Crayfish News

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The classification, status and distribution of Canadian crayfishes: an update

Figure 1. *Faxonius virilis,* formerly *Orconectes virilis* , Canada's most widespread crayfish, found in 6 provinces. (Photo: P.Hamr)

There are presently twelve species of freshwater crayfishes (in four genera and two families) recognized in Canada. Three of these species are introduced while the remaining nine are thought to be native. Crayfish have been recorded from all provinces except Newfoundland, North-West Territories, Nunavut and Yukon. Of all the provinces, Ontario has the richest fauna: 10 confirmed species of which two have been introduced from the United States (Hamr, 2010). Almost two-thirds (64%) of Canadian crayfishes have Canada General Status Ranks (Canada ranks) of "Secure", while 18% have Canada ranks of "Sensitive" (*C. fodiens, L. diogenes* & *F. immunis)*, and none have Canada ranks of "At Risk" or "May Be At Risk" (Govt. of Canada, 2017). In addition to the officially recorded there are two more introduced species that may now be present in the wild. In Ontario, a report on the status of this invasive species was contracted to the author, however the contract was later withdrawn amidst a change in funding policy of the incoming provincial government. The marbled crayfish (*Procambarus virginalis*) is

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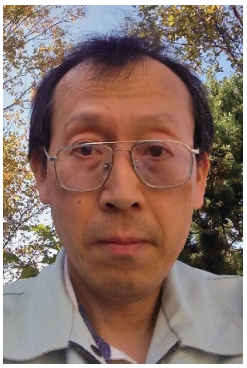

Tadashi Kawai, Ph.D.
IAA President *(Japan)*

In this spring, Coronavirus disease (COVID-19) is spreading worldwide, affecting countries of almost all IAA members. The pandemic causes serious concern for the organization of IAA23 in Czech Republic in June 2020. Governments of many countries have established many kinds of restrictions, leading to larger meetings or events to be postponed or canceled. At the end of April, chief organizer of IAA23 Pavel Kozak of South Bohemian University will inform all participants if the symposium can proceed as scheduled or if it will be postponed. We should await his decision and I pray COVID-19 will calm down sooner, allowing IAA23 to be held as scheduled in June 2020. Meanwhile, I hope all IAA members will be spared from this disease.

Hot news for astacologists emerging from South America in 2020. Brazilian IAA member Felipe Ribeiro of Universidade Federal do Rio Grande do Sul, published a new crayfish monograph this spring entitled "Crayfish, evolution, habitat and conservation strategies" (Nova Science Publishers). This book contains six chapters: Chapter 1 - Diversity and conservation strategies of freshwater crayfish in South America: An update, Chapter 2 - Crayfish of New Guinea: Current status, exploitation and threats, Chapter 3 - Morphometric and behavioral divergence in *Procambarus acanthophorus* inhabiting in a coastal plain wetland and a mountain pine forest, Chapter 4 - Non-indigenous crayfish species: A global assessment and future perspectives, Chapter 5 - Biology, ecology, evolution, systematics and utilization of the parthenogenetic marbled crayfish, *Procambarus virginalis*, Chapter 6: Integrative taxonomy and cryptic diversity in freshwater crayfish: An overview. Many IAA members contributed to this book as chapter author. I highly recommend you to take a look at this new book this spring.

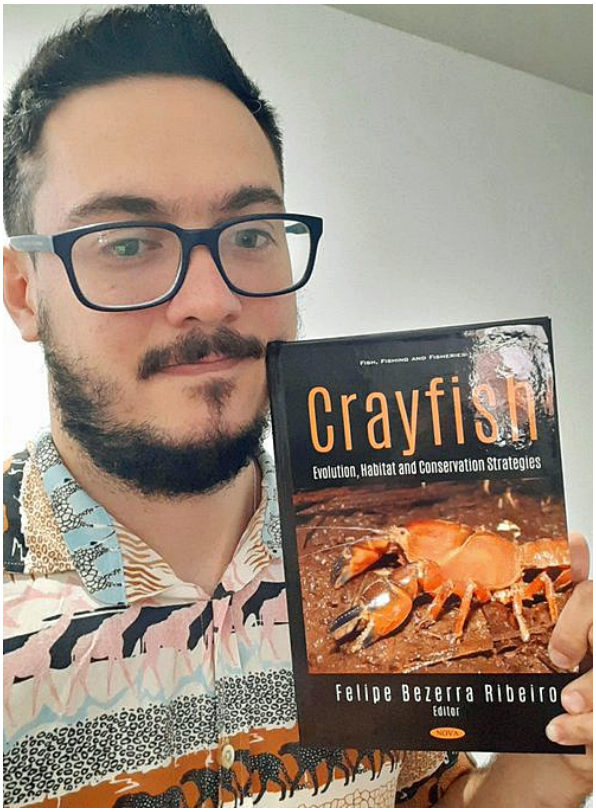

Figure 1. Felipe Ribeiro with his edited book: "Crayfish, evolution habitat and conservation strategies".

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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:

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

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widely available in the pet trade from coast to coast (Hamr, unpublished data) and may have therefore already escaped or been introduced in the wild in several provinces, most likely in British Columbia and southern Ontario where water temperatures are within its known tolerance.

The general distribution of crayfishes in Canada ranges from Nova Scotia (where they have been introduced, Lambert et al. 2007) in the east to British Columbia in the west and north to the James Bay drainage. Their habitats are wide-ranging and include wetlands, wet meadows, stagnant water, ponds, ditches, reservoirs, lakes, intermittent as well as permanent streams and large rivers. These habitats are included in urban, agricultural and natural areas. Crayfish in Canada are an important link in aquatic and terrestrial food chains as they are consumed by a wide variety of predators such as fish, amphibians, reptiles and birds. Crayfish themselves are generally omnivorous, foraging on aquatic as well as terrestrial invertebrates and vegetation. They also consume dead and decaying plants and animal bodies, including animals which are higher in the food chain (Crocker & Barr, 1968; Hamr, 1998 & 2010).

Due to the recent reclassification of three of the genera present in Canada (Crandal & De Grave 2017, Glon et al. 2018) as well as the discovery of an additional species of burrower (Jones et al. 2019) there arose a confusion with respect to the nomenclature as well as the total number of species found in Canada. The changes affected the naming of the vast majority of our fauna and only three species retain their original scientific/Latin names: *Pacifastacus leniusculus*, *Cambarus robustus* and *Cambarus b. bartonii*. In addition, there are two introduced/invasive species (the marbled crayfish and the red swamp crawfish) which are likely to expand into Canada in the near future. There is therefore an urgent need to get this information out to the general public, naturalist groups as well as conservation agencies to clarify the new nomenclature.

Fig. 2. The Invasive *Faxonius rusticus,* formerly *Orconectes rusticus*, an introduced species expanding in Ontario, Quebec and Manitoba. (Photo: P.Hamr)

Fig. 3. *Lacunicambarus. diogenes* , formerly *Cambarus diogenes*, a tertiary burrower found only in wetlands from Niagara to the extreme south-west of Ontario. (Photo: P. Hamr)

Table 1 (page 4) summarizes the taxonomic changes and lists the Canadian crayfish species using the updated nomenclature, the provinces where they occur, as well as their general habitat. The major change is that all species formerly belonging to the Genus *Orconectes* now belong to the genus *Faxonius* (Crandal & De Grave 2017). Additionally, all the burrowing species found in Canada have also been reclassified: *Fallicambarus fodiens* has now been ascribed to the genus *Creaserinus* (Crandal & De Grave 2017) and *Cambarus diogenes* has now been separated into a new genus *Lacunicambarus* (Glon et al. 2018).

As previously mentioned, two additional species are likely to expand into Canada in the near future. The marbled crayfish (*Procambarus virginalis*) is a parthenogenetic species which originated from the German aquarium pet trade and has established in the wild in several European countries as well as Madagascar (Vogt, 2018). It is for sale in Canada from some pet dealers as well as private aquarists over the internet. Single and multiple specimens are available for sale for prices ranging between 1 and 15 CAD (Hamr, unpublished data). Since it survives in the wild in central Europe, it is very likely to escape and establish wild populations in the warmer parts of Canada such as Southern Ontario and coastal British Columbia. So far, it has not been documented in the wild in Canada to date but a release appears to be imminent (Hamr, unpublished data). The second is the red swamp crawfish (*Procambarus clarkii*). This species is a very popular commercial/food species in many parts of the world (e.g. China, Southern USA, Africa). Although live imports of this species to Canada are restricted, live specimens have been

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Crayfishes of Canada

Total fauna: 2 families, 5 genera, 12 species

Family Astacidae

1. *Pacifastacus leniusculus* - Signal crayfish

(British Columbia: Vancouver Island and lower mainland)

Habitat: Streams, rivers and lakes

Family Cambaridae

2. *Faxonius propinquus propinquus* - Northern clear-water crayfish (Fig. 6)

(Ontario & Quebec)

Habitat: rivers, streams and lakes

3. *Faxonius virilis* - Virile crayfish (Fig. 1)

(New Bruswick, Quebec, Ontario, Manitoba, Saskatchewan & Alberta)

Habitat: streams and lakes

4. *Faxonius immunis* - Papershell crayfish

(Quebec, Ontario & Manitoba)

Habitat: farm and natural ponds, ditches and slow streams & stagnant water, moderate burrower.

Can constructs Chimney capped burrows.

5. *Faxonius obscurus* - Obscure crayfish

(**Introduced** from US; Quebec & Ontario)

Habitat: rivers, streams and lakes

6. *Faxonius rusticus rusticus* - Rusty crayfish (Fig. 2)

(**Introduced** from US; Ontario, Quebec & Manitoba)

Habitat: rivers, streams and lakes

7. *Faxonius limosus* - Spinycheek crayfish

(Nova Scotia, New Brunswick & Quebec, may now be present in eastern Ontario).

Habitat: rivers, streams and lakes

8. *Cambarus bartonii bartonii* - Appalachian brook crayfish

(New Brunswick, Quebec & Ontario,)

Habitat: Lakes and streams, fast flowing water.

9. *Cambarus robustus* - Robust crayfish

(Quebec & Ontario)

Habitat: rivers, lakes and streams, moderate to fast flow

10. *Lacunicambarus diogenes* - Devil crayfish (Fig. 3)

(Ontario: extreme south Lake Erie drainage only)

Habitat: natural wetlands (wet meadows & marshes), burrowing species

Constructs Chimney capped burrows.

11. *Lacunicambarus polychromatus* - Painted-hand crayfish (Fig.4)

(Ontario: Detroit river, Winsdor area only)

Habitat: natural wetlands (wet meadows & marshes), burrowing species

Constructs Chimney capped burrows.

12. *Creaserinus fodiens* - Digger crayfish (Fig.5)

(Ontario: central south to south west)

Habitat: roadside ditches, farm fields and irrigation ditches, natural wetlands, burrowing species
Constructs Chimney capped burrows.

Table 1. Crayfishes of Canada

(Continued from page 3)

recently seized in a Toronto market by inspectors of the Ontario Ministry of Natural Resources (Hamr, unpublished data). This widely introduced species (Europe, Asia, Africa and large portions of US) has been recently reported on the Ohio south western shore of Lake Erie (Egly et al. 2019) and therefore it is very likely to invade the northern (Canadian) shores of the lake soon. It has however not been documented in the wild in Canada to date.

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Fig. 4. *Lacunicambarus polychromatus,* Canada's newest species, only know from the Windsor region in the extreme south west of Ontario. (Photo: C. Jones)

Fig. 5. *Creaserius fodiens,* formerly *Fallicambarus fodiens,* a burrowing crayfish restricted to, but common in, Southern Ontario. (Photo: P. Hamr)

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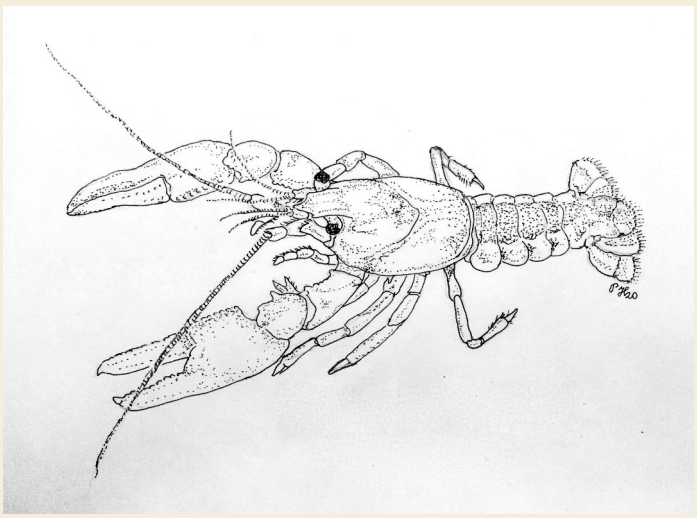

Fig. 6. *Faxonius propinquus propinquus,* the Northern clearwater crayfish. (Drawing by P. Hamr)

Short Articles

Impact of the Australian bush-fires on freshwater crayfish

The Australian continent was profoundly impacted by widespread and enduring bushfires over the 2019–20. An estimated 18.6 million hectares (the United Kingdom is 24 million hectares) were burnt, at least 33 people died, and more than 3000 homes destroyed – in fact 80% of all Australians were believed to be affected in one way or another.

Animals and plants were also devastated with it estimated that more than 1 billion (terrestrial) animals were killed, including Koalas and Kangaroos. Countless freshwater animals, including freshwater crayfish have died not only as the bushfires swept through but also following subsequent rainfall and runoff that has delivered ash and sediment into waterways, which are characteristically experiencing low flows over the summer.

In response, the Australian Government tasked an expert panel to rapidly assess the bushfire impacts and determine which species are most at risk. I assisted the expert panel with the assessment of spiny crayfish (from the *Euastacus* genus), which were deemed the most vulnerable of the Australian freshwater crayfish. At least part of the known range of almost all of the 56 *Euastacus* species (which includes three newly discovered but undescribed species) was impacted by bushfire, but where >30% of the range of species the risk was of particular concern. The conservation status of species prior to the bushfires (more than 80% of *Euastacus* species are deemed as threatened under the IUCN Red List) along with known life-history traits were also evaluated to assess risk.

Figure 1. *Euastacus guwinus.* (photo: R. McCormack)

From this assessment, 22 spiny crayfish (or almost 40% of all *Euastacus* species) were placed on the provisional list of animals (which included 113 species in total) requiring urgent management intervention. This includes species such as the globally critically endangered *Euastacus guwinus* (the Tianjara Crayfish, see figure 1) where the majority of the known range was impacted. Through the process it was evident that there is a lack of knowledge of the range, population dynamics and life history of most members of the genus.

This priority list is helping to guide the response of the Australian government now and over the coming months (and years). More information can be found at www.environment.gov.au/biodiversity/bushfire-recovery.

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A Partial Survey of Baits used in Freshwater Crayfish

Baited traps are a commonly used technique for collecting crayfish. Although there are several biases in this technique, baited trapping is nonetheless a valuable and practical technique for sampling crayfish in lentic and large lotic environments (reviewed by Larson and Olden 2016). Recently, while considering utilizing baited trapping as a means of sampling crayfish as part of an ongoing study, I began searching the astacological literature to look for ideas on what baits attract crayfish. I naturally gravitated towards the pages of the IAA's journal *Freshwater Crayfish* for some ideas. I soon noticed that there was some degree of diversity in baits reported by authors in this journal. While I began this task simply to search for a few references as guidance for bait types to try in my own studies, I decided to expand upon this project by surveying the diversity of crayfish baits used in all the papers of *Freshwater Crayfish* that I was able to access online.

While there have been a number of studies that have evaluated the effectiveness of different bait types on capturing crayfish (e.g., Somers and Stetchy, 1986; Rach and Bills, 1987; and reviewed in Larson and Olden, 2016) it was not my goal to investigate the effectiveness of bait types used. Rather, my goal here is just to summarize the diversity of bait types used within studies published in this journal. Therefore, I examined all papers in *Freshwater Crayfish* that I could access (through 2019) to compile a summary list of baits that were used to capture crayfish in traps. Unfortunately, I was unable to examine any papers in volumes 4 – 11 as well as volume 16 of *Freshwater Crayfish* because these volumes are either not yet available for download online or may not have been permitted for download on my internet server. Additionally, I did not examine papers published in languages other than English and did not examine abstracts of

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conference presentations that were published in the journal.

Overall, I found 57 papers in my sample of *Freshwater Crayfish* volumes that reported information on the type(s) of bait used to trap crayfish (I also noted that many papers reported using baited traps but did not say what bait was used). Of these, some authors utilized more than one type of bait to attract crayfish to traps. Authors in *Freshwater Crayfish* predominantly used fish to bait crayfish traps (Table 1) and (although not reported here) papers ranged from simply reporting that "fish" were used to reporting what genera or species of fish were used. Other relatively commonly used baits included commercially produced crayfish bait, pet (dog and cat) food, bovine liver, and un-baited traps (Table 1). Although robust study regarding the quantitative effectiveness of a large diversity of crayfish bait types is currently lacking (reviewed by Larson and Olden 2016), it is my hope that this brief and partial summary of bait types used by authors in *Freshwater Crayfish* may be of use to other astacologists when considering what options to use for crayfish bait. For instance, I began using fish (canned sardines in oil) to trap crayfish during my preliminary studies but had limited success. However, after reviewing baits used in papers published in *Freshwater Crayfish*, I have switched to using canned moist pet food which has increased my capture rate.

Bait type	Number of studies using bait type
Fish	41
Commercial crayfish bait	10
Dog food	6
Unbaited traps	5
Beef/ox liver	4
Cat food	2
Pig liver	2
Meat baited sticks	2
Beef melt	1
Bread	1
Chicken	1
Chicken pellets	1
Pork sausages	1

Table 1. Summary of bait types used by authors in *Freshwater Crayfish* and number of studies utilizing that type of bait.

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Call for nominations: the 2020 Noble Crayfish Award

Greetings fellow astacologists!

Have you or a fellow International Association of Astacology (IAA) member been actively involved with projects focused on educating and introducing the public to our most cherished aquatic organisms? Would you like to win $100 and critical recognition from your peers? If so, then this announcement is for you! We, the members of the Noble Crayfish Award Committee, are proud to present the 3rd Noble Crayfish Award. This prestigious award is presented on a biennial basis during IAA symposiums to recognize outstanding astacologists involved in public outreach and extension during the previous two years. We are happy to announce a call for nominations for the period of July 2018 - July 2020 and are very eager to read about the creative ways you have sparked public interest in crayfish biology and conservation.

Eligible nominees are any currently active IAA members including professors, governmental and non-governmental scientists, and, of course, students. Valid outreach activities must be crayfish-focused and must have occurred within the aforementioned time period. Examples of such outreach activities include, but are not limited to: volunteer lectures for classes or organizations, advocacy for crayfish conservation, internet blogs, online and radio interviews, and other similar and relevant activities. Nominating materials may be obtained from the IAA23 website. Only complete applications will be considered for the prize. The deadline for all nominating materials will be May 29, 2020 and the winner will be announced during the IAA Biennial Symposium on Freshwater Crayfish (June 29 - July 3, 2020; attendance not required to be eligible for the award). We look forward to hearing from you!

> “
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> SCIENCE THAT IS LOCKED IN AN ‘IVORY TOWER’ DOES LITTLE FOR SOCIETY.
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> ”
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> AUTHOR UNKNOWN

Lastly, the Noble Crayfish Award Committee is made up entirely of current students. Because most or perhaps even all of the current committee members will finish their graduate degrees in the foreseeable future, we will be looking for new members to take our places following IAA23. If you are a student, active in the IAA and interested in serving on this committee in the future, please contact us at nobleclayfishaward@gmail.com to express your interest.

Sincerely,

The Noble Crayfish Award Committee

Mael Glon
Zanethia Barnett
Will Budnick

IAA23: An update concerning the current COVID-19 situation

COVID-19 considerations

Everyone is obviously aware of the various current restrictions, and the possibility of additional future restrictions and implications of COVID-19 on travel, and IAA23 itself.
At this stage IAA23 is proceeding as planned, but the organizers and IAA are monitoring international-domestic situations closely, as well as relevant institutional policies. There are contingencies in place, including postponing IAA23 by one year, if required.

The organisers and IAA will make **a final decision** on proceeding as planned, or postponing the event, **at the end of April.**

In the case that IAA23 is postponed, and/or participants cannot attend, all registration fees for the conference will be refunded as is appropriate.

Registration instructions

Please register **as soon as possible**. Early registration deadline is the 31st March 2020. Simply follow the registration routine on the IAA23 website (iaa23.com).

Payment

You **do not** need to pay the conference registration fee immediately. You should delay your payment until the end of April, or later if that is necessary in your case.

Please, check the IAA23 and IAA webpages regularly for updated information.

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Literature of Interest to Astacologists

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

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