Volume 41, 1 *May, 2022*

The Ecdysiast

The Newsletter of The Crustacean Society

Inside…..

Message from the President…

Dear TCS-colleagues,

I am very happy to have stepped up as the TCS President as of January 2022. During the last two years, the world has been disrupted by the Covid19 pandemic, and unfortunately, all of TCS-related meetings were either postponed or re-organized in a virtual format. This pandemic has nevertheless enhanced our communication through online conversations and virtual meetings. I wish to give a big thanks to the efforts of the past-President, Ingo Wehrtmann during his tenure as President during the pandemic period. He organized a number of on-line meetings for the TCS Executive Committee to continue working on TCS matters including the launch of our website. He also organized the first online meeting for all of the TCS Governors across the world to share their views on promoting membership. This was impossible to achieve in the past, as not all the governors could attend 'in-person' TCS meetings at the same time. I think we can continue to organize world-wide online meetings for TCS Governors to enhance the promotion of TCS worldwide.

Starting from 2022, the world is returning to 'normal life'. In 2022, we will have the TCS online summer meeting (co-organized with the Congresso Brasileiro Sobre Crustaceos (CBC)) in Brazil on 6–9 June this year. Following the TCS summer meeting, TCS will convene its winter meeting at the SICB 2023 Conference in Austin, Texas, USA on 3–7 January 2023. Our 2023 summer meeting will be held during the 10th International Crustacean Congress (ICC10) at Wellington, New Zealand on 22–26 May 2023. This will be a great event for carcinologists world-wide to gather 'in-person' after more than two years of pandemic period!

We are continuing to make improvements to and further develop TCS's outreach! In 2022, we welcome the new Executive Committee members Amanda Windsor (President Elect), Dave Hudson (Program Officer) and Tadashi Kawai (Asia Governor). Laura López-Greco continues a new term of service as Latin America Governor. We are very happy to welcome Ms. Elysia Toh from the National University of Singapore (NUS) as the Social Media Coordinator for TCS. Elysia is a former student of Dr. Darren Yeo (NUS), and works with freshwater crabs. She will be responsible for the Facebook, Twitter, and Instagram accounts of TCS. With Elysia's help, all the social media of TCS will be up-to-date! We are going to organize some activities to enhance the member's participation and sense of belonging to TCS. Firstly, we designed an eye-catching TCS T-shirt "C'est Larvae" (see the design below). The design concept of this T-shirt dated back to 2018, when I was walking with my friend Christopher Rogers (Program Officer at that time) on a street in San Francisco after dinner, during the SICB 2018 meeting. Christopher suggested to me "I would like to have a TCS T-shirt, which has most of the crustacean larvae at the back and with a word 'C'est Larvae' being similar to the pronunciation of the French words 'C'est La Vie'." I thought this was a great idea. So, we followed

through on this concept and designed the C'est Larvae TCS T-shirt, which represents many groups of crustacean larvae. We will send an order form to all members very soon. The second proposed activity will be a crustacean photography competition for members. Another initiative I would like to pursue is collecting photographs of crustaceans taken and submitted by members that can be used for potential TCS calendars, Journal of Crustacean Biology (JCB) cover photos and TCS social media sites. We are also formalizing a student publication competition in the JCB, which will be supported by Oxford University Press. Thanks to Pedro Castro's editorial efforts in JCB, we will annually award the best student paper in JCB. We hope to encourage more student members to submit to our journal and inspire their involvement in TCS social media as well.

I am looking forward to meeting you at the virtual (Brazil) TCS summer meeting in June, at SICB in Austin, USA in January 2023, and at ICC10 in Wellington, New Zealand, during May 2023!

Benny K.K. Chan
President, The Crustacean Society

The TCS C'est Larvae T-shirt. Available in grey or navy blue color. Can you recognize the crustacean groups that these larvae come from?

Thank you to our benefactors

Consider becoming a TCS Patron Member where you support the membership of at least one other member/student. Note the increase in number compared to previous issues. Thank you to you all!

Crustacean Society Patron Members

Shane Ahyong
Raymond Bauer
David K. Camp
Peter Castro
Paul Clark
Neil Cumberlidge
Rodney Feldmann
Sarah Gerken
Sandra Gilchrist
Jens Thorvald Hoeg
Vincent Chi Sing Lai
John Layne
Jeff Levinton
Alejandro Maeda-Martinez
Ngan Kee Ng
Dean Pasko
Gary Poore
Wayne Price
Stefan Richter
D. Christopher Rogers
Bernard Sainte-Marie
Carrie Schweitzer
Thomas Shirley
Brian Tsukimura
Christopher Tudge
Les Watling

The Crustacean Society Board Members, 2021

The Ecdysiast is published twice yearly in May and November and it is available in electronic form at http://www.thecrustaceansociety.org/ecdysiast. All the past issues are also available from the same web site. Submissions for the May newsletter should be received by mid March, while those for the November newsletter should be received by mid September. All types of crustacean-related contributions are encouraged, including announcements of upcoming workshops and meetings, regional updates, meeting summaries (with photos!), new publications and any other crustacean news.

Send all material directly to the Editor:
Kareen Schnabel, kareen.schnabel@niwa.co.nz

The Crustacean Society Liaison Officers, 2021

The Chinese Crustacean Society
Liaison Officer: Jianhai Xiang
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email: jhxiang@qdio.ac.cn

International Association of Astacology
Liaison Officer: Kohei Murakami
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The Brazilian Crustacean Society
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The Carcinological Society of Japan
Liaison Officer: Akira Asakura
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email: asakura.akira.6w@kyoto-u.ac.jp

The World Association of Copepodologists
Liaison Officer: Rony J. Huys
Natural History Museum, London, UK
email: r.huys@nhm.ac.uk

International Research Group on Ostracoda
Liaison Officer: Renate Matzke-Karasz
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Latin American Carcinologist Association
Liaison Officer: Michel Hendrickx
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email: michel@ola.icmyl.unam.mx

Colloquium Crustacea Decapoda Mediterranea Group
Liaison Officer: Enrique Macpherson
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Terrestrial Isopod Biologists Group
Liaison Officer: Jasna Strus
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email: jasna.strus@bf.uni-lj.si

Large Branchiopod Working Group
Liaison Officer: D. Christopher Rogers
University of Kansas, Kansas
email: branchiopod@gmail.com

Amphipod Group
Liaison Officer: Wim Vader
Tromsø Museum, Norway
email: wim.vader@uit.no

German Carcinologists
Group Liaison Officer: Sebastian Klaus
Goethe Universität, Frankfurt am Main, Germany
email: klaus@bio.uni-frankfurt.de

Follow The Crustacean Society on social media

@TheCrustaceanSociety

@CrustaceanSoci2

@ thecrustaceansociety

Treasurer's Report for May 2022

As of April, TCS had 289 renewed members (225 regular members, 25 patron members, and 39 student members). This is up by about 50 members from the same time last year; however we hope to exceed 300 members for 2022 (as we have in the past) - so check your membership status and renew if needed! Encourage your colleagues and students to join; particularly students since they are the future of TCS. Note that the link to join or renew memberships is: https://scienceserv.com/tcs/membership/membership.php and you can contact (mrobinson@burkinc.com) directly if you have any issues with payments. A copy of the membership form is provided at the end of this issue of the *Ecdysiast*.

Please note that one the benefit of student membership is being able to apply for research and travel awards. This year we did not have any applications for support of student participation in TCS meetings. Next year please apply in February, put it on your calendar now! And this is the time to apply for funds to attend the TCS/ICC10 meeting in New Zealand in May next year.

After consulting with Oluwatooni Akinkuotu who is Associate Publisher for Oxford University Press (OUP) in charge of the Journal of Crustacean Biology (JCB), President Benny Chan and I approved the 2023 subscription and APC proposals for the JCB. Specifically, a 3.5% increase in JCB's APC charges and a 5% increase in the online subscription price for individual institutional subscriptions. The Executive Committee of TCS (President Benny Chan, President-Elect Amanda Windsor, Treasurer Jason Williams, Secretary Sarah Gerken, and Program Officer David Hudson) as well as Peter Castro (Editor-in-Chief of JCB) will follow-up with OUP to track how the increase potentially impact institutional subscriptions. OUP has agreed to sponsor a best student paper prize chosen from the JCB articles having students as first authors; President Benny Chan will form a committee to oversee how the award is determined. Insurance quotes for TCS (i.e., General Liability Insurance; Director and Officer Insurance) will be considered by the Executive Committee for a decision needed in August 2022. Finally, we are pleased to provide a stipend to Ms. Elysia Toh (National University of Singapore) as the first Social Media Coordinator for TCS.

TCS investments with Schwab are down but still totaling over US$720K. In the upcoming months I will be working with BAI and the TCS Executive Committee on the proposed 2023 budget.

Respectfully submitted,

Jason Williams

The Crustacean Society
Journal of Crustacean Biology

Editorial Report for Volume 41 (2021)

Highlights. In addition of the announcement of a big jump in JCB's impact factor (to 1.43 up from 1.25 in 2019 and 1.07 in 2018), 2021 witnessed a successful transition to online-only publication.

There was, however, a drop in the number of submitted manuscripts and published articles, partly the result of having no articles from symposia as in previous years. Another factor was that the closing date for the December 2021 online issue was earlier (and for already published articles only) than that for the previous printed December issues. The 22 December 2021 closing date left 19 submissions ready for publication, so they are not included in the 2021 data. These articles will be published online by early 2022 and included in the March 2022 issue.

Number of articles by subject

	2015	2016	2017	2018	2019	2020	2021
Phylogeny & Taxonomy	13	9	14	18	16	16	20
Ecology	15	15	14	15	15	20	17
Research Notes	2	2	9	7	8	4	10
Functional Morphology	5	–	7	3	3	2	6
Genetics & Genomics	1	5	2	7	3	3	5
Reproductive Biology	–	7	11	9	7	6	5
Behavior	4	8	7	5	5	4	4
Physiology	8	1	8	8	4	12	4
Aquaculture	4	6	1	3	–	2	3
Thematic Reviews	–	–	–	–	2	2	2
Historical Memorials	1	–	–	1	–	–	1
Paleobiology	5	5	3	3	8	3	1
Special Sections (symposia)	14	15	–	9	11	15	–
Developmental Biology (embryology)	–	–	–	1	2	6	–
Fisheries (exclusive of aquaculture)	–	–	–	–	–	1	–
Techniques & Methods	–	15	9	4	3	1	–
Commentary/Response	–	–	–	–	2	–	–
Conservation	2	2	3	1	–	–	–
Larval Development*	2	5	–	–	–	–	–
Evolution & Biogeography*	2	–	–	–	–	–	–
TOTAL	**86**	**99**	**88**	**94**	**89**	**97**	**78**

**previous sections now included under developmental biology, ecology, or phylogeny and taxonomy.

We published articles from authors representing 37 nations and territories from all continents. The top ten nations:

Authors (all authors per article) from the top ten nations

	2015	2016	2017	2018	2019	2020	2021
United States	77	87	79	85	97	112	76
Mexico	4	2	11	31	15	19	23
China	35	28	42	36	7	20	22
Japan	24	19	30	18	19	36	20
Brazil	36	22	15	20	20	17	15
Australia	5	16	14	34	12	2	12
Norway	2	6	5	13	8	2	10
Taiwan	6	8	11	7	3	10	10
United Kingdom	17	9	11	9	5	3	10
India	–	–	18	11	2	11	9

The 32 articles appearing in the March 2022 issue of *Journal of Crustacean Biology* are now available online at https://academic.oup.com/jcb.

Looking ahead to 2022, we will publish a special section on Crustacean Mitochondrial Genomics and articles resulting from the 8th Symposium on Fossil Decapod Crustaceans in Zaragoza, Spain, June 2022.

New online covers. Starting in January, *JCB* will highlight a different cover for each of the four online issues. Each cover will be linked to an article in the issue.

New Associate Editors. We welcome two new Associate Editors joining our Editorial Board:

Dr. Tammy Horton (National Oceanography Centre-Southampton, United Kingdom), a specialist on deep-sea biodiversity and taxonomy of amphipods

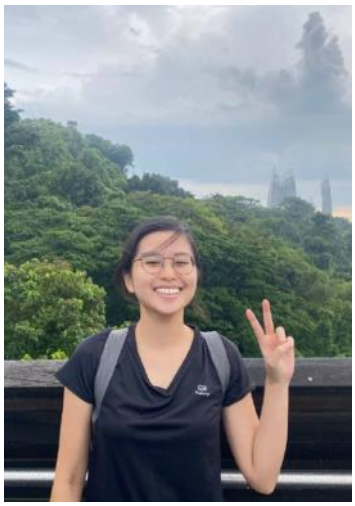
Dra. Laura López-Greco (Universidad de Buenos Aires, Buenos Aires, Argentina), a specialist on the ecology and physiology of decapods

Dr. Zachary Loughman (West Liberty University, West Liberty, West Virginia, USA), a specialist on the biology of crayfishes

With my very best wishes for a healthy 2022,

Peter (Pedro) Castro
Editor-in-Chief, *Journal of Crustacean Biology*

Welcoming our new Social Media Coordinator!



Please join us in welcoming **Elysia To**, our first Social Media Coordinator. A recent MSc graduate from Associate Professor Darren Yeo's Freshwater and Invasion Biology Lab at NUS, her research included reviewing the impacts of climate change on freshwater decapods, specifically focusing on the critically endangered and endemic Singapore freshwater crab *Johora singaporensis*.

Help her raise the profile and reach of TCS by sharing news through the official TCS social media outlets (Instagram, Twitter, Facebook). Reach out to Elysia via DM (direct messages) so we can share the news with the rest of the Society.

@TheCrustaceanSociety on Facebook
@CrustaceanSoci2 on Twitter
@thecrustaceansociety on Instagram

Welcoming our new Program Officer

Please also join us in welcoming **Dave Hudson** as the new Program Officer of TCS! He took over from Christopher Rogers at the end of 2021, prior to the SICB annual meeting. Dave serves as a research scientist and the founder of Remote Ecologist, Inc. (a non-profit), researcher-in-residence at The Maritime Aquarium at Norwalk, assistant research scientist with the Center for Environmental Sciences and Engineering at the University of Connecticut, research associate for Southern Connecticut State University, and adjunct professor with Fairfield University. Additionally, he is a Fellow National at The Explorers Club and a journal associate editor for BioInvasions Records.

He can be reached at dmhudson@remoteecologist.org with any queries around grants, awards and fellowships.

A huge THANK YOU to **Christopher Rogers** for his hard work, it's been a pleasure! He of course continues on as the Liaison Officer of the Large Branchiopod Working Group.

TCS student awards

The Crustacean Society provides a range of grants and scholarships for students and postdoctoral researchers, and we really encourage all who are eligible to apply (see below and visit the TCS website for more details). Here, we announce the TCS Fellowship awards, there were no applicants for this cycle for the Early-Career and Student Travel Awards. We encourage all those who are eligible to apply by the September deadline to fund their travel to this year's SICB meeting.

TCS Fellowship in Graduate Studies

TCS annually awards up to six US$1,000 Fellowships in Graduate Studies in any re-search concerned with the biology of crustaceans. The fellowship is to support the re-search objectives and career goals of graduate students. This award requires a letter of support from their faculty sponsor/TCS mentor. Both the student and their faculty sponsor/TCS mentor must be a TCS member at the time of application. Further details and requirements are in the application (see website). The deadline for application is 31 March annually.

Our winners for 2022 are:

Cory Berger (Woods Hole Oceanographic Institution) - "Metabolic regulation of diel vertical migration in *Acartia tonsa* (Copepoda)". Cory is a PhD candidate in the Massachusetts Institute of Technology (MIT) - Woods Hole Oceanographic Institution (WHOI) Joint Program, where he advised by Dr. Ann Tarrant. His thesis research includes studies of diel vertical migration in Acartia, and the starvation response of Southern Ocean copepods."

Andrew Cannizzaro (Miami University, Ohio) - "Phylogeographic analysis of a poorly studied but widely distributed, hypogean crustacean". In his 3rd year as a Ph.D. student in the Aquatic Biodiversity & Conservation Laboratory at Miami University in Oxford, Ohio, Andrew's research focuses on the evolutionary relationships, taxonomy, biogeography and biodiversity of freshwater organisms; using amphipod crustaceans as a model.

Ruma Chatterji (University of Cincinnati) - "Teaching and Mentorship through research project: Determination if homing accuracy degrades over time during path integration in the fiddler crab, *Uca pugilator*". Ruma is a doctoral candidate studying in Dr. John Layne's lab in the Department of Biological Sciences at the University of Cincinnati. The goal of her dissertation is to advance the understanding of spatial and temporal components of vector memory associated with path integration. Specifically, investigating how fiddler crabs encode the direction of home in memory, how long does their memory last on a short-term timescale, and also, if it only functions accurately within certain spatial limitations.

Talia Head (Colorado State University) - "Molecular regulation of molting in decapod crustaceans". Talia is finishing up the second year of her Ph.D. program at Colorado State University, where she is using transcriptomic and proteomic approaches to study the regulation of molting in decapod crustaceans. This TCS Fellowship will allow her to spend time at the Bodega Marine Laboratory this summer to study the stability of nitric oxide in the Y -organ of the green crab, *Carcinus maenas*.

Jesús Quiñones Llópiz (Universidad de Puerto Rico en Bayamón) - "The diversity and genetic structure of the populations of *Cardisoma guanhumi* in Puerto Rico." His MSc research studies the diversity and genetic structure of the land crab *Cardisoma guanhumi* populations in Puerto Rico and aims to establish a possible connection between populations using molecular tools, and develop recommendations for the management and conservation of the species.

TCS Student awards presented at the 2022 SICB Meeting

The 2022 Society for Integrative and Comparative Biology meeting was a hybrid/virtual meeting in Phoenix, Arizona, this January. This was helpful with last-minute changes for pandemic-related travel, as students could still compete. As always there were plenty of excellent presentations. The Crustacean Society had some 29 students competing for the TCS student presentation awards: 14 were oral presentations and 16 poster presentations, representing 21 different universities and institutions from across three continents.

Both oral and poster presentations could receive a maximum of 100 points each. The judges awarded points based on set criteria. Each presentation was judged by three judges, and all scores were tallied by the Program Officer.

Oral presentations were judged on the following criteria: originality (up to 10 points), hypothesis/ objectives (20 points), experimental design (10 points), implementation (10 points), validity of conclusions (20 points), graphic quality (10 points), oral clarity for content (10 points), and answers to questions (10 points).

Poster presentations were judged on the following criteria: abstract (up to five points), originality (10 points), hypothesis/objectives (20 points), experimental design (10 points), implementation (10 points), validity of conclusions (20 points), graphic quality (10 points), answers to questions (10 points), quality of writing (10 points), and bibliography (5 points). Many thanks to the 8 judges, many of whom pulled double duty by judging in-person and online.

The winners were:

Best Oral Presentation: **Jacob Harrison**, Duke University. “Starting to snap: The development and kinematics of spring-driven strikes in juvenile snapping shrimp” Sponsor: Dr. Sheila Pat.

First runner-up (oral): **Pedro Peres**, Florida International University. “Genomic analyses suggest incipient speciation in a widespread Tropical Atlantic swimming crab.” Sponsor: Dr. Heather Bracken-Grissom.

Second runner-up (oral): **Marisa McDonald**, University of Hawai‘i at Mānoa. “Spectral sensitivity of three species of larval stomatopod crustaceans.” Sponsor: Dr. Megan Porter.

Best Poster Presentation: **Jason Dinh**, Duke University. “The crustacean juvenile hormone: Characterization of the methyl farnesoate signalling genes in the *Gecarcinus lateralis* Y-organ transcriptome.” Sponsor: Dr. Shiela Patek.

First runner-up (poster): **Rosol Aftealh**, The College of Idaho. “Examining the effects of the U.V. filter oxybenzone on stress markers in signal crayfish (*Pacifastacus leniusculus*).” Sponsor: Dr. Mark Gunde.

Second runner-up (poster): **Brooke Bogan**, SUNY Fredonia. “A new method of morphometric analysis for extant and extinct notostracans.” Sponsor: Dr. Thomas Hegna.

All the students did very well, and we were pleased that they shared their research with us. I want to congratulate all our winners; you did well!! I want to thank all the students who participated, their sponsors, and especially the judges who helped determine the winners.

The Crustacean Society provides a wide range of grants and scholarships for students and postdoctoral researchers. The various options are presented below. Please make sure to apply before the deadlines. If you have any questions please contact the TCS Program Officer.

TCS Fellowship in Graduate Studies

TCS annually awards up to six US$1,000 Fellowships in Graduate Studies in any research concerned with the biology of crustaceans. The fellowship is to support the research objectives and career goals of the graduate student. This award requires a letter of support from their faculty sponsor/mentor. Both the student and their faculty sponsor/mentor must be a TCS member at the time of application. Further details and requirements are in the application and can be downloaded here.

DEADLINE FOR APPLICATION: 31 March annually.

TCS Early-career, post-Ph.D. Travel Awards

TCS annually awards up to three (3) US$1,500 travel awards for early-career researchers with a Ph.D. awarded within five years of the application deadline. Extension of up to eight years post- Ph.D. will be considered at the discretion of the Program Officer for applicants having taken a career break for family reasons. The grants shall cover travel to present, preferably in an oral session, results of their research in any field of study involving crustaceans at a TCS meeting (mid-year or SCIB meeting). Preference will be given to applications that will result in a manuscript suitable for publication in *Journal of Crustacean Biology*. Deadlines: 15 March and 15 September annually. The application can be downloaded here.

DEADLINE FOR APPLICATION: 15 March and 15 September annually.

TCS Student Travel Awards

TCS awards a maximum of five (5) US$500 awards twice a year to support student attendance at TCS meetings (TCS mid-year/ICC and SICB). Applicants must be enrolled in an undergraduate or graduate degree program, be the presenter of an oral or poster presentation at the TCS/ICC/SICB meeting they attend, and demonstrate financial need for TCS support of travel to the meeting. Both the student and their faculty sponsor/mentor must be a TCS member at the time of the application. The application can be downloaded here.

DEADLINE FOR APPLICATION: 15 March and 15 September annually.

For additional information contact the TCS Program Officer: Dr. David Hudson
dmhudson@remoteecologist.org

Upcoming meetings

XI CBC
TCS Summer Meeting
June 05-08th, 2022
Santos - Brazil

CONGRESSO BRASILEIRO SOBRE CRUSTÁCEOS (CBC)
THE CRUSTACEAN SOCIETY (TCS) - SUMMER MEETING

Theme: Tradition and innovation: Integrative approaches to crustacean studies

For further information, visit the website **https://cbc-tcs.com/**. This will be a 100% online event.

Meeting Date: Sunday, June 19, 2022 to Friday, June 24, 2022, **Location**: Zaragoza, Spain

Organisers: Samuel Zamora, Fernando A. Ferratges, Álvaro García-Penás

Follow these links for contact Email and Website. Articles resulting from the meeting will be published in *JCB*.

The meeting will cover all aspects of fossil decapod crustaceans including information from modern representatives. We would like to attract researchers from all over the world interested in fossil decapods and related forms. We are planning to organize the field excursion in the Pyrenees and Iberian Cordillera, expending one day in the lower Eocene of Huesca, one day in Lower Cretaceous around Teruel and a third day visiting the famous locality of Koskobilo quarry (Navarra). We are looking forward to seeing you in Zaragoza!

23rd Symposium of the International Association of Astacology

Hluboká nad Vltavou
Czech Republic

June 20 - 26, 2022

Early registration	till March 31, 2022
Regular registration	till April 30, 2022
Late registration	till May 31, 2022
Abstract of submission	till April 15, 2022

For further information, visit the event website **https://iaa23.com/cs/**.

Dear copepodologists,

We are very excited about the opportunity to host the online International Conference on Copepoda from July 25 to 29, 2022. e-ICOC is the first online meeting organised by the World Association of Copepodologists. The time that has lapsed since our last ICOC meeting in California – and for many of us the last time many of our fellow copepodologists could meet up – is coming up to five years. By the time the next ICOC will take place it will be seven years, implying that a generation of copepodologists will have retired by then and at least two cohorts of students will never have had the opportunity to participate in the most appropriate international scientific platform for disseminating their research. Due to the Covid-19 global pandemic having prevented the normal physical conference cycle of 2020, and the recent cancellation of the meeting in South Africa, the Executive Council of WAC endorsed our proposal to host a virtual meeting this year. This event will give priority to early-career researchers who need to present their work as part of their career milestones. The e-ICOC will be held in the Greenwich Mean Time zone, using the Zoom video platform.

e-ICOC is not a replacement for the normal in-person International Conferences on Copepoda. The cycle of these physical meetings is planned to continue from 2024 with Prof. Susumu Ohtsuka taking the lead in organising the next ICOC in Hiroshima, Japan. As during previously organised copepod conferences, e-ICOC will host the WAC Business Meeting during which members of the Executive Council will present the Society's financial reports, overview of activities for 2017–2022, election of Officers, awards for best student presentations, and plans for 2022/2024.

As the conference will be online, registration fees are significantly reduced compared to the physical format, facilitating the attendance of more participants and enabling more inclusion.
Registration is open NOW – please visit http://e-icoc-2022.com for more details.

Looking forward to welcoming you all.

Rony Huys & Alexandra Savchenko

Co-organisers of e-ICOC

3–7 January 2023: SICB annual meeting, Austin, TX, USA

In May 2023 the ICC10, the 10th International Crustacean Congress, will bring together carcinologists at the National Museum of New Zealand Te Papa Tongarewa in Wellington. The hosts invite you to New Zealand in this video. Express your interest now.

Help shape the ICC10 programme!

Symposia submissions are due by 13 July 2022. All you need is a topic, short description and any contributors (if known).
More details here.

Have you completed this crustacean community survey?

Complete now to be entered into the **draw for free ICC10 registration!** We want to hear from all of our community and it only takes a minute to complete.

Be in to win! Click here to complete the survey

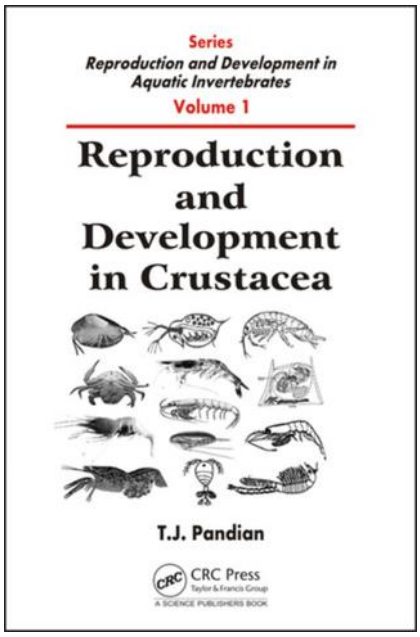
Naturally, we will have a **Ray & Lilly Manning Memorial Crustacean Bazaar** with a silent auction. All proceeds will fund TCS student scholarships. So start dusting off those small "objet d'arthropod" and make space in your luggage!

Book Review

Reproduction and Development in Crustacea

Pandian, T. J. 2016 [2021 Reprint].

Series on Reproduction and Development in Aquatic Invertebrates – Volume 1. CRC Press, Boca Raton, 315 pp. ISBN 978-0-367-79302-0. DOI: https://doi.org/10.1201/b20080. US $54.95 (paperback, eBook), US $200.00 (hardback).



Reviewed by Brady K. Quinn, Fisheries and Oceans Canada, St. Andrews Biological Station, Canada

This is the first book in the six-volume *Series on Reproduction and Development in Aquatic Invertebrates* by T. J. Pandian (2016-2021). The series recently concluded (Vol. 6, 2021) and Vols. 1-5 were re-released in paperback in 2021. The series represents an ambitious, single-authored treatise on reproductive biology and sexual development in all aquatic invertebrate phyla. It should not be confused with the six-volume *Evolutionary Developmental Biology of Invertebrates* series edited by Wanninger (2015), Vol. 4 of which is also on Crustacea. Despite the series' similar titles and divisions into volumes on particular groups, Wanninger's (2015) series includes non-aquatic groups, has chapters authored by various authors, and focuses heavily on evo-devo and genetic patterning of embryonic and post-embryonic development. Pandian's (2016-2021) solo-authored series takes a more traditional approach, synthesizing studies from the literature on the structure and growth of reproductive organs, mating systems, and accounts of the fecundity (production of gametes, young, cysts, etc.) of organisms, relating the latter to species' life history and ecological setting. Pandian actually focuses much more on reproduction than on development, mainly treating the development of sexual organ systems, and thus this series belongs among the reproductive biology literature more than the developmental biology literature. Pandian's volume on crustaceans compiles a lot of information on the reproductive biology of Crustacea, particularly branchiopods (daphnids) and decapods, and while it won't take the place of standard texts in the field it does make some novel contributions to this literature.

The author's thesis across the series is to accumulate data on whether embryonic stem cells (ESCs) and/or primordial germ cells (PGCs) or their immediate derivatives are retained in aquatic invertebrates as adults and relate this to their capacity for asexual reproduction or (sequential) hermaphroditism, respectively, as well as how these capabilities relate to the species' life histories and ecology. A division between aceolomates and eucoelomates, which retain ESCs as adults and can thus reproduce asexually, versus pseudo- and hemocoelomates, which do not, is proposed. It should be noted that Pandian does not consider parthenogenesis (e.g., as enacted by some crustaceans like *Daphnia* and Marmokrebs) as a form of asexual reproduction, but rather, due to its involving meiotic processes, as a derived form of sexual reproduction. Due to the series' focus on aquatic groups, the first volume is the only one that covers Arthropoda in the series (excepting Vol. 6 (2021) on "minor phyla" that covers a few Panarthropoda, e.g., tardigrades). It should be noted that at no point is a reason for the series' focus on *aquatic* invertebrates outlined; given the generality of the author's thesis, it would seem natural to consider terrestrial groups as well, as was done in Wanninger's (2015) evo-devo series.

Within Crustacea, this book makes two broad conclusions: (1) that the majority of sessile or slow-moving Crustacea have separate sexes (gonochorism), while more motile groups have an increasing capacity for hermaphroditism and parthenogenesis; and (2) that the tendency for the majority of Crustacea to brood embryos imposes limitations to their reproductive capacity per body size and leads to reproductive senescence, with crustaceans that shed their eggs sometimes escaping from these constraints. These conclusions are based on the author's survey of the literature and their past studies with fishes and crustaceans. Thoracic cirripedes (predominantly hermaphroditic sessile animals) are a clear exception to the former point that is not really satisfactorily dealt with in

the book. The latter point may also be contentious, as there is a predominant paradigm in fisheries-related decapod research (e.g., of lobsters; MacDiarmid & Sainte-Marie, 2006) that larger females are more fecund than smaller ones without known limits, and very few studies of lobsters are cited in the book; a wider survey of the literature may have modified some of these conclusions. The evidence supporting Pandian's criticism of Vogt's (2010) conclusions that parthenogenetic Marmokrebs (*Procambarus fallax* [*virginalis*]) do not undergo reproductive senescence (ca. pp.102-104) is interesting, but not presented in a way that most readers will find clear or completely convincing. The author also frequently makes reference to phenomena in crustaceans (regeneration, sex change) that presumably indicate that they possess ESCs, PGCs, or their derivatives, which relates to their overall series' thesis and seems new for carcinology. However, such statements do not have a lot of support (i.e., confirmation of the presence of such cells in the indicated organs/processes), though admittedly this may reflect the state of knowledge regarding stem cells in crustaceans. In this case, the book does point out some useful avenues for future research.

The book comprises eight chapters. The first chapter is a general introduction to the series and the author's thesis regarding stem cell retention and invertebrate reproduction. Chapter 2 is a general overview of the Crustacea as a group, with later emphasis on the prevalence of brooding and possibility of reproductive senescence. Chapter 3 is about sexual reproduction in crustaceans, providing overviews of the reproductive organs and their development, the wide variety of sexual systems employed in Crustacea, and the fecundity and ecological aspects of different example groups. Chapter 4 is supposed to be on "Asexual Reproduction"; it initially provides the author's "only" example of asexual reproduction in crustaceans – that of budding in certain colonial Rhizocephala – but then proceeds to review autotomy and regeneration; the latter processes are likened to asexual reproductive processes as they must involve retention and use of some ESCs or immediate derivatives. Chapter 5 reviews cysts and resting stages as components of the reproductive biology of some taxa; while this chapter doesn't exactly fit with the others in light of the series' main thesis, it does compile some interesting information that is relevant to an overall understanding of crustacean life histories and sexual reproduction. Chapters 6 and 7 focus on sex determination and differentiation, respectively, the processes by which an individual's sex is set and then how the different sexual systems develop. These chapters provide good overviews of experimental perturbations to sexual development and their results, the hormones involved in development and reproduction, and the process of sex change within sequential hermaphrodites. Lastly, Chapter 8 is a general summary of the book and the relation of points reviewed for crustaceans to general patterns for invertebrates explored elsewhere in the series.

This volume is not the most comprehensive, general, or extensive review of crustacean reproductive biology or development that I have read, but it is also an interesting volume that contains a lot of useful review information and presents some contentious hypotheses that could be investigated in future studies. The publication of the paperback edition, with its quite affordable cost of ca. US $50 at the time of writing, presents an opportunity for more readers to be made aware of and read this book on Crustacea, and possibly Pandian's series as a whole.

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Pandian, T. J. 2017. *Series on Reproduction and Development in Aquatic Invertebrates – Volume 2: Reproduction and Development in Mollusca*. CRC Press, Boca Raton, Florida, 320 pp.

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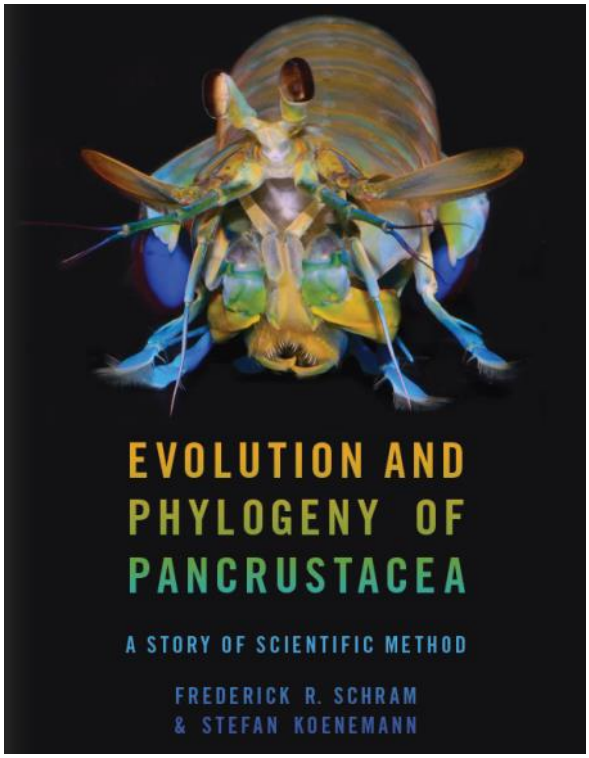
Hot off the press & Online resources

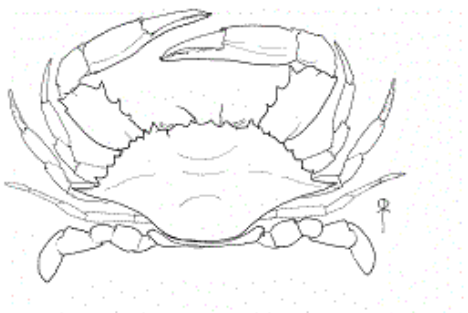
Evolution and Phylogeny of Pancrustacea: A Study of Scientific Method

Frederick R. Schram and **Stefan Koenemann**, 827 pp., Oxford University Press, 2021

Now, available in hard cover as well as an E-book from either OUP, or Amazon.com



The scientific understanding of arthropod phylogeny and evolution has changed significantly in recent decades. One of the most momentous of these involved acceptance that the diverse 'crustaceans' do not form a monophyletic group, but are part of a larger group – Pancrustacea – which also includes the insects and allies. The old ideas surrounding crustacean evolution served scientists well for many years, but it is now time to embrace the results derived from research conducted largely within this century. New insights have arisen from sources that cross several fields of study. Frederick Schram and Stefan Koenemann have created a book that explores paleobiodiversity, and the disparity of modern body plans. Advances within studies of development continue to generate remarkable insights into crustaceomorphic evolution, especially in regard to patterns of classic embryology and a revolution in the application of development genetics. Sophisticated techniques of analysis and new sources of data derived from molecular sequencing and gene studies have forced scientists to reckon with new multiple alternative hypotheses concerning the interrelationships of all the pancrustaceans, both the crustaceomorphs and Hexapoda. Some fossil groups still remain enigmatic, e.g., Cyclida, Pygocephalomorpha, and Thylacocephala. Despite this, research into the fossils (even if they are incompletely understood) fills many gaps in our knowledge of paleobiodiversity, and is useful for many things, including analyzing the origin and early evolution of Hexapoda. Evolution and Phylogeny of Pancrustacea: a Story of Scientific Method demonstrates the use of multiple alternative hypotheses and other analytic techniques through the presentation of diverse data sources involving all the arthropods. Readers are left with hypotheses toward solving great mysteries, including the possible pathways of evolution within the early marine Arthropoda.



CRUST-L@VIMS.EDU, the Discussion List for Crustacea

CRUST-L@VIMS.EDU is the email listserver for those interested in Crustacea. CRUST-L is an unmoderated open list, but you have to be a member to post messages to it. It has around 850 members! You can subscribe or unsubscribe to the list by following the links below. Use CRUST-L@VIMS.EDU to post messages to CRUST-L. The sympa software includes several features such as searchable archives, and a digest mode for intermittent mailings. If you have trouble with your subscription or settings, send a help request to jeff@vims.edu.

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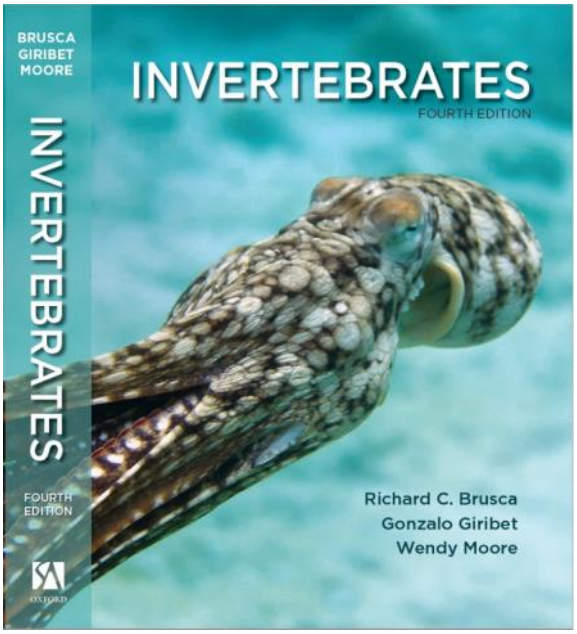
Invertebrates, Fourth Edition

Richard C. Brusca, Gonzalo Giribet, Wendy Moore



To be released in May. The most widely used invertebrate zoology text, in four languages, remains the only college text on the subject in full color. This new edition updates the phylogeny and classification for all groups, including short diagnostic synopses of major taxa. It also features a rewritten chapter on systematics and phylogenetics, many new figures and color photos, new research in evo-devo, and summary boxes for each chapter. Published by Sinauer Associates (now, unfortunately, an imprint of Oxford University Press).
Details can be found in the Oxford University Press online catalog: > here

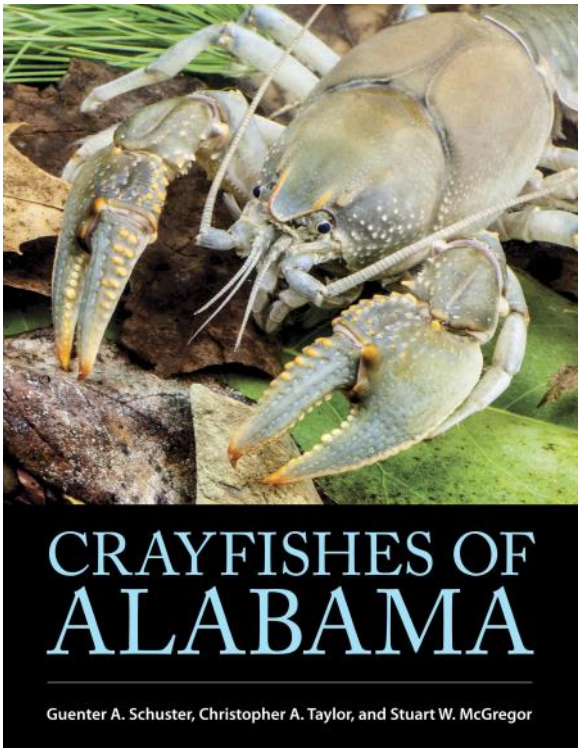
May 15, 2022 | ~950 pp.

Crayfishes of Alabama

Guenter A. Schuster, Christopher A. Taylor, and Stuart W. McGregor

Hardcover, 2022. 520 pp

A comprehensive assessment of the 99 known species of crayfishes inhabiting the state of Alabama



Crayfishes are common organisms in many freshwater habitats. They are usually the largest invertebrates and often represent the greatest amount of invertebrate biomass in their environments. Identified as a keystone species in many ecological communities, aquatic biologists are fond of saying “they eat everything, and everything eats them.”

Crayfishes—sometimes called crawfishes, crawdads, mudbugs, ditchbugs, yabbies, and flusskrebs—are taxonomically and ecologically a diverse group of aquatic crustaceans. There are more than 600 known species worldwide and North America alone is home to more than 400. As home to 99 documented species, Alabama is a global hotspot for crayfish diversity.

Crayfishes of Alabama is the first comprehensive reference work on the subject and provides the most up-to-date information on the vast range of crayfishes known to reside in Alabama. The authors have collected specimens and data from the state’s major and minor waterways and lakes, as well as specialized habitats such as burrows, caves, roadside ditches, marshes, swamps, and temporary autumnal ponds. This volume represents the most in-depth treatment of crayfishes found in the southeastern United States and offers detailed species accounts including descriptions of morphological characters, color, maximum size, comparative species, distribution and habitat, biology, crayfish associates, and conservation status. The species accounts are accentuated with color photographs, photographic morphological plates, and dot maps showing state and national distributions. A photographic key is provided to guide the identification of all 99 species.

Details can be found in the University of Alabama Press online catalog: > here

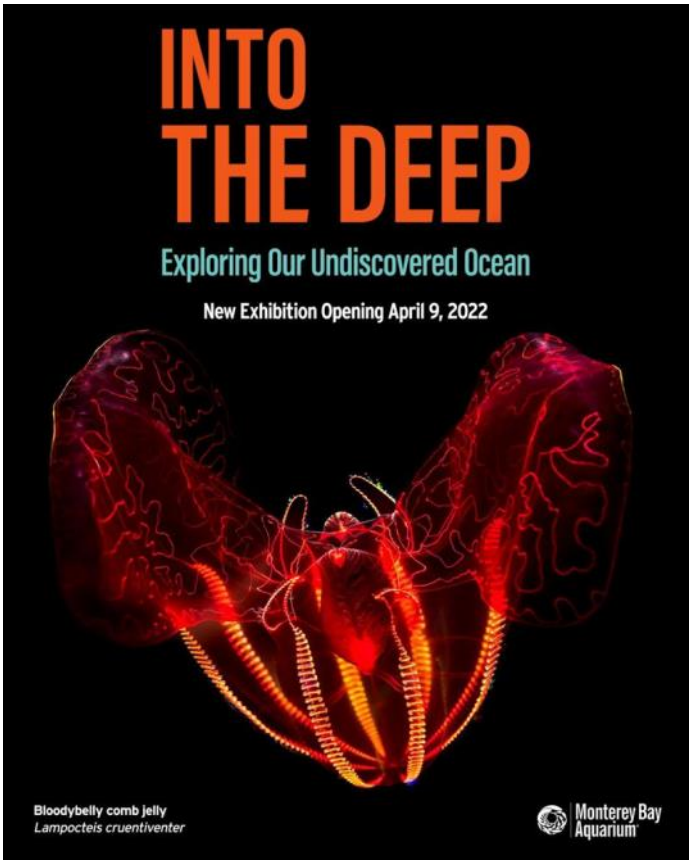
BETA LAUNCH OF FATHOMNET
Global database for underwater image training data

Explore the beta release of FathomNet, an open, expertly curated underwater image training set that will allow us to better understand the ocean and its inhabitants. Funded by the National Science Foundation, NOAA, National Geographic, MBARI and the Packard Foundation, FathomNet is seeded with images from MBARI, National Geographic Society and NOAA Ocean Exploration (you can also contribute your own data), and contains annotation and localisation data that can be used to train machine learning algorithms to automatically detect and classify underwater objects. Congratulations to the founders Kakani Katija (MBARI), Katy Croff Bell (Ocean Discovery League) and Ben Woodward (CVision AI).

Check it out >> http://fathomnet.org/

New Exhibition: Into the Deep

Opening date: 9 April



This April, Monterey Bay Aquarium will be opening its long-awaited deep-sea exhibition. Visitors will have the chance to see creatures from deep-sea isopods to bloodbelly comb jellies.

Learn more >>

Research Papers

Please continue to share your recently published research papers (other than in JCB) that have relevance to crustacean research. If possible, include a link where the paper can be downloaded.

— Kareen Schnabel (Editor *The Ecdysiast*)

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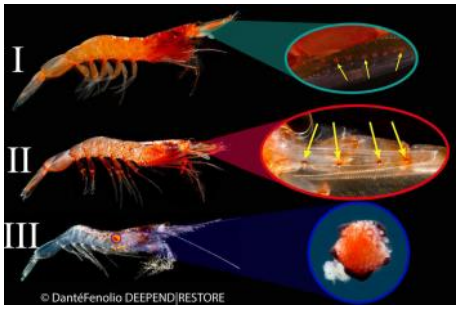

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(read this story in the public media here)

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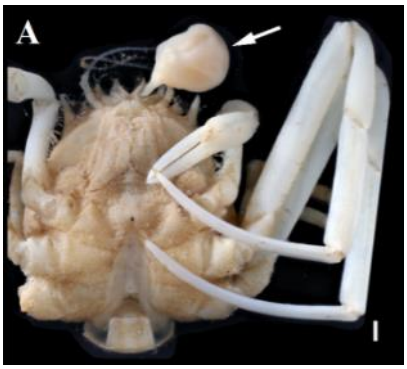
On a different note…

Let's celebrate that three of this year's 'Ten remarkable marine species from 2021' nominated by the World Register of Marine Species (WoRMS) were crustaceans! Find all ten species in the Press release on LifeWatch Portal here

The Hidden Horniman Mysid, *Heteromysis* (*Olivemysis*) *hornimani* Wittmann & Abed-Navandi, 2021

The Balloon Backpack Isopod, *Akrophryxus milvus* Williams & Boyko, 2021



CONGRATULATIONS TO THE AUTHORS!

The Quarantine Shrimp, *Periclimenaeus karantina* JH Park & De Grave, 2021

…and perhaps you'll enjoy My Modern Met's: Mesmerizing Footage Reveals the Radiant Nightlife of Deep-Sea Creatures
Radiant Nightlife of Otherworldly Deep Sea Creatures in the Mediterranean (mymodernmet.com)

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