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# Crayfish NEWS

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The official newsletter of the International Association of Astacology



Participants at the freshwater crayfish meeting in Poitiers, France, September 2001

## Meeting strengthens European crayfish links

Over ninety crayfish researchers and managers attended "Knowledge-Based Management of European Native Crayfishes" in Poitiers, France, 13-15 September 2001.

The meeting was organised by **Catherine Souty-Grosset** from the University of Poitiers, with help from **Frédéric Grandjean**, **Nicolas Gouin**, **Julian Reynolds**, **Francesca Gherardi**, **J. Allardi**, **E. Vigneux**, and **C. Roqueplo**.

The meeting was devoted to the three native European species:

- The Atlantic stream white-clawed crayfish *Austropotamobius pallipes* (AUP). This species was widely distributed in western Europe up to the 19<sup>th</sup> Century, but pressures from environmental disturbances led to its decline. All *Austropotamobius*, which are distributed

around a North-South axis, are now considered threatened. Their importance, both as part of the natural heritage and as a potential biological indicator, was implicitly recognised when they were listed in Annex II and V of the European Directive (92/43/CEE) on "the conservation of natural habitats and of wild fauna and flora".

- The noble crayfish *Astacus astacus* (ASA) whose populations are distributed in Northern Europe along an East-West axis. This species, formerly supporting large recreational fisheries in Scandinavia, is now very restricted across its range.
- The mountain stream crayfish *Austropotamobius torrentium* (AUT) with smaller populations restricted to circumalpine areas.

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The International Association of Astacology (IAA), founded in Hirtzfeld, 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. Services to members include a quarterly newsletter, membership directory, bi-annual international symposia and publication of the journal *Freshwater Crayfish*.

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

#### President's Corner

Firstly, congratulations to **Catherine Souty-Grosset** and her team for organising and staging a highly successful 'crayfish management' meeting in Poitiers, France, in September. I have heard many good reports of the event and the upcoming publication of proceedings promises to be an excellent read.

Preparations are well advanced for IAA 14, to be held in Querétaro, Mexico, in August 2002. In July I visited Querétaro and spent time with **Pedro Joaquín Gutiérrez Yurrita**, who is organising the symposium. It is my opinion that the organisation of IAA 14 is in good hands and the symposium will be a great success. Pedro and his family took me to some fantastic locations planned for conference tours. Querétaro struck me as a very clean and historic city. The proposed venues are well equipped for accompanying guests and children.

Pedro informs me that the nominated travel agency will have a welcome desk in the Mexico City airport for delegates that arrive on 2 or 3 August. There will be one special bus to Querétaro for delegates who arrive on those days. If delegates wish to use this service, they need to contact the travel agency welcome desk upon arrival. More details will be provided closer to August. I took a coach from Mexico City to Querétaro which was very comfortable and took about 3 hours. Because I speak no Spanish, I found it quite difficult to make any communications at the airport. A welcome desk should avoid this problem.

Pedro has said that if delegates book their flights with his nominated travel agency they will receive special rates on many airlines (Airfrance, Mexicana, Aeroméxico, Continental, American Airlines, Japan airlines, and perhaps Qantas). People who came to the congress with this travel agency and will be provided with accommodation at the splendid Fiesta Inn hotel, and other travel/accommodation discounts within Mexico (e.g. Cancun, Puerto Vallarta, Mexico City).

You will be pleased to know that IAA member **Louis Evans** has not only recovered from her illness, but is back at work and has just been awarded a Personal Chair. Congratulations Prof!

Finally, I would like to re-iterate, given recent world events, that IAA is a proudly multi-cultural organisation, with valued members from over 60 countries. I would encourage you to attend the Mexico meeting and catch up with friends.

Happy New Year

**Glen Whisson**  
IAA President

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The main objective of the meeting was to bring together both researchers and managers to help strengthen links between all those working for the implementation of sound crayfish management policies, in order to evaluate new findings and identify the tasks remaining in implementing recommendations for conservation of the three European native species. Discussions were held between researchers and managers, as well as between managers from different countries, about their choice of strategies and assessments of these methods.

Another meeting objective was to begin to synthesize and to bring together recommendations for optimal strategies at a European scale and to identify necessary lines of research in the proceedings (BFPP, Bulletin Français de la Pêche et de la Pisciculture: 'Knowledge and Management of Aquatic Heritage' edited by E. Vigneux at the beginning of 2002).

The meeting included discussions on:

- Monitoring the distribution of European crayfish populations.
- The application of Directive 92/43/EEC 'Habitats' for the conservation of crayfish.
- How to harmonise water quality legislation for the benefit of crayfish.
- How best to manage the conservation of the native crayfish species in the particular range of environmental situations across its distribution in Europe.
- Comparison of strategies tested by different countries to preserve the native crayfishes: advantages, disadvantages of the methods, lessons to be learnt.

Both researchers and managers took part (91 participants from 17 European countries: France, U.K., Ireland, Spain, Portugal, Austria, Switzerland, Germany, Luxembourg, Belgium, Italy, Hungary, Poland, Czech Republic, Sweden, Finland, Norway) and the programme comprised 28 oral communications, 33 posters and 8 roundtables.

Oral communications and posters were divided in sessions:

1. Present knowledge: native crayfish populations (Chair: J. D. Reynolds)
2. Present knowledge: preferred habitats (Chair: D. M. Holdich)
3. Threats and alien species (Chair: F. Gherardi)
4. Biological threats (Chair: K. Söderhäll)
5. Management strategies (Chair: D. Rogers)

In addition, many participants suggested topics for roundtable discussions and the meeting was novel in proposing a full day for 8 roundtables to discuss management issues for European native crayfishes; they were held in concurrent pairs and are summarised as follows:

#### Monitoring in conservation and management of indigenous crayfish population

Chair D.M. Holdich (assisted by J. Reynolds & L. Edsman)

An important part of any conservation and management strategy for populations of indigenous crayfish species (ICS) is knowledge of where the crayfish are located; the size of the populations; any threats to their survival, particularly from non-indigenous crayfish species (NICS) and the crayfish plague; and what changes are taking place over time. However, how do managers go about monitoring such things?

It was clear from the discussions that delegates thought that monitoring had a key role to play in the conservation and management of native crayfish populations, as well as keeping track of the threats to their survival and also from actions that might harm their habitat. It was agreed that the more methods that are tried then the more chances there are of finding crayfish in surveys.

Monitoring does not only involve locating populations (surveying), but assessing their continued presence, and population size, over time if

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possible (surveillance). The threats from NICS cannot be properly assessed unless potential sites where they have not been recorded before are monitored.

How monitoring is carried out often depends on resources - both financial and the availability of surveyors.

In order for the most comprehensive picture of crayfish distribution to be obtained then government agencies, researchers, consultants etc. should all be involved. However, with such a scenario then a certain amount of "politics" may be encountered by those trying to collate records.

Delegates agreed that an atlas of the distribution of crayfish in Europe would be very useful, although a number of difficulties were raised.

#### **Control and management of aliens**

Chair: P. Sibley assisted by P. Noel

By way of introduction a show of hands was requested to determine the number of workers/managers present who were involved in the field of alien crayfish control and management. Of approximately forty people from more than ten countries, just two, including the chair, were actively involved in this field. This response, and the small number of questions relayed to the chair before the discussion served to illustrate one of the key difficulties faced by workers in this field. Namely a very limited programme of current research which in turn yields relatively little hard data on which knowledge-based management decisions can be made.

It was agreed that monitoring is key to any control and management strategy (it is important to know the scale of the problem in order that available resources may be effectively and efficiently deployed).

The fundamental question was asked, should we attempt to control alien populations? The

agreed answer was sometimes given that it is not always practicable to try and control or eradicate established and widespread populations using currently available techniques. However, there are clearly instances where vulnerable populations of native crayfish may be at risk and it is necessary to at least try and reduce the level of threat for conservation purposes.

#### **National and European legislation controlling crayfish**

Chair: E. Vigneux assisted by M. Thibault, F. Marnell & C. Souty-Grosset

Crayfish legislation is very different from country to country; involves different administrative levels (many examples) depending on history, culture, importance of recreational fishing etc; interests / emphases may be gastronomic, patrimonial (heritage), economic or ecological; political and financial power may affect or distort planning decisions. Recommendations from the workshop (i) integrate *Astacus astacus* and *Austropotamobius torrentium* into the Habitats Directive, Annex 2. (this may be a complex process) (ii) highlight the sanitary risks from live importations of crayfish (iii) increase awareness training for a wide range of people, children to adults.

#### **Interactions between natives and aliens**

Chair: F. Gherardi assisted by P. Smietana & P. Laurent

The effects induced by the introduction of NICS into natural habitats were discussed in this session. Two main points were addressed: (1) both negative and positive effects may be exerted by NICS towards the habitat; and (2) their replacement of ICS.

First, the negative effects on habitats may be direct and/or indirect. NICS can prey on invertebrates, larvae and juveniles of vertebrates, macrophytes, etc., but can also destroy the microhabitats necessary to other species to reproduce and/or shelter. However, the actual overall impact on the invaded habitat has been poorly explored in the field and, with a few exceptions, the literature is scant on this issue.

Potential positive effects originating from the introduction of NICS are to be found at a local level only, such as the occupation of vacant niches within highly "stressed" habitats, the re-appearance in some areas of either rare or threatened birds and mammals finding a new abundant prey, and the increase of the economic income within local fish markets using NICS as a resource.

As far as the replacement of ICS is concerned, mechanisms could be (a) direct and/or indirect -exploitative- competition, (b) reproductive interference, and (c) the transmission of the crayfish plague and other diseases. Only the first two mechanisms require the species living in syntopy. Following game theory, when NICS and ICS directly compete with each other, escalation occurs when the Resource Holding Potentials (RHPs) (e.g. size) are similar; the latter are the determinants of dominance, but some experimental works showed that these are not the only factors allowing NICS to out-compete ICS.

Often, NICS are more competitive than ICS in their exploitation ability, through, e.g., the faster acquisition of a shelter - shelter availability is the "principle resource bottleneck" in crayfish populations. Reproductive interference seems a very powerful mechanism; NICS can induce ICS females to spawn and this causes females to skip their reproductive season (see, e.g., *Orconectes rusticus* vs. *O. sanborni* in Ohio and *Pacifastacus leniusculus* vs. *Astacus astacus* in Sweden). However, few field studies on these issues are available.

Finally, two issues were raised:

A. Up to now, crayfish have been studied within single disciplines, such as physiology, pharmacology, etc., but it seems necessary to trespass the boundaries among disciplines and view crayfish holistically.

B. It was stressed that intervention to protect indigenous species and habitats to the invasion of NICS is urgently needed.

#### **Protection of natives in a plague situation**

Chair: L. Cerenius assisted by P. Laurent & L. Edsman

Important questions include: how long can crayfish plague live in water? are there any treatments to the crayfish plague? Do all signal crayfish carry crayfish plague? Are there resistant European native crayfish? Are electric barriers effective in fighting the disease? What are the diagnostic methods for identifying crayfish plague? The level of knowledge about the disease among the participants was quite variable even at this conference with crayfish experts. This seemed to be an effect of background (manager/scientist/authority), time working with crayfish, practical experience and country.

There was an apparent gap between academic scientific work in the laboratory and the practical advice needed by the regional authorities and managers having to take decisions and working in direct contact with people in lakes and running waters.

Enhanced communication between these different groups now seems vital. There is an urgent need for a "Code of Practice" with scientifically based safe time limits for management purposes and programs for reintroductions. Information is needed by national and regional authorities, managers, crayfish farmers, the shellfish trade, fishermen, other researchers, and the general public, on how crayfish plague works, on how it is spread and on how to behave to avoid spreading the disease.

#### **Management: reintroductions and restockings**

Chair: R. Schulz assisted by T. Stucki & C. Souty-Grosset

Restocking of habitats with native crayfish species is considered one of the most important current management and conservation options. However, a successful restocking exercise requires a set of aspects related to ha-



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bitats, stocking material and stocking procedure that should be addressed. The habitats considered for restocking needs to be suitable as a crayfish habitat in terms of water quality, morphological structures and substrate type. A further prerequisite is that the target habitat is free of crayfish plague, which should be checked prior to any restocking procedure. If restocking is planned it should also be assessed if the crayfish may have any negative impact on other endangered species already inhabiting the target water body. The stocking material may either originate from other waters or from crayfish farms.

In many European countries (mainly in Scandinavia), crayfish farming has become one of the most important sources for the production of restocking material. If restocking material is taken from natural stocks, the potential over-exploitation of these stocks needs careful consideration. A central concern is the genetic make-up of the restocking material to be used and many studies have recently attempted to characterize the genetic structure of crayfish populations using various molecular techniques. Up to now, the recommendation seems to be to use local crayfish material for any restocking project.

There are several examples of restocking projects in different European countries, however they have not been compared in a concluding summary. It follows, that there is no agreement on the number of individuals, age structure and sex ratio to be used for restocking and on temporal aspects of the restocking.

Unfortunately, the success of restocking projects has only rarely been assessed over the following years. Important summary questions related to restocking are as follows: i) why are currently no crayfish present in the target habitat, ii) do caged crayfish indicate absence of crayfish plague, and iii) what is the success level of the restocking? It is recommended to compile a guidance document for restocking as an effective conservation strategy for European native crayfish.

#### **Management: habitat restoration**

Chair: D. Rogers assisted by C. Roqueplo, M. Bramard & A. Demers

The definition of habitat restoration can include habitat creation (and does in US literature) but in Europe it is generally considered to mean restoration of habitat following degradation normally caused by the activities of man. Habitat restoration needs to be considered on both a large and a small scale. On a large scale, long-term plans for river catchment restoration might expect to focus on water quality and water quantity issues. On a small scale the focus is often on mitigation measures taken during "in river" construction projects, e.g. bridge construction, and restoration of good habitat following construction.

The following countries were represented at the roundtable: Austria, France, Ireland, Italy, Spain, Sweden, Switzerland, and the UK. All countries had a national commitment to habitat restoration at catchment level (i.e. large scale) but the commitment at a small scale varied tremendously between and within countries. In the worst situations, no action was taken to mitigate the effect of construction projects and no action was taken to protect or restore crayfish habitats resulting in loss of crayfish populations on some occasions. In other construction projects on the other hand, mitigation measures to conserve crayfish were effective and the habitat was restored or sometimes enhanced, i.e. creation of new or improved habitat, following construction. Political pressure due to the view of crayfish as a flagship species sometimes enabled exceptionally improved conditions for crayfish to be achieved during occasional projects in several countries.

The question of the use of "artificial reefs" was discussed and the consensus was that in the long term natural materials were preferable to artificial products but for temporary habitats, e.g. during construction works, artificial habitat could prove useful and there were examples where they had been used successfully.



*Espace Mendes in Poitiers, France where the crayfish meeting took place*

There was also consensus that the use of standard forms would be useful for comparative habitat evaluation and a request that an example of one such form should be included in the proceeding of the meeting. The aim, to restore habitat such that native species can colonise or re-colonise it, was uncontroversial.

#### **Education as a key to conservation**

Chair: M. Puky assisted by J. Reynolds & F. Grandjean

This roundtable aimed to maximise the participation and interactions of participants. A starting point was that native crayfish have a heritage value in some parts of Europe - how can we provide educational packages which help conserve the animal and its habitat? What practical educational work can be done with a protected species? Capture and release? photography and video? captive breeding? We discussed how native animals could be made the focus of educational strategies, with special emphasis on crustaceans. The discussion broadened out to take in strategies

and experiences with other animal groups such as amphibians. Children are naturally interested, and their participation in observations and surveys can be a valuable basis for conservation.

Schools are receptive to educational material, such as posters and information packs, and natural history societies can play an important role. At a third level, crayfish provide opportunities for understanding the decapod crustacean structure, and they are large, long-lived and robust enough to be studied over time and tracked over distance. Crayfish problems associated with disease or environmental deterioration require publicity aimed at specific user groups and at the general public. Crayfish require a clean habitat, and so tie in well with people's concerns about their environment - landscape, air and water quality. The roundtable concluded by recognising that the conservation message is paramount, and can be effectively provided in TV material, postcards and leaflets.



## SEQUENCING CRAYFISH PARASITE

IAA member **Kenneth Söderhäll** informs readers that his team has now sequenced the ribosomal genes of two morphotypes of *P. haeckeli* and found that they are distinct genotypes - maybe even different species. He sends the following abstracts:

1. Eakaphun Bangyeekhun, Heikki J. Rynänen, Paula Henttonen, Jay V. Humer, Lage Cerenius and Kenneth Söderhäll. 2001. Sequence analysis of the ribosomal internal transcribed spacer DNA of the crayfish parasite *Psorospermium haeckeli*. *Dis Aquat Org* 2001 (In press).

**ABSTRACT:** Two morphotypes of the crayfish parasite *Psorospermium haeckeli* were isolated from two crayfish species of different geographical origin. The oval-shaped sporocysts were obtained from the epidermal and connective tissue beneath the carapace of the noble crayfish *Astacus astacus* from Sweden and Finland. Elongated spores were isolated from the abdominal muscle tissue of the red swamp crayfish *Procambarus clarkii* from USA.

To compare genetic divergence of two morphotypes of the parasite, the ribosomal internal transcribed spacer DNA (ITS 1 and ITS 2) and the 5.8S rRNA gene were cloned and sequenced. The analysed region is variable in length, with the ribosomal ITS sequence of the European morphotype longer than the North American one. Sequence diversity is mainly found in ITS 1 and ITS 2 regions and there are 66% and 58% similarity between the two morphotypes, respectively. Thus, analysis of the ribosomal ITS DNA suggests that *Psorospermium haeckeli* forms obtained from Europe and North America are genetically diverse, which supports the previously reported morphological characteristics.

Bangyeekhun Eakaphun, Cerenius Lage and Söderhäll Kenneth. 2001. Molecular cloning and characterization of two serine proteinase

genes from the crayfish plague fungus, *Aphanomyces astaci*. *J Invertebr Pathol.* 77 (3):206-216

**ABSTRACT:** Two novel genes encoding the serine proteinases, subtilisin (AaSP1) and trypsin (AaSP2), from *Aphanomyces astaci* were identified. Based on the amino acid consensus sequences around the catalytic triad of these serine proteinases, degenerated oligonucleotides were designed for isolation of serine proteinase genes from a genomic DNA library. The AaSP1 gene encodes a full-length protein of 515 amino acids as a large precursor of 56 kDa. After cleavage of a predicted leader sequence of 18 residues and a prepeptide of 133 amino acids, the mature enzyme of 364 amino acids is generated with a calculated molecular mass of 39 kDa and a pI of 6.0.

The primary sequence of AaSP1 showed similarity to both bacterial subtilisin and fungal subtilisin-like serine proteinases. Southern blot analysis of AaSP1 revealed the presence of at least two subtilisin genes in the *A. astaci* genome. Northern blot analysis indicated that the size of AaSP1 transcript was 1.6 kb. The AaSP2 gene encodes a prepropeptide of 276 amino acids with a molecular mass of 29 kDa. A mature protein of 237 amino acids is probably generated after cleavage of a 17-residue signal peptide and a 21-amino-acid prepeptide with a predicted molecular mass of 25 kDa and a pI of 6.0.

The primary sequence of AaSP2 showed similarity to trypsin enzymes from various organisms. Southern blot analysis revealed the presence of multiple trypsin genes in the *A. astaci* genome. Northern blot analysis indicated that the size of AaSP2 transcript was 1.0 kb. The regulation of AaSP2 transcription was not controlled by nitrogen catabolic repression. However, the expression of AaSP2 was found to be specifically induced by crayfish plasma, implying a role in pathogenesis toward the crayfish host.

## IAA HONORARY LIFE MEMBERS

In August last year at IAA 13, the following IAA members were given Honorary status within our organisation. Following is the transcript, written by **Jay Humer** and **Ossi Lindqvist**, from the presentation in Fremantle.

### PAULA HENTTONEN

Paula Henttonen has served IAA as Secretary-Treasurer, President-Elect, President, and, for the past two years, Immediate Past President. Paula has maintained an active satellite bank account for IAA that has permitted Finnish members to pay dues conveniently without incurring overseas bank charges. She has also maintained a stock of Freshwater Crayfish volumes for sale to interested persons in her region. During her period of service for IAA, Paula has been an active astacologist and is well known for her studies of the *Psorospermium* organism in all crayfish families as well as studies of Finnish crayfish biology, fisheries, and ecology. Paula is widely published and has worked in Europe, the USA, and Australia. Paula has been a consistent contributor to *Freshwater Crayfish, A Journal of Astacology* and has served regularly as a manuscript reviewer for the various editors. Paula meets all of the criteria established for selection as an Honorary Life Member and it is with great pleasure that we nominate her for this recognition.

Jay V. Humer and Ossi V. Lindqvist - August 11, 2000 - Fremantle, Western Australia

### MAX KELLER, SENIOR

Max Keller, Senior is well known to long term IAA members. This enthusiastic champion of the conservation and restoration of noble crayfish stocks in his native Germany has participated in IAA symposia for many years now. Dr. Keller's herculean efforts to make IAA's 12<sup>th</sup> Symposium in Augsburg a great success will long be remembered by those who were fortunate to attend the symposium and all of those who will read and study *Freshwater Crayfish 12*, a magnificent volume that represents a great tribute to Max's dedication and contributions to IAA. In organizing *Freshwater Crayfish 12*,

Max ensured that a number of volumes would be made available to IAA for sale so as to secure income for IAA activities. Max took the extraordinary step to secure grants and permissions so that astacologists from eastern Europe and the former Soviet Republic could participate in the Augsburg symposium. This contact has enabled IAA to expand its presence in this astacologically important region of the world. For his dedication to astacology and sincere and fruitful work to develop IAA, we are pleased to nominate Max Keller, Sr. as an Honorary Life Member of IAA.

Jay V. Humer and Ossi V. Lindqvist, August 11, 2000, Fremantle, Western Australia

## NEW ISSUE OF BULLETIN FRANÇAIS DE LA PECHE ET DE LA PISCICULTURE

Erick Vigneux and Catherine Souty-Grosset send the following report on the upcoming issue of Bulletin Français de la Pêche et de la Pisciculture, N° 361 (2001 - 2).

This is the third volume in a series on crayfish started in 1997. It is a follow up on previous issues (No. 347: "Crayfish Special, genus *Austropotamobius*" and No. 356: "Crayfish Special, European native species"), focusing on the relationships between native crayfish and other species (foreign crayfish, fish, molluscs, pathogenic agents, etc.). It has become obvious that the problems of ecosystem management and conservation of the three heritage crayfish species (*Austropotamobius pallipes*, *Astacus astacus*, and *Austropotamobius torrentium*) are now a global European issue.

The European scientific community is slowly being organised and research programmes are implemented thanks to interdisciplinary cooperation. In our publications, we shall continue discussing such topics as population dynamics, genetics, habitat studies, environmental deterioration analyses, interrelationships between native and exotic species, stock management, and habitat reclamation.

A fourth volume is being prepared for 2002. It will be thicker and deal with issues of conservation biology and crayfish population management in the wild, following the European symposium held in September 2001 in Poitiers. It will contain the papers read during the symposium, as well as recommendations and pre-conclusions made by way of consequence. The success of this first symposium - dealing exclusively with European astacology - and the papers already published in the first three issues are an illustration of the energy driving the scientists and stress the need for supporting multidisciplinary programmes on a global European scale.

Supplementing the efforts of the International Association of Astacology (IAA), we hope that this BFPP series organised around one topic will be both a forum for scientists and a tool for administrators. Indeed, narrowing the gap between scientists and administrators is a prerequisite for implementing practical actions in the wild in coordination with public authorities, and for federating programmes drawing on European rules and regulations. We hope that this issue, together with Volume IV still to come, will prove to be an effective contribution towards these objectives, and we wish to thank all European astacologists for their active work and their enthusiasm.

#### CONTENTS of the volume:

**WESTMAN K., SAVOLAINEN R.:** Long term study of competition between two co-occurring crayfish species, the native *Astacus astacus* L. and the introduced *Pacifastacus leniusculus* Dana, in a Finnish lake

**SCHULZ R., SMIETANA P.:** Occurrence of native and introduced crayfish in northeastern Germany and northwestern Poland

**RALLO A., GARCIA-ARBERAS L., ANTON A.:** Relationships between changes in habitat conditions and population density of an introduced population of signal crayfish (*Pacifastacus leniusculus*) in a fluvial system

**GHERARDI F., RENAI B., CORTI C.:** Crayfish predation on tadpoles: a comparison between a native (*Austropotamobius pallipes*) and an alien species (*Procambarus clarkii*)

**REYNOLDS J.D., DONOHOE R.:** Crayfish predation experiments on the introduced zebra mussel, *Dreissena polymorpha*, in Ireland, and their potential for biocontrol

**NEVEU A.:** Can resident carnivorous fishes slow down introduced alien crayfish spread? Efficacy of 3 fishes species versus 2 crayfish species in experimental design

**NEVEU A.:** Experimental confrontation between resident omnivorous fish (11 species) and introduced alien crayfish (2 species)

#### CRAYFISH AND DRAGONFLIES

IAA member **Lee Burras** from the Department of Agronomy at Iowa State University, USA, sent the following interesting snippet.

Johnson, D. M. Sluk, D. A., and Debinski, D. 2001. The Endangered Hine's Emerald Dragonfly. Wings - Spring:17-21.

"...Perhaps the most surprising discovery was made by Lauren Pintor, a graduate student with Dan Soluk at the University of Illinois. We were puzzled as to how larvae survived occasional drought, and where they spent the winter. Pintor, who studied crayfish as an undergraduate, decided to look in crayfish burrows. Using a hand operated pump to suck water from burrows, she found larvae of all sizes sharing space with a predacious crayfish, *Cambarus diogenes*. She once extracted seventy-four larvae from a single burrow! We are beginning to suspect that the ability to survive drought in crayfish burrows may be a key to the distribution of Hine's emerald [dragonfly], enabling it to use habitat from which most potential competitors and predators (except crayfish) are eliminated. How it avoids crayfish predation is still a mystery...."

#### IMPROVING THE TAXONOMY OF EUROPEAN CRAYFISH IS A KEY TO PRESERVING BIODIVERSITY

IAA member **Frederic Grandjean** sends the following article on European crayfish taxonomy.

Several studies have shown that an inadequate taxonomy could have dramatic consequences in the management scheme as reported for the tuatara lizards of New Zealand. Unfortunately, classical taxonomical methods are often inadequate to differentiate groups along phylogenetic lines and also to provide a precise delimitation of closely related species or intraspecific taxa. The classical taxonomy of the endangered white-clawed crayfish, *Austropotamobius pallipes*, distributed in Western Europe, represents a good example of this problem.

The systematics of this genus is complicated and controversial, and this is reflected in a different number of species or subspecies recognized by different authors.

For example, in the white-clawed crayfish complex, *Austropotamobius pallipes*, examination of large numbers of specimens over relatively broad geographical ranges revealed a striking amount of intraspecific morphological and meristic variations. This cast doubt on the taxonomic usefulness of several morphological features and left some taxonomic issues controversially discussed (Bott 1950, Karaman 1962, Albrecht 1983, Broski 1983, Starobogatov (1995), Grandjean *et al.* 1998).

Before the application of molecular markers, all authors described the specific status of Spanish crayfish, *A. lusitanicus* or *A. italicus lusitanicus* according to them. However, the molecular data yield a robust phylogeny which do not support the specific or subspecific status given to Spanish specimens (Grandjean *et al.* 2000 and 2001). Other important revisions have also been made for the status of Swiss, Austrian, Italian, and Slovenian white-clawed crayfish.

These results showed the necessity to revise the taxonomy of other European genera in the light

of molecular data and in particular those of the *Astacus* genus, including the species of highest economic importance, in order to:

1. describe the biodiversity; and,
2. improve the management schemes to avoid losing some specific forms, as well as the translocation between different forms which are a threat for the genetic integrity of the endemic species or populations.

This is important work for the near future.

#### AVAILABILITY OF FRESHWATER CRAYFISH BOOK

*Biology of freshwater crayfish* (2001) (ISBN 0-632-05431-X) edited by **David Holdich** can now be ordered from the following suppliers:

##### Australia

Blackwell Science Pty Ltd  
54 University Street, Carlton, Victoria 3053  
Tel. 03 9347 0300 Fax. 03 9347 5001

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Tel. 01235 465500 Fax. 01235 465555  
email: direct.order@marston.co.uk

#### PAPERS OF INTEREST TO ASTACOLOGISTS

1. Abdu U. Barki A. Karplus I. Barel S. Takac P. Yehezkel G. Laufer H. Sagi A. 2001. Physiological effects of methyl farnesate and pyriproxyfen on wintering female crayfish *Cherax quadricarinatus*. *Aquaculture*. 202(1-2):163-175, 2001.
2. Bangyeekhun E. Ryyanen H. Hemtonen P. Haner JV. Ceremius L. Soderhall K. 2001. Sequence analysis of the ribosomal internal transcribed spacer DNA of the crayfish parasite *Pisorosperium haeckeli*. *Diseases of Aquatic Organisms*. 46(3):217-222.

