



# CRAYFISH NEWS

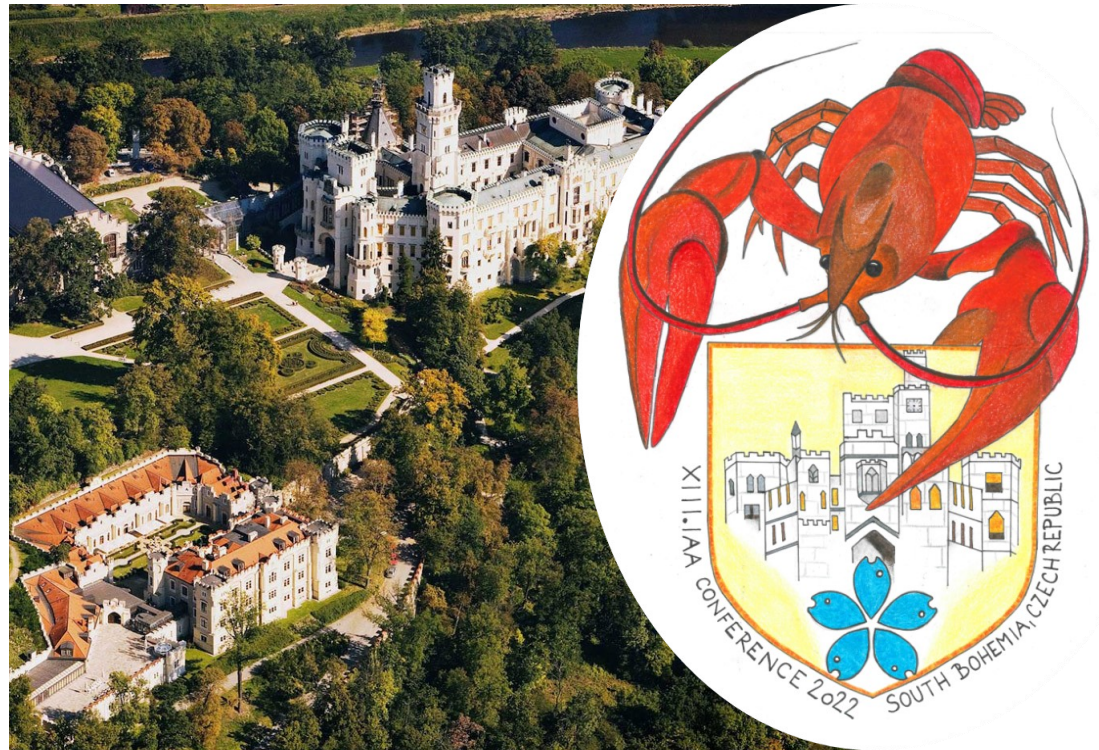
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## IAA23 NOW FEATURING IN 2022

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Considering the various uncertainties with vaccine availability and travel restrictions surrounding the ongoing coronavirus pandemic, the IAA23 Organising Committee and IAA Executive Board decided that postponing the 23<sup>rd</sup> Symposium of the International Association of Astacology, by an additional year, was the most responsible action. **IAA23 will now be held June 20<sup>th</sup> - 26<sup>th</sup> in 2022.**

The venue, preliminary program and other plans remain unchanged, and all deadlines are extended accordingly. Registration and abstract submissions remain open on the [IAA23 website](#). Registration fees **do not need to be paid when you register**, registration fees can be paid in early 2022. Refunds are available to delegates who have already registered and paid, but need to cancel. In this case, please contact the IAA23 Organisers: [iaa23@frov.jcu.cz](mailto:iaa23@frov.jcu.cz).

We will provide updates on the IAA23 meeting in 2022 in due course.

### IAA online



Pavel Kozák  
IAA23 Organiser

IAA Executive Board



# PRESIDENT'S CORNER



**Tadashi Kawai, Ph.D.**  
IAA President (Japan)

Dear IAA members

The upcoming IAA23 conference has been postponed once again. A new schedule will be announced soon by IAA23 organizer Pavel Kozak. Despite this severe situation, I am glad to bring you two good news items concerning new IAA memberships.

Aiki Saito - a young Japanese astacologist - visited my laboratory in Hokkaido, Japan in September 2020. He is a high school student in Tokyo, and only 18 years old. Amazingly, his



**Figure 1.** Aiki Saito



**Figure 2.** Aiki Saito's aquariums

astacological career comprises seven years, which is 38.9 % of his lifetime! Aiki started to study freshwater crayfish in 6<sup>th</sup> grade of elementary school, when he was 11 years old. He has numerous small plastic containers with individually housed

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The International Association of Astacology (IAA), founded in Hintertal, Austria in 1972, is dedicated to the study, conservation, and wise utilization of freshwater crayfish. Any individual or institution interested in furthering the study of astacology is eligible for membership. Service to members includes a quarterly newsletter (*Crayfish News*), a membership directory, biennial international symposia and publication of the journal *Freshwater Crayfish*.

## Secretariat:

The International Association of Astacology has a permanent secretariat managed by **James Stoeckel**. Address: IAA Secretariat, Room 203, Swingle Hall, Department of Fisheries and Allied Aquacultures, Auburn University, AL 36849-5419, USA.

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## IAA Executive Board Members:

In addition to the IAA Officers and Past President, the Executive Board also includes **Juan Carlos Azofeifa Solano** (Costa Rica), **Jacob Westhoff** (USA), **Chris Bovillain** (USA), **Ivana Maguire** (Croatia), **Pavel Kozák** (Czech Republic), **James Furse**, (Australia) and **Quinton Burnham** (Australia).

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*Statements and opinions expressed in Crayfish News are not necessarily those of the International Association of Astacology.*

Header photograph: Noble crayfish (*Astacus astacus*) © 2018 Karolina Śliwińska

This issue edited by **Thomas Abeel**, Managing Editor  
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**Figure 3.** *Astacoides granulimanus*

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alien red swamp crayfish *Procambarus clarkii*, on which he conducts experiments every day. His family is very supportive and they enjoy the daily conversations on freshwater crayfish during dinner time. I certainly hope this young astacologist will continue his research and passion for crayfish in the future.

Freshwater crayfish naturally occur in America, Asia, Europe, Madagascar and Oceania. Until recently, IAA memberships have covered this global range, except for Madagascar. This area is a hot spot of conservation of native *Astacoides* of

Parastacidae. One of our newest members is Andrianaina Liantsoa. He is a student of the University of Antananarivo, Madagascar, working on aquaculture of the native species *Astacoides granulimanus*. His membership is a historic event for IAA, as our association now completely covers the known global range of freshwater crayfish, improving the worldwide communication on astacology!

**Tadashi Kawai**

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**Figure 4.** Liantsoa's indoor aquaculture system



**Figure 5.** Andrianaina Liantsoa



# IAA9 UPDATE

I do concede that 28 years is a somewhat long period to wait for a conference update. However, those members lucky enough to attend IAA9 at the University of Reading in April 1992, just may remember an afternoon bus ride around some sites south of Reading. The first stop was to visit a small stream, the Barkham Brook, where we were lucky to discover that, despite fruitless trapping for the preceding week or so and much to the great relief of the trip guides, the third trap pulled out of the water contained a crayfish - a specimen of the UK native white-clawed crayfish (*Austropotamobius palipes*). (Ignore rumours to the contrary that I believe are still circulating today, this was no fix!)

The ensuing years have seen occasional efforts to check if this population has survived, but with the steady spread in the range of the introduced signal crayfish (*Pacifastacus leniusculus*) hopes of seeing white-clawed in this part of the catchment of the River Thames again, had all but been exhausted. A phone call in August 2020 changed all that. Due to the construction of a new road bridge, a contractor had been engaged to conduct a fish removal on a short section of the stream, that required dewatering. One of the operatives not only spotted a crayfish crawling out of its hide, but was sufficiently sharp eyed to realise that it was a white-clawed, and not another one of the signals that he was only too familiar with encountering in the local rivers.

This promoted a flurry of activity from Wokingham Borough Council (the local authority), Balfour Beatty (the on site construction firm) and the Environment Agency. Surveys were conducted upstream and downstream of the site, by trapping and visual daytime and nighttime inspections, whilst additional thorough checks were carried out during the second dewatering a few weeks later. Results so far have, frustratingly, failed to find any further individuals. It is believed that this population may be hanging on by its chela-tips. However more surveys will be conducted next year, possibly using eDNA techniques to attempt to establish the proximity of any signals, whilst hopefully providing some information on the range of the white-clawed population. It is conceivable that this population may have received some protection from intermittent poor water quality discharges from a small sewage treatment works, whilst a downstream ford may have also provided a deterrent to upstream spread of the signals from the main River Loddon. Further information may assist in establishing guidelines to protect this white-clawed population, possibly with some habitat enhancements.

Martin Moore

## Reference

Holdich, D., Wilson, G. (2004). *The First 30 Years: A history of the International Association of Astacology*. International Association of Astacology.



Figure 1. Jerry Domaniewski proudly displaying a white-clawed crayfish back in 1992 (Holdich & Wilson, 2004).



Figure 2. The recently discovered white-clawed crayfish.



# COLLECTING TISSUE SAMPLES

## HOW TO MINIMALLY DAMAGE PRESERVED SPECIMENS

Collecting tissue samples from preserved specimens for genetic analysis is increasingly common nowadays, or routine. However, in addition to being time consuming, exposing researchers to increased risk from injuries (i.e. cuts from scalpels) and known toxins (in the case of formalin-preserved specimens), collecting tissue samples somewhat obviously physically damages the specimen.

In the case of medium-sized specimens, for example a 400 mm total length (TL) *Euastacus*, even a large piece of musculature missing from under the abdomen is not a big deal, in a morphological sense, but may be unsightly to some.

However, in the case of small specimens, for example a 20 mm TL *Tenuibranchiurus*, obtaining even a small piece of musculature from the abdomen is challenging, and especially without damaging structures that may be morphologically interesting at some future time (e.g. pleopods).

After struggling with collecting tissue from really small specimens (< 20 mm TL) and experiencing the horror of having, well-intentioned, other parties chopping-off near entire *Tenuibranchiurus* abdomens to collect tissue, we thought there must be a better way.

The answer was disposable biopsy punches (Figure 1). We have successfully used these readily-available, relatively inexpensive (~US\$1.40 each) punches for many years. Biopsy punches have proven to be highly effective, and safe for collecting tissue, and the 2 mm  $\emptyset$  punches that we selected to use, have allowed us to routinely collect tissue from even the smallest *Tenuibranchiurus* while minimally damaging the specimen.

Biopsy punches are designed for single-use in humans, but we have demonstrated that they can be sterilized between collection of samples and may re-used many times before the cutting edge becomes dull and replacement is required. The only limitation we have identified is that biopsy punches do not afford any protection from toxic fumes.



**Figure 1.** A selection of variously-sized biopsy punches (5 mm, 4 mm, 3.5 mm, 3 mm and 2 mm  $\emptyset$ , top to bottom).

We are not aware of other workers using this technique on freshwater crayfish, and we hope it may be helpful to others for collecting tissue samples, while limiting damage and reducing risk of injury.

This technique was inspired by one of the authors (JMF) having a plug of flesh removed for analysis from a pectoral muscle with a 2 mm  $\emptyset$  biopsy punch.

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# CALL TO APPENDAGES – STILL ACCEPTING EXPRESSIONS OF INTEREST

## NOBLE CRAYFISH AWARD COMMITTEE

The IAA is seeking any additional expressions of interest from members interested in filling the soon-to-be vacated positions on the Noble Crayfish Award committee.

These volunteer positions have no fixed terms, but candidates able to fill the positions for 2 years would be ideal (i.e. fill the positions between biennial IAA symposia).

The anticipated duties for the positions on the Noble Crayfish Award committee are as follows:

- Soliciting applications for the biennial Noble Crayfish Award;
- Assessing and ranking the applications;
- Announcing and presenting the award at IAA Symposia.

Duties associated with the Noble Crayfish Award committee are sporadic in nature and typically associated with the lead-up to the IAAs biennial symposia.

Note: There is no requirement for committee members to be current students, any IAA member may serve on the committee.

Any applicants interested in joining the Noble Crayfish committee should send expressions of interest (or any questions) to James or Juan Carlos.

We anticipate the outcomes of this recruitment process will be announced at IAA23 in June 2022.

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Photo by Thomas Abeel



# IN MEMORIAM: VALERY FEDOTOV (1945-2021)

On January 16<sup>th</sup>, 2021 a wonderful person, our friend, colleague and like-minded fellow Valery Pavlovich Fedotov passed away at the age of 76 after a prolonged illness.

He was a bright personality, with a great passion for science, an obsession for promoting new ideas and developing scientific directions in environmental and physiological research.

Valery Fedotov was born in Leningrad on March 3<sup>rd</sup>, 1945 into a working-class family. As a child, he experienced all the severities of post-war life. When he had finished school, he entered the Leningrad State University, the Faculty of Biology and Soil Science. Later he specialized in the Department of Human and Animal Physiology, where professors Golikov, Grachev and Vereshchagin - internationally recognised specialists in the fields of comparative physiology of vertebrates and invertebrates - were teaching at that time.

After the second year of study, in 1964, Valery was drafted into the rocket troops of the Soviet army ranks. After leaving the army in 1967, Valery returned to University and continued studying. In the 1960s, Leningrad State University successfully developed the study of morphology and physiological reactions of crayfish to various stress factors. Valery Fedotov was extremely interested in this field.

After graduating from the University, he worked at the All-Russian Scientific Research Institute of Radio Equipment, where he defended his Ph.D. thesis in 1979. Later, Valery worked at the Institute of Radiation Hygiene. These years coincided with the Chernobyl disaster. Valery Fedotov was sent there several times with the responsibility of completing various duties associated with the danger of radiation contamination.

Since 1997, Valery worked at the Scientific Research Center for Ecological Safety in the Russian Academy of Sciences at the Laboratory of Experimental Ecology of Aquatic Systems. His knowledge and new brave ideas on using crayfish as bioindicators of the quality of their aquatic habitat became the basis for the development of an early biological warning biosensor system. This technical system is designed to track changes in the heart rate of crayfish with the natural water flow of different quality, including detecting toxins.

Valery Fedotov was a very active person who gladly communicated with foreign colleagues, developed scientific contacts with specialists, shared his knowledge and skills, and was interested in all new developments in crustacean farming and protection of crayfish and their environment.

Valery was a member of the IAA since 1987 and gave lectures in Finland, the Czech Republic, and Italy at international conferences.

Valery readily supervised students of Leningrad State University and Russian State Humanitarian University. He enthusiastically gave lectures for students and schoolchildren about crayfish, their behavior and life cycle. His bright, imaginative speech shined their



eyes and made them believe that science could be their way forward, where they could do lots of new and progressive things.

Valery was a person of a broad education: he was interested in painting, architecture and music. He played the guitar, sang, wrote poems, read a lot of both scientific literature and fiction. He generously shared his impressions of what he had seen, read, always had his own opinion on everything and bravely defended it.

We remember his ironic remarks: well-aimed, sometimes biting, but never offensive and very useful for erudition and mental development of the interlocutor.

We have lost a wonderful person, an Intellectual, a gallant gentleman who highly appreciated the beauty of nature, women and art, the harmonious constructions of science and technology.

Valery Fedotov is the author of more than 150 scientific publications, three monographs (Crayfish and their breeding, 1983, 1993), regularly published the magazine "Crayfish breeding News" from his own funds, where he familiarized readers with the latest achievements in this field. He completed and published his last book in 2020.

We have lost an amazing person, and lots that he could have gave us. We will keep the memory of Valery Fedotov in our hearts!

Blessed memory to him.

**Tatiana Kuznetsova**

Kindly translated by **Irina Kuklina**



# LITERATURE OF INTEREST TO ASTACOLOGISTS

To view abstracts, etc., click on a reference  
to be taken to the journal website

ALKAN UÇKUN A AND BARIM ÖZ Ö (2020). Acute exposure to the fungicide penconazole affects some biochemical parameters in the crayfish (*Astacus leptodactylus* Eschscholtz, 1823). *Environmental Science and Pollution Research* 27(28):35626-35637. doi: 10.1007/s11356-020-09595-2.

AYANATH A AND RAGHAVAN SDA (2020). Profiling of methyl farnesoate in relation to female reproductive cycle in the freshwater crab, *Travancoriana schirnerae* Bott, 1969 (Crustacea: Gecarcinucidae). *Invertebrate Reproduction & Development*:10. doi: 10.1080/07924259.2020.1808095.

BAO J, XING YN, FENG CC, KOU SY, JIANG HB AND LI XD (2020). Acute and sub-chronic effects of copper on survival, respiratory metabolism, and metal accumulation in *Cambaroides dauricus*. *Scientific Reports* 10(1):9. doi: 10.1038/s41598-020-73940-1.

BELL PR, BICKNELL RDC AND SMITH ET (2020). Crayfish bio-gastroliths from eastern Australia and the middle Cretaceous distribution of Parastacidae. *Geological Magazine* 157(7):1023-1030. doi: 10.1017/S0016756819001092.

BOHM M, DEWHURST-RICHMAN NI, SEDDON M, LEDGER SEH, ALBRECHT C, ALLEN D, BOGAN AE, CORDEIRO J, CUMMINGS KS, CUTTELOD A, DARRIGRAN G, DARWALL W, FEHER Z, GIBSON C, GRAF DL, KOHLER F, LOPES-LIMA M, PASTORINO G, PEREZ KE, SMITH K, VAN DAMME D, VINARSKI MV, VON PROSCHWITZ T, VON RINTELEN T, ALDRIDGE DC, ARAVIND NA, BUDHA PB, CLAVIJO C, VAN TU D, GARGOMINY O, GHAMIZI M, HAASE M, HILTON-TAYLOR C, JOHNSON PD, KEBAPCI U, LAJTNER J, LANGE CN, LEPITZKI DAW, MARTINEZ-ORTI A, MOORKENS EA, NEUBERT E, POLLOCK CM, PRIE V, RADEA C, RAMIREZ R, RAMOS MA, SANTOS SB, SLAPNIK R, SON MO, STENSGAARD AS AND COLLEN B (2020). The conservation status of the world's freshwater molluscs. *Hydrobiologia*:24. doi: 10.1007/s10750-020-04385-w.

BONK M AND BOBREK R (2020). Invasion on the doorstep: will the Carpathians remain free from the spiny cheek crayfish *Faxonius limosus* (Rafinesque, 1817)? *Bioinvasions Records* 9(3):549-561. doi: 10.3391/bir.2020.9.3.10.

BOROS G, CZEGLÉDI I, ERŐS T AND PREISZNER B (2020). Scavenger-driven fish carcass decomposition and phosphorus recycling: Laboratory experiments with freshwater fish and crayfish. *Freshwater Biology* 65(10):1740-1751. doi: 10.1111/fwb.13576.

CARNEIRO VC AND LYKO F (2020). Rapid Epigenetic Adaptation in Animals and Its Role in Invasiveness. *Integrative and Comparative Biology* 60(2):267-274. doi: 10.1093/icb/icaa023.

CHADWICK DDA, PRITCHARD EG, BRADLEY P, SAYER CD, CHADWICK MA, EAGLE LJB AND AXMACHER JC (2020). A novel 'triple drawdown' method highlights deficiencies in invasive alien crayfish survey and control techniques. *Journal of Applied Ecology* 00:1-11. doi: 10.1111/1365-2664.13758.

CHENG S, JIA YY, CHI ML, ZHENG JB, LIU SL AND GU ZM (2020). Culture model of *Cherax quadricarinatus*. Temporary shelter in shed and pond culture. *Aquaculture* 526(735359):8. doi: 10.1016/j.aquaculture.2020.735359.

CHRISTIE AE, RIVERA CD, CALL CM, DICKINSON PS, STEMLER EA AND HULL JJ

(2020). Multiple transcriptome mining coupled with tissue specific molecular cloning and mass spectrometry provide insights into agatoxin-like peptide conservation in decapod crustaceans. *General and Comparative Endocrinology* 299:113609. doi: 10.1016/j.ygcen.2020.113609.

CILBİZ M (2020). Pleopodal fecundity of narrow-clawed crayfish (*Pontastacus leptodactylus* Eschscholtz, 1823). *Invertebrate Reproduction and Development* 64(3):208-218. doi: 10.1080/07924259.2020.1762771.

DAWKINS KL, FURSE JM AND HUGHES JM (2020). The biogeographic history of the relictual Gondwanan lineage of Australian burrowing crayfish. *Hydrobiologia*:18. DOI 10.1007/s10750-10020-04448-y. doi: 10.1007/s10750-020-04448-y.

FORBES JP, TODD CR, BAUMGARTNER LJ, WATTS RJ, ROBINSON WA, STEFFE AS, MURPHY JJ, ASMUS MW AND THIEM JD (2020). Simulation of different fishery regulations to prevent population decline in a large freshwater invertebrate, the Murray crayfish (*Euastacus armatus*). *Marine and Freshwater Research* 71(8):962-971. doi: 10.1071/MF19109.

GELDER SR, PARPET J-F AND OHTAKA A (2020). Early Researchers Involved with Branchiobdellidans (Annelida: Clitellata) on Japanese Crayfish, and a Reassessment of the Taxonomic Status of Branchiobdella digitata Pierantoni, 1906. *Acta Zoologica Bulgarica* 72(2):179-185.

GRAHAM ZA AND ANGILLETTA MJ (2020). Claw size predicts dominance within and between invasive species of crayfish. *Animal Behaviour* 166:153-161. doi: 10.1016/j.anbehav.2020.06.021.

GREEN SJ AND GROSHOLZ ED (2020). Functional eradication as a framework for invasive species control. *Frontiers in Ecology and the Environment*:10. doi: 10.1002/fee.2277.

HILBER T, OEHM J, EFFENBERGER M AND MAIER G (2020). Evaluating the efficiency of three methods for monitoring of native crayfish in Germany. *Limnologica* 85:125821. doi: 10.1016/j.limno.2020.125821.

HU N, LIU C, CHEN Q AND ZHU L (2021). Life cycle environmental impact assessment of rice-crayfish integrated system: A case study. *Journal of Cleaner Production* 280(2):12440. doi: 10.1016/j.jclepro.2020.124440.

JOHNSEN SI, STRAND DA, RUSCH JC AND VRÅLSTAD T (2020). Environmental DNA (eDNA) Monitoring of Noble Crayfish *Astacus astacus* in Lentic Environments Offers Reliable Presence-Absence Surveillance – But Fails to Predict Population Density. *Frontiers in Environmental Science* 8:612253. doi: 10.3389/fenvs.2020.612253.

LARSON ER AND POOL TK (2020). Biological invasions drive biotic homogenization of North American crayfishes. *Hydrobiologia* 847(18):3795-3809. doi: 10.1007/s10750-019-04164-2.

LAURENZ J, LIETZ L, BRENDENBERGER H, LEHMANN K AND GEORG A (2020). Noble Crayfish Are More Sensitive to Terbutylazine than Parthenogenetic Marbled Crayfish. *Water, Air, and Soil Pollution* 231:Article number: 548. doi: 10.1007/s11270-020-04921-3.

LOVRENCIC L, BONASSIN L, BOSTJANCIC LL, PODNAR M, JELIC M, KLOBUCAR G, JAKLIC M, SLAVEVSKA-STAMENKOVIC V, HINIC J AND MAGUIRE I (2020). New insights into the genetic diversity of the stone crayfish: taxonomic and conservation implications. *Bmc Evolutionary Biology* 20(1):20. doi: 10.1186/s12862-020-01709-1.

(Continued on page 9)





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MATHERS KL, WHITE JC, GUARESCHI S, HILL MJ, HEINO J AND CHADD R (2020). Invasive crayfish alter the long-term functional biodiversity of lotic macroinvertebrate communities. *Functional Ecology* 34(11):2350-2361. doi: 10.1111/1365-2435.13644.

NOBLE MM AND FULTON CJ (2020). Pathways to impact for aquatic conservation science via multi-modal communication and stakeholder engagement. *Aquatic Conservation-Marine and Freshwater Ecosystems* 30(9):1791-1797. doi: 10.1002/aqc.3380.

PAN C, LIANG XL, CHEN SJ, TAO FY, YANG XQ AND CEN JW (2020). Red color-related proteins from the shell of red swamp crayfish (*Procambarus clarkii*): Isolation, identification and bioinformatic analysis. *Food Chemistry* 327:7. doi: 10.1016/j.foodchem.2020.127079.

PARVULESCU L, IORGU EI, ZAHARIA C, ION MC, SATMARI A, KRAPAL AM, POPA OP, MIOK K, PETRESCU I AND POPA LO (2020). The future of endangered crayfish in light of protected areas and habitat fragmentation. *Scientific Reports* 10(1):12. doi: 10.1038/s41598-020-71915-w.

ROJE S, SVAGROVA K, VESELY L, SENTIS A, KOUBA A AND BURIC M (2020). Pilferer, murderer of innocents or prey? The potential impact of killer shrimp (*Dikerogammarus villosus*) on crayfish. *Aquatic Sciences* 83(1):12. doi: 10.1007/s00027-020-00762-8.

SHEHATA AI, WANG T, HABIB YJ, WANG JF, FAYED WM AND ZHANG ZP (2020). The combined effect of vitamin E, arachidonic acid, *Haemtococcus pluvialis*, nucleotides and yeast extract on growth and ovarian development of crayfish (*Cherax quadricarinatus*) by the orthogonal array design. *Aquaculture Nutrition* 26(6):2007-2022. doi: 10.1111/anu.13142.

ŚMIETANA N, PANICZ R, SOBCZAK M, NĘDZAREK A AND ŚMIETANA P (2020). Variability of elements and nutritional value of spiny-cheek crayfish (*Faxonius limosus*, Rafinesque, 1817): Variability of elements and nutritional value of *F. limosus*. *Journal of Food Composition and Analysis* 94:103656. doi: 10.1016/j.jfca.2020.103656.

SON MO, MORHUN H, NOVITSKYI RO, SIDOROVSKYI S, KULYK M AND UTEVSKY S (2020). Occurrence of two exotic decapods, *Macrobrachium nipponense* (de Haan, 1849) and *Procambarus virginalis* Lyko, 2017, in Ukrainian waters. *Knowledge and Management of Aquatic Ecosystems*(421):11. doi: 10.1051/kmae/2020032.

VESELY L, ERCOLI F, RUOKONEN TJ, BLAHA M, KUBEC J, BURIC M, HAMALAINEN H AND KOUBA A (2020). The crayfish distribution, feeding plasticity, seasonal isotopic variation and trophic role across ontogeny and habitat in a canyon-shaped reservoir. *Aquatic Ecology* 54(4):1169-1183. doi: 10.1007/s10452-020-09801-w.

YURDAKOK-DIKMEN B, TURGUT Y, GUNAL AC, UYAR R, KUZUKIRAN O, FILAZI A AND ERKOC F (2020). In vitro effects of selected endocrine disruptors (DEHP, PCB118, BPA) on narrow-clawed crayfish (*Astacus leptodactylus*) primary cells. *In Vitro Cellular & Developmental Biology-Animal* 56(9):783-791. doi: 10.1007/s11626-020-00514-w.

ZHANG Y, SUN K, LI Z, CHAI X, FU X, KHOLODKOVICH S, KUZNETSOVA T, CHEN C AND REN N (2021). Effects of acute diclofenac exposure on intestinal histology, antioxidant defense, and microbiota in freshwater crayfish (*Procambarus clarkii*). *Chemosphere* 263:128130. doi: 10.1016/j.chemosphere.2020.128130.

# IAA23

## INTERNATIONAL SYMPOSIUM ON FRESHWATER CRAYFISH

### NEW DATE: JUNE 20 - 26, 2022



DON'T MISS THE 23<sup>rd</sup> SYMPOSIUM  
OF THE IAA IN THE CZECH REPUBLIC!

REGISTRATION IS NOW OPEN

[www.IAA23.com](http://www.IAA23.com)

