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Crayfish NEWS

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The official newsletter of the International Association of Astacology

THUNDER BAY HOSTS IAA XI

IAA had a wonderful eleventh meeting at Thunder Bay in August thanks to Dr Walter Momot and his staff. The minutes of the board and business meetings and the financial situation of IAA will be published in the next newsletter.

Over 100 astacologists attended the meeting and there were slightly over 100 oral and poster presentations. Copies of the abstracts will be mailed to all IAA members by the end of October 1996 - a custom established some years ago to give all members rapid access to the information provided at the meetings.

• **Submission of Manuscripts** - Editor Walter Momot will accept manuscripts for papers presented at Thunder Bay until 15 November 1996 for *Freshwater Crayfish XI*. One manuscript will be accepted per laboratory. Instructions were provided to the presenters at the meeting. Target publication date is September 1997. There will be a voluntary page charge of US\$5.00 per printed page for published papers. Manuscripts will be reviewed and only those deemed of high quality by referees will be accepted for publication.

• **Charter Members Honored** - The following individuals are Charter IAA Members: Jacques Arrignon, James W. Avault Jr., Per Brinck, Magnus Furst, Charles R. Goldman, Andres Habsburgo-Lorena, A. Stellan Karlsson, Pierre Laurent, Kenneth Soderhall, Reinhard Spitz and Kai Westman. Jacques Arrignon, Jim Avault, Andres Habsburgo-Lorena, and Kai Westman were in attendance. All Charter Members were awarded Charter Member Medals.



• **Honorary Life Members** - David Holdich, Jay Huner and Stellan Karlsson were awarded Honorary Life Membership for their contribution to IAA. All are past presidents and well known astacologists. Congratulations!

• **Future Meetings** - IAA XII will be held in Augsburg, Germany on 3-9 August 1998. Head of the organizing committee is Dr Max Keller together with Prof. Dr R. Hoffmann (University of Munich) and Dr Günter Vogt (University of Heidelberg). Dr Keller may be contacted at: First Bavarian Crayfish Hatchery, Habsburgstrasse 14, D-86199 Augsburg, Germany, fax 49 821 701980. Prof. Dr Hoffmann may be contacted at: Institute of Zoology, Fish Biology and Fish Diseases, University of Munich, Kaulbachstrasse 37, D-80539 Munich, Germany, fax 49 89 2805175, E-mail: R.Hoffmann@lhz.uni-muenchen.de.

Note: Members have asked about a change of dates to permit closer association with the Fourth International Crustacean Conference in The Netherlands in July 1998. The dates for the Augsburg meeting were set in April 1994 and could not be changed.

(Continued on page 3)



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*.

Secretariat

The International Association of Astacology has a permanent secretariat managed by Jay Huner. The address is: IAA Secretariat, PO Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

Tel: (+1 318) 4825239

Fax: (+1 318) 4825395.

Officers:

• **Paula Henttonen, President**, Dept Appl. Zoology, University of Kuopio, PO Box 1627, SF-70211 Kuopio, Finland.

• **David Rogers, President-elect**, Department of Life Science, The University of Nottingham, Nottingham, England.

• **Glen Whisson, Secretary/Newsletter editor**, Aqua Research & Marketing Services, 29 Pine Terrace, Darlington, Western Australia 6070.

• **Jostein Skurdal, Immediate Past-President**, Eastern Norway Research Institute, PO Box 1066 Skurva, N-2691 Lillehammer, Norway

Editorial

IAA produces *Crayfish News* quarterly and its success depends on contributions from members. We will now be including the occasional photograph where appropriate - so if you have a quality picture to accompany your article/notes then please send them to Glen at the following address:

Glen Whisson, IAA Secretary, 29 Pine Terrace, Darlington, Western Australia 6070, Australia
Tel: 61 9 299 7306; Fax: 61 9 470 5815
E-mail contributions are welcome and should be addressed to: twhisson@alpha2.curtin.edu.au

Glen Whisson and Jay Huner, editors

PASSING ON THE FOSSIL CRAYFISH

A message from the immediate Past-President

This is the end of my term and it seems to have only just started. Adelaide, April 1994 seems just like yesterday yet it's such a long time ago. What can I say. First of all it has been a pleasure to be President, and the reason for this is all the helpful and kind people who are members of IAA. Crayfish are territorial and aggressive, yet crayfish fanatics are both sharing and friendly. I would therefore like to take this opportunity to thank all those who have helped to make my term (1994-1996) successful. These include of course my fellow officers: Secretary/Treasurer Michelle Wheatly (USA), President Elect Paula Henttonen (Finland) and Immediate Past President Jay Huner (USA), and the board members David Holdich (England), Julian Reynolds (Ireland), Michael Geddes (Australia), Walter Momot (Canada), Chris Austin (Australia), Günter Vogt (Germany) and Jeffrey L. Gunderson (USA). During the term we have worked on a number of issues which have demanded effort and good communication and everyone has done their best.

The IAA Officers Nomination Committee, the IAA By-Law-Amendments Committee, the IAA Honorary Life Member Committee, and the IAA Symposia Time and Place Committee have also done a great job and have my deepest appreciation.

I realize that there is "work undone" but expect that President Paula Henttonen will provide outstanding leadership as IAA moves into the future. I wish the next President and the new officers good luck for the next period. I feel certain that IAA will continue to develop for the benefit of its members.

My last task as the IAA President is to pass on the fossil crayfish. I have kept the fossil crayfish for the last two years - after it was delivered to me by honorary member Reinhard Spitzzy at the Adelaide meeting. The fossil crayfish has been in Bavaria for some 130 million years and I am glad that we will next meet in Germany so it can be back home for a week or two. The idea of meeting in an area where there have been crayfish for some 160 million years is also very exciting. Good luck with your term as President and see you all in Augsburg!

Jostein Skurdal
IAA Immediate Past-President

News from Thunder Bay

(Continued from page 1)

IAA 2000 (IAA XIII) will be held in August 2000 in Perth, Western Australia. An invitation to meet in Perth was tendered by Prof. Louis Evans of Curtin University of Technology, GPO Box U 1987, Perth, Western Australia 6102, Australia.

• **Financial Situation** - IAA has combined assets of about \$18,000 with an operating budget of about \$12,000 for two years. Efforts are being made to try to develop a fund to assist students and financially disadvantaged members to attend international meetings. Walter Momot initiated an auction at Thunder Bay with the proceeds to be dedicated to the fund. Approximately \$250 was collected and it is hoped that members will be generous with gifts to the fund as well as bringing items for auction to Augsburg.

• **Sture Abramsson Memorial Lecture** - Past President James Payne presented the SAML which involved an innovative video and slide presentation dealing with embryonic development of cambarid crayfishes and life histories of the family. The video involved microphotography of embryonic development of *Cambarellus diminutus*.

• **New Officers** - The new IAA Officers for 1996-1998 are: Paula Henttonen, President, Kuopio, Finland; David Rogers, President-Elect, Nottingham, England; and Glen Whisson, Secretary, Perth, Australia. Jostein Skurdal, Lillehammer, Norway, is Immediate Past President.

• **Activities** - David Holdich will prepare an IAA history to commemorate IAA's 25th anniversary in 1997. Contact David at Department of Life Sciences, University of Nottingham, Nottingham NG7 2RD, England, with comments, materials, and inquiries. Jay Huner will organize an IAA **Crayfish Cookbook** with proceeds to go to the new travel fund. Send recipes to Jay at Crawfish Research Center, PO Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504 USA. Make sure that all recipes are typed and include a signed and dated statement that they are original contributions.

• **IAA Board Members Named** - President Henttonen has named the following individuals as board members for 1996-1998: Louis H. Evans, Perth, Western Australia; Michael Geddes, Adelaide, South Australia; Jeffrey Gunderson, Duluth, Minnesota, USA; Walter Momot, Thunder Bay, Ontario, Canada; Martin Moore, Reading, Great Britain; David Rouse, Auburn University, Alabama USA; and Gunter Vogt, Heidelberg, Germany.

IAA ACTIVITY AND FINANCIAL REPORT 1994-1996

Jostein Skurdal, Immediate Past-President

I would like to start the report by bringing your attention to the Adelaide meeting in April 1994, the beginning of my term as President. Unfortunately I have kept the notes for the opening address I gave as the coming President in which I focused on four issues:

- good service to members;
- IAA Chapters;
- increased concern on the conservation of crayfish;
- Eastern Europe Colleagues.

You have to judge for yourself whether these issues have been properly handled when reading the report.

Membership

We had some 300 paid members in the period 94-96, and together with the additional honorary members and *gratis* members we had 350 members from 40 countries. There was an increase of Eastern European members to 15, we have already registered an additional increase for the 96-98 period. We started the process of renewals in January and already some 225 have paid their dues for the next period. At the Adelaide meeting only some 40 members had paid their dues for the next period. There was a modest increase in dues (\$US 10, 5, and 20 for Regular, Student, and Business/Institutional memberships respectively) in 1994, however there are no plans to increase the dues for the next two periods. The question of annual dues was discussed but the system with bi-annual dues will continue.

Service to members and activities

The Membership Directory and the list of addresses have been published. The next directory will be published in early 1997. *Freshwater Crayfish VIII* and *10* have been published and we appreciate the efforts of the editors: R. Romaine (*Freshwater Crayfish VIII*) and Michael Geddes, Donald Fielder and Alastair Richardson (*Freshwater Crayfish 10*, published just one year after the symposium due to their joint efforts). David Holdich did a wonderful job with the bibliography published in *Freshwater Crayfish 10*. So far 500 articles on crayfish have been published in *Freshwater Crayfish*. Our newsletter, *Crayfish News*, has been published quarterly (8 issues) with information on IAA activities, information from members, publications of interest to astacologists and news from our 16 national IAA correspondents. The national correspondents have done a good job providing *Crayfish News* with updated information, communicating with other members in their countries and promoting IAA. The 11th IAA Meeting was held in Thunder Bay thanks to the efforts of Walter Momot and his co-workers. Plans for our 12th meeting in Augsburg, Germany, 1998 and an invitation to come to Perth, Australia for our 13th meeting in 2000 have been excellently presented.

Crayfish have also invaded the Internet, and you may already find information about crayfish and IAA on several net sites. David Bechler has developed a homepage for IAA and Keith Crandell's homepage also has IAA/crayfish information. An Australian IAA Chapter is established and is working excellently with Mike Geddes in charge. The number of Australian members increased from 25 to 41 in the period 1992-94 to 1994-96. We are now waiting for initiatives to develop IAA Chapters in Europe and North America. Milton Fingerman and Brian McMahon are acknowledged for their joint effort for IAA in the American Society of Zoology. The IAA by-laws have been amended based on recommendations from a committee chaired by David Holdich and the amendments include increased focus on conservation and adjustment to the current organization of IAA and our activities. A committee chaired by Ossi V. Lindqvist has developed criteria and suggested

candidates for honorary membership. The Permanent Secretariat has also during this session provided members with excellent service and manager Jay Huner is as always doing much more than anyone could demand. He has also now succeeded in providing us with the possibilities for Credit Card Charges which will make payment of dues and other material much more convenient. When talking about IAA we have to remember that Jay Huner is synonymous with IAA for most people. No wonder! His efforts are remarkable. He has served IAA in an outstanding way. He has been newsletter editor for more than 10 years, he has held all positions in IAA and he virtually is the Permanent Secretariat. His efforts and dedication to IAA is much appreciated.

Financial situation

The financial situation is good and we have at present some US\$18,000 in our various IAA accounts compared to US\$12,000 in 1994. The budget for the 96-98 period indicates a total expenditure of approximately US\$ 15,000 which balances with the expected income for the same period. Our main expenditure is the Newsletter, copies of the symposium abstracts to all members, the Directory and list of addresses, mail expenses and seed money for the next IAA meeting. We hope that our financial situation will permit us to provide additional support for student and Eastern European attendance at our next IAA Symposia and support for regional crayfish meetings. In addition there are plans to produce a booklet in conjunction with our 25th Anniversary in 1997. David Holdich has kindly offered to edit the book. Those of you with pictures and stories (not only the nice ones) please contact David. Jay Huner has offered to edit the *IAA Crayfish Cookbook* so please send your favourites to him.

Jostein Skurdal

E-mail Jostein.Skurdal@ostforsk.no

WEB PAGE

David Bechler, Department of Biology, Valdosta State University, Valdosta, Georgia 31698-0015 USA, has completed the IAA Home Page on the Internet. The 'address' is:
<http://www.valdosta.peachnet.edu/vsu/dept/cas/bio/iaa/>

When using Telnet or FTP, change directory (cd) to: /cwis/vsu/dept/cas/bio/iaa;
That is: cd /cwis/vsu/dept/cas/bio/iaa

SECRETARIAT E-MAIL NUMBER

The permanent IAA Secretariat can be accessed by contacting the General Manager, Jay V. Huner, at jhuner@usl.edu.

MEMBERSHIP

IAA has about 250 members in good standing as of mid-September 1996. There are about 75 members who have not paid their dues or contacted the Secretariat to discuss their situation. The Secretariat sends receipts for dues within 14 working days of having received them. If your mailing label is not annotated with 1996-98, your dues have not been received by IAA as of mid-September 1996 or if you paid your dues in September, they had not been received in time to annotate the mailing labels. Please check with the Secretariat as you will receive no more mailings until the situation is clarified. Tel: 318-482-52139; fax: 318-482-5395
E-mail: jhuner@usl.edu.

JIM AVAULT RETIRES

James W. (Jim) Avault, Jr. has retired as a Professor Emeritus from Louisiana State University after 30 years of service. Jim is an Honorary Life Member who is a past president, host of IAA II and IAA VIII, editor of *Freshwater Crayfish II*, and contributor to all volumes of *Freshwater Crayfish*. Well-wishers may contact Jim at: School of Forestry, Wildlife and Fisheries, Louisiana State University, Baton Rouge, Louisiana 70803-6202 USA.

NEW LOUISIANA CRAWFISH INDUSTRY BROCHURE

A new color brochure, entitled *Louisiana Crawfish*, describing the Louisiana crawfish industry has been released by the Louisiana State University Agricultural Center. Authors include IAA Members Jimmy Avery and Dwight Landreneau. Sections include an introduction, production from Atchafalaya Basin, pond production, availability, selection, and nutrition. Inquiries should be directed to Jimmy Avery at

Louisiana Cooperative Extension Service, Knapp Hall-Louisiana State University, Baton Rouge, Louisiana 70803-1900 USA.

TOXICITY HANDBOOK

IAA Member Arnold Eversole is the senior author of a crayfish pesticide toxicity handbook entitled *Handbook of Relative Acute Toxicity Values for Crayfish*. Co-authors are Jack M. Whetstone and Benjamin C. Sellers. Toxicity rankings for 97 chemical compounds are presented in this easy to read and use handbook. Inquiries about this very valuable contribution should be directed to Dr Eversole at: Department of Aquaculture, Fisheries and Wildlife, Clemson University, Clemson, South Carolina 29634-0362 USA.

EURASIAN CRAYFISH TAXONOMY REVISED - PAPER REVIEW

Dr Ya. I. Starobogatov has revised the taxonomy of Eurasian crayfishes in a recent Russian language paper with an extended English abstract. The reference is:

Starobogatov, Ya. I. 1995. Taxonomy and geographical distribution of crayfishes of Asia and East Europe (Crustacea Decapoda Astacoidei). *Arthropoda Selecta* 4 (3/4): 3-25, 22 figures.

IAA Member Joe Fitzpatrick (Tulane University Museum of Natural History, Belle Chasse, Louisiana 70037 USA) has written the following review of this provocative paper.

Yaroslav I. Starobogatov is one of the outstanding carcinologists of the old Soviet Union, and since the death of Curkerzis and Brodsky's retirement and emigration to Israel, he is unquestionably the pre-eminent Russian authority on the systematics of crawfishes. Thus, anything he writes must be examined carefully. This paper is much more than the title implies. The details of the study are based on the extensive materials on deposit at the Zoological Institute of the Russian Academy of Sciences at St. Petersburg and at the Zoological Institute of Moscow State University. The latter contain the specimens on which Birshtein and Vinogradov (1934. *Zool. zhur.* 13:39-70) based their seminal study of Russia's decapods. It is on these that he



proposes a major revision of crawfish systematics and phylogeny.

After a brief historical review, he begins his systematic survey with the Cambaridae, represented by its endemic genus *Cambaroides*, of the monotypic Asian subfamily Cambaroidinae. Until Birshtein and Vinogradov, the genus had four species found in extreme eastern Siberia, Mongolia, Korea and Japan. Using only Russian specimens, they divided *C. dauricus* into three subspecies and *C. schrenckii* into two. Starbogatov elevates these to full species and provides a key to the genus. His distributional notes essentially add nothing to those given by Birshtein and Vinogradov. Here, as elsewhere, he demonstrates the strong influence of working principally with astacids. He gives no attention to the details of the apex of the male first pleopod, so important in the taxonomy of the Cambaridae, although he illustrates them; additionally, he does not address the question of alternation of reproductive states as reflected in pleopod morphology. He rejects Hobbs', Villalobos', and Laguarda's division of the family into three subfamilies and proposes instead that the Cambarinae and Cambarellinae be recognized only as "tribes" of a single North American subfamily. I doubt that this will be accepted by any North American worker. The branchial formulae differences are completely ignored.

Turning to the Astacidae, he erects a monotypic subfamily to receive the genus *Pacifastacus*, an action that is more likely to be accepted than his treatment of the Cambaridae. In recognizing the nominate subfamily, a typographical error creates a misleading ending, *Astacidae* instead of *Astacinae*. He recognizes the four established genera *Astacus* Fabricius, *Austropotamobius* Skorikov, *Atlantastacus* Bott, and *Pontastacus* Bott, plus he adds the new genus *Caspiastacus* to receive *dauricus* Birshtein and Vinogradov and *pachypus* Rathke. Starbogatov recognizes the taxonomic and nomenclatorial problems created by the appearance of numerous "tribes", "natio" and the like, and attempts to resolve some of them by according sub-specific status to several populations. Equally significant, and to my mind a much delayed necessity, he provides the first tacit rejection of Albrecht's (1982. Mitteilungen des hamburgischen Museums und

Instituts 79:187-210) extreme collapse of the family into a single genus with no subgenera and only five species.

At this point, he progresses into some of the most controversial aspects of his study. Primarily, he rejects the position of Hobbs and most others that the extreme diversity of crawfishes in the southeastern United States argues for a cambarid emergence there from a marine or estuarine astacoid ancestor just prior to the Paleocene, and the astacines emerging separately from the same but geographically separate stock. Instead, he proposes a single emergence in Southeast Asia and subsequent spread into Europe and North America. He concedes a separate emergence to the Parastacidae, but places it in South America. In all of his arguments, he fails to address the basic question under debate: are the crawfishes monophyletic or polyphyletic in origin?

By implication, he endorses the latter concept, but he does not develop his argument in favor of it. I believe that his scenario fails to present a case to explain the current and fossil absence of any kind of crawfish from eastern and southeastern Asia, excepting the presence of *Cambaroides* in the extreme northeast. The arguments presented are essentially the same ones he offered to explain the distribution of freshwater crabs (Starbogatov and Vasilenko, 1979. Zool. zhurn. 18:1790-1801), but it is they, not astacoids, that fill the equivalent niches circumtropically. He can be excused for not being aware of the arguments of Scholtz (1995. Zool. J. Linnean Soc. 113:289-328; 1995. Sitzungsber. Gesell. Naturforsch. Freunde Berlin 34:93-115) supporting a monophyletic origin, but there are other, earlier articles in which the debate is clearly outlined. Unfortunately, this lack of knowledge and the arguments presented produce only the opinion of an experienced scholar and not real resolution of the question.

Equally controversial will be his division of the Parastacidae into three subfamilies: Parastacinae (*Parastacus* Huxley, *Paraneohrops* White, *Samastacus* Riek, and *Virilastacus* Hobbs), Austroastacinae (*Austrastacus* Clark, *Astacopsis* Huxley, *Cherax* Erichson, *Engaeus* Erichson, *Engaewa* Riek, *Euastacoides* Riek, *Euastacus* Clark, *Geocherax* Clark, and *Gramastacus* Riek), and the newly proposed Parastacoidinae

(*Parastacoides* Clark and *Tennibranchiurus* Riek). In his treatment of this family he seems to be totally unfamiliar with the recent publications of the Australian workers and is much at odds with their conclusions. I expect that they will reject his proposals and that molecular studies currently under way will provide negative support for his ideas. Nevertheless, Starbogatov's standing in the crustacean community world-wide will cause his ideas to be considered by all serious taxonomists and they will not be rejected out of hand. A lengthy English summary makes the paper widely accessible.

REDCLAW CULTIVATION IN ECUADOR

Member **Xavier Romero M.** (Centro Aereo 1233, P.O. Box 522970, Miami, Florida 33152-2970 USA fax 593-4-882469) writes to clarify comments published in the last issue of *Crayfish News* (18/4).

According to Mr Romero, he did not mean to say that "the benefits are not obvious" regarding the use of gravel on the bottom of the ponds for redclaw aquaculture. He notes that the redclaw industry is new and nobody has all the answers for growing the species so the contribution of different ideas, including some that others may not share, is going to help to develop a system that can work better.

Mr Romero believes that the only problem with gravel bottom ponds is their cost but he does believe that gravel bottoms are better than soil-water interaction bottoms as they have fewer possibilities of running into the most common problem in intensive pond aquaculture, soil degradation and low pH. Gravel has greater interstitial spaces so there is better movement of water and oxygen through the substrate to maximize oxidation of organic matter.

Mr Romero also wants to explain that approximately 50% of the female redclaw start breeding at 5-6 months. Thus, in a mixed sex pond, only about 25% of the population stops growing.

FOURTH INTERNATIONAL CRUSTACEAN CONGRESS

The congress will be held 20-24 July 1998 in Amsterdam, The Netherlands. It will include the Third European Crustacean Conference and the 1988 Annual Summer Meeting of the Crustacean Society. Co-sponsoring societies include: The Crustacean Society, Brazilian Crustacean Society, Carcinological Society of Japan, Crustacean Society of China, Groupe d'Etudes et de Reflexion sur l'Evolution des Crustaces, and the University of Amsterdam.

The Chairman of the Organizing Committee is Prof. Dr Frederick Schram. The overall theme of the congress will be "Crustacea in the Biodiversity Crisis". The ICC 4 Secretariat contact details are: ICC 4, c/o Wil van Zijl, University of Amsterdam, Vakgroep SEP, PO Box 948766, HL-1090 GT Amsterdam, The Netherlands, tel. 31 20 525 6635 6435 5422, fax. 31 20 525 5402, E-mail: zijl@bio.uva.nl; schram@bio.uva.nl.

COMPLETED DOCTORAL THESES

English member **Dawn Middleton** (Department of Life Sciences, University of Nottingham, Nottingham NG7 2RD, Great Britain) has completed her thesis and also published a paper dealing with her crayfish research. The references are:

Middleton, D. 1995. Comparative aspects of the immunobiology of freshwater crayfish species. Doctor of Philosophy Thesis. Nottingham University, Nottingham, Great Britain.

Middleton, D., D. M. Holdich, and N. A. Radcliffe. 1996. Haemagglutinins in six species of freshwater crayfish. *Comparative Biochemistry and Physiology* 114A(2):143-152.

Portuguese member and correspondent **Alexandra Marçal Correia** (Museu Boccaje, Museu Nacional de Lisboa (UL), R. Escola Politecnica, 58 - 1200 Lisbon, Portugal - fax 01 396 97 84) has recently completed her doctoral thesis on the population biology and tropic interspecific interactions for *Procambarus clarkii* in Portugal. The reference is:





IAA NI Thunder Bay 1996



WELCOME
TO
LAKEHEAD

Correia, A. M. 1995. Biologia populacional e interacções tróficas de *Procambarus clarkii* (Crustacea, Decapoda, Cambaridae) no sistema hidrográfico do rio Tago (Ribatejo, Portugal). PhD Thesis, Faculdade de Ciências da Universidade de Lisboa (FCUL). Lisboa. 313 pp.

EUROPEAN CRAYFISH RESEARCH GUIDE

Charter member **Kai Westman** (Finnish Game and Fisheries Research Institute, Aquaculture Division, P.O. Box 202, FIN-00151 Helsinki, Finland - fax 358 0 631 513) has sent a publication that lists the institutes, research workers, and programs related to crayfish research in Europe. It is very useful and will benefit anyone looking for more information about crayfish management and biology in Europe. The complete reference is:

Westman, Kai and Kaarina Manninen (editors). 1996. Institutes, Research Workers and Programs Related to Research on Crayfish in Europe. Finnish Game and Fisheries Research Institute, Kala-Ja Riistaraportteja nro 65, Helsinki, Finland, 82 pp.

INFORMATION ABOUT CRAYFISH CULTURE IN MADAGASCAR SOUGHT

Torie Lines (Ranomafana National Park Project, Ill. L. 102, Tsimbazaza, B. P. 3715, Antananarivo 101, Madagascar - E-mail 0002002226@mcimail.com) sends the following commentary and inquiries.

"...I am working as an aquaculture consultant with the Ranomafana National Park Project in Madagascar. The park's mandate is to conserve the rainforest still standing in the area. In my job I work with people living in villages surrounding the park. Our aim is to help these communities raise their socio-economic status, thus decreasing the need to exploit the forest's dwindling resources.

"One of the biggest pressures on the park is the harvest of endemic species of crayfish. There is a huge market for crayfish here, and 100% of them come from streams in and around the park. So, although personally I have little experience with crayfish, I would like to be able to teach farmers a simple way to raise them in ponds or rice paddies.

Can you offer me any advice?

"The crayfish found here are of the genus *Astacoides* and there are seven species found in the park: *caldwelli*, *granulimanus*, *betsileoensis* (red and red/green), *madagascarensis*, *crozieri* and *petiti*. Have you heard of these guys? I have very little information on their natural habitats or food preferences.

"What I'm looking for is technical information on pond construction, feeding, reproduction and polyculture with other fish like *Tilapia nilotica*. The staple crop here is rice, so I'm also very interested in techniques for raising crayfish in rice paddies. The paddies are small, 200m² is probably about average-size, and they are fed by surface water. We can only work with technology that requires little or no complicated mechanization...."

FRESHWATER CRABS AND REDCLAW INTERACTIONS

Member **Ian Karplus** (PO Box 6, Bet Dagan 50250, Israel) has noted apparent negative interaction between the freshwater crab *Potamon potamios* and redclaw crayfish *Cherax quadricarinatus* in both experimental culture ponds and aquaria. According to Dr Karplus, juvenile crayfish (2-3 g) were stocked in aquaria with crabs of different sizes. Survival of the crayfish was higher when raised alone as compared to those sharing aquaria with crabs. On two occasions, crabs were actually observed killing and feeding on the crayfish.

LOUISIANA USA/CHINESE CRAYFISH CONTROVERSY - UPDATE

The following article is quoted from the Louisiana Crawfish Farmers' Association Newsletter of September-October 1996 (LCFA, PO Box 25100, Baton Rouge, Louisiana 70894-5100 USA).

Louisiana Crawfish Coalition Update: Since meeting with Governor Foster's office and the Louisiana political delegation in Washington DC, a number of events have happened.

Senator Bennett Johnston met with the Ambassador of China to discuss the import situation. As a result of that meeting the Louisiana Senators, Commissioner (of Agriculture) Odom and the Chinese delegation met to discuss the Chinese crawfish import situation. The crawfish coalition is still moving forward and looking at other remedies to the situation. [Louisiana Crawfish Coalition] Chairman [Harold] Benoit has indicated that these meetings with the Chinese delegation is a positive step but the coalition will continue with the anti-dumping suit.

Meanwhile the House Committee on Ways and Means has formally requested a fact finding investigation to obtain information concerning the current competitive conditions in the U.S. market for crawfish. This investigation will be done by the U.S. International Trade Commission under Section 332 (g) of the Tariff Act of 1930 (19 U.S.C. 1322 9g).

Crawfish producers, processors and buyers from Louisiana will be surveyed by the International Trade Commission. Crawfish importers will also be surveyed.

The Louisiana Department of Agriculture along with the Louisiana Crawfish Coalition have also retained a Washington DC based law firm to represent the Louisiana Crawfish industry in a possible trade action against imported Chinese crawfish.

Pending the results of negotiations with the Chinese government to give relief to the Louisiana industry, the firm is preparing anti-dumping petitions. The success of these petitions will depend a great deal on the accuracy and volume of information regarding the damage to the U.S. industry caused by the dumping in the U.S. of Chinese crawfish.

The cooperation and assistance by the Louisiana crawfish industry in providing the information is vital to the success of any future actions and possibly the health and very existence of our industry.

NOTE: The following headline appeared on page 2b of the Baton Rouge, Louisiana (USA) newspaper *The Advocate* on Monday.

September 23, 1996: "Louisiana seeks 424% tariff on Chinese crawfish". In the story released by *The Associated Press*, state officials a petition was filed with the U.S. International Commission and the U.S. Department of Commerce on behalf of Commissioner of Agriculture and Forestry Bob Odom and the Crawfish Processors Alliance. A tariff of as much as \$12.50 per pound (454 grams) could be imposed on imported crawfish meat. The trade commission will rule whether or not there has been import-caused injury within 45 days. If there is injury, then the case will continue. If the Commerce Department issues a preliminary finding by February that is favorable to the Louisiana industry, importers will be required to put a tariff margin in escrow until a final decision is issued.

CRAYFISH PAPERS PRESENTED AT THE 2ND EUROPEAN CRUSTACEAN CONFERENCE

The following papers were presented at the 2nd European Crustacean Conference, 2-6 September 1996 in Liege, Belgium. Page numbers refer to the pages on which they appeared in the printed abstracts. The organizers may be contacted for information about the abstracts at: 2nd European Crustacean Conference (Attention: Professor Andre Pequeux), General Secretariat, Quai Van Beneden, B-4020 Liege, Belgium.

Guckler, R., K. -H. Tomaschko, and D. Euckmann. Comparative investigation on the morphology and structure specificity of the ecdysteroid sensors in decapod crustaceans. p. 22.

Harris, R. R., S. Collins, and R. McCabe. The effect of ammonia on ionoregulation in the crayfish *Pacifastacus leniusculus*. p. 44.

Hernandez-Guzman, M., L. M. Mejia-Ortiz, M. Signoret Poillon and J. A. Viccon-Pale. Decapods in the Huiztilapan river in Veracruz, Mexico. p. 45.

Wheatly, M. G. Calcium transport mechanisms in crayfish. p. 76.

Fanjul-Moles, M. L., E. G. Escamilla-Chimal, and V. J. Romero-Diaz. Serotonin immunoreactivity daily changes in crayfish *Procambarus clarkii* during development. p. 82.

Fuentes-Pardo, B., J. Hernandez Falcon, and A. de la O. Steroids modulate excitability of crayfish (*Procambarus digueti*) photoreceptors. Long and short-term actions. p. 83.

Huberman, A., M. B. Aguilar, D. Soyey, D. F. Hunt, and J. Shabanowitz. The nature of neuropeptide isomorphs of *Procambarus bouvieri*. p. 85.

Miranda-Anaya, M. and M. L. Fanjul-Moles. Effect of monochromatic light on the synchronization of the locomotor activity of juvenile crayfish *Procambarus clarkii*. p. 85.

Huang, T.-S. A putative iron-responsive element in the 5'-untranslated region of crayfish ferritin mRNA is functional as human iron-responsive element. p. 91.

Zwi'ling, R. Proteases in Crustacea. p. 96.

Holmblad, T. Identification of an integrin in haemocytes of the freshwater crayfish *Pacifastacus leniusculus*. p. 98.

Johansson, M. W. Peroxectin, a novel cell adhesion protein from crayfish blood. p. 99.

Soderhall, K. Humoral and cellular defence reactions in Crustaceans. p. 100.

Ackefors, H. The capture and culture fisheries for European crayfish. p. 103.

Grandjean, F. and C. Souty-Grosset. Mitochondrial DNA genetic variability in populations of the endangered crayfish *Austropotamobius pallipes*: management considerations. p. 106.

Huner, J. V. The capture and culture fisheries for North American crayfish. p. 107.

Souty-Grosset, C. and F. Grandjean. Genetic variability of mtDNA in the signal crayfish *Pacifastacus leniusculus* Dana. p. 112.

Fingerman, M. Identification and actions of neurotransmitter that mediate release of reproductive neurohormones in decapod crustaceans. p. 118.

Khalaila, I. and A. Sagi. The androgenic gland and intersexuality in the crayfish *Cherax quadricarinatus*. p. 120.

THE PRESENCE OF SIGNAL CRAYFISH IN HOKKAIDO, JAPAN

Correspondent: Shin-ichi Hiruta

There are three crayfish species living in Hokkaido, Japan: *Cambaroides japonicus*,

Procambarus clarkii and *Pacifastacus leniusculus* (signal crayfish). *C. japonicus* is the native species and widely distributed in Hokkaido, although its wild populations have been decreasing in recent years because of changes in water quality and modification of habitat. Recently wild populations of *P. clarkii* in Hokkaido have been reported for the first time at a few sites which are influenced by hot springs.

Signal crayfish (*P. leniusculus*) were imported by the Japanese Government from Portland, Oregon five times during 1926 to 1930. In Hokkaido, it was introduced into Lake Mashu on 1930 and still survives. In other parts of Japan, except for a few cool places, it could not survive because of the hot climate. Judging from a recent survey, signal crayfish seems to be spreading mainly in eastern Hokkaido. In some lakes, the native species have been replaced by signal crayfish. It is not known whether the native crayfish populations were affected by crayfish plague or not.

For further information contact: Shin-ichi Hiruta, Biological Lab. Hokkaido Univ. of Education at Kushiro.

LONG-TERM VIABILITY OF CAMBARID CRAYFISH SPERM

Members Jay Huner and Mark Konikoff (Crawfish Research Center, University of Southwestern Louisiana, Lafayette, Louisiana 70504-4650 USA, E-mail jhuner@usl.edu) have been conducting a study of comparative reproductive physiology of *Procambarus clarkii* and *Procambarus zonangulus* funded primarily by the U.S. Department of Agriculture with support from the Louisiana Crawfish Promotion & Research Board. They report that they held mature females in artificial burrows for 11 months from June 1995 to the end of May 1996. Survivors, about 40%, were released into tanks with no males present and fed. None exhibited any glair (cement) gland development.

After a month, roughly half molted with the remainder showing advanced glair gland development. The non-molting females were put back into artificial burrows and by mid-August 1996, two *P. zonangulus* laid viable eggs that

hatched by early September and reached the independent stage by mid-September. Thus, sperm stored in the annulus ventralis of the two females remained viable for at least 13 months. [Note: none of the *P. clarkii* have laid eggs but continue to exhibit advanced glair gland development and are being closely observed.]

CRAWFISH RESEARCH REPORT AVAILABLE FROM LOUISIANA'S RICE RESEARCH STATION

Member W. Ray McClain (Louisiana State University Agricultural Center, Rice Research Station, P.O. Box 1429, Crowley, Louisiana 70527 USA) has published the results of recent crawfish aquaculture research in a report entitled "Crawfish Research Projects. Annual Summary and Reports 1994 - 1995". Titles include: Annual Summary of Environmental Conditions and Crawfish Production; Effects of Density Reduction on the Production of Large Crawfish; Comparison of Traditional and Drain Harvest Methods for Retrieving Crawfish Relayed into a Rice Crop; Effects of Water Source on Crawfish Mortality During Purging; Determination of Crawfish Condition in Burrows Prior to Flood-Up; Factors Affecting Crawfish Spawning Success in Artificial Burrows; and Maleic Hydrazide and Ratoon Rice Biomass Production and Persistence for Crawfish.

TURKISH CRAYFISH PRODUCTION

Member and Correspondent Patrick Bagot (Peewee Industries, c/o Gok Dil Yabancı Dil Kursu, Istanbul CD/Dantelaci SK No. 7, Bakirokoy, Istanbul, Turkey) has sent the following statistics (see table below) about total, official crayfish production in Turkey for the period 1981-1994. Note: All values are presented in 1,000 kg.

OFFICIAL TURKISH CRAYFISH PRODUCTION STATISTICS 1981-1994

year	1981	1982	1983	1984	1985	1986	1987
kg x 10 ³	6,131	6,534	6,742	7,937	6,244	1,585	1,565
year	1988	1989	1990	1991	1992	1993	1994
kg x 10 ³	1,823	964	542	320	324	404	524

The "collapse" of the fishery for *Astacus leptodactylus* during the 1985-1986 season has been directly attributed to exposure of the crayfish, on a wide-scale to the crayfish fungus plague pathogen, *Aphanomyces astaci*.

CRAYFISH NEWS FROM FINLAND

Correspondent: Jorma Kirjavainen

Noble crayfish (*Astacus astacus*) consumption is growing faster than production in Finland. The price of live noble crayfish in 1995 was 20 % higher than 1994, and at the start of the 1996 season (late July-August) the prices were even higher. The main reason for the high prices is that demand exceeds the supply, and in addition in 1996 moulting was 2-3 weeks late because of the cold weather in June and July.

Eating crayfish is something special in Finland; it is 'in' to eat crayfish. Our president, famous film stars etc. eat crayfish. Crayfish is considered as the delicacy of high society because of its high price. Sure it is a delicacy, but it is also a good excuse for wild late night summer parties with good friends. At crayfish parties we raise a toast (e.g. ice-cold Finlandia vodka) so often that people quickly lose control and are allowed to do almost anything without feeling guilty afterwards.

Because our native noble crayfish populations have suffered great losses due to crayfish plague and poor management of stocks, we have to import crayfish. One hundred years ago we were major exporters in Europe. The signal crayfish (*Pacifastacus leniusculus*) catches are still modest and most of the signal crayfish catch is used for introduction purposes in chronic plague waters (ie. large lakes).

Some fluctuation in custom and catch-statistics

The import and consumption of crustaceans in Finland was increasing during the 80s and 90s, but in 1995 imports unexpectedly decreased 10% from 1994. In 1995 the value of crustacean import was about US\$20 million/year. More than 90 % of imported crustaceans are prawns (*Pandalus borealis*) from Norway and the rest includes freshwater crayfish. The total import of freshwater crayfish in 1994 was US\$1.13 million. The total value of imported freshwater crayfish in 1995 was only US\$0.3 million.

In 1994 we imported 3.2 million *Procambarus* pieces (*Procambarus clarkii*) from the USA with a value of US\$800,000 (mean value in custom was US\$7.4/kg). In 1995 the freshwater crayfish import from USA was only US\$70,000 (mean value US\$6.8/kg). The reason for the decrease is unknown. Maybe membership into the European Union has somehow, or perhaps there are errors in Customs' statistics.

Some of the imported *Procambarus* was from Spain, but Chinese *Procambarus* is not yet available in our stores. There are also imported freshwater crayfish from Russia (*Astacus leptodactylus*) and some years ago there was also imported signal crayfish from the USA. Import from Russia has also decreased and signals have disappeared from shops. The reason is unknown.

The price for vacuum-packed scandinavian style (in salt and dill water) cooked and deep-frozen whole crayfish is now twice as high for consumers.

There are also some fluctuations in catch-statistics. According to the Finnish Game and Fisheries Research Institute, our noble crayfish catch from wild waters in 1992 was 4.8 million crayfish, but in 1994 only 2.5 million. Sure there are some variations in catches between years and noble crayfish catches are falling little by little, but these numbers indicate the difficulty in obtaining reliable statistics: the truth is probably somewhere in between. Most of the total catch is noble but the number of signals is increasing all the time. In future years signal crayfish may play a major role in our crayfish economy because

every year the crayfish plague kills about 10 noble populations, and introduction of signal crayfish seems profitable. The value of noble and signal crayfish introduction in Finland is now about US\$700, 000/year.

Vigorous noble crayfish populations have been concentrated more and more in small isolated headwaters. In larger lakes and lake systems which are chronic plague waters we have the possibility of establishing crayfisheries by introducing signal crayfish. We are following Swedish footprints in our stocking strategy: signal crayfish introduction is allowed only in some waters in southern Finland. All signals must be plague-free when introduced, but quite soon in larger lakes they become infected, indicating that there are chronically plagued waters.

We have not forgotten the noble crayfish although some of the stockings have failed because of the plague. There are a lot of noble crayfish available for stocking because there is no longer a minimum catch size. The price for mature 6-9 cm long individuals is only US\$0.5-1. The price for similar sized signals is US\$3-4. Therefore it is not so profitable to culture noble crayfish for stocking purposes.

Crayfish culturing is increasing because of price decreases in our common agricultural products (meat, eggs, wheat etc.) since joining the European Union in the beginning of 1995. In small farms it is economically impossible to produce low-priced products, but if we produce high-priced delicacies, it is possible to go on even in small areas. Most crayfish farmers now produce crayfish for both stocking and consumption in extensive or semi-intensive methods (earthen ponds), but some greenhouse farmers are interested in producing crayfish in intensive methods indoors. Nearly all farms have plague free signals.

There are no large research programmes underway involving crayfish problems and without adequate research it seems that it will be a long time until we are able to ship large amounts of cultured or wild harvested crayfish to middle-European markets.

For more information contact: Jorma Kirjavainen, Rural Business District of Häme, PO Box 20, 13101 HÄMEENLINNA, FINLAND

AUSTRALIAN FRESHWATER CRAYFISH PRODUCTION - 1994/95

State	yabby		marron		redclaw	
	kg	SAUS (mil)	kg	SAUS (mil)	kg	SAUS (mil)
Western Australia	210,000	2.1	17,300	0.385	-	-
South Australia	9,000	0.086	5,000	0.099	-	-
Victoria	2,400	0.024	-	-	-	-
New South Wales	32,365	.511	365	0.007	2,591	.041
Queensland	-	-	-	-	59,600	0.825

Source: *Freshwater Farmer* (Australia), Vol.3, No.4:12.

PSOROSPERMIUM DNA ANALYSIS

Correspondent: Kenneth Soderhall

Psorospermium haeckeli together with 4 other organisms forms a novel clade of protistan parasites near the animal-fungal divergence.

By analyzing nuclear-encoded rDNA sequences of *Psorospermium haeckeli* and three other protistan fish parasites we found that these organisms belong to an unanticipated and as-yet-unnamed clade of eukaryotic protists, named as DRIP's clade after its presently known members: D-Dermocystidium; R-rosette agent; I-Ichthyophonus and P-Psorospermium. We now hope that it will soon also be possible to in vitro culture *Psorospermium haeckeli* and study its physiology, molecular biology, infection biology and epidemiology (ie. epizootology). The results of this investigation will appear in the following paper:

Ragan, M., Goggin, L. C., Cawthorn, R. J., Cerenius, L., Jamieson, A. V. C., Plourde, S., Rand, M., Soderhall, K. and Gutell, R. 1996. *Proc. Natl. Acad. Sci. USA* (in press).

For further information contact: Kenneth Soderhall, Dept. Physiological Botany, University of Uppsala, Villavägen 6, S-752 36 Uppsala, Sweden. Tel: 46-18-182818. E-mail: Kenneth.Soderhall@fysbot.uu.se.

PUBLICATIONS OF INTEREST TO AQUACULTURISTS

1. Aonuma, H., T. Nagayama & M. Takahata. 1996. Distribution of autofluorescent cell bodies in the crayfish central nervous system. *J Exp Physiol.* 275(6):406-412.

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- Austin, C. and Knott, B. 1996. Systematics of the freshwater crayfish genus *Cherax* Erickson (Decapoda:Parastacidae) in south-western Australia: Electrophoretic, morphological and habitat variation. *Austral. J. Zool.* 44(3):223-258.
- Brown, P.B., White, M.R., Chaille, J., Russel, M. and Oseto, C. 1996. Evaluation of three anaesthetic agent for crayfish (*Orconectes virilis*). *J. Shellfish Res.* 15(2):433-436.
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- DeHus, P. 1995. Fluskreise in Baden-Württemberg: Gefährdung und Schutz. Broschüre. Fischereiforschungsstelle Baden-Württemberg, Langenargen (Germany), 24 pp.
- Diamond, J.M. A-bombs against amphibians. *Nature* 383(oct):386-387.
- Dunham, D. and J. W. Oh. 1996. Sex discrimination by female *Procambarus clarkii* (Girard, 1852) (Decapoda:Cambaridae): use of chemical and visual stimuli. *Crustaceana* 69:534-542.
- Escartin, E. & C. Porte. Acetylcholinesterase inhibition in the crayfish *Procambarus clarkii* exposed to fenitrothion. *Ecotoxicol Environ Safety* 34(2):160-164.
- Ferrier, G. 1996. Tyre shelters for aquaculture. *Freshwater Farmer* 3(4):17-18.
- Gamradt, S.C. & L.B. Kats. 1996. Effects of introduced crayfish and mosquitofish on California newts. *Conservation Biology* 10(4):1155-1162.