 (40%) do not have sanitary facilities. When analyzing the educational level, Maracanaú municipality has the largest proportion, around 80% and Icó municipality has the smaller, about 57%. The malacologic survey reported the capture of *B. straminea* in all municipalities, however, only 09 specimens presented positivity for *S. mansoni* cercaria. Parasitologic analysis of feces was carried out in the 7 to 14 years schoolchild. There were a total of nine cases of schistosomiasis mansoni in five different municipalities.



Situation of liver fasciolosis in Brazil

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Fasciolosis is a liver parasitism induced by a kind of fluke with habitat in bile tract of vertebrate hosts. In Brazil there is only one species of liver fluke causes agent *Fasciola hepatica*, and a genus of Mollusca, Gastropoda, Pulmonata, Lymnaeidae, the pond snails that participates in the cycle of helminthes where happens the evolutionary stage of development with multiplicative training juvenile stages (redial and cercaria); two species of snail are the most cited as hosts of these forms – *Lymnaea columella* (the more dispersed in the geopolitical space of Brazil) and *L. viatrix* (virtually restricted to the South of Brazil), and may change morphological and physiological by fluke account on your body, such as the castration, gigantism, little shell calcification, and even death. Around the vertebrate hosts, herbivorous mammals, notably the primary hosts are domestic ruminants (cattle, sheep, goats, buffaloes), followed by omnivore(mouse, rabbit, pigs), and non-ruminant herbivores (horses, asses), that act as secondary hosts, after the carnivores as accidental hosts (dogs). Humans are susceptible hosts if infected with ease by the ingestion of form of resistance in vegetables raw, consumption or undercooked. In Brazil there are records of human cases in the four southern States (Rio Grande do Sul, Santa Catarina, Paraná, and São Paulo), in the South-East region (São Paulo, Rio de Janeiro, Minas Gerais, and Espírito Santo), in the Central-West region in Mato Grosso do Sul, Northeast in Bahia, and in the Northern State of Amazonas; a record for the Pará is a proven case allochtoon. The total records of human Fasciolosis in Brazil is of 980 cases, being the most consequential surgery finds in the gastrointestinal, liver problems or emergencies and necropsy; few were the own surveys to learn this kind of dispersion in human *F. hepatica* parasitism.



Surveillance and control of intermediate hosts of schistosomiasis in Brazil

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Schistosomiasis mansoni is distributed in 19 States and occurs mainly in cities located near the coastline of Northeast and the North of Southeast. The disease affects about 2.5 million people and causes a significant number of serious forms and causes a significant number of deaths. In 2011, 50,603 patients were identified with *Schistosomamansoni*. The Ministry of Health Schistosomiasis Program recommends the addition of active search and treatment of patients with *S.mansoni*, conducting additional measures to interrupt transmission as health education to communities at risk and household and environmental sanitation. The natural intermediate hosts of *S. mansoni* in Brazil belong to the family Planorbidae. In this family, only the genus *Biomphalaria* epidemiologically important features include the three species found naturally infected by *S. mansoni*. The *B.glabrata* is the most important intermediate host species of *S. mansoni* in the Americas, due to its high levels of infection and have their distribution in Brazil, almost always associated with the occurrence of schistosomiasis. Its presence was reported in 806 counties in 16 states. The presence of *B. straminea* was registered in 1280 cities in 24 states. It is the most adapted species to climatic variations, being found in almost all basins in the country, except the states of Amapá and Rondônia. *B. tenagophilaw* was notified in 562 districts of 10 states. It as epidemiological importance in the transmission in the South and Southeast states. It is responsible for most cases native of Sao Paulo and Santa Catarina in the outbreaks. The surveillance of intermediate hosts consists in the inspection of catch basins for collecting, identifying and determining the location of the breeding and shellfish species of epidemiological importance. The control of snails with molluscicides substance use is permitted by current environmental legislation, but it is recommended only in special cases like acomplementary character.



Molecular identification of parasites and vectors of Brazil

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Proper knowledge on taxonomy and classification is the starting point for most studies in the biological sciences. The ability to provide a biodiversity inventory is key to the fields of ecology, biogeography, and evolution. This kind of information is of particular relevance when applied to public health issues. The correct identification of parasite and vector species allows for the development and improvement of disease control strategies and, ultimately, contributes to the reduction in human suffering. DNA barcoding is a system designed to provide rapid, accurate, and automated species identification through the use of short, standardized gene regions that serve as species tags. The aim of the project "Molecular Identification of Parasites and Vectors of Brazil" is to generate DNA barcodes for approximately 1,200 species of parasites and vectors deposited in 18 biological collections kept at the Oswaldo Cruz Foundation. This talk will focus on the results gathered thus far, and will discuss advantages, challenges, and technical limitations of the proposal.



SYMPOSIUM XII
MUSEUMS AND SYSTEMATIC
COLLECTIONS



Malacological collection, Museo de La Plata (Argentina): value and profiling as a tool for management

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Natural history collections contain a sample of the biodiversity and its spatial and temporal distribution, and represent a monumental societal investment in research and applied environmental science. This information is used for scientific research, as an educational resource and environmental modelling by the State to define strategies for conservation and resource utilization in the country. Also, collections should be housed in institutions with the capacity to organize, manage, integrate and disseminate information on biodiversity for multiple users. The Museo de La Plata (FCNyM-UNLP, Argentina) develops knowledge, preserves and disseminates the representative collections of natural and cultural heritage of South America. Within its collection, the Malacological Collection is one of the most important because: (1) this has 12,728 lots (8,895 identified to species level, including 511 types) of 5 groups of molluscs, terrestrial and aquatic environments; (2) the material is from mid-1800 and continues to grow. The lots are from different regions of Argentina, Antarctica, and neighbouring countries, among others. (3) The trajectory of their donor/collectors both historical (*e.g.* Spegazzini, Moreno, Lahille, Doello Jurado, Parodiz, Hylton Scott, Frengüelli, Birabén.) as present. Several projects are currently running, including the "Assessment of Dry Collection" considering the state of preservation, storage, identification and documentation of the lots in order to know the strengths and weaknesses. This information permit: to quantify the relative health of the collection, to evaluate the needs and to have arguments to obtain financial support. Sixteen parameters are taken, with 4 to 6 profiling scores, with three spatial levels in relation to conservation (environment, furniture, container lot), cataloging level, label condition and digitalisation, identification (level and quality), other information attached (*eg.* historical data, geographic usage) and documentation. Results to date indicate acceptable levels of conservation, the need to change some of the furniture and containers as well to increase documentation and georeferencing of the lots.



The Museum of Natural History of San Marcos University as a center of both research and dissemination of Peruvian biodiversity

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The Natural History Museum of the Universidad Nacional Mayor de San Marcos was founded on February 28, 1918; it is in charge of collecting, researching and displaying representative samples of Peruvian Natural Heritage regarding flora, fauna and minerals, to generate scientific knowledge and disseminate it to all levels. Such samples are studied, preserved and curated in the Museum, forming specialized scientific collections. The Museum combines research and dissemination of the natural wealth of Peru. Research is carried out by the researcher professors in each of the departments into which the organizational structure of the Museum of Natural History is divided, which are specialized academic areas, working with the scientific collections of the Museum, focusing on research on systematics, ecology and biogeography. The dissemination of the information by the Museum of Natural History of San Marcos University is performed through showrooms, conferences and publications. The Museum offers to visitors, through its exhibition halls, an overview of the diversity of life forms and minerals of Peru, both present and past. The Museum also shows landscapes of Peru's natural environments through dioramas. Showrooms available to the Museum are: Mammals, Primates, Invertebrates, Reptiles, Amphibians, Birds, Botany, Fossils, Dinosaurs, Fish, and Minerals. Public activities are carried out as workshops, lectures, documentaries, "Museum Night" taking a flagship species to transfer knowledge in a popular language.



**The malacological collection of the Museo Nacional de Historia Natural
(Montevideo): past, present and future**

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Before 1955 the malacological collection of the Museo Nacional de Historia Natural (Montevideo, Uruguay, MNHN) had scarce development and use. Between 1955-1980 it received a great impulse through the work of Miguel A. Klappenbach (in charge of the collection until 2000) who promoted exchanges, donations, campaigns, active collaboration of non-malacologists as well as short contracts of several malacologists and students during the '70s. Three major events occurred during this latter period: the incorporation of the private collection of Antonio Formica-Corsi, first Uruguayan malacologist; José Olazarri executed a great reorganization of the whole collection and Eliseo Duarte collaborated actively cataloguing thousands of lots. During 1980-2000 the collection had only short term periods of cataloguing and no major rearrangements/movements. During 2000-2004 the collection suffered a movement together with part of the Museum to a dreadful rented building but fortunately no major losses occurred. Since 2005 a renewed impulse, still within a rented old house, is being carried focussing on: optimization of spaces, from vials and small boxes to cabinets and rooms, including the duplication of number of cabinets; transfer of all formerly formaline-preserved material to ethanol and adequate vials; development/transfer/sorting of collections (mainly ethanol preserved) through the cooperation with DINARA, including freshwater, marine coastal, shelf and slope habitats and the transfer of private collections. The cataloguing and digitalization of the material needs important efforts yet. In fact, only a fraction (15500 lots) of the 30000-40000 lots currently allocated in the collection is catalogued and a smaller part has been digitalized. The collection has no permanent positions for its administration and its current situation is affected by the lack of support to the MNHN. An international call is here made to cooperate for the support of this collection that has the World largest freshwater mollusc holdings from Río de La Plata basin.



Type specimens of molluscs deposited in Museu Oceanográfico “Prof. E. C. Rios” - MOFURG, RS, Brazil

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Natural history collections, including the malacological collection of Museu Oceanográfico “Prof. Eliézer de Carvalho Rios”, at the Universidade Federal do Rio Grande (MOFURG), have been used as resources for taxonomic research and as repository of important taxonomic specimens (types and vouchers). The MOFURG collection is of great value in support of studies of biodiversity, faunal inventories, and conservation of Brazilian molluscs. The MOFURG collection is one the major malacological collections in South America, with about 52,000 lots. The collection includes rare specimens as well as Recent molluscan types, which are often borrowed by students and researchers. The goal of this work is to present the list of type specimens (Holotypes and Paratypes) deposited at the MOFURG, highlighting the most representative species and/or those that present historical records for the institution (such as *Peretrochus atlanticus* Rios & Matthews, 1968 and *Adelomelon riosi* Clench & Turner, 1964). A total of 347 type specimens of molluscs are included, comprising 78 Holotypes and 269 Paratypes. Dominance of gastropods was observed, with over 90% of molluscan types. Given their great scientific importance, special attention has been given to the type material. A catalogue is in preparation, in accordance with Recommendation 72F.4 of the International Code of Zoological Nomenclature (ICNZ, 1999), which recommends that the lists of types deposited in institutional collections should be published.



Data base from the Malacological Laboratory collection of Museo Nacional de Historia Natural, Chile (MNHNCL)

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During the year 2009, from a IABIN-OEA Project, worked out together by the Malacologic Society of Chile (SMACH) and the Museo Nacional de Historia Natural (MNHNCL), the data base integrating the different lots deposited in the MNHNCL Malacological Laboratory was started. The software BIOTICA was used because the Ex-CONAMA (today the Chilean Environmental Minister) and the Museum together decided to initiate a modern data base for the entire Museum and then to continue using this system in the future for the natural Chilean collections. With this data base using BIOTICA the MNHNCL is able to answer, in a modern way, the multiple questions derived from the scientific research and from the education in natural sciences. A methodology including the following steps was developed: 1) Bibliographic gathering; 2) Bibliographic recording; 3) Data digital recording in plachets; 4) BIOTICA transformation data and recording of it. The Excell records were worked out in the international Darwin Core format. This system of recording data needs several established field that at the same time have subfields, which must be already considered in the original Excell records. These fields are the following: a) Elements of registry identification, b) Taxonomic elements, c) Collection, d) Geographic elements, e) Biological elements and references, f) Previous Catalog Number and g) Date Last Modified. As a result of the lot recording in the database, to the year 2011, a total of 1,000 record of BIOTICA and a number of 13,480 Excell records were entered. From the systematic point of view they represent 5 Classes, 342 Families and 1,287 genera, remaining 1,028 lots still not completely determined.

The background of the cover is a microscopic image showing several large, rounded cells with prominent, dark, circular nuclei. The cells are arranged in a somewhat regular pattern, and the overall color palette is muted, consisting of light beige, tan, and soft purple tones. The text is centered in the upper half of the page.

SYMPOSIUM XIII
MOLLUSCAN REPRODUCTION AND
DEVELOPMENT

Evolution of reproductive patterns in marine caenogastropods; the western south Atlantic experiment

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Caenogastropods have evolved a high diversity of reproduction modes, with life cycles adapted to different environmental conditions. Energy sources for the embryo development is one of the main factors contributing to this diversity. Vitelogenesis in Caenogastropods is the primary process of accumulation of energy requirement of the embryo. The egg size of Caenogastropods is rarely exceeding 1mm in diameter in very few species. But in many species crawling juveniles of several millimeters emerge from the egg capsule, due to supplementary food resources. This is the case for the presence in the egg capsule of nurse eggs (undeveloped eggs) and/or food substances as albumine, amino-acids and carbohydrates. All these strategies are enabling the intracapsular (or direct) development of the embryo, avoiding a free swimming larval stage. In the South American Sea, several evolution lines have arrived to the suppression of free swimming larvae. We have some examples in Olividae, Volutidae and Nassariidae which constitute original and endemic reproductive modes. One hypothesis is that the extensive shallow soft bottoms which characterize the South American Atlantic have been a major factor in this evolution. This is supported by the differences which are seen when comparing the reproductive modes from Brazil to Argentina with the southern Pacific species in Chile-Perú. It seems that the “Thorson rule” applies to the Pacific, but not to the Atlantic. And the big difference between both environments is the dominance in the Pacific of hard bottoms and in the Atlantic soft bottoms.



Reproductive patterns in Caenogastropoda and Neogastropoda (Mollusca, Gastropoda) in Northeast Brazil

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Reproduction, embryonic development and gonadal maturation cycle are key elements for the understanding of the biology of any organism and reproductive success is one of the most important aspects in the study of selection and adaptation of an organism. Mollusks have varied reproductive strategies and some of them involve the deposition of egg masses or embryos in benthic egg capsules where embryos remain until, at least, the early stages of development. Among cenogastropods and neogastropods, it can be observed great variation in the morphology of reproductive systems and behavioral strategies among different taxa. These behavioral strategies are responsible for the successful adaptive radiation of these mollusks. The cenogastropods are well adapted in almost all marine environments, having presented an explosive radiation during the Cretaceous period. Many species of mollusks reproduce continuously, whereas others concentrate their reproduction in a period of the year. The maturation of gametes and subsequent release of the eggs may be influenced by abiotic factors, and it can occur a close relationship between the reproductive cycle and environmental changes. Among the main environmental factors that may regulate or synchronize the reproductive cycle of mollusks and most marine invertebrates, are the temperature and salinity, and many authors report temperature as the most important factor. Considering the mode of larval development among the living marine gastropods, it can be recognized species that have a long pelagic larval stage and a wide distributional range, and those with non-planktonic larval development and a lower ability to disperse. The neogastropods are ecologically homogeneous groups, where predominates the pattern of an intracapsular development with an outbreak of a juvenile. The egg capsules of cenogastropods and neogastropods work in the protection against predators and stresses of the physical environment, being structurally and chemically complex and having a high energetic cost. These capsules are frequently proteinaceous envelopes. Many species of cenogastropods and neogastropods clump together during the breeding season and lay eggs communally, and some species do not feed during the breeding season.



**Spermatozoan ultrastructure, shell features and molecular analysis of
Crassostrea cultured in Cananéia, Brazil**

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Oysters are commercially important and widely cultivated along the Brazilian coast. The morphology of their shells can be strongly influenced by environmental conditions, and thus, their identification based on conchological characteristics is difficult and not unequivocal. Studies are controversial determining the number of species of the family Ostreidae in the South and Southeast regions of Brazil. In the present work, the sperm ultrastructure of *Crassostrea* specimens, identified as *C. brasiliiana* and sampled in the region of Cananéia, was described with the objective of contributing with new traits for the taxonomy and aquaculture of this genus. The TEM analysis of spermatozoa from the *Crassostrea* specimens revealed a small head, short midpiece and a simple flagellum. The acrosome is short and posteriorly invaginated, resting as a dome on the membranes of an oblate spheroidal nucleus. In the acrosome apex, there are four whorls rich in basic proteins, as observed using the E-PTA method. The acrosome invagination and the anterior nuclear fossa form a wide subacrosomal area that contains a material with longitudinally linear organization, corresponding to an axial rod that did not have its chemical composition identified. The midpiece contains similar-sized spherical mitochondria grouped as a ring-shaped cluster right below the head. The centrioles are orthogonally arranged. Spermatozoa ultrastructure is extremely conserved among *Crassostrea*, *Saccostrea* and *Ostrea* species. Subtle differences were described particularly in the substructure of the acrosomes. However, sometimes, these structural details (such as the four whorls arranged in the apical area of the acrosome of *C. brasiliiana* spermatozoon) are not preserved due to certain fixation methods, avoiding an extensive comparison between these particularities which could be helpful for distinguishing these bivalves. The adductor muscle scar pigmentation is likely to be inappropriate as a taxonomic trait for distinguishing *C. rhizophorae* from *C. brasiliiana*. The scar pigmentation diversity could reflect pliability in *Crassostrea* species. The sequences of mitochondrial gene 16S rDNA from *Crassostrea* specimens showed 100% similarity each other and also with *C. brasiliiana* sequences available in GenBank. The sperm ultrastructural traits, of the specimens described herein, and molecular studies confirm the presence of *Crassostrea brasiliiana* in Cananéia.

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Temporal variation in gametogenesis and spawning of *Limnoperna fortunei* (Bivalvia) in the alluvial floodplain of the upper Paraná River (Brazil)

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In order to understand the reproduction of golden mussel in two different environmental situations, we intend to answer: i) There is synchronicity of the the sexual cycle? and ii) There are variations related to population structure in the two studies sites? These questions were elaborated on the assumption that gametogenesis is governed by the synergistic effect of environmental factors and in different environments, even though geographically close, the gamete production and the elimination period can be differentiated. Evaluate and discuss this premise is the object of this study. We monitored monthly the reproductive activity of golden mussel from two localities in the alluvial plain of Paraná River. The populations have not a similar age structure and variations were evident in the sexual cycle. Individuals from Baia River have follicles larger than Paraná River; the production of gametes was plentiful and continues. Those from Parana River the follicles are small, fewer, and present a pronounced period of rest after spawning. Strategies considering environmental factors to limit the production of gametes combined with population control measures are suggested.





SYMPOSIUM XIV
MOLLUSCAN AS BIOINDICATORS

Endocrine disruption in marine mollusks along the Brazilian coast: recent findings and trends

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Endocrine imbalance is a very delicate and poorly known subject that depends on several biochemical processes with multiple interference possibilities. Specific bioindication responses in marine organisms to chemical compounds are much more the exception than the rule. One of these few exceptions is the imposex response, a masculinization of marine gastropod females caused by organotin compounds in antifouling paints. Studies in this area have been made in Brazil since the late nineties, and a reasonable amount of evidence is now available. A recent review of the biological studies along the Brazilian coast has shown that in most areas from NE to S gastropods populations presented some degree of masculinization in the females, and that in some instances localized populations have been extinct. In most cases, this impact could be traced to illegal application of organotin-based antifoulings to small boats. Another study has shown that even in the most preserved areas of Rio de Janeiro state coast, considered to be a model study due to the extention of marine activities there located, impacts are occurring and in some instances the conditions are getting worse. Furthermore, endocrine disruption has also been shown to occur in bivalve mollusks, in this case mostly related to parasitism and organic sewage contamination. These findings and the possible risks to human health in these coastal areas will be briefly discussed in this work.

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First record of the imposex and biphallia phenomenon in *Heleobia australis* (Gastropoda) from South America

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Organotin compounds, mainly tributyltin (TBT), have been used in antifouling paints. One consequence of exposure is the occurrence of imposex, superimposition of male sexual characters onto female gastropods. One variety of imposexuality is biphallia, more than one penial structure. *Heleobia australis* is a depositivorous gastropod endemic to South America. We report a novel occurrence of imposex in females and biphallia in male *Heleobia australis* in a TBT contaminated system: Guanabara Bay (Rio de Janeiro, Brazil). Monthly, April 2011–March 2012, 100 adults (>2mm) were sorted and shell height (SH) and diameter (SD) were measured before sex determination. Penis length of males and imposexed females were measured for indices calculations: Relative Penis Length Index (RPLI) and Relative Penis Size Index (RPSI). Sex ratio was compared using chi-square (χ^2). Differences on SH, SD and SD/SH ratio among groups were evaluated using One-way ANOVA and Tukey post-hoc test. A total of 1191 individuals were sexed showing 45.9% males and 54.1% females, 3.7% of females showed imposex. The low imposex incidence may be due to the distance of sampling site to potential sources of contamination. RPLI and RPSI were 28.32 and 2.27%, respectively. Biphallia just occurred in one male; penis was divided approximately in the middle into two parts: trunk (1.04mm) and “appendage” (0.31mm). Sex ratio was 0.88 ($\chi^2=4.92$, $p=0.05$), with a significantly higher number of females. Comparisons of SH and SD/SH ratio among groups showed significant sexual dimorphism (FSH (2,1185)=30.13, Fratio (2,1185)=66.57, $p<0.001$) between males-females and males-imposexed females, but no significant difference between imposexed females-females ($p>0.05$); seeming that imposex does not affect shell morphometrics. It is the second record of imposex in Guanabara Bay and first occurrence for a depositivorous species, which probably accumulates TBT via ingestion of sediment, and besides, it's the first known record in hydrobiid snails from South America.

Financial support: CNPq.



Intraspecific variability in penial structure of *Heleobia australis* population from Guanabara Bay (Brazil)

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Heleobia australis (Hydrobiidae) is known to show a wide intraspecific morphological variability; this high phenotypical plasticity is supported by high variability of external characters depending on environmental conditions, but there is a lack of information about variation in internal characters. Our objective was to evaluate morphological variations in *H. australis* from Guanabara Bay (Rio de Janeiro). Monthly sediment samples were collected and sieved through a 100µm mesh. Each month, 100 adults (>2mm) were sorted and measured (shell height and diameter, aperture height and diameter) before cracking the shells for genitalia evaluation based on penises morphology (shape). Comparison between morphotypes, based on number of individuals, was conducted using one-way Anova (Statistica 8.0). None difference was found in shell morphology. Nevertheless, based on penises morphology, it was found four significant different morphotypes of male genitalia from 513 males evaluated (One-way Anova $p < 0.001$; $F(4,48) = 12.55$). Morphologies were: (morph1) curved with the apex pointing toward basal region, and slightly flattened; (morph2) curved with apex pointing toward anterior region of animal, and slightly flattened; (morph3) basal region curved or elongated and gradually forming a hook toward the apex; (morph4) elongated, more cylindrical than flattened. Three morphotypes have occurred in all months with similar contribution in population, except morph2 that showed lower contribution (11%) and did not occur in April. Since penises morphotypes were found in the same population, since its population had the same distribution in time and space, and it was the unique notable difference among specimens; our data support that *H. australis* is a polymorphic species but based on the internal characters, instead of the external ones as in other studies. Further analyses should evaluate possible effects of the variations of penial structure to the reproduction of *H. australis*.

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Study of the HSP70 protein in *Biomphalaria glabrata* (Say, 1818) snail as a model of environmental biomarker

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Molluscs have been employed as bioindicators in many studies of environmental monitoring considering its propitious characteristics inter alia ease of experimental manipulation, wide distribution and accumulation of toxicants. In this way the freshwater snail *Biomphalaria glabrata* has been studied as a good laboratorial model, and previous studies have pointed for its application in environmental research. Our group has been working in the investigation of responses of *Biomphalaria* as model for studies of environmental stresses. The HSP70 protein is one of the most studied molecules as a potential biomarker for environmental injury indicating stress and protecting the protein damage in organisms. In this work, we aimed to characterize the protein HSP70 in *B. glabrata* by western blotting, after exposition to reference stimuli, with view to its employment in future environmental applications. To this purpose, 5-6 months old snails, with shell diameter of 14 (± 1.8) mm, were exposed to heat and to cadmium chloride in order to verify the response of this protein in the presence of such different stresses. The CL_{50/96h} was determined as 0.32 (0.28-0.35) ppm for CdCl₂, and results showed induction of the HSP70 protein by both stimuli, as well the relation between HSP70 and the improvement of survival to lethal stimuli after a previous exposition of the snails to mild stresses, although interindividual variations were observed. The digestive gland was the most responsive tissue to stress, regarding the HSP70 protein. Our results contribute to the knowledge of the physiology of *B. glabrata*, besides being a first study of heat shock proteins with molluscs. The positive response found in this work contributes to the establishment of *Biomphalaria* as a good bioindicator of chemicals and physical environmental stressors.



The background of the page is a close-up photograph of a wasp nest. The nest is composed of numerous hexagonal cells, some of which are filled with larvae or pupae. Several wasps are visible, some on the surface of the nest and others flying in the air. The overall color palette is muted, with shades of brown, grey, and green.

POSTERS SESSION

First confirmed record of *Limnoperna fortunei* (Dunker, 1857) in Santa Catarina State, Southern Brazil

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The occurrence of the asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857), only freshwater/ limnic representative known of the Family MYTILIDAE (an invasive introduced species), is confirmed for first time in Santa Catarina State/ SC and the system of the Upper Uruguay River Basin. Presumably introduced in this region as a consequence of anthropic actions, and showing a relatively low population density, in June 11 2012 five field pictures an a lot (random sample) compound of 19 specimens of this exotic species were examined, presenting sizes between 6,0 and 17,0 mm of length, collected by the Technical BAESA José Manuzzi (May 30 2012) in the reservoir area comprised between “Barra Grande” and “Machadinho” hydroelectric power plant installations, Pelotas River Basin in Anita Garibaldi Municipal District. Comparative material finally deposited in the scientific malacological collection of the “Museum of Sciences and Technology”, Pontifical Catholic University of Rio Grande do Sul - PUCRS, Porto Alegre/ RS (MCP 09547). Additionally, a second lot compound of 14 specimens coming from the same locality and presenting the same biometric characteristics, was deposited in the mollusks collection from the “Ecology and Zoology Department”, Center for Biological Sciences, Federal University of Santa Catarina State - UFSC, Florianópolis/ SC (CMOUFSC s/c).



Characterization of *Limnoperna fortunei* (Dunker, 1857) byssus by differential scanning calorimetry and optical microscopy

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Limnoperna fortunei (Dunker, 1857), the golden mussel, is a freshwater Mitilid bivalve. It is native from the Southeast of Asia and it recently became a threat for South American countries, such as Brazil and Argentina. In 1991, *L. fortunei* was firstly introduced in Argentina by ballast water from ships, which came from China. Brazil had its first contact with *L. fortunei* seven years later, in 1998. In that year, the Paraguai-Paraná waterway carried golden mussel into Pantanal Rivers and in the system of Patos` Lakes. Golden mussel is considered an exotic and invasive species. Some reasons for this consideration are wide environmental tolerance and genetic variability, short life cycle, fast growing and sexual precocious maturity. Because of these characteristics coupled with its high taxes of filtration, golden mussel is capable of destroying native species occupying their ecological niches. The members of *Mytilidae* family secrete a structure called byssus, which is composed basically of threads and adhesive plaques. Molecularly, it is made of a vast number of proteins, such as collagen and adhesive proteins like *Limnoperna fortunei* foot protein (Lffp). This adhesives secreted by the golden mussel are responsible for biofouling. At hydroelectric power stations, *L. fortunei* can obstruct pipes, reduce the water flow and stick to grids of these plants. The aim of this study is to characterize the distal and proximal portions of byssus threads, the stem and the root of golden mussel by optical microcopy analysis and differential scanning calorimetry (Diamond DSC Perkin Elmer). Understanding the structure and the way that byssus operates, it may be possible associate it with further studies and effective strategies for controlling the adhesion and interrupting *L. fortunei* biofouling.

Preliminary data on size and sexual maturity of *Achatina fulica* from Vila Dois Rios, RJ

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Achatina fulica is an invasive species, potential intermediate host of nematodes of medical and veterinary importance working as paratenic host of parasites that affect some wild vertebrates. This snail was introduced in several countries including Brazil, where nowadays it is present in 24 of the 27 Brazilian states. Their introduction in our country is related to commercial purposes being estimated to the 80's. Concerning natural history of *A. fulica*, the reproduction and development are topics that encourage some studies. The main goal of this study was to verify an association between shell size (height) and maturity in *A. fulica* from Vila Dois Rios, Ilha Grande, Angra dos Reis, RJ, Brazil. The snails were collected in December/2008 and were anesthetized by immersion in water previously boiled. The shells were measured with a 0.05mm precision caliper. The soft parts were dissected to evaluate conditions of the reproductive system. The reproductive system was classified as mature or immature depending on development of nidamental gland, aspects of gonoducts and presence or absence of eggs. It were analyzed 175 specimens, being 113 (65%) mature and 62 (35%) immature. Out of the 113 mature specimens only 12 (19%) show eggs in the oviduct. The average size of mature specimens (71.7 ± 14.2 mm) was significantly greater than the average of immature specimens (63.1 ± 16.4 mm; t-test; $p < 0.05$). This information can be used in future strategies of *A. fulica* control in Ilha Grande. This way, the biggest specimens have priority to be removed to avoid that specimens reproduce.

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Foot surface characterization of the freshwater mussel *Limnoperna fortunei* (Dunker, 1857)

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Limnoperna fortunei (Dunker, 1857) is a bivalve mollusc known as the golden mussel and represents a typical example of invasive species capable of inducing significant changes in natural or artificial water systems. Its quick expansion imposes the need for researches to increase the knowledge about the mussel attachment process, which may facilitate the development of techniques for efficient and environmentally sustained control. The present study used SEM for the microstructural characterization of the golden mussel's foot due to the efficiency of the electron microscopy for the characterization of materials and biological structures. Adult golden mussels were collected and transported to the laboratory in refrigerated and aerated boxes. Samples were collected in the cultivation laboratory in CETEC facilities. The animals were dehydrated, the foot were dissected and properly prepared for scanning. The images were produced with the technological support of the Microscopy Center (UFMG). In the obtained images, we observed ciliary structures in the whole extension of the foot, and not only on the back as described in the literature. These small filaments that cover the foot of the mussel are also found covering the toes of geckos, particularly in the genus *Gecko*, and they may indicate a similar adhesion effect and an explanation for the strong adherence of mussels to almost any substrate.

Populational parameters of *Achatina fulica* Bowdich, 1822 in Ilha Porchat, São Vicente, Brazil

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Achatina fulica is considered one of 100 worst alien species in the world, and is the vector of *Angiostrongylus cantonensis*. Ilha Porchat, is a region with high impact because of the urban occupation and introduction of exotic species, but still has fragments of native vegetation. Modified environment facilitates the establishment and dispersion of this specie. The aim of this study was to analyze the population parameters of this specie, to know more about its population status. We chose three areas in Ilha Porchat, where we did quadrats with 5 x 5 m. In area 1, we did 6 quadrats, in area 2 we did 3 quadrats, and in area 3, we did 2 quadrats. In the quadrat, we marked all the individuals of *Achatina fulica*, with nail polish. We used Schawars-Arnason model to create 8 populational models and estimate the population parameters. We used Akaike information criterion (AIC), the ΔAIC and the AIC weight to see how model has a better fit and precision to the data. We made 12 samplings during 6 months. We mark 177 individuals of *Achatina fulica* in this study, with 17 recaptures. The model $\phi (\cdot) p (\cdot) \beta (t)$ (survivorship constant, probability of capture constant and probability of entry variable) was the most parsimonious. The apparent survivorship ($\phi = 0.55$) was low, who indicates that this species is an r strategist. We found that this specie had monthly peaks of recruitment, which indicate that *Achatina fulica* is an iteroparous specie, but we found only one peak of abundance during the study. We hope that this study helps in future action with the aim to control this specie in natural and antropic environments.

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***Isognomon bicolor* (C. B. Adams, 1845) (MOLLUSCA: BIVALVIA: ISOGNOMONIDAE) in the Northeast of Brazil: current bioinvasion situation**

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In the coastal regions, especially in harbour areas, there have been growing the concern about non-native species introduction. The introduction of a species into new habitat is a risk because the favorable environmental conditions and the lack of predators, parasites and natural competitors, these new organisms can reach high densities. Once established, they are hardly to be eliminated. In Brazil there are number of studies being carried on, most of them to the Southeast and South, in order to make a detailed survey of exotic species and its invasive potential. The genus *Isognomon* Lightfoot, 1786 was first recorded in Brazil in the 70s. Later *Isognomon bicolor* (C. B. Adams, 1845) was recorded to the South (Santa Catarina), Southeast (Rio de Janeiro and São Paulo) and Northeast (Bahia, Pernambuco, Rio Grande do Norte and Ceará). In this study new records of *I. bicolor* were reported to Ceará, Rio Grande do Norte, and Pernambuco, complementing previous data about occurrence of this specie in the Northeast of Brazil. In Ceará State, the specie occurs in Icapuí, Pecém, Taiba, Flecheiras and Mundaú beaches. In the Rio Grande do Norte State, new records were reported in Upanema, Baixa Grande and Ponta do Mel beaches. In Pernambuco State, at Suape beach. *Isognomon bicolor* develops dense aggregations on the sandstone reefs and in crevices between the mid coast rocks. It could be verified in the competition process with many native species like the Zoanthideans, bivalves Mytilidae and Ostreidae, natural preys to several species, e. g., *Stramonita haemastoma* (Linnaeus, 1758). Almost all locations are near harbors, and let us postulate that, it might be happened by accidental introduction by ballast water or incrustation on the ships with subsequent expansion into neighboring regions.

***Achatina fulica* in Araguaína as natural intermediate hosts of nematodes of medical and veterinary importance**

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Nowadays Brazil is experiencing an explosive phase of *A. fulica* invasion. Regarding public health, *A. fulica* may act as intermediate host of two species of nematodes, *Angiostrongylus cantonensis* (Chen, 1935) and *Angiostrongylus costaricensis* (Morera and Céspedes, 1971), the etiologic agents of eosinophilic meningoencephalitis and abdominal angiostrongyliasis, respectively. In order to investigate the occurrence of nematodes of medical and veterinary importance in *A. fulica* from Araguaína, TO, snails were collected at eight different neighborhoods from November 2011 to June 2012. They were individually wrapped in paper towels, packed into appropriate boxes to be sent to the Laboratório de Referência Nacional em Malacologia Médica/ Instituto Oswaldo Cruz/Fiocruz. The snails were artificially digested in 0.7% HCl solution using the technique of Wallace & Rosen (1969) modified. The digested material was subsequently examined under stereoscopic microscope to search for nematode larvae. From 155 specimens examined, 123 (79.3%) were infected with nematode larvae, which were identified by the morphological characteristics: rhabditiform larvae, including *Rhabditis* sp., *Strongyluris* sp. and *Aelurostrongylus abstrusus* (Railliet, 1898). The following rates were obtained: *Rhabditis* sp. (10.9%); *Strongyluris* sp. (10.3%); *A. abstrusus* (18.1%); *Rhabditis* sp. and *Strongyluris* sp. (5,9%); *Strongyluris* sp. and *A. abstrusus*, (12,3%); *Rhabditis* sp. and *A. abstrusus* (14,2%); *Rhabditis* sp., *Strongyluris* sp. and *A. abstrusus* (7.7%); and no infected (20.6%). Although no *A. fulica* specimen had been found infected with larvae of *Angiostrongylus* spp., the metastrongylid *A. abstrusus*, a parasite of Felidae lungs, was found in almost all investigated area, thus confirming the importance of *A. fulica* also under the veterinary point of view. Those results, in addition to the high infestation of *A. fulica* in Araguaína point out the need for surveillance and control of this snail in the studied area. This is the first report of *A. fulica* infected with *A. abstrusus* in the state of Tocantins.

New records of terrestrial and freshwater alien snails in the municipality of Juiz de Fora and Belo Horizonte, Minas Gerais state, Brazil

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The aim of the present study is to record the presence of seven alien species of terrestrial snails and slugs and three alien species of freshwater snails in two municipalities in the state of Minas Gerais, Brasil. In the municipality of Juiz de Fora, we found the following land snail species: *Subulina octona* (Brugüière, 1789) and *Rumina decollata* Linnaeus, 1758 (Subulinidae), *Limax maximus* Linnaeus, 1758 and *Deroceras reticulatum* (Müller, 1774) (Limacidae); *Achatina fulica* Bowdich, 1822 (Achatinidae); *Zonitoides arboreus* (Say, 1816) (Zonitidae) and *Bradybaena similaris* (Férussac, 1821) (Bradybaenidae); and the freshwater species: *Physa acuta* Draparnaud, 1805 and *Aplexa marmorata* (Guilding, 1828) (Physidae) and *Melanoides tuberculata* Müller, 1774 (Thiaridae). In the municipality of Belo Horizonte, we record two species of land snails: *Limax maximus* and *Bradybaena similaris*. The land snail and slug species were recovered from anthropogenically influenced areas, like plantations, greenhouses and gardens. The freshwater physids were recovered from irrigation canals and several polluted urban streams. *Melanoides tuberculata* was found in an artificial pond for fish farming. Invasive species represent an important conservation and health challenge. Non-indigenous land and freshwater snails can negatively affect native snails directly through competition for resources, and indirectly through changes in ecosystems. The introduction of invasive species with high reproductive potential and resistance to adverse environmental conditions is of essential importance to the epidemiology of several parasitic diseases. *Subulina octona*, *A. fulica*, *B. similaris* and *P. acuta* have medical and veterinary importance due to their potential role as intermediate hosts for several parasite species. Additionally, because some of these species are readily cultured in the laboratory they may serve as useful study organisms in research for the development of molluscicides. The results presented here can contribute to better understand the distribution range of invasive mollusk species in Brazil.



The invasive slug *Arion lusitanicus* and the native slug *Arion rufus* in the context of genetic studies in Poland

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Since the 1980s *Arion lusitanicus* has been spreading rapidly in Poland as a result of natural expansion and accidental introductions, most probably with plant material (seedlings, plant products), soil, communal waste or on vehicles. The slug adapts easily to new habitats, forming abundant populations and causing extensive damage and has big and beneficial influence on species biodiversity to horticultural crops. The great inter- and intrapopulation differentiation found in *A. lusitanicus* indicates a non-uniform origin of the Polish populations, probably resulting from multiple independent introduction events. The genotype found in the first four Polish populations (South Poland) suggests that their origin is different from the remaining populations and that they probably originate from the south of Europe. The others Polish population can origin from West Europe because one of the genotypes is shared for central population in Poland and one population in Belgium. The genetics diversity of *A. lusitanicus* individuals ranged from 0.2% to 2.1%, whereas that of *A. rufus* was twice as low: 0.4-1.0% (for *coxI* gene). The difference between the two *Arion* species within two mitochondrial genes (16S rRNA and *coxI*) was about 12%. Mitochondrial genes are suitable for taxonomic identification much better than nuclear DNA (18S, ITS1, 5.8 S ITS2, 28S).

Toxicity of *Bacillus thuringiensis* sv. *israelensis* commercial products on *Limnoperna fortunei* (Dunker, 1857) and ecotoxicological indicators

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The Asian golden mussel invaded South America via ballast water in the 1990s and caused irreparable environmental problems. Golden mussel biofouling in hydropower plants results in great economic damage. The *B. thuringiensis* sv. *israelensis* (Bti) is widely used in Brazil to control the dengue vector, *Aedes aegypti*. Use of this microbial agent to control insects is recommended by the Ministry of Health of Brazil. In order to control the golden mussel, this study aimed to evaluate the effectiveness of two Bti commercial products, one with aqueous formulation (AS) and other with dispersible granules (WG). Bioassays were conducted in beakers containing 250 mL water reconstituted and ten adult's individuals of *L. fortunei*. Three concentrations of the product (0% as control, 0,2%, 0,4%, and 0,8%) were tested, each concentration quintuplicate. The assay was conducted at 21 ±2 °C with oxygenation provided by aerators. Mortality was assessed daily during seven days. The highest mortality (100%) was obtained in the treatment with 0.8% of product AS, followed by 55% mortality at 0.4% concentration, and low mortality rate (20%) with 0.2% AS, significantly differing from the control group. The WG formulation did not result in mortality of *L. fortunei*. Similar test was made with a native *Pisidium taraguyense* Ituarte, 2000 (Bivalvia, Sphaeriidae) and the result showed 100% of mortality with high AS concentration (0,8%). The toxicity test of the AS formulation was done with fish *Pimephales pomelas*, microcrustacean *Ceriodaphnia dubia*, algae *Pseudokirchneriella subcaptata*, following the official Brazilian Standards Methods (ABNT). The concentrations 0,2, 0,4 and 0,8% showed acute toxicity to all organisms evaluated. The use of Bti commercial products should be restricted to closed systems. The high toxicity may affect the benthic community, including native bivalves. A scientific research directed to bioprospecting Bti strains less toxic to aquatic organisms, however effective on golden mussel decline is necessary. The standardization of ecotoxicological evaluation methods using natives bivalve should be required to get the license for commercial using of the formulated products.

Determinant limnological variables of *Limnoperna fortunei* (Dunker, 1857) population: densities prediction and survival limiting factors

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The Asian golden mussel invaded South America via ballast water in the 1990s. Economic damage on aquatic ecosystems and hydroelectric plants are well known. Golden mussel database supported by CT HIDRO Project performed during 2006 to 2008 at Jacui River Delta (South Brazil) was evaluated considering: 1) monthly densities of planktonic larvae (PL), 2) monthly densities of recruits on wood artificial substrate (MR), 3) accumulative density of recruits in different exposed times (2, 3, 4...,12 month) on the same substrate (AM) and, 4) accumulative adults (AR), with similar expose time like AM, and 4) limnological variables like a water temperature (WT), conductivity (CON), alcalinity (ALC), water hardness (WH), total coliforms (TC), sulfate (SUL), total phosphate (TP) and others. The predictors limnological variables of the population densities of *L. fortunei* were obtained through multiple regression analysis: $PL = -4.76728 + (0.24743 * WT) + (-0.0992 * WH) + (0.18378 * ALC)$; $MR = -5.0415 + (0.30652 * WT) + (-0.16344 * WH) + (0.25001 * SUL) + (0.61555 * TC)$, $AR = 6.88597 + (0.25307 * WT) + (-1.53415 * pH) + (-0.22585 * WH) + (0.29564 * SUL) + (0.69396 * TC)$, and $AA = 0.23145 + (-0.21194 * WT) + (1.05761 * pH) + (-23.6415 * CON) + (0.21457 * WH) + (-6.76357 * TF) + (-0.34624 * SUL)$. The simple regression between real and simulated densities did result in the following determination coefficients (r^2): PL (0,84), MR (0,86), AR (0,83), and AA (0,88). Laboratory assay was made to evaluated survivorness of *L. fortunei* of exposed to different values of pH (2 a 13) and conductivity (1, 84, 110, 147 e 300 μ S/cm). The assay was conducted at 21 ± 2 °C with oxygenation provided by aerators. Mortality was assessed daily during fourteen days. The models obtained based on field database were efficient to predict densities of this golden mussel population. Approximately 90% of individuals survived at pH 4 (acid extreme) and 97% at pH 13 (alkaline extreme). The bioassay of conductivity showed a lethal concentration (LC50) of 115 μ S/cm. The pH and conductivity values observed on bioassays showed high resistance of this invasor specie on extreme conditions. Statistical models and the knowledge of these limiting factors consist of important tools for managing of *L. fortunei*. However, we did not recommend the generalizations of these results to other populations of the same species. Invasive species have a high capacity to adapt to new environments during a bioinvasion process.

Anatomical description of *Sinotaia quadrata* (Benson, 1842): first record of a living viviparid in South América

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An invasive species causes changes on native communities and affects ecosystems through competitive exclusion of indigenous biota. Viviparidae are a large family of operculate snails and except as fossils, were absent in South America. Taxonomy of this group is mainly based on shell morphology, but the species are difficult to differentiate due to its high intraespecific variability. To accurately identify *Sinotaia quadrata* (Benson, 1842), syntypes were localized at London Museum (NHMUK). A complete description of *S. quadrata* is provided, necessary due to the lack of previously published information on the species. Data reconfirms the taxonomic identity of this alien species that we are reporting for Argentina. Live specimens were first located in 2009 in Cordoba Province, during 2010 and 2011 field work was done to state its distribution. *Sinotaia quadrata* is different from any other species of freshwater snail living in Argentina at first glance due to its large shell size. Shell bears two to three carina on body whorl and hairs or lamellae are visible in juveniles and lost in adults. In male specimens, testis is large, curved and extends over half the length of mantle cavity while in females the pallial oviduct occupy half of the pallial cavity with numerous egg capsules. Populations at Cordoba are already established since they have occurred there for at least two consecutive years. Juveniles of different sizes collected in the same place indicate successful reproduction. Other invasive species from Physidae and Corbiculidae plus two native species, *Pomacea canaliculata* (Lamarck, 1822) and *Biomphalaria tenagophila* (d'Orbigny, 1835) were also detected living together with *S. quadrata*. Interactions of *S. quadrata* with native species inhabiting in the area is difficult to predict, whereby this new invasion needs to be monitored with caution and the impact of its introduction evaluated at different levels.



**Taxonomic identification of a new exotic species for Chile, Laguna Conchalí:
Pomacea sp. (Gastropoda: Ampullariidae)**

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In December, 2008, several living adult specimens and eggs from the genus *Pomacea* Family Ampullariidae (= Pilidae) were found in the Laguna Conchalí, Los Vilos, Central Chile. This fresh water prosobranch species was an exotic gastropod that would be, later on, considered as a new record for Chile. The collected material was integrated to the Museo Nacional de Historia Natural de Chile mollusks collection. *Pomacea* Perry, 1811, is a snails group originated in the American continent. The species of the genus inhabit calm waters from ponds and lagoons (lentic environments). They are distributed almost in the total extension of the Neotropical Region, Central America, South America, the Caribbean islands and the southern part of North America in the Mexican Gulf Region, particularly in southern Florida. In Argentina it is distributed to the 36° latitude, especially to the Cuenca del Plata. *Pomacea canaliculata* has separated sexes and it is oviparous. The eggs are of a pink color, gelatinous consistency and calcareous shell. These eggs are disposed as grapes grains on aquatic emergent plants or on solid surfaces out of waters. Its feeding is herbivorous-detritivorous. They have been considered pests in the rice and taro cultures. The phylogenetic molecular analysis (Gen Bank: with a high percentage of bootstrap, 100%) have allowed us to confirm that this haplotype integrates a monophyletic group with a sequence of *P. canaliculata* from Argentina. Therefore, it has been confirmed that the specimens gathered in the Laguna Conchalí, Chile, belong definitively to *Pomacea canaliculata*.



Shellfish culture in Sepetiba Bay: challenges with socioenvironmental problems and hazards to public health

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Not only does the marine shellfish culture offer an important alternative to overfishing, but it also has technical peculiarities which foment sustainable practices and bring income to coastal communities. However, the coastal zone is a concentration region of human impacts, characterized by social and environmental conflicts and risk generation to public health, due to the consumption of fish or aquatic organisms grown on potentially contaminated environment. In scientific literature, both port operations and effluents from industries and domestic sewage are referred to as sources of oil pollution, heavy metals, pathogenic and organic matter to adjacent water bodies, contributing to ecosystem breakdown like harmful algal blooms. The current study was carried out in Sepetiba Bay (Rio de Janeiro, Brazil) and aimed to identify the: 1) main potential sources of anthropic pollution; 2) marine farms of shellfish culture. The methodology of the work consisted in the study of shellfish culture in Sepetiba Bay through a bibliography survey, environmental legislation research, visits to marine farms and analysis of the environmental impact reports (RIMA) of seven large enterprises already placed or intended to be placed in the watershed around Sepetiba Bay. Sixteen potential important sources of pollution such as ports, industries and urban clusters were identified in Sepetiba Bay. Among several fishermen's associations existing in the Bay, there are two of shellfishermen producing mussels *Perna perna*, oysters *Crassostrea gigas* and scallop *Nodipecten Nodosus* ones. It can be concluded that shellfish culture and other extractive activities accomplished in Sepetiba Bay take place in both public health and socioenvironmental high-risk scenario due to: 1) the progressive deterioration of environmental quality caused by uncontrolled development associated with the presence of large enterprises; 2) the absence of the government in the coastal zone management; 3) the lack of monitoring of the main parameters of water quality and shellfishes produced.



Does the presence of conspecific adults influence the embryonic development of *Lymnaea columella*?

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Snails belonging to genus *Lymnaea* are the known intermediate host of *Fasciola hepatica*. Prevention and control of fasciolosis can be improved by the knowledge of its biology. The aim of the present work is to assess if the presence of conspecific adults affects the embryonic development of *Lymnaea columella*, the main intermediate host of *F. hepatica* in Northeastern Argentina. We worked with 8 egg capsules (48 eggs) deposited by *L. columella* from Berón de Astrada, Corrientes Province, Argentina and maintained in the laboratory. The 8 egg capsules were randomly distributed in two experiments: P=Presence and A=Absence of conspecific adults that were replicated twice. "P" treatments consisted of 2 egg capsules each (P₁=6 and 7 eggs; P₂=4 and 6 eggs) and 15 *L. columella* adults each; "A" treatments consisted of 2 egg capsules each (A₁=8 and 6 eggs; A₂=6 and 5 eggs). Treatments were conducted simultaneously and performed in glass aquaria with filter and aerated water, at 22°C, under a 12:12 light: dark photoperiod. Beginning on the oviposition date (t₀) and every two days, water was changed, all embryos were measured and dates of hatching were recorded. In "A" treatment none of the embryos could hatch. In "P" treatments, 82.6% of the embryos successfully hatched and their median time of development was 14.0 days (1stQ=11.0; 3rdQ=15.5 days). At the beginning of development, no differences were found in the size of the embryos between treatments (t₍₀₋₂₎=0.3mm and t₍₃₋₄₎=0.4mm; p>0.05). From day five after laying onwards, embryos in "P" treatments were significantly bigger than embryos in "A" treatments: t₍₅₋₇₎=0.6 vs 0.4mm, U=103, p<0.05; t₍₈₋₉₎=0.7mm vs 0.3mm, U=71.5, p<0.05; t₍₁₀₋₁₁₎=0.7mm vs 0.4mm, U=77, p<0.05; t₍₁₂₋₁₄₎=0.6mm vs 0.4mm, U=73.5, p<0.05). Our results show that the presence of conspecific adults stimulates the embryonic development of *L. columella*. Future studies are needed to determine the cause of this observation.



Gametogenic activity of golden mussel in the Cais do Porto, Porto Alegre, RS

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The golden mussel *Limnoperna fortunei* (Dunker, 1857), found in South America since 1991, is an invasive species at the Prata-Paraná-Paraguai basin. Usually individuals of this species are dioecious, however in Brazil there are records of occasional hermaphroditism. The present study focuses on the reproductive biology of *L. fortunei*, with emphasis on the description of the gametogenic stages. Between February 2010 and September 2011 a total of 313 individuals were analyzed, their biometric variables measured. The average length of males was 23.50 ± 8.45 mm, the height 10.69 ± 3.64 mm and the weight 0.85 ± 0.71 g. For females the mean measures were: length 23.56 ± 8.44 mm, height 10.84 ± 3.69 mm and weight 0.85 ± 0.77 g. For the not identified the length, height and weight were 16.90 ± 8.59 ; 7.72 ± 3.40 ; 0.49 ± 0.53 , respectively. Samples gonad tissues were studied by histological techniques (H&E). From the total of individuals analyzed, 122 were males (39%), 169 females (54%) and 22 (7%) not identified due to the absence of gonads. Like most of the Mytilidae, in the golden mussel the sex identification is possible when they are mature, by the color of the mantle, gray in males and rosé in females. The gametogenesis was continuous during this study, with cell proliferation during all the period. There was a rest stage identified only scarce isolated individuals where residual or remaining gametes in reabsorption. Three elimination periods occurred per year: on January, May and September. No cases of hermaphroditism. The gametogenesis is an important aspect for understand the population dynamics, guiding the steps of control the spread of invasive larvae of this species that is free in the early stages.



Concerning genetic lineages and conservation units in *Aylacostoma* snails from High Paraná River (Argentina-Paraguay)

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We provide a genetic analysis of *Aylacostoma* snails (Thiaridae) from Argentina-Paraguay focused on setting conservation priorities. This group is listed by IUCN as “extinct in the wild” as the result of filling the Reservoir of Yacyretá. Three endemic species were described by mid-1950s along a short reach of the High Paraná River. Two of them can presently be considered as extinct; however, *Aylacostoma chloroticum* is still found in nature, but critically endangered. Recently, few specimens of a new uncharacterized morphotype (hereafter NM) were recorded from the same area. We use cytochrome oxidase subunit 1 (COI) sequences to identify genetic lineages both for *A. chloroticum* and NM. We analyzed 37 specimens from six localities spanning the narrow geographical range of *A. chloroticum*, and 6 specimens from the only two sites where NM is known to occur. We obtained 43 sequences of 658 bp in length from which we identified three haplotypes (H): two for *A. chloroticum* differing in 1 substitution i.e. H1 (n=33) and H2 (n=4); the third (H3) was exclusive to NM, differing in 28 substitutions from *A. chloroticum* (H1). From a phylogenetic perspective, two subclades were recognized within *A. chloroticum*, one including all the geographic records, and a minor one containing specimens only from a single location. Phylogenetic reconstructions also suggest that NM might be a new species, rather than a lineage of *A. chloroticum*. Finally, we used genetic data to define evolutionarily significant units (ESUs) for conservation purposes. Our data suggest that *A. chloroticum* presents, at least, two ESUs. Since both ESUs converge in a single location, and given that the new morphotype occur at the same site, the location referred as Rio Beach, Paraguay (27°24'29.83"S; 55°49'32.94"W), is highlighted as a key source of genetic diversity to optimize ex situ conservation of these snails.



Morphometric analysis of *Bulimulus bonariensis bonariensis* (Rafinesque, 1833) and *Bulimulus bonariensis sporadicus* (D'Orbigny, 1835) (Gastropoda, Orthalicidae)

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Orthalicidae (=Bulimulidae) are the largest gastropod family in the terrestrial Neotropical malacofauna, accounting for 40-60% of the landsnail diversity in many countries. They are widely distributed in the tropic and subtropical regions of South America, Australia, New Zealand and Tasmania. The aim of the present work is to analyze the conchological variation of two subspecies of the genus *Bulimulus*, *Bulimulus bonariensis bonariensis* (Rafinesque, 1833) and *Bulimulus bonariensis sporadicus* (d'Orbigny, 1835), estimating apex, last whorl and aperture. Material studied, *Bulimulus b. bonariensis*, is from collections in Florencio Varela, Buenos Aires (n=21) and specimens deposited in the MLP (n=21). The morphogeometric analysis was conducted using the deformation method, the *Thin-Plate Splines* (TPS) and the *Relative Warps Analysis* (RWA). The specimens were photographed with a digital camera. Fifteen landmarks were digitalized on each photograph, eight of which were semilandmarks. The first four morphometric variables obtained by the RWA accounted for 83.79% of the local variation observed. MANOVA test was conducted using the above variables to asses their significance in distinguishing among subspecies. Next, canonical variables (CVA) were estimated to maximize their separation. ANOVA revealed significant differences among the subspecies (λ de Wilks = 0.761; F (4, 58) = 4.547, $P < 0.005$). CVA showed that differences in the form of the subspecies were maximized. CV1 accounted for 100% of the variation observed between both subspecies, with *B. bonariensis sporadicus* situated on the most negative region on the axis(suboval shell), while *B. bonariensis bonariensis* (more stylized shell), was on the positive region overlapping the subspecies on the medium region of the CV1.



Habitat characteristics and morphology of two species of bivalves from the Irituia river, Eastern Amazon

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In the *Diário Oficial da União* of May 28th 2004, the Ministry of the Environment lists the Brazilian species of threatened and endangered aquatic invertebrates, including species of Unionoida. As part of a research project of Amazonian Unionoida, the morphology of shells of two genera of the family Hyriidae: *Castalia ambigua* (Lamarck, 1819) and *Triplodon corrugatus* (Lamarck, 1819) was investigated as well as the physico-chemical characteristics of the Irituia river, Pará, Eastern Amazon. Specimens were collected manually in the drier period (November 2011). Sex was determined by biopsy and shells of *T. corrugatus* (n=30) and *C. ambigua* (n=40) were measured with a digital callipers (precision 0.01 mm) for height, length and width. Physico-chemical parameters (Turbidity, pH, dissolved oxygen, conductivity and temperature) were determined using an HORIBA – 10 multianalyser. Water was collected from the bottom using a Van Dorn bottle Transparency was also measured using a Secchi disk. Means and standard deviations were calculated for shell variables and a multivariate ordination (non metric multidimensional scaling) (MDS) of the shells. Principal Components Analysis (PCA) of sites was carried out using physico-chemical parameters. All data were analyzed with GNU-R using RStudio and the vegan library. The results indicated high turbidity and pH at the river margins. Shell measurements were not associated with sex in *C. ambigua* and *T. corrugatus*. The Irituia River is well oxygenated, which is important for bottom dwelling organisms such as bivalves.

Effects of trophic availability on the shell morphology of the apple snail
Pomacea canaliculata

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Pomacea canaliculata is a freshwater snail native from South America and a successful invader worldwide. The shell shape on this genus is highly variable leading to considerable taxonomic confusion. It has been previously determined that the origin of interpopulation variation is both genetic and environmental but the reaction norms to specific environmental factors such as trophic availability are still unknown. The aim of our study was to search for shape changes attributable to the food availability at which snails were reared. Eighty two full sibling snails were reared individually, under seven different levels of fresh lettuce availability (from 100% to 20% of ad libitum ingestion rate). The shells were photographed in apertural view at maturity (one month after the first egg mass) and we analyzed nine landmarks and ten semilandmarks using geometric morphometrics techniques. In males and females significant allometry was found: a relative decrease of the spire height in both sexes and an expansion of the shell aperture in males. Due to this sexual dimorphism males and females were analyzed separately and thereafter we worked with the residuals of the regression between shape and size (centroid size) to remove the allometric component. We found a significant relationship between shape and trophic availability in females, being more globose and with a higher aperture when grown at high food availability levels. In the case of males, no relationship between shape and food availability was found after removal of the allometric effect; this could be due to the absence of this relationship or to the high correlation between food availability and size at maturity (males mature always at the same age but at different sizes). The morphological differences found between females relative to trophic availability could be useful for paleoenvironmental reconstruction and for assessment of actual trophic availabilities in the field.



**Continental molluscs occurring in the Santa Catarina's State, Southern
Brazil: new contributions to regional inventory**

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Starting from the year 2008, based on extensive literature review and examination of specimens deposited in institutional collections, including samples obtained in the course of work/ field studies, this contribution includes the record of over 32 specific known taxa (9 limnic/ freshwater & 23 terrestrial). Prior systematic inventory of the continental molluscs of Santa Catarina's State/ SC, the geopolitical smaller portion of the southern Brazil region, including 28 Gastropoda (1 HELICINIDAE, 3 HYDROBIIDAE, 1 THIARIDAE, 1 ANCYLIDAE, 5 SUBULINIDAE, 4 BULIMULIDAE, 1 AMPHIBULIMIDAE, 1 ODONTOSTOMIDAE, 1 STREPTAXIDAE, 3 SYSTROPIIDAE, 5 CHAROPIDAE, 1 GASTRODONTIDAE/ ZONITIDAE - exotic, 1 VERTIGINIDAE - exotic) & 4 Bivalvia (1 HYRIIDAE, 1 MYCETOPODIDAE, 1 CORBICULIDAE, 1 MYTILIDAE - exotic) distributed in 26 genera and 17 families. Our studies increased to a new total of 192 species and subspecies known regionally. Two alien species were confirmed: *Meghimatium pictum* (Stoliczka, 1873) (PHILOMYCIDAE) and *Lehmannia valentiana* (Férussac, 1823) (LIMACIDAE). Regarding the new records, the asiatic golden mussel *Limnoperna fortunei* (Dunker, 1857), only freshwater/ limnic representative known of the Family MYTILIDAE (an invasive introduced species), the freshwater native snail *Aylacostoma* sp. (THIARIDAE), the rare arboreal native snail *Macrodonates thielei* Pilsbry, 1930 (ODONTOSTOMIDAE), *Cyanocyclas* (= *Neocorbicula*) *limosa* (Maton, 1809) (a native representative of the family CORBICULIDAE) and, finally, the native freshwater mussel/ naiad *Diplodon* (*Rhipidodonta*) *koseritzi* (Clessin, 1888) (HYRIIDAE considered in "endangered" status), comparative material was deposited in the scientific malacological collection of the "Museum of Sciences and Technology", Pontifical Catholic University of Rio Grande do Sul - PUCRS, Porto Alegre/ RS (MCP 09559).



Reproductive biology of *Octopus insularis* Leite & Haimovici, 2008 in Paracuru, Ceará

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Octopuses have high ecological importance for the ecosystem as predators of several species and also as prey for some fish, besides being an important fishery resource in countries of the North Atlantic Ocean, Mediterranean Sea and Pacific Ocean. The aim of this study was to analyze the reproductive biology of *Octopus insularis* Leite & Haimovici, 2008 caught by artisanal fishery in Paracuru, Ceara, Brazil. The study was conducted from January to October 2011 in “beach rocks” from Pedra Rachada, Paracuru, Brazil. We analyzed the dorsal mantle length (DML) and total weight (Wt), in addition to classifying male and female gonads according to the stage of maturation. Thus, it was possible to calculate the length of first maturity (L50%). In total, 74 specimens (21 males and 53 females) were analyzed. The mean DML was 6.23 ± 1.51 cm for males and 5.660 ± 1.413 cm for females during the sampled period. The mean Wt was 170.476 ± 137.480 g for males and 116.189 ± 82.920 g for females. During the sampled period, a higher frequency of spawning was in the period from May to December (dry season) for both genders. The L50% obtained for males was 5.2 cm and 6.6 cm of females. The *Octopus insularis* showed length of first maturity less than *Octopus vulgaris* from other regions of warm water. This study is the beginning to the preservation of the species of octopuses to the area of environmental protection (APA) Paracuru, Ceará, Brazil.



Mollusc diversity in natural beds of *Gigartina skottsbergii* (Rhodophyta) in the Strait of Magellan, Chile

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The growing demand for carrageenan by the Chilean and global industry have resulted in strong extraction pressure on natural beds of the 'luga', *Gigartina skottsbergii*, shifting fishing effort from 41°S to the southernmost region of Chile (54–56°S). Despite the generated knowledge about the biology of *G. skottsbergii*, the impacts of extractive fishing of this resource on its associated organisms still are unknown. In this study we assessed seasonally the mollusc diversity associated with two natural beds of *G. skottsbergii* located in the Strait of Magellan. The study sites corresponded to Punta Santa María (53° 21'S, 70° 27'W; Tierra del Fuego Island) and Punta Santa Ana (53° 37'S, 70° 52'W; Brunswick Peninsula). Samples were obtained by SCUBA diving in quadrants of 0.25 m², which were arranged randomly within each bed. Fifteen quadrants were sampled per bed in each season (2010–2011). We identified a total of 45 species of molluscs in both beds. The best represented families were Buccinidae (5 species) and Chitonidae (4 species). The most abundant species were the polyplacophoran *Tonicia lebruni* (117 individuals) and the gastropod *Trochita pileus* (94 individuals). In the bed of Santa Ana, the highest values of Shannon diversity and Pielou evenness were obtained during the summer (values of 2.1 and 0.9, respectively), while at Santa María the highest values were obtained during the autumn (values of 2.9 and 0.8, respectively). For each season, the species richness, abundance and diversity showed significant differences between the two beds ($p < 0.05$). The information generated on molluscs associated with *G. skottsbergii*, is very relevant from the fishery standpoint of this alga, since their ecological role was unknown. Therefore in near future is important to know which species of shellfish could be impacted with overexploitation or absence of this resource.



Mollusks of intertidal zone under influence of Terminal Portuário do Pecém, Ceará, NE Brazil

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Terminal Portuário do Pecém is an offshore seaport, located in Pecém Beach, west coast of Ceará, NE Brazil. Intertidal zone of Pecém Beach have a large sandy area and some patches of hard substrate. After construction of seaport, sedimentary dynamic of this area was changed. Currently, this beach suffers periodic processes of erosion and siltation. Since 2005 Pecém Beach is monitored through monthly field activities. The aim of the present work was analyzed qualitatively the malacofauna in the tidal zone of Pecém Beach under influence of *Terminal Portuário do Pecém*, Ceará. To obtain qualitative data on the malacofauna two sampling sites of sedimentary substrate and four sampling sites of hard substrate were chosen in the intertidal zone. Substrate samples from the sandy intertidal zone were taken to inventory the malacofauna. Random search was conducted on hard substrate, in order to record species that were present in this environment. With systematic sampling conducted since 2005, three classes of Mollusca were found in the study area: Gastropoda, Bivalvia and Cephalopoda. In sandy area, 11 species of Bivalvia and 7 species of Gastropoda were found. In patches of hard substrate, a total of 14 species of Mollusca were found, including 4 species of Bivalvia, 9 species of Gastropoda and one species of Cephalopoda. The invasive bivalve *Isognomon bicolor* occurs in Pecém Beach at low densities. This study provides the first reports of *Donax gemmula* and *Heterodonax bimaculata* from Pecém Beach. An explanation for the occurrence of these species in this area is introduction by ballast water, given that in this region there is intense ship traffic. One of the greatest threats to marine biodiversity is the introduction of exotic species, combined with destruction of habitats and overexploitation for human consumption.

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Mollusks of recruitment panels placed on Terminal Portuário do Pecém, Ceará, NE Brazil

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Terminal Portuário do Pecém (3°30' S, 39° 50' W) is an offshore seaport, located on west coast of Ceará, NE Brazil. The aim of the present work was analyzed qualitatively the malacofauna found on recruitment panels placed on *Terminal Portuário do Pecém* from October 2009 to November 2011. This experiment is part of project “*Bentos em regiões portuárias ao longo da Costa Brasileira: biodiversidade, filogeografia e aspectos de bioinvasão por biofouling*”, a partnership among Federal Universities of Ceará and Paraná and São Paulo University, started in 2009. A set of 30 sampling units was submerged among pillars of the pier at approximately 6 m depth, consisting of two polyethylene panels of 10 x 10 cm, arranged in parallel with a 2 cm space between them. Every three months, 15 panels were removed to examine the biota present. A set of 15 panels was left submerged for one year and removed to analyze after this period. All removed panels were replaced by new ones on the same day. Eight removal/replacements of panels were performed (eight collections of quarterly plates and two collections of annual plates) from October 2009 to November 2011. Two classes of Mollusca were found in recruitment panels: Gastropoda (18 species and 13 families of prosobranchs) and Bivalvia (13 species and 9 families). In quarterly and annual plates, the most abundant species were *Crassostrea brasiliiana* and *Musculus lateralis*. This study extended the geographical range of *M. lateralis* along the Brazilian coast, from previous records from the states of Pernambuco to Santa Catarina. The most individuals of *C. brasiliiana* were juveniles. Two specimens of invasive bivalve *Isognomon bicolor* occur in recruitment panels. The occurrence of this species in *Terminal Portuário do Pecém* is due to introduction by ballast water, given that in this region there is intense ship traffic.

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Freshwater molluscs from the municipality of Araguaína, Tocantins State, Brazil

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Malacological survey has been a relevant tool for monitoring presence, distribution and relative abundance of planorbids and to identify potential vector species, especially for schistosomiasis. Araguaína is the second most important city of Tocantins state and its population is more than 150 thousands inhabitants. It's considered the major center of economy, commerce and health services of the north of Tocantins and the south of Maranhão and Pará states. The city is localized in the transition from Cerrado to Amazon forest ecosystems. The climate is tropical humid and the hydrography is formed by Araguaína river and tributary streams. The present work deals with the primary data of a major project that aims to map the occurrence and distribution of freshwater molluscs in Araguaína region. The samples were collected in July 2012, at Lontra river, Neblina stream and a lake at the rural campus of Federal University of Tocantins. All collected material was send to Laboratory of Malacology (IOC/FIOCRUZ) for morphological identification. In all, six different families were found: Ampullariidae (*Pomacea maculata*), Ancyliidae, Hyriidae (*Diplodon* sp.), Physidae (*Physa marmorata*), Lymnaeidae (*Lymnaea columella*) and Planorbidae (*Biomphalaria straminea*). Some of those species are vectors of digenetic trematodes of medical and veterinary importance: *B. straminea* and *L. columella*, intermediate hosts of *Schistosoma mansoni* and *Fasciola hepatica*, respectively. It is noteworthy that in some endemic areas, *B. straminea* is the main responsible for schistosomiasis transmission and although Tocantins is considered schistosomiasis non-endemic area, the presence of the intermediate host deserves attention. Besides the importance of this study under the public health point of view, this is first freshwater mollusc survey performed in this region, which is also considered quite interesting under the ecological and biological point of view. Further studies aiming to map the distribution of freshwater mollusc species of this region as well as the search for trematode infection will be done.



**Malacological freshwater fauna from the Bajo
Madre de Dios River Basin, Peru**

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Aquatic molluscs are one of the most endangered groups of invertebrates, because they are threatened by water pollution, flow modification, destruction of habitat, overexploitation and invasion by exotic species. For these reasons, molluscan survey and its proper assessment are required to evaluate their biodiversity and possible extinctions. In Peru, there are few studies in freshwater molluscs, especially in the Amazon Basin. Freshwater molluscs are an important group because they are good bioindicators, and some are intermediate hosts of many human and veterinarian diseases. They also play significant ecological roles including belonging to a trophic chain linking freshwater and terrestrial communities, as decomposers of organic matter and in sediment bioturbation. The aim of this study was to evaluate the aquatic molluscan fauna in the Bajo Madre de Dios River Basin in order to support further studies in taxonomy, ecology, systematics and phylogeography. The samples made were the result of exhaustive searching in all water bodies including rivers, lakes, ponds and oxbow lakes. Nine localities were sampled: Cocha Valencia, ITA Station, Cocha Gamitana, Quebrada Tres Marias, Cocha Afluente Madama, Machiguenga, Selva Alegre, Fundo Concepcion and Sandoval Lake. A total of eight families containing 23 species were found: Ampullariidae, *Pomacea maculata*, *P. canaliculata*, *Pomacea* sp. and *Asolene* sp.; Cochliopidae, one unidentified species; Physidae, *Physa marmorata*; Planorbidae, *Drepanotrema aff. limayanum*, *D. aff. lucidum*, *D. aff. cimex*, *D. kermatoides*, *D. anatinum*, *Biomphalaria tenagophila aff. guaibensis*, *B. intermedia*, *Drepanotrema* sp., *Biomphalaria* sp., *Gundlachia aff. radiata*, *G. aff. ticaga*, *Laevapex* sp. and *Anysancylus aff. obliquus*, Mycetopodidae, *Anodontites elongatus*, and Pisidiidae, *Pisidium* sp. and *Eupera aff. simoni*. Cocha Valencia and Sandoval Lake had the greatest diversity and both areas are the least affected by mining. Sandoval Lake is the only sampled site, which is located in the Tambopata Protected Reserve Area.



Distribution of *Melanoides tuberculatus* and *Corbicula fluminea* in Peru

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Species invasion is one of the main problems that freshwater ecosystems are facing nowadays polluting them and displacing other species due to resource competition. As examples, the African snail *Melanoides tuberculatus* and Asian clam *Corbicula fluminea* have invaded Europe and America largely. In Peru, there are no actual data about their distribution, making a gap in the knowledge about populations and the effect on the local fauna. The aim of the study was to determine the distribution of both mollusks in Peru. A revision of the scientific collection of the Museo de Historia Natural of the UNMSM (MUSM) and existing literature was done. *Melanoides tuberculatus* is well distributed in all the Peruvian Coast, the oriental slope of the Andes including Huanuco, Junin and Pasco, and the Amazon including Amazonas, Loreto and Ucayali. The presence of this snail near urban communities as Lima and Iquitos is concerning because they are intermediate hosts of many trematodes involved in human diseases. In the case of *Corbicula fluminea*, its distribution is extended in Loreto and Madre de Dios in the Amazon, and in Tumbes in the Coast. This both regions share the same tropical weather. Also, it has been found in Cañete Valley. In the future this bivalve could extend its distribution to the warm regions of the South of Peru. There is a necessity to develop more studies about density and population dynamics of these mollusks and to know their morphological and molecular variation.



Environmental factors influencing land snail diversity in a protected forest at Ilha Grande, RJ, Brazil

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In Brazil, there are few studies on land snail communities and their associated ecology, despite the estimated high regional molluscan biodiversity and the high potential to discover new species. This study assessed the land snail composition and the environmental factors that influence the distribution of molluscs among these communities at Pico da Pedra d'Água, a protected forest on Ilha Grande, Angra dos Reis, Rio de Janeiro state, southeastern Brazil. Sampling was carried out at seven sites at approximately 100 m intervals from 100 to 700 m above sea level. At each site we sampled suitable microhabitats for a total of 2.5 person/hours, and collected leaf litter from ten quadrates of 25 x 75 cm. For each quadrat, environmental data including atmospheric and soil temperature, relative air humidity, luminosity, canopy closure, litter depth and moisture were obtained. The leaf litter was visually searched on white trays looking for snails, live and shells, using a strong light for easy visualization. The Cluster Analysis was performed with the biological data, using average and Euclidian distance, to identify similar groups, among the different altitudes. These groups were used in Discriminant Analysis (DA) aiming to identify the environmental factor responsible for the clustering or similarities. In the total we collected 304 specimens, 28 species and 9 families. The richness ranged from 5 to 16 species per site. The micromolluscs corresponded to 55.9% of the total abundance and 42.8% of the richness. The most abundant species was *Happiella* sp. that occurred at all altitudes. The result of the DA significantly distinguished the biological groups formed in the Cluster Analysis (*Wilks' lambda* = 0.301; $p < 0.000$). The environmental factors which were associated with variation in species composition were the relative air humidity, soil temperature and canopy closure.

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**Interaction between *Biomphalaria tenagophila* and *Melanoides tuberculata*
during six years on Ilha Grande, RJ, Brazil**

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Biomphalaria tenagophila (d'Orbigny, 1835) (Planorbidae) is a freshwater snail of great medical interest as one of the intermediate hosts of *Schistosoma mansoni* Sambon, 1907, that causes schistosomiasis. *Melanoides tuberculata* (Müller, 1774) (Thiaridae) is an African-Asian snail that was introduced in Brazil around 1967. The two species were registered for the first time on Ilha Grande in 2005. Some studies suggest that *M. tuberculata* can act as biological control agent of the vectors of schistosomiasis. The objective of this study was to investigate the interaction between *B. tenagophila* and *M. tuberculata* during six years (July/2006 to June/2012) in a stream in Vila do Abraão, Ilha Grande, Angra dos Reis, Rio de Janeiro, Brazil. The stream was divided in to eight collection stations and the snails were searched bimonthly with three collectors during 15 minutes. The specimens were quantified, fixed and were deposited in the Collection of Molluscs of UERJ. In the first investigation 25 adult snail individuals of *B. tenagophila* and 694 of *M. tuberculata* were found. We observed fluctuations of *B. tenagophila* population with pronounced reductions, not being found in April 2010, and July/2011 October/2011. After the population declining of *B. tenagophila*, the turnover was also noticed later. The population of *M. tuberculata* also exhibits the same pattern. It seems that the population recovery of *B. tenagophila* occurred before that of *M. tuberculata*. The fluctuations of snails population may not be effected by physical conditions such as seasonal changes. This is confirmed by the non significant statistical test. It should be noted that the population size of *B. tenagophila* is rather smaller than that of *M. tuberculata*. We can initially conclude that the two species live together in the studied same for at least the last six years which probably interacted with each other.

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Looking for new approaches for understanding the ecology of mollusc assemblages in muddy bottoms

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Studying the temporal variation of soft-bottom mollusc assemblages is most commonly managed by attending to their species composition, but also by classifying the taxa into functional groups. Single-criteria grouping is the most frequent approach but, recently, more complex functional approaches have been done by gathering information on several biological traits, looking for a more detailed picture of the structure of the assemblage. Our goal is to test the differences in the interpretation of the temporal structure of benthic mollusc assemblages by 1) considering the species composition and 2) using other approaches based on functional groups. The study site was a muddy bottom (17m depth) in the Ría de Aldán (NW Iberian Peninsula), where the mollusc assemblage was studied from May 1998 to May 1999. Five replicate samples were taken monthly by means of a Van-Veen grab and sieved through a 0.5mm mesh. Sedimentary features and physico-chemical characteristics of both water and sediment were measured as well. Molluscs present in the samples were sorted, identified and counted, and further classified according to both trophic groups and life habits. For each approach, different multivariate analyses were carried out by using PRIMER statistical package. The bivalves *Kurtiella bidentata* (Montagu, 1803) and *Thyasira flexuosa* (Montagu, 1803) appeared to be the numerically dominant species, followed by the gastropod *Calyptraea chinensis* (Linnaeus, 1758). The trophic approach showed the closest results to those obtained considering species composition, while that based on the life habits provided higher correlations with abiotic variables. The joint use of both criteria leads to results somehow intermediate between the ones obtained when using them separately. These results suggest that different classifications could be useful for different study purposes and that the use of more complex sets of biological traits could improve our understanding of the ecology of benthic assemblages.



Patterns of temporal variation of the marine soft-bottom bivalve *Thyasira flexuosa* (Montagu, 1803)

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Thyasira flexuosa is a small lucinid bivalve which is commonly found in organically enriched or hydrocarbon-polluted muddy sediments, even under anoxic conditions. Its ability to survive in such conditions is due to several adaptations, including a population of chemoautotrophic endosymbiotic bacteria inhabiting its gills, which allow *T. flexuosa* to feed on hydrocarbons. Here we provide a comparison of the temporal variation of this bivalve in two small embayments in the Galician Rías (NW Iberian Peninsula). The study sites were two muddy bottoms in the Ensenada de Baiona (2m depth) and the Ría de Aldán (17m), where *T. flexuosa* was studied from May 1996 to May 1997 and from May 1998 to May 1999, respectively. In each case, five replicate samples were taken monthly by means of a Van-Veen grab and sieved through a 0.5mm mesh. An additional sample was taken to characterize several sedimentary parameters. Abundance of the species was quite high in both sites, which showed strikingly similar temporal patterns. These were characterized by abundance peaks in August-September and November, and another one in spring, although this one starting already by late winter in one of the sites. Although both sites were characterized by organically enriched sediment, the one in the Ría de Aldán appeared to be finer and with a higher content in both carbonates and organic matter. In spite of these differences in granulometric features, depth and study period, similarities of temporal dynamics of *T. flexuosa* between both sites are remarkable. In addition, these results differ from those previously described for *T. flexuosa* in the same area.



Populational parameters of *Megalobulimus paranaguensis* (Pilsbry & Ihering, 1900) in Ilha Porchat, São Vicente, Brazil

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Megalobulimus paranaguensis, is a neotropical giant land snail of family Megalobulimidae. Since 2008, we found many individuals of this species in Ilha Porchat, located in São Vicente, State of São Paulo, Brazil. Ilha Porchat is a region with high antropic impact, because of urban occupation and introduction of exotic species, but still has fragments of native vegetation. The aim of this study was to analyze the population structures of this species. We chose three areas in Ilha Porchat, where we did quadrats with 5 m. In area 1, we did 6 quadrats, In area 2 we did 3 quadrats, and in area 3, we did 2 quadrats. In the quadrat, we marked all the individuals of *Megalobulimus paranaguensis*, with nail polish. We used Schawars-Arnason model to create 8 populational models and estimate the populational parameters. We used Akaike information criterion (AIC), the ΔAIC and the AIC weight to see how model has a better fit and precision to the data. We made 11 samplings during 6 months. We mark 121 individuals of *Megalobulimus paranaguensis* in this study, with 16 recaptures. The model $\phi (\cdot) p (t) \beta (t)$ (survivorship constant, probability of capture variable and probability of entry variable) was the most parsimonious. The apparent survivorship ($\phi = 0.73$) was high, which indicates that this species is a K strategist. We identified one peak of recruitment and two peaks of abundance, apparently correlated with the peaks of activity. We found only one peak of recruitment in this study, but because of the two peaks of abundance found in this study, which suggest more than one peak of recruitment, we believe that *Megalobulimus paranaguensis* is an iteroparous species, same pattern found for *Megalobulimus abbreviatus*, in a histological study of the gonads.

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Population dynamics and morphometry of *Pisidium punctiferum* in Ilha Grande, Rio de Janeiro, Brazil

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The Laboratory of Malacology/UERJ is since 2006 surveying the fauna of molluscs in a stream in Vila do Abraão. This study had two goals: the first, to monitor the effects of population fluctuations of the exotic species *Melanoides tuberculata* (Müller, 1774) on the abundance of *Pisidium punctiferum* (Guppy, 1867); the second, to analyze the morphometry of the last species and its correlation with its abundance and size in dry and rainy seasons. We believe that *M. tuberculata* have a negative effect over *P. punctiferum*, affecting the size and abundance of this bivalve. The stream was divided into eight sampling stations where three people search for the molluscs for 15 min, using a metallic handled scoop. The fluctuations of the populations were observed in the period from July/2006 to March/2011, on a bimonthly base. For the morphometric analysis, were measured the length and height of 111 specimens from December/2008 to June/2009. A linear regression was made between the average heights and average abundance of each sampling point, each shipment as well as between the average abundance and average lengths. Morphometric differences between the dry and rainy seasons were evaluated using t test. The two populations show similar fluctuations in their abundances, showing that *P. punctiferum* is not influenced by *M. tuberculata*, contradicting previous results. In *P. punctiferum* the body size is not affected by the abundance (height, $p=0.885$; length, $p=0.868$). There are also not observed differences between the length in rainy and dry season ($p=0.127$). In relation to height, the differences are significant ($p=0.023$). Apparently *M. tuberculata* is not affecting *P. punctiferum* in the studied stream.

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First report of *Plesiophysa guadeloupensis* (Mollusca; Planorbidae) in the State of Maranhão, Brazil

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This study is part of the PhD thesis of the first author which aims to perform the freshwater malacological survey in the Microregion Baixada Maranhense, an endemic area for schistosomiasis in the State of Maranhão. Field surveys were performed in 15 municipalities (March and July 2012) and the molluscs were obtained using collecting sieves. Abiotic factors in the habitats (temperature, pH, conductivity, and dissolved oxygen in the water) were also provided. Specimens were anesthetized in Hypnol 0.05% solution, for five hours and then killed by hot water (70° C) and fixed in Railliet-Henry solution for the morphological diagnostic. Part of the specimens is being kept in aquaria for further studies on the development of the juveniles. In all, 5 families were found (Ancyliidae, Ampullariidae, Lymnaeidae, Planorbidae and Physidae) and the following species were identified: *Antillorbis nordestensis*, *Biomphalaria* sp., *Biomphalaria glabrata*, *B. schrammi*, *B. straminea*, *Drepanotrema anatinum*, *D. depressissimum*, *D. lucidum*, *Physa marmorata*, *Pomacea maculata* and *Plesiophysa guadeloupensis*. The temperature of water was in between 25 to 36°C, pH 4.2 to 7.3, dissolved oxygen 0.1 to 26.0mg/l and conductivity 21.40 to 1350ms/cm. This paper deals with the first report of *P. guadeloupensis* (Planorbidae) in Maranhão, in natural biotopes in two municipalities, Pedro do Rosário (locality of Três Palmeiras) and Santa Helena (locality of Mangabeira). In Brazil, there are only two species of *Plesiophysa*: *Plesiophysa dolichomastix* Paraense, 2002 and *P. guadeloupensis* (Crosse & Fischer in Mazé, 1883). The first occurs only in the State of Goiás whereas the latter has been reported to the States of Bahia, Espírito Santo, Minas Gerais, Paraíba, Pernambuco, Rio de Janeiro, Rio Grande do Norte and Sergipe. The preliminary results of this first freshwater malacological survey performed in this region is in accordance with one of the main goals of this study, i.e., to contribute to a better understanding on the freshwater biodiversity of the State of Maranhão.



Primary productivity of microphytobenthos and condition index of *Ruditapes philippinarum* in Taean Peninsula, Korea

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Seasonal primary productivities of microphytobenthos (MPB) were estimated by using chlorophyll *a* content and the number of cells at three shore levels of Jinsanri, Taean Korea from April to December 2011. Seasonal condition index of *Ruditapes philippinarum* and primary productivity such as chlorophyll *a* contents, cell number, and HPLC pigment analysis of MPB were also examined at Hwangdori and Jeongsanpo showing different levels of chlorophyll *a* contents from February to August 2012 in order to elucidate their relationship. Seasonal gut contents were also investigated to know the foodstuffs of *R. philippinarum*. At Jinsanri, chlorophyll *a* concentration was 66.00-120.73 mg/m² with minimal in July and maximal in October 2011, and it was maximal in mid shore with 137.35 mg/m². The number of cells of microphytobenthos was between 78,556-287,898 cells/cm² and it was maximal in April and minimal in July 2011 at Jinsanri. Seasonal chlorophyll *a* concentration was 79.37-212.48 mg/m² (average 145.93 mg/m²) at Hwangdori and was 71.75-124.60 mg/m² (98.18 mg/m²) at Jeongsanpo. Also, seasonal condition indices of *R. philippinarum* were between 0.58-0.78 at Hwangdori and between 0.42-0.45 at Jeongsanpo. Thirty two species were identified, including 30 diatom and 2 silicoflagellates in the gut of *R. philippinarum* and dominant microalgae were *Cylindrotheca closterium*, *Cylindrotheca gracilis*, *Navicula* sp, *Nitzschia* sp., and *Paralia sulcata*. These results indicate that primary productivity of MPB and condition indices of *R. philippinarum* are positively correlated. Thus, we suggest that condition index of *R. philippinarum* could be enhanced with increasing primary productivity of intertidal mudflat because microphytobenthos are used as food stuff of *R. philippinarum*.

**First field record of predation of *Didemnum psammotodes* (Sluiter, 1895)
(Ascidacea: Aplousobranchia: Didemnidae) by *Lamellaria* sp. (Mollusca:
Caenogastropoda: Velutinidae)**

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Many mollusks are recorded among the predators of ascidians. In Caenogastropoda there are some species distributed in fourteen families. The species belonging to the family Velutinidae are known for their carnivorous habit and *Lamellaria* has been studied for its association with the ascidian species of family Didemnidae. Velutinid gastropods use Didemnid species as hosting for their eggs, oviposition, and as source of food (predation). *Lamellaria* sp. was recently found in area under influence of the *Complexo Industrial e Portuário de Suape* (a harbour), Cabo de Santo Agostinho, Pernambuco State, Brazil. During field work we observed predation of three specimens in three different colonies of *Didemnum psammotodes* (Sluiter, 1895). There had been no record of the occurrence of the genus *Lamellaria* on the coast of Pernambuco State, or registration in the field of its predation on this species of sea squirt, until now. The presence of *Lamellaria* sp. at the bay area under influence of the harbour can be linked to accidental introduction of exotic species through transportation of larvae by ballast water or a migration of species from South and Southwest of Brazilian coasts, since that the occurrence of the ascidian family Didemnidae might be facilitating the adaptation of the gastropod to the new environment. More studies are necessary to test these hypotheses.

**Synergetic effect of the environmental factors on the larval incubation of
Anodontites trapesialis (Unionoida, Mycetopodidae)**

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The *Anodontites trapesialis* (Lamarck, 1819) as most of the freshwater mussels are parasites of fishes as most of the Mycetopodidae. Then it is trivial to assume that availability of hosts is an important factor for the maintenance of populations of native freshwater mussels. What seems obvious is not always so simple to be demonstrated. Researches on gametogenesis, incubation period, and the relations established between these bivalves with their hosts are scarce in Brazil, mostly when it comes to the Pantanal region, which has a characteristic flood pulse. This study proposes to investigate the effects of the abiotic and biotic variables related to the hatching of larvae in *A. trapesialis*. For this, we estimate different biological indexes and frequency of fecundation and try to capture the dimensionality of the temporal variation of environmental variables along with the fish fauna. During the whole sampled period incubated individuals were found with more frequency during November, May, and August. The Canonical Correspondence Analysis demonstrated that there was a synchronicity between the factors and variables proposed here, and we infer that the flood pulse acts as a synergistic factor in this process. The incubation was associated with dry season months (July, August and September), the richness and abundance of fish are associated with the October, November and December, months of flooding. On the other hand, the frequency of non-incubated is related to the months of the rainy season (January, February and March) along with depth and transparency. Therefore, we can trace a relation of this period of higher maturation and elimination of gametes with the exit of fish from the lakes and flooding adjacent areas, which are characteristic of the studied region. It is clear the dependence of *A. trapesialis* with the fish fauna.

**Academic production on malacology education published in proceedings of
Brazilian Malacology Meetings (2001-2011)**

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In this study, we review the evolution of teaching malacology in Brazil (courses, workshops, meetings, museum visits, etc.), according to 34 abstracts published in the Annals of EBRAM - Brazilian Malacology Meetings - from 2001 to 2011. We focused our study on their contents, geographical distribution, and target audience. Most of these contributions, 26 abstracts (76.5%), were from the Southeast of Brazil, 6 (17.5%) were from the Northeast, 1 (3%) from the Midwest and 1 (3%) from the South. Formal educational programs were described in 17 abstracts, addressing students in elementary, high school, college, and graduate levels. Non-formal educational programs included visits to museums, collections, and traveling exhibits. They were all introduced as means to increase popular education and interest in the natural sciences. The most common contents were: i) the giant African snail *Achatina fulica* Bowdich, 1822 and ii) schistosomiasis. *A. fulica* was addressed in 10 abstracts, five of which were about educating community workers, teachers, students, and the general public, on how to control this exotic species so common in Brazilian ecosystems. Schistosomiasis was addressed in four abstracts. Two of them assessed the quality of the information available on the Internet and in texts books (listed in the National Textbook Program), one emphasized the importance of research and education on health issues in endemic areas, and the last one introduced the Project for Monitoring and Control of Vectors and Reservoirs, which aimed at training technicians on health problems produced by schistosomiasis and other parasitic diseases. Programs were addressed to a very diverse audience, 55% of which were students (at primary, secondary, and undergraduate levels), 30% were the general public, 10% teachers, 2.5% community workers, and 2.5% health professionals. Most of the abstracts claimed to be part of developing strategies designed to improve teaching on malacology, but no further information on such projects was ever found in later publications of the annals.



Training specialists in medical malacology: education based on biosafety questioning

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This paper aims to present a teaching experience on biosafety, grounded on the questioning methodology, experienced during the Course of Biosafety, Specialization in Medical Malacology of Instituto Oswaldo Cruz / Fiocruz. The content of the course of biosafety considered that professionals who are dedicated to the study of molluscs, especially those that are intermediate hosts of digenetic trematodes and nematodes parasites of humans and domestic animals, are exposed to work-related risks when they conduct field work (during the collection of continental gastropods) and in the laboratory (during the technical procedures necessary to identify morphological and molecular characters, as well as to discriminate specimens infected with larvae of helminthes of medical and veterinary importance). Thus, this study focused on three basic issues: biosecurity is to protect whom? (the researcher, the object of study and the work environment); from what? (agents risks, particularly biological and chemical); and how? (through protective barriers, namely infrastructure, protective equipment and laboratory conducts). On the class's first day, the following information was identified through a questionnaire: the students' profile (biologists, 13 women and three men, 50% aged between 20 and 30 years), and the primary concepts of biosecurity (75% related to the theme "laboratory safety"). We have also applied a pre-test (class's average: 71.02). The program included lectures stimulating the research process to understand the involved issues, development of recreational activities (games and movies) and case studies. In order to monitor student performance, several types of evaluation procedures were applied throughout the course, including extracurricular work, seminars and a final test. In summary, we could infer that the methodology used during these didactic activities facilitated knowledge acquisition, not only assessed by the final average of the class, which was 85.72 (20.70% increase when compared to the initial average), but also during debates in the classroom: students' argumentation was no longer based on common sense, but supported by technical expertise, legal and historical biosecurity.



Concepts of high school students residents in Ilha Grande, Rio de Janeiro, on exotic species

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Exotic species are the second leading cause of biodiversity loss and the primary cause of extinction in islands. On Ilha Grande, a continental island south of Rio de Janeiro, there are records of many exotic organisms and their negative influence on that environment, among these the most representative is the African snail *Achatina fulica* Bowdich, 1822. The problems that exotics can bring to Ilha Grande are reflected on the environment, public health and the economy, since the local economy is based on tourism, directly related to the natural environment and its biodiversity. Considering the issues above, this study surveyed the previous concepts of high school students residents in Ilha Grande about alien species. We interviewed 41 students around 16 years-old. The answers were analyzed quantitatively and by means of the Discourse of Collective Subject. Most students (76%) know what are exotic species; 50% are able to list *Achatina fulica* as exotic; 58% believe they are harmful to health (but do not know why); 34% do not believe they can affect the local economy. Although exotic species is a local problem, discussions about them have been not carried out efficiently at school or local groups. Half of the students do not associate lectures and other activities at school with the local reality, do not realizing the connection between theory and practice. Considering these and others aspects, we understand that this is a problem that involves the whole community at various levels, and should be part of discussions both in schools as in collectives groups for the understanding of problems and for taken of action. It is necessary a public effort to understand the problem, to develop strategies that people can take part in discussions and decisions, however, it is essential to encourage them to think critically and analyze their reality.

Establishment of the control chart to *Biomphalaria glabrata* (Mollusca: Gastropoda) using potassium dichromate

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Control charts are used to establish an acceptable range of test variability, accuracy and reliability of the results. For elaboration of the control chart of sensitivity, assays are conducted regularly using reference substances, such as potassium dichromate ($K_2Cr_2O_7$). In this work, assays with the freshwater snail *Biomphalaria glabrata* were performed to prepare the control chart required in toxicity assays applied in the molluscicides screening and ecotoxicological studies. Acute toxicity assays were performed quarterly, from November 2010 to July 2012. Adults and embryos were exposed to potassium dichromate for 24 and 48 hours to determine LC_{50} (concentration that affected 50% of the exposed organisms to the test substance). Mortality and malformation were the endpoint. The mean values for LC_{50} were 66.08mg/L for adults with 24 hours of exposure and 60.03mg/L with 48 hours. For embryos exposed for 24 h, the results obtained for blastulae, gastrulae, trochophore and veliger stages were 20.89mg/L, 17.53mg/L, 11.78mg/L e 5.90mg/L, to embryos exposed for 48 h, LC_{50} values were 13.18mg/L, 11.97mg/L, 6.19mg/L and 2.10mg/L, respectively. Embryos were more sensitive than adults and we observed teratogenic effects induced by potassium dichromate in all embryonic stages. The results remained within the confidence limits in all assays and indicated that sensitivity of organisms reared in laboratory is under control. It was possible to establish the potassium dichromate concentrations and control chart to be used in assays with *Biomphalaria*.

Effects of Atrazine and Roundup pesticides on Biochemical and Molecular aspects of *Biomphalaria alexandrina* snails.

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Excessive use of pesticides in agriculture has sparked researchers' interest in investigating the harmful effects of these compounds. Consequently, there has also been an increase in the number of studies aiming at evaluating the action of the residues of such chemicals on non-target organisms. The present study aimed to evaluate the pesticides Atrazine and Roundup (glyphosate) on biochemical and molecular aspects of *Biomphalaria alexandrina* snails. The results showed that LC10 of the two pesticides caused considerable reduction in survival rates and egg production of treated snails. The result showed that the pesticide Atrazine proved to be more toxic to *B. alexandrina* snails than Roundup. The results revealed that the glucose concentration in hemolymph and Lactate and free amino acid (FAA) in soft tissues of treated snails were increased ($P < 0.001$) while Glycogen (GN), the lipid content, pyruvate (PV), total protein (TP), nucleic acid (DNA and RNA) levels in snail's tissues decreased ($P < 0.001$). The activities of glycogen phosphorylase, superoxide dismutase (SOD), catalase (CAT) and glutathione reductase (GR), succinic dehydrogenase (SDH), acetylcholinesterase (AChE), and phosphatase (ACP and ALP) enzymes in homogenate of snail's tissues were reduced ($P < 0.001$) in response to treatment with the two pesticide while lipid peroxide, Lactic dehydrogenase (LDH), transaminases (GOT and GPT) activity increased ($P < 0.001$). The changes in the number, position and intensity of DNA bands induced by pesticides may be attributed to the fact that pesticide can induce genotoxicity through DNA damage. Thus the present study indicated that the genotoxicity products at low concentration and for long time treatment showed the hazard of pesticides addiction on man life.

***Pila globosa* (Swainson, 1822): a sentinel organism to monitor climatic stress in the ecosystem**

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The Indian Apple snail, *Pila globosa* is chosen as a model gastropod as it is a common and conspicuous amphibious species in the Indian subcontinent and is widely distributed in the Godavari- Krishna basin of South India. During the months when the landscape in the catchment areas receives more water than they can retain, there is run-off leading to increased water flow in rivers and collection in marshes. Thus, the occurrence of suitable habitat is a seasonal marshy area that is at times interrupted by drought upto two months or more in summer season. As a consequence of such adverse bio-geographical conditions, the amphibious snail, *Pila globosa*, has developed an innate adaptive physiological response, namely aestivation (summer sleep). Simulating the conditions of heat stress and lack of vegetation in the laboratory and to understand the compensatory mechanisms, the collected snails were placed on a bed of filter papers in plastic troughs and kept in wooden boxes set to a temperature of $35 \pm 1^{\circ}\text{C}$ by an electric bulb covered with tin foil to avoid brightness. This aestivation experiment was terminated at time points 7, 15, 30, 60 and 90 days. Data from western blot analysis revealed an up regulation of Hsp 40 at time points 60 and 90 days in hepatopancreas of *Pila globosa*. This seems to be one of the compensatory mechanisms which may differ from model organisms that are being characterized by increased levels in Hsp 90 and Hsp 70. Hsp 90 and Hsp 70 group of proteins are being used widely as bio-indicators in monitoring stress-related studies of aquatic eco-systems; however the possible species-specific synthesis of heat shock proteins should be taken into account. Additional histological evidence of calcium accumulation in hepatopancreas, a unique observation in the present study needs to be explored further to understand their contribution in the adaptive response.



The Museum of Zoology from UNICAMP (SP, Brazil): improving the scientific collection and training specialists on taxonomy of Mollusca

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The Museum of Zoology “Adão José Cardoso” (ZUEC), from UNICAMP, was created in 1992 and since then has been gathering samples of molluscan species from different parts of the world. As a result of the activities of many scientific projects voucher specimens have been deposited in the ZUEC, enriching the molluscan collection and also contributing to assembly the Brazilian biodiversity. The Projects “Marine Benthic Biodiversity in the State of São Paulo” (BIOTA/FAPESP), and “Evaluation of the Potential for Sustainable Living Resources in the Exclusive Economic Zone” (REVIZEE/South Score – Bentos), are good examples of such projects, which included in their studies the diversity of the malacofauna from the southeastern coast of Brazil. With the main purpose of training specialists on taxonomy, during 2011, the specimens of Bivalvia collected by these projects were examined and deposited in the ZUEC. Each sample was sorted and the animals were identified, counted and separated in lots; data from the specific placement of collection, as depth and geographic locality, are catalogued in an online database called “SpeciesLink” (<http://www.splink.org.br>), of the “Reference Center of Environmental Information” (CRIA). Two students were involved in this work, and 8543 specimens of 43 families were examined; they form 1236 lots which are now in molluscan scientific collection of the ZUEC. Most of them belong to the families Mytilidae, Nuculidae and Veneridae. Through the SpeciesLink, these lots can be traced and their data plotted in maps for analyses of bathymetric and geographic distribution. Pictures of the main species were also obtained.

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Malacological Collection from Federal University of Mato Grosso, Cuiabá, Brazil

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Zoological collections have been of great scientific relevance for biogeographical studies, taxonomy, and biodiversity. The malacological collection of UFMT was initiated in 2006 by Professors Maria Cristina Dreher Mansur and Claudia Tasso Callil. This work aims at the reorganization, maintenance and dissemination of the wet and dry components of the collection Jose Parodiz (JPMT). The collection is currently in the Biology Department of Zoology with 710 lots distributed in 12 families: Ampullariidae with 2 representatives Ancyliidae 4, Chilinidae 1, 151 Corbiculidae, Dreissenidae 1, 140 Hyriidae, Megalobulimidae 1, 358 Mycetopodidae, Mytilidae 13, Planorbidae 1, Sphaeriidae 31, and Thiaridae 7. The collection (JPMT) has more than 50 lots totaling approximately 60 species, most of the Pantanal of Mato Grosso. This will be georeferenced and will be available on a website for better accessibility.



Taiwan Malacofauna Website—Shell, Humanity and Database

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Setting up a useful malacofauna database website is one of the most important initiatives for promoting conservation and research on shell biodiversity. However, due to the frequent changes in synonymy and local taxonomists, establishing and maintaining a local molluscan species database are unavoidable responsibilities of local malacologists. The Taiwan Malacofauna Database includes records of 277 families and 3,755 species from the Taiwan area. This number does not include some unidentified species, especially mini-shells and deep-sea shells. The curatorial and basic data of the Taiwan Malacofauna have been integrated into a single database, which can be accessed interactively on the website at <http://shell.sinica.edu.tw>. Here, we wish to bring out an idea that combines anthropology and biology, and that may provide a new way to research the relationship between humanity and shells. From the “humanity-shell” view, *Pithecanthropus* used shells as food, ornaments, and tools for hunt, weave, and containers. Since antiquity humans have been using shells for merchandise (money), medical treatment (medicine), and building materials. Even now the civilization imitates the buoyancy mechanism of nautilus to build the great vehicle - the nuclear submarine. Shells are everywhere around the world, closely linked to people. From the reverse view of “shell-humanity”, molluscan distribution patterns suggest the existence of 16 biogeographical provinces (Dance, 1974), each containing a high proportion (at least 50%) of species that are absent from all other provinces. Comparing these data with the distribution area of Austronesians, the Indo-Pacific biogeographical province inferred from molluscan distribution patterns is almost of the same scope. So based on these two directions, we do hope we can find more relationships between humans and shells in Austronesians and as well as in Indo-Pacific shell province.



**Clinical evaluation of healing process in mice wound skin treated with
Phyllocaulis boraceiensis mucus**

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Phyllocaulis boraceiensis mucus has been studied as a potential source of new natural compounds capable of inducing proliferation and remodelling tissue. Human fibroblasts treated with 0.012 µg/µl of *P. boraceiensis* mucus have high rates of proliferation inducing a significant increase in production and secretion of extracellular matrix such as collagen fibres. The aim was evaluate evolution and clinical aspects of healing wound skin of mice treated with mucus released by *Phyllocaulis boraceiensis*. Briefly, mice were anaesthetized intra muscular by ketamine-xilasine and a 1cm² dorsal incision was made under sterile conditions. Mice were treated with papain as control (T₁), papain associated with 0.18 µg/µl of mucus (T₂) and papain associated with 0.012µg/µl of mucus (T₃). During 16 days both groups received a portion of each topical treatment and everyday images were captured of each wound using a dermatoscopy. Measurement of clinical aspects and scar evolution follow a score applied to determine if an aspect was present in high, moderate or low intensity. Proliferation was accelerated to T₃ being observed after three days presenting high deposition of fibroblasts at wound margin while in T₁ was started five days after surgery. T₂ presented inflammation during all period of observation even when healing had already begun, the new tissue showed capillary fragility. Remodeling was started after four days in T₃ while the others after six days. T₃ showed edema, hyperemia and bleeding only until the 5th day and granulation tissue and scar appear intensely from the 11st day. T₁ and T₂ showed edema, hyperemia and bleeding until the 11st day and granulation tissue and scar appear after 13th day. Although results require histological studies, it is possible to infer that dermatological treatment using prescription made up with mucus of *P. boraceiensis* is recommended since this compound proved to be a potential inducer of regeneration.

Teredinids cellulolytic enzymes: possible potential uses in biotechnology

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Teredinids are marine or brackish water mollusks, very specialized in wood boring and digestion. Feeding mainly on wood gave these animals lots of modifications in body morphology and structure. The teredinids are the only bivalves to exhibit specialized digestive glands responsible for wood digestion. Although these glands are capable of producing cellulolytic enzymes, its size seems to be too small to deal with the whole amount of wood that passes through the digestive system. Nonetheless, the rapid growth and development of these animals inside logs suggests that symbiosis with cellulose degrading fungi and bacteria is likely to be important at least in some stage of their life cycles. The interaction between teredinids and cellulolytic bacteria in gills is very well studied, but symbionts in the other organ are poorly known. According to that, teredinids can be a potential source of cellulolytic enzymes, which were identified as bottleneck for bioethanol production. Second generation ethanol, produced from biomass, requires the conversion of cellulose into simplest sugars prior to fermentation, and cellulolytic enzymes are fundamental to this process. The commercially available enzymes do not guarantee a low cost and its industrial large scale production. In this panorama the study of cellulolytic enzymes of teredinis may contribute to find an enzyme pool with a promised biotechnological potential. The teredinids were collected from logs in the mangrove of Itaoca and Guaratiba and from the plates in Ilha Grande Bay, all localities in the State of Rio de Janeiro and the essays are conducted with alive and frozen animals. The organs were removed, macerated and enzyme extracted for identifying where the cellulases can be found. Further, the enzymes will be quantified/identified as β -glucosidase, endo or exo-glucanase. The identification of a powerful enzymatic pool can give fundamental guidance for genes cloning and expression for industrial enzyme production.



Crystallization of a lectin from the mucus of the snail *Achatina fulica*

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The *Achatina fulica* is an invasive exotic snail from Africa responsible for strong environmental and economic impacts. It was first introduced in Brazil for gourmet reason for its resemblance with the snail *Helix pomatia*, which is widely prized in French cuisine. The *Achatina fulica* belongs to the Phylum Mollusca, Class Gastropoda, Order Pulmonata, Family Achatinidae. The mucus in animals has functions to assist in the process of locomotion and reproduction as well as immune protection and against dehydration. Some studies with the mucus from *Achatina fulica* shown that it possesses activity not only on rabbit skin healing but the mucus is able to inhibit the growth of gram-positive and gram-negative bacteria. In the field of lectinology the species *Helix pomatia* is a model organism for invertebrate lectins and this has known several biological activities as well as its three-dimensional structure. The 3D structure of the HPA is a hexamer complex consists of a dimer of trimer and the authors propose the classification of this group of lectins as H-type lectins. Both mollusks are phylogenetically close, the great importance of studying the lectin from *Achatina fulica* is to obtain crystals of this protein and solve its three-dimensional structure for comparison with the structure of *Helix pomatia* lectin, besides testing their biological activities for possible use as a biotechnological tool. This study demonstrates the purification of *Achatina fulica* lectin from mucus by chromatography and the crystallographic preliminary tests to obtain the final structure of this lectin.



Molecular markers in *Megalobulimus sanctipauli* (Ihering & Pilsbry, 1900)

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The terrestrial mollusk *Megalobulimus sanctipauli* (Ihering & Pilsbry, 1900) was registered for the first time in the city of Botucatu, São Paulo, Brazil (type locality), and its distribution area comprises southern Brazil, Paraguay and northeastern Argentina (Misiones and Corrientes Provinces). Original description of *M. sanctipauli* was based on shell features. More than a century later, shell data are still used for specific diagnosis, given that anatomical, morphometric, genetic and ecological data are still lacking. In this study, two molecular markers were characterized for the first time for the species. Samples of *M. sanctipauli* were collected from Puerto Iguazú city, Misiones, Argentina (n=5) in 2011. DNA was extracted by using standard CTAB protocol. Universal PCR primers were used to amplify partial regions from the cytochrome b (*Cb*) and the cytochrome oxidase subunit I (COI) genes of the mtDNA. Both amplified genes were confirmed through sequencing. After editing, sequences of *Cb* and COI were 361 bp and 655 bp in length, respectively. One haplotype for *Cb* and two haplotypes for COI were found among the five individuals. Comparison of COI gene with other available DNA sequences for terrestrial gastropods demonstrates accuracy for species specific identification, the same as for *Cb*. To our knowledge, this is also the first time than *Cb* is obtained for a *Megalobulimus* species. Both markers could be considered as diagnostic tools which can offer valuable support to the traditional taxonomic methods, and partial sequence of both genes are expected to contribute further studies to elucidate phylogenetic relationships of *M. sanctipauli*.

New aquaporin isoform identified in the terrestrial snail *Helix pomatia* L.

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Aquaporins are integral transmembrane proteins, which facilitate the transport of water and small hydrophilic molecules through a lipid bilayer. The proteins can be divided into “orthodox” aquaporins (transporting mainly water) and aquaglyceroporins (additionally transporting some other uncharged solutes, e.g. glycerol and urea). Aquaporins play important physiological roles in animals, plants, bacteria, filamentous fungi, and protozoa. Adaptation to variable environmental conditions is one of their functions. It has been proved experimentally that aquaporins take part in mitigation of the negative effects of dehydration and freezing. To date there are no data in the literature about water channels found in molluscan tissues. In our research we indentified several sequences of cDNA encoding aquaporins in this animal group, including an aquaporin in *Helix pomatia*. The obtained sequence was analyzed with the use of bioinformatic methods. *In silico* translation revealed that this protein is an “orthodox” aquaporin. Phylogenetic analyses confirm this. Our study shows also that this protein is more similar to insect aquaporins than to freshwater molluscan aquaporins. Explanation of this phenomenon requires further study. Furthermore, we found that the cDNA encoding aquaporin in *H. pomatia* can be extracted from the hepatopancreas, kidney, and foot. The presence of aquaporins in these tissues indicates the importance of this protein in adaptation to environmental conditions, as these tissues play a crucial role in maintaining proper water balance and are responsible for mitigation of the negative effects of changes in temperature and humidity.



Study on *Biomphalaria amazonica*, *B. cousini* and their hybrids using molecular taxonomy

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Species of mollusks of the genus *Biomphalaria* act as intermediate hosts of *Schistosoma mansoni*, etiological agent of intestinal schistosomiasis. The main tool for the specific identification of *Biomphalaria* snails is the researcher's ability to dissect and characterize snails based on their morphological differences. *Biomphalaria amazonica*, *B. cousini* and their hybrids are indistinguishable to what regards their shell morphology and the majority of organs that make up their reproductive system. Therefore, it is difficult to differentiate them. Moreover, species complex are referred to as the group of species or subspecies with morphological similarity, possible hybridizations, and molecular similarity, making it difficult to identify them correctly. Although the biological knowledge on many species has become more detailed, morphological characters have not been sufficient for a correct classification. Thus, molecular techniques have been used to complement specie identification. The correct identification of these species contributes to the understanding of disease dynamics and for the success of vector control programs. Snails of the Malacological Collection of Helminthology and Medical Malacology Laboratory of CPqRR/Fiocruz from different places in Brazil, Bolivia and Colombia were used for Polymerase Chain Reaction and Restriction Fragment Length Polymorphism (PCR-RFLP), and for phylogenetic analysis. The RFLP profiles found have shown that one profile is characterized by the presence of three bands corresponding to *B. cousini*, another one presented five bands corresponding to *B. amazonica*, and a third one had a mix of these two profiles corresponding to the profile of hybrids. The tree topology shows a closer relationship among *B. amazonica*, *B. cousini* and their hybrids that was represented by most of their clades, poorly supported by bootstrap. Based on previous studies, and on these molecular data, we propose grouping *B. amazonica*, *B. cousini* and their hybrids into a *B. amazonica* complex.



Molecular studies in *Mytella guyanensis* (Lamarck, 1819): comparisons between populations from northern coast of Brazil

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Currently the genetic diversity of populations of mussels *Mytella guyanensis* in the Brazilian coast is poorly known even though the species used as food and as a means of income for the coastal population. The main objective of this study was to molecularly characterize, a population of *M. guyanensis* from Camboa Ring in the Piauí State (PI: N = 22) based partial sequences of the cytochrome c oxidase subunit I (COI), to compare the degree of structure of this population with those from Pará (PA) and Maranhão (MA). COI sequences from 22 individuals were obtained. Each sequence included 501 (bp) with 36 variable sites and 12 parsimony informative. The base frequencies were 0.40 nucleotide (T), 0.14 (C), 0.25 (A) and 0.21 (G). The distances (P-distance) between sequences of COI in the population from Piauí ranged from 0 to 0.008. They were compared to the sequences from Pará (N = 26) and Maranhão (N = 30), the distances between the sequences ranged from 0 to 0.010. Thirty haplotypes were found in these three populations. The most frequent (H1) was present in 43 individuals. The haplotype diversity (H) was high in the population from Maranhão and Piauí and moderate in the population from Pará. The nucleotide diversity (π) was low for all three populations: H = 0.6874 and π = 0.002377 in Maranhão, H = 0.8497 and π = 0.003392 in Piauí, and H = 0.4738 and π = 0.001228 in Pará. The selective neutrality tests of Tajima and Fu were significant for all locations, while the sum of squares of deviations rejected the hypothesis of population expansion for the population of Piauí. Fst test showed that in the population from Piauí, structuring is probably result of the of discharge Delta of parnaíba that is serving as a barrier for the gene flow.

**Primary cell culture of tissues from *Lymnaea columella*, (Say, 1817):
preliminary data**

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Snails of genus *Lymnaea* are the intermediate hosts of *Fasciola hepatica*, a trematode of veterinary and as so, an issue that regards worldwide importance for public health. Cell cultures models have a great potential to study interactions between host-parasite and are yet underexplored. This study starting point aims to identify and cultivate cells from tissues and organs of *Lymnaea columella*. Those tissue samples of *L. columella* were obtained for primary cultures from nine F1 specimens (7 to 11 mm) not infected with *F. hepatica* collected in the municipality of Itajubá, Minas Gerais, Brazil, and cultivated in laboratory. The snails were treated with metronidazole and dissected under sterile conditions using a stereomicroscope. Tissues extracted from foot, mantle, antenna, kidney, heart, stomach, digestive gland and ovotestis were cultivated in Schneider media at 15 oC in humid chamber. Samples were collected and fixed with 3:1 (methanol: acetic acid) and allocated in glass slides, stained with Giemsa solution in bright field microscopy. *In vitro* observations were done in fluorescence microscopy with cells stained with ethidium bromide and acridine orange solution for test apoptosis. Our initial results with cell cultures of *L. columella*, stained with Giemsa shown goblet cells containing vacuoles and smaller cells adhered to each other in groups. After eight days the cultures still showed a predominance of living cells, as observed in the test of apoptosis. This study is, at this moment, is the first report of primary cultures of cells derived from tissues of *L. columella*. Nevertheless, the work remains in progress aiming to increase the knowledge about morphology and function of those cells, by using histochemical and electronic microscopy analysis procedures and challenges to miracidia, sporocyst and redia of *F. hepatica*.

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**Standardization of the nomenclature of the siphonal muscular layers of
Tellinidae, based on topological homology**

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The siphons of *Tellina lineata* Turton, 1819 and *Macoma biota* Arruda & Domaneschi, 2005 were investigated by histology and compared with other already described Tellinoidea species. Live specimens were dissected and their siphons analysed through transverse and longitudinal sections. A clear pattern of organization of their internal tissues was observed and here we propose a standardization of the nomenclature of these layers: the orientation of the muscle fibers is indicated with a first capital letter, as they are longitudinal (L), circular (C), or radial (R); and the position of each layer is indicated with a second lower case, “o”, “m” and “i” (outer, median or inner). So, in *T. lineata* and *M. biota* there is a main median longitudinal muscular layer (Lm), and two peripheral circular layers, one inner (Ci) and one outer (Co), near the epithelia (Ei and Eo, respectively). A median circular layer (Cm) separates an internal (Lmi) from an outer (Lmo) median longitudinal layer. Further, the Co is split by a thin outer longitudinal layer (Lo), forming Coi and Coo layers, the former being obliquely oriented. Thin radial fibers (R) delimit clear packages of Lmi and Lmo fibers. In each siphon, there are six longitudinal nerve cords (N) within the Lmi layer. In *M. biota* the Lmo of the exhalant siphon is almost twice the thickness of its Lmi, and the Coi is very thick. Similarly, the Lmo of the exhalant siphon of *T. lineata* is by far the most developed layer, and in the vicinities of the nerve cords the Cm is split in two layers. More than a simply nomenclature standardization, with this proposal, hypotheses of homology between the muscle layers of different species are clearly putted, and then can be tested through future studies on ontogeny or by phylogenetic analysis.

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Comparative morphology among three species of *Gundlachia* Pfeiffer, 1849

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Gundlachia Pfeiffer, 1849 is one of the seven Ancyliidae genera that occur in Neotropical region. This genus comprises the greatest number of species in this region. The main objective of this study was to provide and increase morphological information about three species found in Brazil: *Gundlachia bakeri* Pilsbry, 1913; *G. radiata* (Guilding, 1828) and *G. ticaga* (Marcus & Marcus, 1962). The material used in this study was deposited in Coleção de Moluscos da UERJ. A comparative study of shells morphology was carried out by light and scanning electron microscopes images. We measured 365 shells (31 shells of *G. bakeri*, 142 of *G. radiata* and 183 of *G. ticaga*) and obtained four measurements under a research stereomicroscope using a caliper: length (L), height (H), anterior width (W1) and posterior width (W2). We also obtained five morphometric indices of shell shape: W1/L, W2/L, H/L, H/W1 and W2/W1. Variables were analyzed by Pearson's correlation and those strongly correlated ($r > 0.95$) were excluded, in order to ensure independence among variables. The Discriminant Analysis (DA) was carried out in order to test for the level of discrimination of shells from the three species. To compare the soft parts, specimens were stained and dissected under a research stereomicroscope. Morphometrical variables differed significantly among the three species studied, as showed by DA (Wilks' Lambda = 0.2848; $F_{14,694} = 51.963$; $p < 0.001$). The variables L and W1 were removed before because they are highly correlated. The classification matrix also corroborated that each species had its proper morphological identity. In the soft part found differences in mantle scars, pigmentation of mantle, radula and reproductive system. The morphometry associated with the data of internal morphology of these three species will be used to aid future morphological and phylogenetic comparisons of the species of *Gundlachia*.

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Morfometric variation of *Helicina* sp. in three localities in Ilha Grande, RJ, Brazil

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The genus *Helicina* Lamarck, 1799 (Helicinidae) is represented by a diverse group of operculate land snails that have arboreal habits. There are 33 species known to Brazil and seven to state of Rio de Janeiro. However, many of the records of Helicinidae for the state are without specific identification, including those that were cited to Ilha Grande. This is due to limited knowledge about the genus in Brazil and the absence of expert taxonomists to the family. This study aims to analyze the morphology of shell, as well as the morfometric variation between three *Helicina* populations from three localities in Ilha Grande: Jararaca(J), Parnaioca(P) and Caxadaço(C), to contribute to the systematics, phylogeny and ecology. Forty-eight shells were drawn under a stereomicroscope with camera lucida (J=18, P=13, C=17). Five measurements were obtained from the drawings: greatest diameter, major diameter, minor diameter, height of the last whorl and height. All samples analyzed showed a depressed shell; slightly yellowish; some samples have a reddish band in the margin of the lip; the last whorl is rounded; aperture lunate; reflected lip and suture slightly marked. Discriminant analysis distinguished significantly the three populations and the variable that most influenced the discrimination was the greatest diameter (Wilks's Lambda=0.42; p=0.000). The shells from Caxadaço are larger than those of other localities (C=6.91+0.37mm; P=5.41+0.99mm; J=5.51+0.98mm). Although there is a direct relationship between size of the shell and moisture, this was not observed in this study. Jararaca is the wettest area, but the shells are not bigger than that from Caxadaço, but are bigger than Parnaioca shells. The presence of operculum in these animals can provide greater adaptation to moisture changes in the environment, thus not affecting their development. Detailed anatomical studies are in progress, in order to identify the studied specimens to the species category.

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**Taxonomy, anatomy and distribution of a Chaetodermomorpha
(Aplacophora) from Campos Basin, Rio de Janeiro, Brazil**

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The Aplacophora are characterized by their vermiform body, without a shell, covered by aragonite spicules. The mantle cavity is positioned at the posterior end of the body and the distinct head and foot typical of other molluscs are absent. There are two aplacophoran groups, the Solenogastres (or Neomeniomorpha) who have a ventral pedal groove that acts like a creeping sole, and the Caudofoveata (or Chaetodermomorpha) in which this feature is absent. The Brazilian aplacophorans are almost unknown, but recently a large collection of these animals was revealed by the dredgings activities of the “HABITATS Project-Campos Basin Environmental Heterogeneity by CENPES/PETROBRAS”. One of the most common species in this collection was studied, with the aim to identify it, also presenting its morphological characters and data on the batimetric distribution. This species has a cylindrical body, up to 3 mm in length, similar to those of species of the family Limifossoridae. The spicules are superimposed on each other and through the Scanning Electron Microscopy they revealed to be morphologically distinct in the three body regions (anterior, trunk and posterior). The animals present two different morphologies: one with the muscles relaxed and an exposed oral disc (which is partially divided); and other, with the muscles contracted and the oral disc inside the body, comma-shaped. The radula is very small, only visible through histological sections, and is typical of the family Chaetodermidae, genus *Falcidens* Salvini-Plawen, 1968. Seventy six samples containing 220 specimens were obtained, mostly from about 400 meters depth of the continental shelf and slope. It is very similar to *Falcidens limifossorides* Salvini-Plawen, 1986, and this study presents the first finding of this species from the Brazilian coast.

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**Morphology, morphometry and distribution of two Chaetodermidae
(Aplacophora) from Campos Basin, Rio de Janeiro, Brazil**

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The Chaetodermidae (=Chaetodermatidae) is one of the most diversified families of the Aplacophora, a group largely unknown for the Brazilian coast. A detailed study is presented on the two most abundant morphospecies of this family, collected by the Habitats Project – “Campos Basin Environmental Heterogeneity” - coordinated by CENPES/PETROBRAS; the “morphospecies 1” is represented by 872 specimens from 179 samples and the “2” by 120 animals in 50 samples. Each specimen was examined and measured under the stereomicroscope. Well preserved animals were observed by the scanning electron microscopy (SEM); others had their radula and spicules isolated from different parts of the body. They are very similar morphologically, bearing elongated bodies, with a well-marked tail distinguished from the trunk; however, the morphospecies 2 has a shorter tail than the 1. An U-shaped mouth shield is present in both, and its spicules are smaller than those of the trunk and tail. There are main differences between the morphospecies in the spicules from the trunk and the tail: in morphospecies 2, there are several ridges that are interwoven near the base and some spicules have a notch in the base, not present in those of the 1, where there is only a single large central ridge. Their radulae are very reduced and related to other species of Chaetodermidae. The morphospecies 1 shows a peak of distribution in 400 to 450m depths, but also occurring in the shelf and in depths up to 1000m. The 2, on the other side, is only distributed in the continental slope, with a peak around 700m. These characters are similar to those of *Falcidens* Salvini-Plawen, 1968, but a precise identification at the specific level is already under investigation. Thus, further data were added to the description and registration of aplacophorans in the Brazilian coast.

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Morpho-anatomy of the reproductive and renal systems and shell morphology of seven subulinid species (Gastropoda, Pulmonata, Subulinidae)

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Subulinidae is a land snail family indigenous to tropical America and Africa. For the most part of the subulinids, species descriptions are limited to shell morphology. The poor morphological descriptions, the lack of specialists dedicated to the taxonomy of this family, the low vagility and the ability to reproduce by self-fertilization make these molluscs interesting models to investigate hidden biodiversity. More detailed morphological studies may contribute to improve the taxonomy and systematic of this family, allowing the better recognition of species boundaries. The objectives of the present study were ⁽¹⁾to provide lacking information about renal and reproductive morphology of seven subulinid species originally described on the basis of shell morphology: *Leptinaria unilamellata*, *Subulina octona*, *Allopeas gracilis*, *A. micra*, *A. clavulinum*, *Dysopeas muibum* and *Beckianum beckianum*; ⁽²⁾to present shell descriptions based on scanning electron microscopy, ⁽³⁾to improve morpho-anatomical descriptions of the species *S. octona*, *A. gracilis*, *D. muibum* and *L. unilamellata*, for which reproductive morphology was incompletely provided by previous authors; ⁽⁴⁾to present geographical distribution data concerning these species. The studied specimens were collected in the municipalities of Juiz de Fora and Belo Horizonte, Minas Gerais state, killed and fixed by conventional malacological techniques and dissected under a bright-field microscope with camera lucida. The comparative morphology of the reproductive system pointed out some characters that may be of significant value in future attempts to improve the taxonomy of this family and to elucidate species' boundaries. The main characters that distinguished the species are concerned to the penial complex, such as the proportion between the length of the penial complex and the length of the free oviduct, presence of a flagellum, site of insertion of the bursa copulatrix duct relative to the site of insertion of the penial complex and presence and extension of the penial sheath.



**Reproductive system redescription and geographical distribution extension
of *Omalonyx geayi* Tillier, 1980 (Gastropoda, Succineidae)**

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Omalonyx geayi was described by TILLIER (1980) as an endemic species for Kaw swamp, French Guiana, with unique characteristics within the *Omalonyx* group: a hermaphrodite duct twice as long and sacculate without radial ducts, also presenting a funnel-shaped insertion on the ovariotestis and longitudinal wrinkled folds on the evertophallus' inner wall. Two lots – from Trinidad and Carauari (AM, Brazil) – presented specimens with ovariotestis and hermaphrodite duct similar to *O. geayi*; however, with distinct evertophallus inner wall aspects. Eight other lots – from Suriname, Ecuador, Brazil (Amazonas and Alagoas States), Bolivia and route Cayenne-Kourou in French Guiana – presented specimens with evertophallus inner wall aspects analogous to *O. geayi* and ovariotestis and hermaphrodite duct similar to the other *Omalonyx* species. By analyzing the phylogeny, the histological analysis and dissections, we concluded that the ovariotestis and hermaphrodite duct previously described for *O. geayi* were based on parasitized specimens.

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Some observations on epidemiology on lungworm infection of hares

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Protostrongylid lungworms, related to the infamous *Angiostrongylus*, develop in land snails as larva and they need to be ingested by their definitive herbivorous hosts. The route of infection is considered controversial as larval worms are not able leave the snail's body, even if they completed the development. As the herbivores never intentionally consume snails, the infection with these worms is often considered to be a rare event. The larvae that are shed into the environment in the feces from the definitive host are also faced with the difficulty of locating and infecting a suitable snail host, which is also considered to be a rare event. Hares or rabbits harbor lungworm infections in spite of the tendency to avoid the consumption of snails and conversely droppings of leporids do not seem to be a preferred food for snails first. Therefore questions are emerging relating to the transmission of nematode larvae to hares and the species of snails involved in the epidemiology of leporid protostrongylids. Recent observations indicate that the European brown hare (*Lepus europaeus*), on undisturbed habitats, prefers certain small places to defecate. At these locations, droppings are accumulate and minute snails like to graze on old decaying fecal material. If more animals may use these “fecal pits” for defecation in order to detect the presence of other members of population by olfactory stimuli, this situation would raise the probability of increased interactions between snails and parasitic larvae on narrow localities and thus increasing the likelihood of hares becoming parasitized by lungworms. Longitudinal observation of “fecal pits” may reveal which snails have the most important role in sustaining of life cycle of protostrongylids in nature, as laboratory experiments indicate all species of non marine snails can be infected with protostrongylid larvae. Initial findings do indicate minute land snails and slugs may act as determinative source for larval infection for hares as they will be more likely to be accidentally consumed and larger snails are avoided.

A short review on snails and mussels as vectors of parasitic helminths in Hungary

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In the small Central-European country of Hungary there are more than 270 mollusc species known to science. This number is continuously increasing in consequence of faunistical research and the continual identification of invasive exotic species, which have recently been artificially introduced. Many kinds of parasitic helminths, particularly trematodes, are able to develop in these molluscs and utilize them as effective intermediate hosts. To date representatives of 42 families of trematodes have been detected in Hungary, but only the larvae of Aspidogastridae, Bunostomidae, Diplostomidae, Strigeidae, Schistosomatidae, Echinostomatidae, Psilostomatidae, Fasciolidae, Dicrocoeliidae, Amphistomidae, Notocotylidae, Plagiorchiidae, Microphallidae, Lecithodendriidae, Opecoelidae, Opistorchiidae, Allocreadiidae, Gorgoderidae, Cyathocotylidae, Brachylaemiidae, and Leucochloridiidae have been associated with specific molluscs inhabiting the country. Chiefly the freshwater snails carry trematode larvae and bivalves also frequently may act as intermediate hosts for flukes. It seems that the most diverse parasitic fauna occurs in freshwater pulmonates and although relatively fewer parasite species are associated with freshwater prosobranchs, and to a lesser extent land snails. However, the species of Dicrocoeliidae, Brachylaemiidae and Leucochloridiidae infect land snails frequently in certain areas. Freshwater mussels are also known to be infected with larval trematodes primarily those that parasitize fish. However, this association between trematodes and bivalves occurs mainly in artificial fish ponds with high densities of fish and lesser extent in natural waters. There is considerable species richness of flukes in freshwater pulmonates known and identified. This detailed knowledge of the pulmonate and trematode association is in direct relation to their medical and veterinary importance. Other helminths including cestodes and nematodes of vertebrates are also known from Hungarian land snail species.



Electrophoresis analysis, biochemical and histological aspects of *Bulinus truncatus* snails infected with *Schistosoma haematobium*

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Schistosomiasis is an important parasitic disease that infects humans. *Schistosoma haematobium* is one of the main species of schistosomes infecting humans. *Bulinus truncatus* snails, act as an intermediate hosts and play a major role in the transmission of schistosomes. The effect of *S. haematobium* on the survival rate, egg production, electrophoresis analysis, biochemical and histological aspects of *B. truncatus* snails infected with *S. haematobium* were studied. The obtained result showed that a rapid decline in survival rate and egg production of infected snails with *S. haematobium*. The present results also, showed that many considerable changes in the digestive gland of snails infected with *S. haematobium* especially those containing with large numbers of sporocysts and cercariae at several stages of development and mostly encircled by cysts. The results, also, revealed that the glucose concentration in treated snails was increased in hemolymph, while soft tissue glycogen decreased. The activities of glycogen phosphorylase, succinate dehydrogenase (SDH) and glucose-6-phosphatase in homogenate of snail's tissues of infected snails were reduced ($P < 0.001$) in response to infection. Qualitative and quantitative effects on the protein patterns have been revealed for infected. The electrophoresis pattern of total protein showed differences in number and molecular weights of protein bands.

Occurrence of mollusks naturally infected with *Angiostrongylus cantonensis* in Santos's urban region, São Paulo State/Brazil

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The rat lungworm *Angiostrongylus cantonensis* is a zoonotic nematode with a wide distribution and is the etiologic agent of eosinophilic meningoencephalitis. In Brazil, this worm has been reported in five States: Espírito Santo, Rio de Janeiro, São Paulo, Santa Catarina and Pernambuco, confirming the predictions of the introduction of this parasite in South America. The natural intermediate hosts are several species of mollusks as *Achatina fulica*, *Sarasinula marginata*, *Subulina octona* and *Bradybaena similaris*. In Espírito Santo State, Brazil, second- and third-stage nematode larvae (L2 and L3) were detected in the snail specimens, *S. marginata* were highly infected (approximately 500 L3/slug), *S. octona* (20 larvae/mollusk), *A. fulica* and *B. similaris* (approximately 1,000 L3 and 300 L3 respectively). This study aims to investigate the presence of L3 larvae of *A. cantonensis* in mollusks naturally infected in the municipality of Santos, São Paulo State, Brazil. The collected gastropods were identified as: *S. marginata*, *S. octona* and *B. similaris*. The snails were digested by the Wallace & Rosen method (1969) and sedimentation, for three hours, using the Baermann method (Moraes 1948). After sedimentation, the material was examined in bright field stereoscopic microscope for visualization of the larvae. Molecular characterization was performed with the aid of the Wizard Kit (Promega) from L3 of mollusk. Amplification of the transcribed spacer region of ribosomal DNA (rDNA-ITS2) was performed using the primers NC1 (forward, 5' - ACGTCTGGTTCAGGGTTGTT-3') and NC2 (reverse, 5' - TTAGTTTCTTTTCCTCCGCT-3'). The results of this study indicate that the snails were naturally infected, and the larvae genetic profile was compatible with that of *A. cantonensis*. Further studies to enhance understanding of the infection dynamics of *A. cantonensis* in natural invertebrate hosts could help elucidate the role of snails in the transmission of angiostrongyliasis.

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Occurrence of *Achatina fulica* naturally infected with *Angiostrongylus cantonensis* in Santos's urban region, São Paulo state/Brazil

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The rat lungworm *Angiostrongylus cantonensis* is a zoonotic nematode with a wide distribution and is the etiologic agent of eosinophilic meningoencephalitis. In Brazil, this worm has been reported in States of Espírito Santo, São Paulo, Pernambuco, Rio de Janeiro and Santa Catarina, confirming the predictions of the introduction of this parasite in South America. The natural intermediate hosts are several species of mollusks as *Achatina fulica*, *Sarasinula marginata*, *Subulina octona* and *Bradybaena similaris*. However, *A. fulica*, the most important intermediate host of *A. cantonensis*, is a tropical snail species native of Africa. The rapid spread of *A. fulica* over the country is likely contributing to the dispersion of the parasite. In the municipality of Olinda, Pernambuco, 42% of *A. fulica* were collected naturally infected with *A. cantonensis* and the states of Rio de Janeiro (municipalities of Barra de Piraí and São Gonçalo) and Santa Catarina (municipality of Joinville), 21% of the collected specimens were infected with *A. cantonensis* and 17% had concomitant infection with *Strongyluris* sp. or *Rhabditis* sp. This study proposes to investigate the presence of L3 larvae of *A. cantonensis* in *A. fulica*, naturally infected in Santos, State of São Paulo, Brazil. The snails were digested by the method of Wallace & Rosen (1969) and sedimentation, for three hours, using the Baermann method (Moraes 1948). After sedimentation, the material were examined in bright field stereoscopic microscope for visualization of the larvae. Molecular characterization were performed with the aid of the Wizard Kit (Promega) from L3 of mollusk. Amplification of the transcribed spacer region of ribosomal DNA (rDNA-ITS2) were performed using the primers NC1 (forward, 5' - ACGTCTGGTTCAGGGTTGTT-3') and NC2 (reverse, 5' - TTAGTTTCTTTTCCTCCGCT-3'). The results of this study indicate that the snails were naturally infected, and the larvae genetic profile was compatible with that of *A. cantonensis*.

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New morphological description of *Brachylaemus mazzantii* (Trematoda: Brachylaemidae) based on confocal laser scanning microscopy

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Brachylaemus mazzantii (Travassos, 1927) is an intestinal parasite of columbid birds. The brachylaemids have as intermediate hosts land snails and slugs as *Zonitoides arboreus*, *Agriolimax agrestis*, *A. reticulatus*, *Helix aspersa*, *Helix sp.*, *Limax sp.*, *Rumina decollata*, *Pylomycus sp.*, *Euhadra sp.*, *Helicella arignonis*. The intermediate hosts of *B. mazzantii* are unknown but they're probably terrestrial gastropods like other brachylaemids. This specie was first described by light microscopy and only this approach was used to study its morphology. We worked on a new description of the morphology of *B. mazzantii* utilizing confocal scanning laser microscopy, which provides details of the gross anatomy of parasites, showing the body organization in a deeper way. The micrographs showed the musculature, attachment apparatus, digestive, reproductive, excretory and nervous system. The alimentary tract has a muscular pharynx, small esophagus, esophageal glands, and two intestinal caeca lined by microvilli. The presence of esophageal glands, microvilli and papillae on the surface of suckers constitutes new data for this species. The organization of the musculature is the same found in other trematodes, being formed by three layers: circular, longitudinal and diagonal. Some specialized fibers were seen around the ventral sucker. The reproductive system has a common opening at the middle of a discrete salience. The male portion is represented by the cirrus and cirrus pouch, two testes, deferent duct and seminal reservoir, while the female portion has the ovary, ootype, vitelline glands and reservoir, Mehlis glands and uterus. The excretory system is represented by thin excretory ducts running along the lateral of the body, and communicate with two larger caliber ducts which give place to a bladder ending in an excretory pore. This new description of the gross anatomy of the systems allowed an overview of the morphology of the organs, contributing to the knowledge of this specie of helminth.



Comparative analysis of mollusks hemocyte response after *Angiostrongylus vasorum* experimental infection

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Angiostrongylus vasorum (Nematoda: Protostrongylidae) is a parasite of canids. Mollusks serve as intermediate hosts in this heteroxenous life cycle. This parasite can infect several genera of mollusks, allowing the comparative study of the host-parasite relationship. This investigation aims to compare the morphological aspects of the hemocyte response of three genera of mollusks after *A. vasorum* experimental infection. Experimental models represent three different groups within the class Gastropoda: *Melanoides tuberculatus* (Thiaridae); *Sarasinula marginata* (Veronicellidae) and *Bradybaena similaris* (Xanthonychidae). Mollusks were collected at Belo Horizonte city and submitted to light exposition (*M. tuberculatus*) and artificial digestion (all species) to assess the occurrence of parasitism. In the absence of previous parasitism, individuals from such populations were selected for experimental trials. *A. vasorum* larvae (L1) were obtained from the cycle kept in the Universidade Federal de Minas Gerais. Mollusks were individually infected with 1000 L1 and fixed at ten per cent buffered formalin after 30 minutes, 2, 8 and 15 days. Hematoxilin-eosin histological sections were analyzed under transmitted light optical microscope. Thirty minutes after infection L1 were observed in the tissues of all mollusks. After two days of infection L1 were surrounded by activated hemocytes, presenting a vacuolized cytoplasm. In the eighth day, L2 were observed in the tissues of all species. After fifteen days of infection we observed the predominance of L3 in *M. tuberculatus* and *B. similaris*, while *S. marginata* presented equilibrium between the amount of L2 and L3. The intensity of the response differed among the species: *M. tuberculatus* < *B. similaris* < *S. marginata*. The cellular response to the parasitism and the larval development differ among the species studied. *S. marginata* presents the most intense hemocyte response and the slower larval development. *M. tuberculatus* hemocyte response is the less intense among the studied species, however, the larval development in this species and in *B. similaris* occur in similar manner and after 15 days of infection most of the larvae were in L3 stage.

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**The resistance of *Biomphalaria tenagophila* (Mollusca: Gastropoda) of
Espírito Santo state to *Schistosoma mansoni* infection**

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Biomphalaria tenagophila snails considered intermediate host of schistosomiasis, have populations susceptible and resistant to *Schistosoma mansoni*, such as *B. tenagophila* from Taim (RS, Brazil) never became infected when exposed to different strains of *S. mansoni* with variable number of miracidia. Besides, these snails have internal defense system capable of encapsulating the sporocysts and destroy them. Nevertheless, no study was conducted to determine if these snails are refractory, there is no penetration of miracidia, or if they are resistant, when the miracidia penetrate, but are destroyed by the internal defense. To answer these questions, susceptibility experiments were performed with a population of *B. tenagophila* from Anchieta (ES, Brazil). Each snail was exposed to 100 *S. mansoni* miracidia of the LE strain. After 80 days subsequent to exposure all the specimens were without shedding cercariae. This procedure was repeated to SJ and AL strains. Furthermore, *B. tenagophila* from the same population above was exposed to 100 *S. mansoni* miracidia of the LE strain and separated into six groups of 10 snails. Each group was killed at intervals of 1, 5, 10, 24, 36 and 48 hours after exposure. Total DNA was extracted from the body of each snail and was examined by low stringency-PCR (LS-PCR) to detect the presence of *S. mansoni*, in molluscs in the pre-patent period. The same experiment was conducted with specimens of *B. glabrata* exposed to 10 *S. mansoni* miracidia as control group. It was possible detect the presence of *S. mansoni* in the snails *B. tenagophila* up to 36 hours after exposure. At the control group *S. mansoni* was detected up to 48 hours. These results confirm that the population of *B. tenagophila* from Anchieta (ES, Brazil) is resistant to *S. mansoni* infection since the miracidia penetrate but is destroyed.

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Obtention an evaluation of *Piper* compounds in biological models to schistosomiasis mansoni control

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Schistosomiasis is a parasitic disease and the use of molluscicides has been considered an appropriate method to prevent human infection; however, there is no viable molluscicide available. The aim of this study was to search for compounds in *Piper* species active in *B. glabrata* adults and embryos and to evaluate schistosomicidal activity in miracidia and cercariae of *S. mansoni* and toxicity of the most active compound in *Daphnia similis* and *Danio rerio*. The active compounds were obtained from *Piper diospyrifolium* bioguided fractionation, which resulted in isolation of two molluscicidal compounds: the flavokavain A, isolated in this species for the first time and the 4-hydroxy-3-[3,7, trimetildodeca-11-2 ,6,10-trienil] benzoic acid, a novel chemical structure. The search for active compounds was carried out in amides and chalcones. Of the eight compounds evaluated in this study (2', 4', 6'- trihydroxydihydrochalcone, dihydroflavokavain C, flavokavain A, 4-hydroxy-3-[3,7,11- trimetildodec-2 ,6,10-trienyl] benzoic acid, pelitorin , piperine, peperlonguminine and piplartine), four were active (2', 4', 6'- trihydroxydihydrochalcone, flavokavain A, 4-hydroxy-3-[3,7,11- trimetildodec-2 ,6,10-trienyl] benzoic acid and piplartina). Piplartine amide was the most active in *B. glabrata* adults and embryos, being, therefore the selected compound for evaluation of schistosomicidal activity toxicity. There was no mortality of miracidia and cercariae exposed to piplartina. This amide was classified as toxic to *D. similis* and *D. rerio*; nevertheless it was less toxic than niclosamide, the only available molluscicide. In this study, molluscicidal compounds were obtained from bioguided fractionation and by evaluating the activity of amides and chalcones from *Piper*. Both methods were suitable to obtain active compounds. In addition, principal component analysis (PCA) was performed and also proved to be a viable tool for the screening of active compounds in species with described chemical profile. This study was the first to perform the bioassay-guided fractionation and to use chemometrics to obtain molluscicidal compounds.



Molluscicidal activity of *Hymenaea courbaril* L. against *Biomphalaria glabrata*, intermediate host of *Schistosoma mansoni*

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Researches on natural products areas are very promising in the search for new drugs in different fields. One of this is the control of snail intermediate hosts of schistosomiasis, a parasitic disease caused by *Schistosoma mansoni*, which currently affects, according to World Health Organization (WHO), 200 million people in tropical and subtropical areas worldwide. Population control of the snail *Biomphalaria glabrata* has been done with synthetic molluscicides that are expensive and cause an ecological imbalance. Jatoba (*Hymenaea courbaril*) is a plant used in folk medicine to treat ulcers, bronchitis and stomach disorders. Are reported in the literature, anti-inflammatory activity and analgesic for the hydroalcoholic extract of stem bark. The aim of this study was to evaluate the molluscicidal activity of ethanolic extract of stem bark of *Hymenaea courbaril*, against *Biomphalaria glabrata*, intermediate host of *S. mansoni*. To obtain the ethanolic extract, after drying and grinding, the barks were submitted at room temperature with ethanol followed by concentration under reduced pressure. Aliquots of the stock solution were added to the dechlorinated water to obtain concentrations of 100, 10 and 1 ppm. Testing for molluscicidal activity were performed according to the standards of the WHO, 10 adult snails were used per group, with sizes between 10 to 13mm. The snails were placed in 400 ml of test solution, and the mortality assessed at 24 and 48h of exposure. After this time, the animals were removed, washed three times with distilled water and transferred to another tank where they remained for a period of recovery time equal to the exposure. The experiment was performed in duplicate. The extract of the stem bark of *H. courbaril* caused 100% mortality at a concentration of 100 ppm with 24 hours of exposure. We conclude that it has molluscicidal activity against *B. glabrata* at levels 100 ppm/24hours.



First report of *Aelurostrongylus abstrusus* (Railliet, 1898) larvae infecting *Achatina fulica* from Araguaína, Tocantins, Brazil

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The giant African snail, *Achatina fulica*, is native to East Africa and is considered one of the hundred worst invasive species in the world. The introduction of *A. fulica* occurred in 1988 at an agricultural fair in Paraná, as an unsuccessful attempt to culture it for commercial purposes and spread nationwide. In addition to ecological and agriculture impacts, it also presents a serious concern to public health because the snail serves as intermediate host for the nematodes *Angiostrongylus cantonensis* and *A. costaricensis*, causing eosinophilic meningoencephalitis and abdominal angiostrongylosis, respectively. In Brazil, the first three documented cases of eosinophilic meningoencephalitis occurred in 2007 the state of Espírito Santo. A new case was reported in the state of Pernambuco in 2009. As a result of the recent cases in Brazil we sought to examine the occurrence of snails naturally infected that may serve as potential reservoirs for the parasite in Araguaína, Tocantins. Two hundred *A. fulica* were collected from eight districts in the metropolitan municipality of Araguaína to investigate the prevalence of nematode larvae of zoonotic interests. Snails were sent to the National Reference Laboratory in Medical Malacology, Instituto Oswaldo Cruz / Fiocruz, Rio de Janeiro, where nematode larvae were extracted using artificial digestion. After digestion, larvae were examined and identified with the aid of a stereo microscope. No *Angiostrongylus* spp. were recovered, but several other nematodes species were found including *Rhabditis* sp., *Strongyluris* sp. and others. Most notably, *Aelurostrongylus abstrusus* larvae were recovered from snails collected in seven of eight neighborhoods, and were found to have an infection rate of 54.9%. *Aelurostrongylus abstrusus* is a nematode parasite of feline pulmonary system and the causative agent of "aelurostrongilosis." Clinical signs of this disease in domestic cats result from presence of parasites in small branches of pulmonary arteries, alveoli, alveolar ducts and bronchioles.

Freshwater malacological survey in the municipality of Cantagalo, Rio de Janeiro state, Brazil

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The main parasitosis of medical and veterinary importance caused by trematodes and transmitted by freshwater snails in Brazil are schistosomiasis (caused by *Schistosoma mansoni*) and fasciolosis (*Fasciola hepatica*). The latter is a worldwide parasitic disease common in ruminants, especially cattle, buffaloes, sheep, and goats. In the Rio de Janeiro State were recorded fasciolosis in humans (municipalities of Paracambi, Sumidouro and Volta Redonda) and animals (Campos dos Goytacazes, Itaguaí, Maricá and Valença). The occurrence of cattle infected by *F. hepatica* in the Cantagalo led to a freshwater malacological survey in nine farms from that municipality. The collections were performed by the team of the Secretaria Estadual de Saude do Rio de Janeiro and that of Laboratório de Referencia Nacional em Malacologia Médica in nineteen localities from nine farms (Campo Belo, Vale Verde, Sossego, São Primo, Pouso Alegre, Monte Vernon, Bem Posta, Curitiba and Dona Inês). Live snails were kept in aquaria, until the parasitological analysis. All molluscs were exposed to artificial light to search for trematode larvae. For the morphological diagnostic, specimens were anesthetized in Hypnol 0.05%, and killed by hot water (70° C) and fixed in Railliet-Henry. Five families were found (Ampullariidae, Lymnaeidae, Planorbidae, Physidae and Thiaridae) and were identified: *Biomphalaria tenagophila*, *Biomphalaria straminea*, *Drepanotrema anatinum*, *Drepanotrema cimex*, *Drepanotrema depressissimum*, *Lymnaea columella*, *Melanoides tuberculatus*, *Physa marmorata* and *Pomacea* sp. *L. columella* (snail vector of fasciolosis) were found in four farms and of the 82 snails examined none were infected with *F. hepatica*. Some specimens were infected with Ornatae cercariae (families Macroderoididae and Haplometridae) parasites of amphibians and reptiles. Although the malacological survey is still in progress the occurrence of a large number of *L. columella* and *B. tenagophila* and *B. straminea* (snail hosts of *S. mansoni*) reinforce the need for surveillance and control of those molluscs in the studied area.

**Chronic effects of aqueous extracts of *Solanum lycocarpum* in
*Biomphalaria glabrata***

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The need to find efficient and selective molluscicides for the control of *Biomphalaria glabrata* motivated the present study aimed to comparatively evaluate the chronic effects of aqueous extracts of *Solanum lycocarpum* from the Ecological Station of Pirapitinga, Três Marias, MG and Seropédica Campus of the Universidade Federal Rural do Rio de Janeiro, RJ survivors on snails bioassay, using the parameters mortality and reproduction. Leaves of *S. lycocarpum* in the proportion of 10.0% w/v, were subjected to infusion, in distilled water at 90 °C for 15 minutes and the static soaking in distilled water at room temperature for 24 hours. For the bioassays, groups of 30 snails 9-13 mm shell diameter were exposed to concentrations of 10.0; 7.0 and 4.0%. The survival bioassay ranged from 1 to 27. Snails survivors were observed for 60 days for the quantification of the dead and the egg masses. Statistical analysis showed no significant difference in mortality between the survivors snails and between those in the control group. The eggs' number/snails and eggs' number/egg masses of snails surviving the bioassays with extracts obtained of the infusion of the Três Marias, showed significant difference in the 10.0% and 4.0%. However, only the number of eggs/snail showed significant difference in static maceration with 4.0%, between locations and between the extraction methods for Três Marias. The number of snails hatched/number of eggs showed a statistical difference between the extraction methods on Campus Seropédica to 4.0% and also between the collecting localities in static maceration 4.0%. The activity of these extracts on reproduction of surviving snails was influenced by the location of plant's origin and the extraction method. The observation of snails bioassay survivors introduces new prospects for schistosomiasis control programs.



Histological aspects of *Achatina fulica* experimentally infected with the nematode *Angiostrongylus cantonensis*

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Angiostrongylus cantonensis (Chen, 1935), a nematode parasite of the pulmonary arteries of rodents, is the most important etiologic agent of eosinophilic meningitis. The natural life cycle involves several species of mollusks as intermediate hosts and crabs, fishes and amphibians as paratenic hosts. Other mammals, including humans, become infected accidentally by ingestion of raw or undercooked mollusks or paratenic hosts. Although considered an important vector of eosinophilic meningitis, the giant African snail, *Achatina fulica*, Bowdich, 1822, presents low parasitic burden when experimentally infected, according to some authors. Herein we present preliminary data from histological analyses to evaluate the susceptibility of *A. fulica* to *A. cantonensis* infection. *A. fulica* reared from laboratory hatched eggs in the Laboratório de Referência Nacional em Malacologia Médica/Fiocruz (9 specimens) were separated into three groups (3 animals / group) and infected with L₁ from *A. cantonensis* São Gonçalo strain at three months of age. In the first group all animals were infected with 1000 L₁ individually. In the second group with 1500 and the third group with 2000 larvae. One animal from the first and second groups was killed on the 37th day after infection and one animal from the third group was killed on 47th for histological examination. The molluscs were preserved in Carson's formalin-Millonig, followed by routine histological preparation. Haematoxylin-eosin stained sections were examined under a *Axio Observer Z1*, Zeiss microscope equipped with a CCD AxioCam (Zeiss). Many larvae were observed in the fibromuscular tissue, digestive gland and intestine of snails from all three groups. The parasites were surrounded by exudative-productive granulomas consisting of two well-defined layers: an inner formed of epithelioid amebocytes, and other peripheral forming a pseudocapsule constituted by fibroblast cells. All parasites observed in histological sections were inside granulomas where there were no dead larvae or debris. The results confirm the susceptibility of *A. fulica* to *Angiostrongylus cantonensis* and indicate the potentially significant role this snail may play in the epidemiology of eosinophilic meningitis, particularly since *A. fulica* has become widespread in Brazil. Further studies using different numbers of larvae in the experimental infection are in progress in order to better clarify this parasitic interaction.

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Changes in lipid content of *Bradybaena similaris* (Fèrussac, 1821) infected with *Eurytrema coelomaticum* (Giard et Billet, 1892) Looss, 1907

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The snail *Bradybaena similaris* is a terrestrial gastropod widely distributed throughout the Brazilian territory, which feeds mainly on leaves and are pests in horticulture. Moreover, this snail serves as intermediate host of *Eurytrema coelomaticum*, a digenetic trematode parasite of the pancreatic ducts of ruminants. The eggs laid by adult parasites are released with bile secretions and when eaten by *B. similaris* intense asexual reproduction of the parasite occurs. The snail ingests the eggs and the miracidium hatches beginning an intense asexual reproduction process requiring numerous substrates to obtain energy. Some studies have shown the severe depletion of lipids in the snail host. *B. similaris*, were collected and experimentally infected with eggs of adult worms of *E. coelomaticum* collected from the pancreas of cattle naturally infected and kept by three months under laboratory conditions. Each month a group of snails was dissected, without anesthesia, to collect the hemolymph and digestive gland-gonad complex tissue and stored at -20°C. Subsequently, the tissues were analyzed using onedimensional thin layer chromatography (TLC), for determination of neutral lipids such as triglycerides, cholesterol, fatty acids and esterified cholesterol. Different lipid classes were observed through TLC analysis. The results obtained demonstrate that in response to infection, a significant decrease in lipid of *B. similaris* infected with *E. coelomaticum* in the digestive gland-gonad complex, it was observed that the cholesterol content significantly decreased in the group infected in the second and third months, while the content of esterified cholesterol was a significant increase during the first month of infection. There was no detectable content of triglycerides in animals infected with the control group viewed only the second month, while the fatty acid content was significantly reduced in the third month, indicating use of these substrates by trematode during your cycle, particularly during periods between second and third month of infection because the corresponding period of development of second generation sporocyst and cercaria. The snail *B. similaris* already showed exhaustion in lipid content, there being a good ability to homeostatic regulation, due on the infection of *E. coelomaticum*.

Changes in the contents of organic acids *Bradybaena similaris* (Fèrussac, 1821) infected *Eurytrema coelomaticum* (Giard et Billet, 1892) Looss, 1907

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The snail *Bradybaena similaris* is a terrestrial gastropod widely distributed throughout the Brazilian territory, which feeds mainly on leaves and are pests in horticulture. Moreover, this snail serves as intermediate host of *Eurytrema coelomaticum*, a digenetic trematode, parasite of the pancreatic ducts of ruminants. The eggs laid by adult parasites are released with bile secretions and when eaten by *Bradybaena similaris* intense asexual reproduction of the parasite occurs. The snail ingests the eggs and the miracidium hatches beginning an intense asexual reproduction process requiring numerous substrates to obtain energy. Some studies have shown the severe depletion of glucose and amino acids in the snail host. The present study aimed to analyze the effects of larval intramolluscan development of *E. coelomaticum* on the organic acids in the hemolymph of the snail *B. similaris*. Specimens of *B. similaris*, were collected and experimentally infected with eggs of adult worms of *E. coelomaticum* collected from the pancreas of cattle naturally infected and kept under laboratory condition for three months. The hemolymph was collected by cardiac puncture, without anesthesia, and stored at -20°C. The hemolymph was assayed by high performance liquid chromatography. It was possible detect the presence of oxalic, pyruvic and lactic acids through the experimental period of observation. In the first month of infection only pyruvic acid was detected in the uninfected (control) snails, and the oxalic and lactic acids were absent in both groups of uninfected (control) and infected snails, suggesting that the aerobic oxidative metabolism occurred at this time, the pyruvic acid formed is quickly consumed in the Krebs cycle. The oxalic acid was observed in the infected snails in the second and increased significantly in the third month of infection, when the pyruvic acid content was unchanged and the lactic acid increased, showing a tendency to turn the energetic metabolism from aerobic to anaerobic.



**Sublethal stimuli induce resistance to cadmium and heat
in *Biomphalaria glabrata* (Say, 1818) snails**

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Extracellular mild stresses induce heat shock response and can protect cells against subsequent exposition to lethal stresses, rendering cells resistance. This phenomenon is called cross-resistance. The heat shock response involves induction of heat shock proteins (HSPs). In this study, we demonstrated that previous sublethal exposure to heat or cadmium chloride improved the survival of the snails *Biomphalaria glabrata* to a lethal concentration of cadmium chloride or a lethal temperature, respectively; probably activating protective mechanisms involved in the maintenance of life in these organisms. This mollusc species has been used in many previous experimental protocols in diverse areas, and there are evidences that corroborate its application in environmental investigations. Our findings pointed to a possible role of HSP70 protein in this process, as could be seen on the western blot. We used six month old snails with shell diameter of 14 ($\pm 1,8$) mm, exposed to 33 °C or to 0,22 ppm CdCl₂, and challenged with 0,7 ppm CdCl₂ or 42 °C, respectively, as these stimuli were proved lethal to this mollusc. The results showed an increment in survival of snails pre-exposed to sublethal stimulus. The control group survived for no more than 96 hours to 0,7 ppm of CdCl₂ and in the maximum five hours at 42 °C, while the mean survival time in the pre-exposed groups was higher to both challenges. The western blot showed an induction of HSP70 protein in the pre-exposed groups as compared to the control ones. Despite of the well known role of HSP70 in thermotolerance and tolerance to other stress agents in living organisms, it was the first time it was shown in *Biomphalaria glabrata*, supporting its application in environmental monitoring studies.

Spermatozoon ultrastructure of *Solen tehuelchus* (Bivalvia, Solenidae)

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The ultrastructural study of spermatozoa spawned by marine organisms has been an important taxonomic tool. This field of knowledge has complemented anatomical, molecular and conchological investigations, clarifying taxonomic and classification problems. The morphology of spermatozoa can vary among orders, families and even species. The male gamete of the marine bivalve *Solen tehuelchus* is described in the present work. The acrosome is conical and short, showing regions of different electron densities: (1) at its base, symmetrically arranged electron-dense materials are interspaced by narrow electron-lucid strands; (2) at the central region, there is the sub-acrosomal area, which is electron-lucent; (3) at its rounded apex, a homogeneous electron-dense material can be observed. The nucleus is barrel shaped with a slight anterior fossa and the chromatin is not highly condensed, presenting electron-lucent regions. The middle piece is composed of four spherical mitochondria organized in a ring around a pair of short centrioles, arranged perpendicularly. The axoneme, rising from the distal centriole, has 9+2 microtubular structure. This spermatozoon was compared with gametes of superfamily Tellinoidea representatives and we can state that it's similar to spermatozoa of bivalves from the family Donacidae. Gametes produced by *Solen* and members of Donacidae are similar, containing a conical and short acrosome, with an electron-lucent sub-acrosomal area, a rounded shaped apex, an electron-dense material at its base, a barrel shaped nucleus with an anterior fossa and a middle piece composed of spherical mitochondria.

Spermatozoan ultrastructure of *Diplodonta punctata* Say, 1822 (Mollusca: Bivalvia)

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Comparative work on sperm ultrastructure gives rise to characters of taxonomic and phylogenetic significance within the Bivalvia. The family Ungulinidae comprises around 12 living genera. Although some Ungulinidae species share similar shell features with Lucinidae, investigations have demonstrated that the superfamily Lucinoidea is not monophyletic, that Ungulinidae are unrelated to Lucinidae and that the former should be removed from Lucinoidea. Using transmission electron microscopy, the spermatozoan morphology of *Diplodonta punctata* (species belonging to the Ungulinidae family) was described. Some traits of the sperm cells such as the elongated nucleus, which tapers and exhibits a slight curvature, are modifications of the primitive type. A comparison of sperm ultrastructure among bivalves indicates that there is a certain correlation between the evolution of long sperm nucleus and large, yolk-rich eggs, suggesting that the sperm nuclear shape is related to the size of the oocyte and the type of fertilization. One possible reason for the presence of an elongated sperm head is that this shape is more efficient than the primitive one for penetration into the jelly coat and cytoplasm of large oocytes. The acrosomal vesicle is short, conical and contains a small amount of lytic substances. There is not an anterior nuclear fossa. Mitochondria are laterally projected beyond the basis of the nucleus and the proximal and distal centrioles are perpendicularly arranged. The flagellum has the standard 9+2 arrangement of microtubules. In spermatids, a late chromatin compaction is observed in the posterior region of the nucleus. Recently, using molecular analysis, it was found that Ungulinidae corresponds to a monophyletic group together with the clades: Arcticidae, Veneridae and Mactridae. The ultrastructural analysis of spermatozoa spawned by Ungulinidae reveals that these gametes resemble sperm cells produced by Veneridae, especially because of the presence of a nuclear curvature. Therefore, the results of the present study are taxonomically relevant and could contribute to the systematics of bivalves.



Contamination of mussels *Perna perna* on the south coast of the state of Rio de Janeiro – RJ: a possible danger to human health?

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Many chemical contaminants and microorganisms are present in municipal effluents and may cause reproductive damage in different aquatic organisms through the disruption of its hormone system (endocrine disruption). In addition, as various species of these organisms such as fish, mussels and oysters are consumed by man, there are reports on the possibility of danger to human health by consumption of contaminated food. In Brazil, there are few articles that report the effects of endocrine disruption in edible aquatic organisms, with the exception of some reports on reproductive system disfunctions of mussels *Perna perna*, which was observed in the southern region of the country and in the Guanabara Bay (RJ). In these works, the only consideration was related on parasitism, and the possible relation with the occurrence of chemical agents in the local environments was not considered. Also the possible risks to the consumer health conditions were not discussed. In this study, still preliminary, it was found that 47% of mussels *Perna perna* collected at four sites located in Ilha Grande (RJ) showed damage to their reproductive tissues. As this region is a place of great importance for tourism, being considered pristine, and as in many instances the animals are eaten raw by tourists and residents of the region, there is the possibility of exposure to contaminants as well as to the parasites that may cause health risks in human beings. Therefore, further studies on this endocrine disruption in bivalve molluscs are needed in order to provide a better evaluation of the shellfish sold and consumed in this part of the country.



Oogenesis, Oocyte Degeneration and the Function of Follicle Cells in *Macra chinensis* Philippi, 1846

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The ultrastructures of vitellogenesis in the oocytes and follicle cells associated with oocyte degeneration in female *Macra chinensis* were investigated for clams collected from Simpo, Jollabuk-do, Korea by cytological, histological observations. In this study, vitellogenesis in the oocytes occurred through a process of endogenous autosynthesis, involving the combined activity of the Golgi complex, mitochondria and rough endoplasmic reticulum, and a process of exogenous heterosynthesis, in which extraovarian precursors were incorporated into oocytes by endocytotic activity at the basal region of the oolemma of the early vitellogenic oocytes before the formation of the vitelline coat. From the results of observations of the follicle cells attached to the degenerating oocytes after spawning, follicle cells of this species probably have a lysosomal system for break down, and resorb various phagosomes in the cytoplasm for nutrient storage, as seen in other bivalves. And also it is assumed that follicle cells of this species probably are involved in the induction of oocyte break down for reabsorption of various phagosomes (phagolysosomes) in the cytoplasm for nutrient storage during the period of oocyte degeneration.



Spermatogenesis and Taxonomic Values of Sperm Morphology of *Atrina pectinata* (Pteriomorphia: Pinnidae)

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In this study, the ultrastructural characteristics of germ cell differentiations during spermatogenesis and mature sperm morphology in male *Atrina (Servatrina) pectinata* were evaluated via transmission electron microscopic observation. Spermatogonia were located nearest the outer wall of the acinus, whereas spermatocytes and spermatids were positioned nearby the accessory cells. The accessory cells, which are in close contact with developing germ cells, contained a large quantity of glycogen particles and lipid droplets in the cytoplasm. Therefore, they are assumed to be involved in nutrient supply for germ cell development. Morphologically, the sperm nucleus and acrosome of this species are ovoid and conical in shape, respectively. The acrosomal vesicle, which is formed by two kinds of electron-dense or lucent materials, appears from the base to the tip: a thick and slender elliptical line, composed of electron-dense opaque material, appears along the outer part (region) of the acrosomal vesicle from the base to the tip, whereas the inner part (region) of the acrosomal vesicle is composed of electron-lucent material in the acrosomal vesicle. Two special characteristics, which are found only in the acrosomal vesicle of *A. (S) pectinata* in the Pinnidae, can be employed for phylogenetic and taxonomic analyses as a taxonomic key or a significant tool. The numbers of mitochondria at the sperm midpiece of this species are five, which is a common characteristic that appears in most of the species in the Pinnidae and other families in subclass Pteriomorphia. The acrosomal vesicles of Pinnidae species do not harbor the axial rod or several transverse bands in the acrosome, unlike the Ostreidae species in subclass Pteriomorphia. These characteristics can be employed for the taxonomic analysis of the family or superfamily levels as a systematic key or tools. The spermatozoa were approximately 45-50 μm in length, including a sperm nucleus (about 1.43 μm in length), an acrosome (about 0.51 μm in length), and a tail flagellum (about 46-47 μm). The axoneme of the sperm tail evidences a 9 + 2 structure.



Survival, fecundity and fertility of *Lymnaea columella*, intermediate host of *Fasciola hepatica* in northeastern Argentina

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Lymnaea columella is the main intermediate host of *Fasciola hepatica* in Northeastern Argentina. The knowledge of its biology is essential for the development of effective measures to control fasciolosis. The aim of this work is to study the survival, mortality rate, fertility and fecundity of *L. columella* under laboratory conditions. The ultimate goal is to develop an efficiently rearing system with many reproducing adults and a continuous production of offsprings that could be used in future biological assays. In total, 1206 *L. columella* snails were collected in the locality of Berón de Astrada, Corrientes Province, Argentina and transported alive. In the laboratory, they were placed in groups of 30 individuals in glass aquaria with filter and aerated water, maintained at 22°C and under a 12:12 light: dark photoperiod. They were feed with fresh lettuce *ad libitum* and pieces of Styrofoam were added as oviposition sites. Every 3 days water was changed, fresh lettuce were added, dead snails and unconsumed lettuce were removed and the number of living snails was registered in all recipients. The number of egg capsules and their date of hatching were registered weekly. Wild *L. columella* survived under laboratory conditions for 231 days (8 months). The monthly mortality rate ranged between 25.9% in the 2nd month and 69.5% in the 8th month, with a mean of 53.3% ± 0.2. During this period, *L. columella* snails laid a total of 4.198 egg capsules, with an average number of 12.6 eggs each (Min= 4; Max= 30 eggs). The fecundity (# of egg capsules/adult) ranged between 0.2 and 1.6 (Mean= 0.7; SD= 0.4). The mean fertility rate (% of hatching eggs) was of 57.1%. Our results show that *L. columella* can be successfully reared under controlled conditions. Snails rapidly adapt to laboratory conditions and start to reproduce immediately.



Reproduction and parasitism of *Melanoides tuberculata* from Vila do Abraão, Ilha Grande, RJ, Brazil

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Melanoides tuberculata (Müller, 1774) is an invasive Afro-asiatic freshwater gastropod registered for the first time to Ilha Grande in 2005. It can act as the first intermediate host for several trematodes. Populations of this snail are composed mainly by females which reproduce by parthenogenesis. Females have a brood pouch, where embryos develop, giving birth to juveniles. This study had as objective to determine the relationship between the number of eggs and juveniles in the pouch with the size of the female and the presence of cercariae. We analyzed females bimonthly from March/08 to June/09. The samples were separated into four size classes, according to shell diameter: I-0.01 to 2.99 mm; II-3.00 to 5.99 mm; III-6.00 to 8.99 mm; IV-bigger than 9.00 mm. In each size class was selected five females, that is, 20 females/collection were examined, except to April/09 (19 females) totalizing 159 females. Each female had the palial cavity dissected for observation of cercariae, eggs and juveniles. The eggs and juveniles were found in all collections. The average of eggs and juveniles per size class were the following: I-0.65; II -39.95; III-133.6; IV-150. Cercariae are present in 61 females (38.37%). In December/08 were recorded only 87 eggs and juveniles, perhaps due to the high infestation by "Pleurolophocercous cercaria" (65% were parasitized). The t-test showed that parasitized females showed reduced number of eggs and juveniles in relation to nonparasitized. The ANOVA showed that there is significant variation in the number of eggs and juveniles throughout the year ($p=0.019$). Also significant difference was found between the number of eggs and juveniles according shell size classes ($p=0.000$). Based on the presented data, we conclude that this species is iteroparous, animals in class I don't reached the sexual maturity and the interaction with parasites are harmful to mollusc.

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Taxonomy of *Asolene meta* (Ihering, 1915) and *Asolene spixii* d'Orbigny, 1838 (Gastropoda: Ampullariidae)

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Ampullariidae are freshwater snails naturally distributed throughout tropical and subtropical regions in Asia, South and Central America and Africa. They are often major constituents of native freshwater molluscan fauna and play important roles in food webs. They can also be disease vectors, such as, for instance, for eosinophilic meningitis, which is presumed endemic to Southeast Asia, but with several cases in the Americas, including Brazil. A few South American ampullariids have been introduced to the North America, Asia and Europe, and have become serious crop pests, destroying rice crops, as well as causing serious environmental impacts. Despite the wide distribution and importance of the group, the detailed morphology of ampullariids is poorly known and their classification is based primarily on shell characters, resulting in confusing taxonomy, with a large number of nominal species. Among the five genera occurring in Brazil, *Asolene* is one of the least studied and requiring further investigation. To clarify the taxonomy of *Asolene meta* and *Asolene spixii* and provide additional data to understand the systematic relationships of ampullariids, morphological and biological data were collected from specimens collected from two populations in Brazil. This is a pioneering study in Brazil, given that there are no published studies on the morphology of these species. Preliminary results indicate that the primary differences between the species are in characters of the kidney; in *A. meta*, the anterior chamber is larger than in *A. spixii*; and the apical gland of the penial sheath larger and more voluminous in *A. spixii*. The taenioglossate radula is similar in both species, except for the presence of an internal cusp in the lateral teeth of *A. spixii*. Additional morphological, microanatomy, biological and molecular data are being collected to expand the characters available for clarifying the taxonomy of the group.



First inventory of Chilean molluscs housed at the Maggiorino Borgatello Museum (Punta Arenas, Chile)

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The Chilean malacological collection of the Maggiorino Borgatello Salesian Museum (Punta Arenas, Chile) was created around the year 1905 with the aim of preserving local knowledge of molluscs. From then until mid-twentieth century, many specimens have been incorporated into the collection. Those were identified by local curators, but never underwent a comprehensive inventory and proper taxonomic identification. This report provides comprehensive information on the taxonomy and distribution of molluscan species currently present in the museum. We recorded 37 species of molluscs (26 gastropods and 11 bivalves), of which 19 are commercially important species. From the biogeographical standpoint, the collection represents about 4% of the registered molluscs for the Chilean territory and about 10% of that reported for the Magellan Region. At the species level, we highlight the presence of specimens of *Photinula roseolineata*, *Calliostoma irisans* and *Buccinanops globulosum*, which have very few records in the Magellanic Biogeographic Province. The maintenance and preservation of this malacological collection has great local and regional relevance as a way of preserving a portion of the cultural heritage in this part of the Southern Hemisphere.



The importance of histology in the description of a new Brazilian microbivalve species of Cyamiidae

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Composed of small marine bivalves (<40 mm), the family Cyamiidae G. O. Sars, 1878 has about 50 described species distributed into six genus, well represented in Australian, New Zealand, Antarctic, Subantarctic and Magellanic waters. Recently, individuals belonging to one of these genus, *Cyamiocardium* Soot-Ryen, 1951, were collected at the Rio de Janeiro coast, representing the first discovery of a Cyamiidae from Brazil, also extending the geographical distribution of this family in the southwestern Atlantic. Forty individuals of this species have intact soft parts; some were dissected and four were selected to be decalcified and subsequently embedded in Historesin®. Longitudinal and transverse 5µm-thickness sections were obtained and stained with Toluidine Blue. Apart from anterior and posterior adductors, pedal retractors muscles are also observed, as well as pallial fibers which are inserted near the posterior adductor and branching into the tentacles present at the inhalant and exhalant openings. Details of the nervous system could be examined, as the visceral, cerebral-pleural and pedal ganglia, the latter associated with statocysts of the type B1. Its complete, eulamellibranch, homorhabdic gills have fused ventrally inner demibranchs, without interlamellar junctions, forming spacious brooding pouches, where large embryos ($150 \pm 5\mu\text{m}$, $n = 10$) and juveniles ($500 \pm 15\mu\text{m}$, $n = 10$) are incubated; this species is dioecious and thus ovoviviparous. The foot has a deep groove and a byssogenic complex, consisting of four types of glands. The ligament has inner and outer portions. As this species is too small, with a maximum of 3.1mm length, these observations through histological sections revealed to be essential to complement studies made by dissections and by the electron microscopy.

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**Morphometry as a tool in discrimination of *Diplodon* species
(Unionoida, Hyriidae)**

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There is not yet a suitable classification for species of *Diplodon* Spix in Wagner, 1827, and it is also difficult to identify great part of the species in this genus because lack of good diagnostic characters. Morphometry can be used as an important tool in the discrimination of morphologically similar species, nevertheless few studies used this method to identify and delimitate species of *Diplodon*. In this study, we applied a morphometric approach to discriminate 113 valves from eight lots of Museu Nacional do Rio de Janeiro (MNRJ), testing the efficiency of morphometry in the distinction of species. The valves were draw with the aid of a camera lucida and 23 measurements were taken. The normality of variables was verified, and nine variables were excluded of the analysis for not presenting a normal distribution. The variables R1 (length of the line beginning on the shell centre toward the vertex of the quadrant of the anterior length of the valve) and P (dorsal length of the valve) also were excluded because of the high correlation ($R \geq 0,94$) with other variables. After that, the variables were standardized using the Standard Deviation. The Discriminant Analysis used 12 variables and showed results that differed, significantly, the lots studied (Wilks's Lambda = 0,004; $gl = 84,536$; $p < 0,001$). Percentage of cases correctly classified in the classification matrix was 81%. The muscles and teeth variables were the most important in the separation of the groups. The lots MNRJ 4492 (83%) and MNRJ 30290 (94%) had a good discrimination in the graphic. The other lots were overlapped, but with a tendency to form groups. Another analysis will be done, with the insertion of more conchological data and the insertion of new lots.

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**Phylogenetic analysis of the superfamily Tellinoidea (Mollusca: Bivalvia)
based on partial mitochondrial gene sequences**

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Despite the ecological and economic relevance of the superfamily Tellinoidea, which exhibits an almost cosmopolitan distribution, constructions of phylogenetic relationships for this group using molecular and/or conchological tools correspond to controversial issues and a unanimous agreement has not been reached until this moment. Sequences of mitochondrial 16S ribosomal DNA are frequently used to study the phylogenetic relationships within the class Bivalvia at less comprehensive hierarchical levels, due to fast-evolving mitochondrial genes. Specimens of Tellinidae, Semelidae and Psammobiidae families were collected from the São Paulo coastline (Southeast Brazil) and about 480 nucleotide fragments of their mitochondrial large ribosomal subunit (16S rRNA) were sequenced. Three outgroups (from Cardiidae) and fifteen ingroup taxa (one Donacidae, two Solecurtidae, two Semelidae, three Psammobiidae and seven Tellinidae) were analyzed. Phylogenetic inferences were made by using the maximum parsimony analysis. Preliminarily in our cladogram, sequences of the 16S ribosomal gene suggest proximity between the *Tellina*, *Strigilla* and *Sanguinolaria* genera. Semelidae, Psammobiidae and Tellinidae families seem to be paraphyletic groups. Simultaneously, the spermatozoan ultrastructure of species of Tellinoidea has been described. Our results indicate that there are two clearly and well defined patterns of sperm morphologies among Tellinidae species. Tellininae and Psammobiidae produce *modified* spermatozoa whereas Macominae and Semelidae produce *primitive* spermatozoa. The helical nuclei, overlapped in its base by mitochondria, could be a synapomorphy of all examined genera belonging to the subfamily Tellininae, but interestingly also occurs in at least two Psammobiidae (*S. sanguinolenta* and *Nuttalia japonica*). This similarity could correspond to phylogenetic proximity between Psammobiidae and Tellininae species or represent an adaptive convergence. Further investigations using other genes, higher numbers of specimens and taxa, including morphological characters, such as spermatozoan ultrastructure, will confirm or reject the relatedness between Psammobiidae and Tellininae.

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Shell morphometry in Scaphopoda (Mollusca): discrimination power at species and genera level

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Studies on the shell morphometry became an important tool to be applied in taxonomy, aiding in the discrimination of morphologically similar species. Among scaphopods, these studies are scarce despite having a relatively homogeneous shell. This study examined the applicability and robustness of morphometric characters to distinguish species and genera of the orders Dentaliida and Gadilida. To obtain morphometric variables were used shells from malacological collections of the following genera: order Dentaliida: *Paradentalium* (03 species), *Antalis* (03 species), *Graptacme* (04 species), *Fissidentalium* (01 specie) and *Fustiaria* (02 species); order Gadilida: *Entalina* (01 specie), *Striocadulus* (01 specie), *Cadulus* (02 species), *Gadila* (04 species) and *Polyschides* (04 species). In general, eleven morphometric variables were measured from 25 species distributed among ten genera. After obtaining the variables, we proceeded to a correlation analyze between them all, and strongly correlated variables were excluded from the subsequent analyzes. Morphometric data were standardized and treated by Discriminant Analysis. The Discriminant Analysis did not distinguish significantly the genera of the order Dentaliida, classifying only 58% of the specimens properly. In this model four variables were used, the remaining were highly correlated. However, the model generated for the genera of the order Gadilida showed high discriminatory power, ranking 93% of the specimens properly (eight variables were used in the model). At species level (i.e., comparison of species within a genus), species from Dentaliida showed a high potential for discrimination between them using shell morphometry, but at genera level the meristic characters of the shell (e.g., presence or absence of ribs, number of ribs, slits at apex) seem to prevail over the measures. Within Gadilida, morphometric analyses were effective at both levels (genera and species). Gadilida shells are usually smooth and unornamented making it shells morphometry an important tool for the taxonomy of the group.



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