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A Productive Year For Describing New Crayfish Species !



Cambarus (Cambarus) eeseehensis, one of two new species described by Roger Thoma in 2005. Photo ©2005 by Roger Thoma.

Keep up to date with crayfish related news and events by joining the crayfish list server, [CRAYFISH-L](#), and/or the [Freshwater Crayfish Forum](#). This is also a great way to keep in touch with other Astacologists and find out what is happening with the IAA.

This past year has been a productive one in terms of the number of new crayfish species described by astacologists. In total, 10 species were described as new to science, while one additional species was redescribed based on old type materials (see Table 1 for a list of the new species).

Three species (2 *Cambarus*, 1 *Orconectes*) were described from the United States (Thoma et al., 2005, Thoma, 2005, Wetzel et al., 2005), a new *Procambarus* was described from Hi-

dalgo, Mexico (Lopez-Mejia et al., 2005), a new *Virilastacus* was described from Chile (Rudolph & Crandall, 2005), a new *Astacoides* was described from Madagascar (Boyko et al., 2005), and four species of *Euastacus* were described from New South Wales, Australia (Coughran, 2005, see also pg. 10).

In addition, *Cambaroides similis* from Korea, was redescribed after the type material (presumably lost for quite some

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Francesca Gherardi,
IAA President

Presidents Corner

Dear IAA members:

This is to quickly wish you my warmest "Happy New Year!" (this morning I started my third class of the first semester!). We certainly had a very busy 2005. We made a lot of field and laboratory work, attended several conferences, taught too many classes, and wrote enough papers. Indeed, 2006 will certainly bring much more work to all of us. Our usual objectives will be: To increase and disseminate our knowledge. To find and propose measures to improve crayfish conservation and to counteract biological invasions. To extend our passion and belief to the younger generations. To develop our Society and find means to improve its "health".

Remember that this coming August we will meet at the exotic location of the Gold Coast of

Australia for the 16th IAA Symposium. You are all invited to take part in this meeting. A number of important decisions will be made there. We will nominate the new President and Board, and decide the venue for the 17th IAA Symposium. Also, that will give all of us a chance to express our opinions about the future of our beloved Society. ♣

See you soon,
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The International Association of Astacology (IAA), founded in Hintertal, Austria in 1972, is dedicated to the study, conservation, and wise utilisation of freshwater crayfish. Any individual or firm interested in furthering the study of astacology is eligible for membership. Service to members include a quarterly newsletter, membership directory, bi-annual international symposia and publication of the journal *Freshwater Crayfish*.

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This issue edited by James W. Fetzner Jr. and Francesca Gherardi



Table 1. List of newly described crayfish species.

Family: Cambaridae

Cambarus (Tubericambarus) polychromatus

Cambarus (Cambarus) eeseehensis

Orconectes (Procericambarus) pardalotus

Procambarus (Ortmannicus) hidalgoensis

Family: Parastacidae

Astacoides hobbsi

Euastacus dalagarbe

Euastacus girurmulayn

Euastacus guruhgi

Euastacus jagabar

Virilastacus rucapihuelensis

time) were recently found in the Natural History Museum in Vienna.

For additional information, photos, abstracts, and links to downloadable PDF files of these papers, please see the Freshwater Crayfish Forum at the following link <http://147.72.68.29/crayfish/phpbb2/viewforum.php?f=10>. ♀

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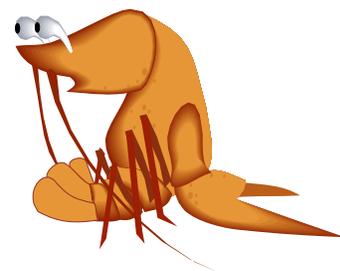
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Rudolph EH and Crandall KA (2005). A new species of burrowing crayfish, *Virilastacus rucapihuelensis* (Crustacea: Decapoda: Parastacidae), from southern Chile. *Proceedings of the Biological Society of Washington* **118**(4): 765–776.

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Thoma RF (2005). *Cambarus (Cambarus) eeseehensis* (Decapoda: Cambaridae), a new species of crayfish from the Linville River of North Carolina and its bearing on understanding the evolution of the subgenus *Cambarus*. *Proceedings of the Biological Society of Washington* **118**(4): 794–802.

Wetzel JE, Poly WJ and Fetzner, JW Jr. (2005). *Orconectes pardalotus*, a new species of crayfish (Decapoda: Cambaridae) from the lower Ohio River with notes on its life history. *Aqua, Journal of Ichthyology and Aquatic Biology* **10**(2): 57–72.



Impact of the Introduced Red Swamp Crayfish in Rice Field Ecosystems

Scientific conclusions are presented for this recently completed project, which was funded by "FCT - Fundação para a Ciência e Tecnologia", project POCTI/2001/BSE/42558 and by FEDER.

You can find more information, namely a project description and a publication list, on the project homepage: <http://crayfishandrice.no.sapo.pt/index.htm>

This project showed how much and in what ways crayfish affect rice plants and also how these effects relate to both crayfish and plant growth phases. Larger crayfish size results in larger negative effects on rice plant establishment, and consumption is the most important cause of rice destruction. Although the consumption rates may be rather low, a high number of seeds or seedlings are affected by crayfish. Recently developed parts of the rice plant are preferred and the effect is highest during the first days of growth. Seedlings are more affected by crayfish than seeds or older plants.

The project also studied the effects of crayfish on the other rice field ecosystem components namely on the algae, macrophytes, macroinvertebrates and water quality. One of the main objectives was to check if the indirect effects of crayfish on rice would be positive or negative. We found that crayfish change several water quality variables, among which we emphasize the turbidity of the water during early rice growth. Nevertheless, the effects of crayfish on the studied rice variety through water quality changes are not relevant to early rice developmental stages.

Crayfish do eat several rice pests and this was demonstrated by our field monitoring studies, experimental outdoor mesocosms and laboratory work. In fact, the presence of *P. clarkii* may significantly affect e.g. the abundance of *Chironomus riparius* and *Physa acuta*. Our field work also demonstrated that crayfish adapt their diet to the abundance of prey and this may eventually work as an important rice pest outbreak control mechanism.

Other rice pests, such as algae and macrophytes, are also consumed by crayfish. The amount of filamentous algae (*Pithophora* spp.) removed by each crayfish (g removed · g crayfish⁻¹ · day⁻¹) can be modelled by the use of the equation: $y=0.0452x+0.0228$ ($n=35$, $r^2=0.8743$). Average algae consumption rate was 0.057 g (live weight) · g crayfish⁻¹ · day⁻¹ in the absence of other food items. We concluded that, when given a choice of several vegetal materials, crayfish usually prefer rice seedlings, although algae are consumed more than other plant pests.

The study of the interference of crayfish with rice field aquatic vertebrate fauna demonstrated that there may be an effect of crayfish on amphibian populations. In fact, our results indicate that *P. clarkii* is a potential predator of amphibian eggs and larvae. *Hyla meridionalis* tadpoles are more vulnerable to predation than *Rana perezi* and crayfish eat *R. perezi* eggs. Direct consumption aquarium experiments showed that *P. clarkii* consumes mosquitofish, *Gambusia holbrooki*, and that *G. holbrooki* consumes *P. clarkii* juveniles. However, mesocosm experiments showed no significant predation on mosquitofish by crayfish. Moreover, *G. holbrooki* did not display anti-predator behavior when exposed to *P. clarkii* under laboratory conditions. We be-

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Overview of Crayfish Situation in Greece

This is the second Greek contribution to Crayfish News. Only recently have crayfish attracted scientific interest in Greece through a handful of people. Therefore, information on crayfish species (native and alien) has been really scarce.

In general, crayfish can be found in 19 out of 53 prefectures, forming isolated populations in relatively pristine water bodies. Three native species occur in Greek waters: *Astacus astacus*, *Astacus leptodactylus* and *Austropotamobius torrentium* as well as one alien species *Pacifastacus leniusculus*. Greece represents probably the most southern natural distribution limit for *A. astacus* and *A. torrentium*. Concerning non indigenous crayfish species, *P. leniusculus* was imported from Sweden and Germany during the early and late 1980s, respectively, in order to replace *A. astacus* stocks which were diminishing at that time.

Recently, a male *Cherax quadricarinatus* was seen in a restaurant's aquarium (city of Igoumenitsa, Region of Epirus), raising fears about uncontrolled imports of alien pet species (Fig. 1). On a subsequent visit to the nearby pet shop, three more *C. quadricarinatus* were available to hobbyists at a price of € 9.5 each.

During our 2004-2005 survey, we found that *P. leniusculus* not only established a thriving population in the artificial Lake Agra (Region of Central Macedonia) but also live together with *A. torrentium*. It is also suspected that *A. astacus* may co-exist with these two species, as three large male specimens were caught in a creek in close vicinity to the lake.

As for *A. leptodactylus*, there was no recent information about occurrence, and the only three preserved samples from the River Evros (natural border with Turkey in Thrace), dated back to the 19th century (Machino &



Figure 1: Male *Cherax quadricarinatus* in aquarium (city of Igoumenitsa, N.W. Greece) (Photo by Costas Perdikaris)

Holdich 2005). During 2005 accidental catch of six specimens in the same river re-documented the occurrence of the species (Perdikaris *et al.* 2005).

Finally, published work by Koutrakis *et al.* (2005) showed that a deep-dwelling *A. torrentium* population with bluish legs might live in depths up to 7,800 meters inside the Aggitis Cave in north-eastern Greece.

There is a lot of work to be done, both from scientific and production points of view, on distribution and population dynamics, genetics, reproduction and farming of crayfish species. Moreover, several actions should be undertaken to reform the existing legislation, in order to protect native species and their habitats. †

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First Report of Branchiobdellidans From Lake Tahoe

There is strong evidence that crayfish did not occur in Lake Tahoe, California-Nevada, USA, before the documented introductions of *P. leniusculus* between 1895 and 1916 (Abrahamsson & Goldman, 1970: 84). The introductions probably consisted of all three subspecies of *P. leniusculus* from various watersheds, predominantly, but not necessarily restricted to Oregon. As a result, the current *P. leniusculus* population in the lake now consists of many hybrids (Abrahamsson & Goldman, 1970). The numerous introductions of signal crayfish around the region have blurred the subspecies characters to such an extent that this study only uses *P. leniusculus* unless a citation refers to a particular subspecies.

Perry C. Holt visited Lake Tahoe, California, in 1964, and was given a number of preserved signal crayfish, mainly *Pacifastacus leniusculus leniusculus* (Dana, 1852) and a few *Pacifastacus leniusculus trowbridgii* (Stimpson, 1857), that had been collected from a number of sites by local collectors. He (P. C. Holt, unpublished data) removed the branchiobdellidans and identified specimens of *Xironogiton victoriensis* Gelder & Hall, 1990, which he named *Xironogiton instabilis* (Moore, 1894), along with those of an undescribed species. He gave these latter mounted specimens a name but did not publish a named description of them. The mounted specimens were subsequently placed in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington D.C., U.S.A., collection after Holt's death.

These undescribed specimens were examined by the author in the belief that a new species of branchiobdellidan from Lake Tahoe might prove to be unique, or of limited distribution to the area. However, all the specimens turned out to be *Sathodrilus*

attenuatus Holt, 1981, a widely distributed species on *P. leniusculus* in the Northwestern U.S.A. Slides (USNM 101628 to 101635) were returned to the NMNH where the correct names have been added to the labels.

Gelder et al., (2002: 460) noted that branchiobdellidans had not been reported from Nevada. As the eastern portion of Lake Tahoe occurs in Nevada and the crayfish move freely about the lake, this State can be considered to have branchiobdellidans. In addition, *P. leniusculus* were also introduced into the Carson River and Washoe Lake, Nevada, about 100 years ago (Abrahamsson & Goldman, 1970: 84). Therefore, branchiobdellidans were probably present on those crayfish too, but as far as the author is aware, specimens from the area have not been examined for the ectosymbionts. †

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lieve that in rice field conditions the impact of crayfish on mosquito fish is negligible.

With the scientific data obtained by this project we were able to design applied field experiments namely devoted to testing new control methods for crayfish effects on rice. The preliminary results of these experiments are quite promising and hopefully the new rice growth techniques will spread rapidly among farmers. ♪

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page 9 for a table of contents for the third volume. Also, the table of contents for this and previous volumes of BFPP relating to CRAYNET meetings have been posted to the IAA website at http://iz.carnegiemnh.org/crayfish/IAA/BFPP1_toc.htm. ♪

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busia holbrooki, and the red swamp crayfish, *Procambarus clarkii*, are native to North America, and have been introduced worldwide, causing negative effects on aquatic ecosystems. The interactions between these exotic species are poorly known. In natural habitats *P. clarkii* consumes *G. holbrooki*, but it is not clear if the mosquitofish has anti-predator defenses against the crayfish. The main objective of this study was to determine if *G. holbrooki*

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Koutrakis E.T., Machino Y., Kallianiotis A. & Holdich D.M. (2005). *Austropotamobius torrentium* (Schrank, 1803) in the Aggitis Cave (Northern Greece). Is it a cave-dwelling species? Bulletin français de la Pêche et de la Pisciculture **376/377** : 529-538.

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exhibits anti-predator behavior in the presence of *P. clarkii*. To address this question, laboratory tests were performed in experimental aquaria, analyzing the following behavioral traits of the mosquitofish: activity, distance from the predator, and space use. The mosquitofish were generally active and mainly preferred open space in both controls and treatments. Results suggest that *G. holbrooki* does not display anti-predator behavior when exposed to *P. clarkii* under the laboratory conditions used in this study. ♪



News From Around The World

IAA Members Catherine Souty-Grosset and Leopold Füreder Announce the Publication of the Volume Issued From the Third Thematic Meeting of CRAYNET, Innsbruck (Austria, 8-11 September 2004)

The third thematic meeting of CRAYNET (co-ordinator C. Souty-Grosset), entitled "European native crayfish in relation to land-use and habitat deterioration with a special focus on *Austropotamobius torrentium*", was held in Innsbruck, Austria from 8-11 September 2004. This meeting in the middle of the Alps attracted 75 participants from 17 European nations.



The effect of land-use and habitat deterioration on autochthonous and alien crayfish in general was considered a specific topic of particular importance, since the European Water Framework Directive defined guidelines towards unified freshwater assessment methodologies and required member states to commit to the ecological, catchment-orientated management of freshwaters. Therefore, the aim of the Innsbruck meeting was to gather crayfish researchers and managers from the Alpine countries (Austria, Northern Italy, Germany, Switzerland) and to associate partners from circum-Alpine regions (Bosnia-Herzegovina, Croatia, Czech Republic, France, Hungary, Slovenia, Slovakia, Yugoslavia, etc.) in order a) to define the status of crayfish species including *Austropotamobius torrentium* in the individual countries, b) to share the latest results on crayfish research, and c) to discuss necessary research activities and management strategies for crayfish protection



Leopold Füreder and Daniela Sint, organizers of the meeting, looking for *Austropotamobius torrentium* during the field trip (Tyrol, Austria)

(species conservation programmes).

The volume (25 papers and 4 roundtables) is now published by the French Higher Fisheries Council (Conseil Supérieur de la Pêche) in the Bulletin Français de la Pêche et de la Pisciculture (Knowledge and Management of Aquatic Ecosystems): this is the third volume published with the help of The European Commission. The fourth volume about the CRAYNET final conference ("European crayfish as heritage species-linking research and management strategies to conservation and socio-economics", Firenze, May 2005) is in preparation. See

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Abstracts and keywords of all articles are in French and English. Main text : in French (F) - in English (E)

Redaction : Conseil Supérieur de la Pêche, Immeuble « La Péricentre », 16 avenue Louison Bobet, 94132 Fontenay-sous-Bois, France.

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Yabbies Ain't Yabbies...

The rainforests of the Northern Rivers still hold many surprises...

Biological surveys have revealed a staggering four new species of freshwater crayfish from the subtropical rainforests of northeastern New South Wales. Formal descriptions for the four new yabbies have just been published in the prestigious journal, *Records of the Australian Museum*, by Southern Cross University PhD Candidate **Jason Coughran**.

According to Jason, the yabbies in this part of the country have previously been overlooked by scientific research. "When my research began, I was looking at five species in the region, and none of them had previously been studied in the wild. So I knew that it was going to be exciting to record the biology of these animals for the first time... but I didn't expect anything like what I found."

The four new species described in Jason's latest paper are small, rainforest species,

and together they form an identifiable group within the spiny crayfish genus, *Euastacus*. All four species are of conservation concern due to their restricted distributions.

With funds from the Australian Geographic Society and the NSW Fisheries Scientific Committee, Jason's research has yielded many other surprises. "It was a real can of worms. The level of species diversity is astounding, and the number of species in the area has doubled during my research. But there's also an enormous diversity in aspects of growth, size, reproduction, behavior, seasonal activity, and habitat." Jason has recently prepared a field guide to the region's yabbies, which was developed with the general community in mind. It includes all of the recently discovered species, and is planned for release in early 2006. ♪

For more information, visit

<http://www.croakingenvironment.com.au/pages/products/CrayFG.html>

or contact Jason at

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One of the new yabbies discovered in recent surveys.





Dear Fellow Astacologists,
 Happy New Year! Good luck, good health, and many new interesting things for the new year! We have started up the first station for bio-indication with crayfish (see photo above). ☘

Sincerely yours,
Valerij Fedotov at al. from Russia

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Abstract: Recent sampling has provided new records for two Illinois crayfish species that dramatically increase their known ranges within the state. The new records for the Cajun dwarf crayfish, *Cambarellus shufeldtii*, most likely represent an undiscovered population while those of the red swamp crawfish, *Procambarus clarkii*, represent an introduced population. The records of the latter species illustrate the continual problem of non-native species introductions and the lack of effective

regulatory mechanisms.

Leite EP, Anastacio PM, Ferreira, M, Vicente L, and Correia AM (2005). Do eastern mosquitofish exhibit anti-predator behavior towards red swamp crayfish? *Zoological Studies* 44(4): 513-518.

Abstract: Anti-predator behavior has been described in many freshwater fish species. Freshwater crayfish may have a great impact on prey species through behavioral changes. The eastern mosquitofish, *Gambusia holbrooki*, is a common

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Literature of Interest to Astacologists

Carmona-Osaldea C, Olvera-Novoa MA, and Rodríguez-Serna M (2005). Effect of the protein-lipids ratio on growth and maturation of the crayfish *Procambarus (Austrocambarus) llamasii*. *Aquaculture* **250**(3-4): 692-699.

Helms BS and Creed RP (2005). The effects of 2 coexisting crayfish on an Appalachian river community. *Journal of the North American Benthological Society* **24** (1): 113-122.

Jiravanichpaisal P, Sricharoen S, Söderhäll I, and Söderhäll K (2006). White spot syndrome virus (WSSV) interaction with crayfish haemocytes. *Fish & Shellfish Immunology* **20**(5): 718-727.

Martínez-Pérez F, Zinker S, Aguilar G, Valdés J, and Aréchiga H (2005). Circadian oscillations of RPCH gene expression in the eyestalk of the crayfish *Cherax quadricarinatus*. *Peptides* **26**(12): 2434-2444.

Sullivan JM and Beltz BS (2005). Newborn cells in the adult crayfish brain differentiate into distinct neuronal types. *Journal of Neurobiology* **65**(2): 157-170.

Jones JPG, Andriahajaina FB, Hockley NJ, Balmford A, and Ravoahangimalala OR (2005). A multidisciplinary approach to assessing the sustainability of freshwater crayfish harvesting in Madagascar. *Conservation Biology* **19**(6): 1863-1871.

Abstract: There is growing interest among conservation decision makers in promoting harvesting of forest products as an incentive for communities to retain forest cover. Assessments of the sustainability of existing harvests are essential for implementing such policies. Madagascar's endemic freshwater crayfish, *Astacoides* spp., are harvested throughout their range. Despite their importance to human communities, Madagascar's crayfish, like much of the island's fresh-

water biodiversity, are poorly known, and there is concern that the harvest may be unsustainable. We investigated sustainability of the crayfish harvest in and around Ranomafana National Park in eastern Madagascar, focusing on the heavily harvested *A. granulimanus*. Several villages around the park have traditional taboos against selling crayfish, resulting in widely varying levels of crayfish exploitation. We used two approaches to assess sustainability of the harvest. First we used participatory mapping combined with a geographic information system analysis to produce a spatially accurate map of harvesting intensity. We then carried out mark-and-recapture sampling at 74 sites across a range of harvest intensities to test whether the level of harvesting was a significant predictor of crayfish density and structure. Second, we used size-structured matrix population models to estimate the forest area necessary to provide the observed annual harvest from one harvesting village and compared this estimate with the area available to the harvesters. Our findings show that the crayfish harvest in Ranomafana may be sustainable under current socioeconomic conditions, suggesting that *A. granulimanus* is less vulnerable to overexploitation than previously thought. We emphasize the importance of a multidisciplinary approach to assessing sustainability involving both ecological information about the harvested species and socioeconomic data about the level and spatial pattern of the harvest.

Christopher A. Taylor and John K. Tucker (2005). New distributional records for Illinois crayfishes (Decapoda: Cambaridae) with comments on the continued spread of non-native species. *Transactions of the Illinois State Academy of Science* **98** (1&2): 75-80.

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