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2. Freshwater Crayfish IV (1979) - Prof. Pierre Laurent. Available from The IAA Secretariat, P.O. Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504 USA. Cost is \$US 25 plus \$US 3 postage in the USA and Canada or \$US 4 surface postage elsewhere. Air mail postage is available for \$US 14.

3. Freshwater Crayfish VI (1986) - Prof. Per Brinck, Ecology Building, Univ. of Lund, S-223-62 Lund, Sweden. Cost is \$US 30 plus \$US 5 surface postage.

4. Freshwater Crayfish VII (1988) - Prof. Pierre Goeldlin, Directeur du musée Zoologique, 6 Place de Riponne, Case Postale 448, CH-1000 Lausanne 17, Switzerland. Cost is 50 Swiss Francs including surface postage.

5. Freshwater Crayfish IX (1993) - Prof. David Holdich & Prof. George Warner. Available from The IAA Secretariat, P. O. Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504 USA. Cost is \$US 25 plus \$US 3 postage in the USA and Canada or \$US 4 surface postage elsewhere. Air mail postage is available for \$US 14.

NOTE: FRESHWATER CRAYFISH II, FRESHWATER CRAYFISH III, AND FRESHWATER CRAYFISH V ARE "OUT OF PRINT." FRESHWATER CRAYFISH VIII IS "IN PRESS" AND FRESHWATER CRAYFISH X IS "IN PREPARATION."



We would very much appreciate receiving drawings and illustrations for the newsletter - here is a drawing of crayfish made by my son Øystein Skurdal at an age of 6 - probably a new species David!



Crayfish NEWS

IAA Newsletter

Volume 16 Number 2 August 1994

IAA

The International Association of Astacology (IAA), founded in Hintertal, Austria in 1972, is dedicated to the study, conservation, and wise utilization of freshwater crayfish. Any individual or 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 have a permanent secretariat. The Secretariat is managed by Jay Huner and the address is IAA Secretariat, P.O. Box 44 650, Univ. of Southwestern Louisiana, Lafayette, Louisiana 70504, USA; phone (318) 231-5239 / fax (318) 231-5395.

Officers:

• Jostein Skurdal, President, Eastern Norway Research Inst., P.O.Box 1066 Skurva, N-2601 Lillehammer, Norway.

• Paula Henttonen, President-Elect, Dept. Appl. Zoology, Univ. Kuopio, P.O. Box 1627, SF-70211 Kuopio, Finland.

• Michele Wheatly, Treas., Dept. of Zool., University of Florida, Gainesville, Florida 32611, USA.

• Jay Huner, Past President, Crayfish Center, Univ. Southwestern Louisiana, Lafayette, Louisiana 70504, USA.

FRESHWATER CRAYFISH, THE NEWSLETTER OF THE INTERNATIONAL ASSOCIATION OF ASTACOLOGY

Please send information to the Permanent Secretariat or to the editors. We appreciate any information on crayfish research, culture, publications a.s.f. We can not provide you with more information than we receive.

Jostein Skurdal and Jay V. Huner, Editors

IAA NEWS

TELECOMMUNICATIONS NUMBERS CHANGE FOR IAA SECRETARIAT

The new telecommunications numbers for the IAA Secretariat are:

Phone: Country Code 1 Area Code 318 Number 482-5239

Fax: Country Code 1 Area Code 318 Number 482-5395

MEMBERSHIP STATUS

If your mailing label does not show 94-96, your dues are delinquent for 1994-96. Please send payment - \$US 35, regular; \$US 17.50, student; or \$US 70, business or institutional - to the Secretariat at your earliest possible convenience. Official money orders must be in US Dollars drawn on an American bank. Official Money Orders include routing numbers/codes on the bottom margin. IAA cannot accept credit card payments. IAA can accept cash but it should be sent via registered mail. The receipt of dues is acknowledged by first class mail within 10 days of receipt.

IAA memberships have been growing steadily during recent years and we anticipate also a modest growth for this period and hope to be more than 400 members worldwide when we meet in Thunder Bay. However we need the joint effort from all members to succeed, please pay your dues and please help informing colleagues about IAA and our services and encourage them to become members. IAA wants to be an active body of astacologists working with aquaculture, management and research and its therefore important that those interested are members and share their knowledge with us.

STATUS OF PUBLICATIONS

1. Freshwater Crayfish IX - The following ISBN number has been assigned to the Holdich/Warner Freshwater Crayfish IX volume: ISBN 0-9642382-0-9. A reasonable number of copies are still available for sale at a base price of \$US 25.00 plus postage and handling. Its also possible to buy this volume from David Holdich, England, Paula Henttonen, Finland or Jostein Skurdal, Norway.

2. Freshwater Crayfish VIII - Anticipated publication date for this volume is now autumn 1994. Inquiries should be directed to the editor, Dr. Robert P. Romaine, School of Forestry, Wildlife & Fisheries, Louisiana State University, Baton Rouge, Louisiana 70803-6202, tel. 504-388-4208/ fax. 504-388-4227.

3. Freshwater Crayfish X - Deadline for receipt of manuscripts was 1 July 1994. Editor, Dr. Michael Geddes, has arranged for an editorial board (Himself, Richard Allalstar, University of Tasmania and Don Fielder, University of Queensland) so that manuscripts will be reviewed prior to acceptance. Anticipated publication date is summer 1995.

4. Abstracts from Tenth International Symposium of Astacology - These have been published and mailed to all IAA members. Separate copies are available at \$US 5.00 each. However, new members receive a copy as a part of their membership dues.

BRODSKY'S UKRANIAN CRAYFISH BOOK
Member Semen Brodsky (Ramat-A, Block 34/3, Sullam Yaakov Str., 97729 Jerusalem, Israel) continues to seek support for the publication of the English language translation of his fine crayfish book. He needs to secure at least 150 paid orders - \$US 50 - before the Israeli Center for Absorption in Science will authorize publication of the book. IAA members are encouraged to support Professor Brodsky's efforts. IAA has and continues to support Professor Brodsky, in principle, but does not have adequate resources to maintain services to the membership and underwrite publication of the text.

IAA OFFICERS, BOARD MEMBERS, COMMITTEE MEMBERS, & NATIONAL CORRESPONDENTS LISTED FOR 1994-1996

L. Officers -
President, Jostein Skurdal, Norway.

President-Elect, Paula Henttonen, Finland.
Secretary-Treasurer, Michele Wheatly, USA.
Immediate Past President, Jay Huner, USA.

2. Past-President Board - Per Brinck, Sweden, Stellan Karlsson, Sweden, David Holdich, England, Jim Avault, USA, Jim Payne, USA, Jay Huner, USA, Pierre Laurent, France, and Ossi Lindqvist, Finland.

This board should advise the Executive Board and have the right to attend the Executive Board meetings.

3. IAA Officer Nominations Committee - David Holdich, England (Chairman), Michael Geddes, Australia, Jay Huner, USA, Kai Westman, Finland, and Hans Ackefors, Sweden.

Those who have candidates to suggest or are willing to serve IAA should forward them to David Holdich, Dept of Life Science, The University of Nottingham, Nottingham NG7 2RD, England. The election of officers will take place in spring 1996.

4. IAA Honorary Life Member Committee - Ossi Lindqvist, Finland (Chairman), Per Brinck, Sweden, Pierre Laurent, France, Walter Momot, Canada, and Jim Avault, USA.

The main objectives of this committee is to suggest criteria and candidates for Honorary Life Members. Present suggested criteria for Honorary Life Members include:

- (1) IAA member for at least 10 years;
- (2) Well known astacologist - science, government, and/or commercial;
- (3) Service to IAA, two or more of the following -
 - (a) Long term participation in meetings,
 - (b) Consistent publication in Freshwater Crayfish,
 - (c) Reviewer of Freshwater Crayfish manuscripts,
 - (d) Officer or Board Member,
 - (e) Correspondent,
 - (f) Newsletter editor,
 - (g) Organizer of IAA Symposium, and
 - (h) Freshwater Crayfish editor.

Those who have candidates for Honorary Life Membership should forward them to Ossi V. Lindqvist, Dept. of Applied Science, University of Kuopio, P O Box 1627, SF-70211 Kuopio, Finland.

5. IAA Symposium Time & Place Committee - Paula Henttonen, Finland (Chairman), David

Holdich, England, Michael Geddes, Australia, Gunter Vogt, Germany, and Charles Roqueplo, France.

Instructions and main objectives of the IAA Symposium Time and Place Committee include:

- (1) Collect information about the Site and Organizers;
- (2) Advise the Organizers on the requirements to be met by the Organizers including -
 - (a) Conference facilities and services including accommodations,
 - (b) Financial situation,
 - (c) Official invitation from governmental agency and/or research institute or university,
 - (d) Post-conference program, and
 - (e) Responsibility for publishing Freshwater Crayfish - A Journal of Astacology.

Those interested in hosting a symposia should forward information and suggestion to Paula Henttonen, Dept. of Applied Science, University of Kuopio, P O Box 1627, SF-70211 Kuopio, Finland.

6. Committee to Suggest IAA By-Law Amendments - David Holdich, England (Chairman), Ossi Lindqvist, Finland, Jay Huner, USA, Jostein Skurdal, Norway, and Michael Geddes, Australia. If anyone feel there is a need for adjusting some parts of our by-laws please mail suggestions to David Holdich. The by-laws is published in Freshwater Crayfish IX.

Those have questions or suggestions for by-law amendments should contact David Holdich, Dept of Life Science, The University of Nottingham, Nottingham NG7 2RD, England.

7. National Correspondents -
NORWAY - Trond Taugbol;
FINLAND - Jorman Kirjavainen;
TURKEY - Patric Bagot;
GERMANY - Günter Vogt;
SWEDEN - Tommy Odelström;
SPAIN - Javier Dieguez-Urbeondo;
PORTUGAL - Alexandra Correia;
ENGLAND - John Foster;
USA - Jeffrey Gunderson (North) and Keith Callander (South);
AUSTRALIA - Michael Geddes (South) and Pierre Horwitz (Western); and CHINA - Shu Xinya.

NOTE: INDIVIDUALS INTERESTED IN BECO-

MING CORRESPONDENTS FOR OTHER COUNTRIES SHOULD CONTACT PRESIDENT SKURDAL - THANK YOU!

FUTURE SYMPOSIA

1. IAA XI - This meeting is scheduled for August 1996 in Thunder Bay, Ontario, Canada at Lakehead University. Organizer is Walter T. Momot, Department of Biology, Lakehead University, Thunder Bay, Ontario, Canada P7B 5E1.

2. IAA XII - An invitation to hold this meeting in Habsburg, Germany in the summer of 1998 has been received from Dr. Max Keller. It is being reviewed by the Symposium Time & Place Committee.

3. IAA XIII - An inquiry has been received to hold this meeting in Bordeaux, France in the summer of 2000.

IAA ADELAIDE GROUP PHOTOS AVAILABLE

Organizer Mike Geddes (Dept. of Zoology, Univ. of Adelaide, Adelaide, South Australia 5005 Australia) can provide participants in the meeting with black and white or color copies of the group photo taken toward the end of the meeting for a nominal cost. Those interested in securing copies of the photo should contact Mike directly for details and costs.

AUSTRALIA IAA CHAPTER

Following the Adelaide IAA symposium, Australian participants decided that it was time to begin an Australian IAA Chapter. This will develop closer ties between those involved in freshwater crayfish in Australia at both the research and industry levels. It is expected that there will be a national symposium every two years alternating with IAA's international symposium. The first will be held in Queensland next year. Australian members of IAA will automatically become members of the chapter. For further information, contact Dr. M. C. Geddes, Zoology Department, University of Adelaide, Adelaide, South Australia 5005 Australia.

IAA PRESIDENT AND IAA NORWEGIAN CORRESPONDENT COMPLETE DOCTORAL STUDIES

Jostein Skurdal, IAA President, and Trond Taugbol, IAA Norwegian Correspondent, (Eastern Norway Research Institute, Box 1066 Skurva, N-2601 Lillehammer, Norway) have successfully defended

their joint doctoral thesis entitled: **BIOLOGY, CULTURE AND MANAGEMENT OF THE NOBLE CRAYFISH *ASTACUS ASTACUS* L.** University of Oslo, Norway, 1994. Review of past issues of Freshwater Crayfish will find a number of jointly authored papers that these two dedicated IAA members have published. Many additional papers have been published elsewhere in appropriate international journals. The thesis is based on 22 published papers completed over the past 14 years. Hearty congratulations to Drs. Skurdal and Taugbol.

RUSSIAN SCIENTIST REQUESTS ASSISTANCE

Dr. S. Kozlovsky, Academy of Sciences, Institute of Ecology of the Volga River Basin, Komzina 10, Togliatti 445003, Russia, has written to inform IAA that his institute has been involved in the development of intensive culture of commercial freshwater crustaceans in the surrounding region. He requests any pertinent information on firms and researchers dealing with selection, cultivation and sales of any freshwater crustaceans and design and manufacture of appropriate production and processing equipment. [tel (8-848-2) 235685 & fax (8-848-2) 235478.]

HASIOTIS PETRIFIES THE PALEONTOLOGICAL WORLD

Member Steve Hasiotis (Dept. of Geological Sciences, University of Colorado, Box 250, Boulder, Colorado 80309 USA) has generated some significant astacological publicity in the popular American press dealing with his work with ancient fossil crayfish and their burrows. Some interesting points appeared recently in news articles written by Joseph B. Verrengia of the Schripes Howard News Service. Steve contends that crayfish have definitely been present and little changed for the past 220 million years. They may date to 280 million years and might even predate homarid lobsters. While popular news articles are not very useful technical citations, members unfamiliar with Steve's work will find that he has generated a most impressive series of publications dealing with both fossil and contemporary crayfish with particular emphasis on burrowing and burrow morphology.

NORDIC COURSE ON PROTOCOLS FOR CRAYFISH PATHOLOGY METHODOLOGY RESCHEDULED

The NORFA (Nordic Academy for Advanced Study) has financed a course on "Protocols for

Crayfish Pathology Methodology." Originally scheduled for August 1994, logistical problems have necessitated its rescheduling to May 1995. Organizers invite interested students and professionals to inquire about places in the course. Contact Jari Rantamaki, University of Jyväskylä, Department of Biology, FIN-40351 Jyväskylä, Finland, tel. 358-41-602220/ fax. 358-41-602221, or Paula Henttonen, University of Kuopio, Department of Applied Zoology, FIN-70211 Kuopio, Finland, tel. 358-71-163133/ fax. 358-71-163148.

IS THERE MORE THAN ONE SPECIES OF *PSOROSPERMIUM*?

President-Elect Paula Henttonen (Dept. of Applied Zoology, Univ. of Kuopio, FIN-70211 Kuopio, Finland) has been studying the enigmatic *Psorospermium* organism for the past 7 years primarily in Scandinavia and North America. Paula recently spent some time in Western Australia at the laboratory of member Louis Evans at the Curtin University of Technology in Perth. According to Paula, she examined adult marron, *Cherax tenuimanus*, from four farms. No *Psorospermium* were found in three of the farms but 100% of the marron were infested at the fourth farm. The *Psorospermium* had a completely different structure in its outer shell as compared with European and North American organisms.

Member Kenneth Söderhäll (Department of Physiological Botany, Uppsala University, Uppsala, Sweden) has initiated DNA studies to determine, once and for all (hopefully) just what *Psorospermium* is. The results of Kenneth's studies will be very welcome and will have the secondary benefit of providing us with a way to determine just how many "species" of *Psorospermium* exist!

POLLUTION PROBLEMS AFFECT CRAYFISH IN TASMANIA

Member Bob Cope (Northwoods Center, Route 1, Ishpeming, Michigan 49894 USA) participated in IAA X at Adelaide and continued a trip through Australia after the symposium ended. He sent a news clipping from The Sunday Tasmanian dated April 17, 1994. An industrial chemical spill killed large numbers of Great Forester River macrofauna including brown trout, eel and freshwater crayfish (most likely *Astacopsis*). There was no news about the degree of damage and its long term effects in the article. However, the incident points out just how

sensitive aquatic environments are to biocides.

THE 1993-94 LOUISIANA USA CRAYFISH SEASON COMES TO AN END

IAA Member Tom Hymel (P.O. Box 10025, New Iberia, Louisiana 70562-0025 USA) is a fisheries specialist with the Louisiana Cooperative Extension Service. Excerpts from his June 24, 1994 newsletter provide an excellent summary of what happened during Louisiana's 1993-94 crayfish season:

The crayfish season was dominated by wild crayfish and pressure from imported tail meat product. Basin crayfish harvest continued through last summer into the early winter. Farmers were unable to take advantage of traditional higher prices for early pond crayfish due to small catches and the presence of wild crayfish on the market. Through the season, buyers paid more for Basin crayfish than for those from ponds.

Basin fishermen had an excellent season this year with large catches and good prices. Basin crayfish were exceptional with most of the crop tending to be larger than normal. Ninety percent of the catch fell in the large and jumbo size. Many fishermen feel that most of these crayfish were holdovers from the past season. Small crayfish preferred for peeling were not abundant in the Basin this year.

This extraordinary volume of high quality crayfish was great for those in live sales but caused major problems for tail meat packers. Processors were not able to obtain the amount of smaller, cheaper, peeling size crayfish that they needed. In a normal season, the industry is usually glutted with more small crayfish than can be processed. Instead, they were forced to peel large crayfish to supply markets with fresh tail meat. The higher cost of the live crayfish and lower meat yields cut profit margins and resulted in a poor season for tail meat processors.

Processors were once able to pass on these increased processing costs to the consumer. This is difficult to do now because of the influence of imported Chinese tail meat on meat prices. It is hard for a processor to peel 40 cent crayfish yield 12% meat and compete with imported product available from \$2.75 to \$3.50 per pound. One major processor described the season as his worst in the past 20 years.

Swedish packers → more product available than they knew what to do with. Suppliers were limited in

the amount of the crayfish they could deliver daily.

Very little crayfish was processed for the freezer this season. A rapid decline in Basin water levels caught many processors by surprise. They were expecting a slow fall and good landings. This did not occur. Off season meat demand will have to be filled by imports this year.

Farmers across the state had a poor season in general. Crayfish from ponds were late and smaller than normal. A few producers reported having a good season but they were the exception. A large amount of rice acreage was drained much earlier than normal because of low prices. It was difficult to compete with Basin crayfish volume and quality. Most farmers are looking to next season and hoping the Basin does not hit 3 years in a row.

The past two crayfish seasons were not typical. The 92-93 season produced the largest volume of crayfish in the history of the industry. The 93-94 crop yielded more large crayfish than anyone can remember. What will the next season bring? No one really knows. The only thing we can say about the crayfish business is that we cannot predict what is going to happen next.

FRENCH CRAYFISH IMPORTS IN 1993

The June 1994 issue of *L'Astaciculteur de France* (Volume 39:7-12) includes an article by Past President and Honorary Life Member, Pierre Laurent dealing with French crayfish imports for 1993. The English language abstract is presented here:

The quantity of crayfish imported to France in 1993 is the lowest encountered since 1981. Deep frozen crayfish represents only about 1/3 of the total imported crayfish. Spain remains the leader among exporters of deep frozen crayfish whilst Turkey sells more than 81% of the fresh crayfish consumed in France. New countries inside E.U. appear among the crayfish exporters but they only despatch to France, as their own production, species not allowed to be imported alive. Price of noble crayfish is clearly increasing whilst those of narrow clawed and red swamp crayfish remains lower and rather stable since several years.

The total imports of deep frozen crayfish for 1993 were 127.5 tonnes from the following sources: Spain, 90.6 t; Turkey, 27 t; Belgium 5.6 t; Great

Britain, 1.5 t; USA, 0.9 t; and Switzerland, 0.4 t. The total imports of live crayfish for 1993 were 252.1 tonnes from the following sources: Turkey, 205.3 t; Spain, 21.0 t; Great Britain, 9.6 t; Italy, 6.7 t; Belgium, 4.2 t; USA, 2.1 t; Portugal, 1.6 t; Denmark, 0.5 t; Pays Bas, 0.4 t; Greece, 0.4 t; Australia, 0.2 t; Norway, 0.1 t; and Lithuania, 0.1 t. Frozen *Procambarus clarkii* (red swamp crayfish) from Spain were roughly 20 French Francs per kg. Live *Astacus leptodactylus* (narrow clawed crayfish) from Turkey were about 40 French Francs per kg. Live *Astacus astacus* (noble crayfish) were about 110 French Francs per kg. The total imports of just over 332 tonnes in 1993 compare to almost 2,000 tonnes in 1981 prior to the collapse of the Turkish narrow clawed crayfish fishery. This suggests that there is much potential market demand for crayfish in France.

NOTES FROM ZAMBIA

Member C. J. Grubb (P.O. Box 60287, Livingstone, Zambia) cultures red swamp crayfish, *Procambarus clarkii*, yabby, *Cherax destructor*, and red claw, *Cherax quadricarinatus*. According to Mr. Grubb, the Zambian Fishery Department at Chilanga has recently purchased red claw brood stock from him to evaluate cultural potential elsewhere in the country. Mr. Grubb has been cultivating all three species for several years now on a small, but profitable scale, starting with red swamp crayfish obtained from Kenya. He notes that red claw grow rapidly to 200 g in a concrete pool system but slowly after that. He considers yabby to be very cannibalistic in his pool system. Lack of water is the main reason why he has not yet cultured red claw and yabby in earthen ponds but points out that problems from predatory frogs, monitor lizards, and marauding crocodiles are serious considerations as well. Mr. Grubb does note that yabby and red swamp crayfish are "easier" to eat than red claw because their exoskeletons are like "armoured plating!" In addition, he "preserves" crayfish by freezing them whole and has found that when frozen for a "long" time and thawed, all of the legs and claws seem to break off. This does not seem to be a problem with the other species.

FRESHWATER CRUSTACEAN ATLAS PUBLISHED IN FRANCE

Yoichi Machino (13 Rue Montorge, F-38000 Grenoble, France) was kind enough to send a copy of the a recently published (1993) French language freshwater crayfish atlas entitled: "Atlas

Preliminaire des Crustaces Decapodes D'Eau Douce de France" authored by E. Vigneux, P. Keith, and P. Noel. The complete reference is included in "Recent Publications of Interest to Astacologist" below. The crayfish referenced include *Astacus astacus*, *Ecrevisse a pied rouges*, *Astacus leptodactylus leptodactylus*, *Ecrevisse a pattes greles*, *Austrototamobus pallipes pallipes*, *Ecrevisse a pieds blancs*, *Pacifastacus leniusculus*, *Ecrevisse de Californie ou ecrevisse signal*, *Orconectes limosus*, *Ecrevisse americaine*, and *Procambarus clarkii*, *Ecrevisse de Louisiane*.

AMERICAN SOCIETY OF ZOOLOGISTS MEETING

IAA has been a co-sponsor of the "ASZ" meeting for some years now. Members Brian McMahon and Milton Fingerman have been the official IAA representatives for recent meetings. They organized an outstanding crayfish physiological adaptations session at the meeting last winter in Los Angeles, California USA. Those review papers are to be published in an upcoming issue of The American Zoologists. The next ASZ meeting will be January 4-8, 1995 at the Adam's Mark Hotel, St. Louis, Missouri USA. Individuals interested in learning more about the meeting should contact the American Society of Zoologists, P.O. Box 809292, Chicago, Illinois 60680-9292 - tel. 312-527-6697.

A BIT OF ENGLISH CRAYFISH HUMOR

Past President David Holdich (Dept. of Life Sciences, University of Nottingham, Nottingham NG7 2RD, Great Britain) sent the following information about crayfish in the London area.

"...On a place called Hampstead Heath in London there is a pond called the Men's Bathing Pool where nude bathing among other things takes place! A Cajun restaurant up the road has been known to dump red swamps [*Procambarus clarkii*] in it and there now appears to be a good population - although we have yet to find a female with eggs. Anyway when David Rogers was trapping last week [mid-June 1994] the Press turned up and made a big thing in a London newspaper about the fact that he had only managed to trap males in the Men's Bathing Pool! Can crayfish read the asked?"

CRAYFISH PROMOTIONS IN CALIFORNIA USA

The first weekend in May is the time for the "International Breaux Bridge (Louisiana) Crawfish

Festival." According to articles in The Advocate (Baton Rouge, Louisiana USA June 13, 1994), the "Isleton (California) Crawdad Festival" is gaining more and more attention following its origins in 1986. Located in the Sacramento River Delta region, the festival features "river" crayfish, *Pacifastacus leniusculus*. These are harvested in the river channels surrounding irrigated farm land - mostly rice. The rice fields, however, harbor large populations of introduced *Procambarus clarkii*. These are more likely, however, to be harvested for fish bait than food although transplanted Louisiana "cajuns" are doing their best to change attitudes. The California festival has become the state's largest festival and the state record holder for beer consumption; however, it is unlikely that the quantity of crayfish consumed there approaches the magnitude of that consumed in a normal spring weekend in southern Louisiana, at least for now!

CRAYFISH RESEARCH IN CHINA

Member Guo Xiaoming (Nanjing Institute of Geography & Limnology, 73 East Beijing Rd, Nanjing 210008 People's Republic of China) has been studying *Procambarus clarkii* growth and reproduction in the local region. The title is "Study on Growth and Reproduction of *Procambarus clarkii* (Girard). Copies of the complete English language summary are available from Dr. Guo who plans to translate the rest of the entire paper into English. Length-weight, fecundity, and growth model equations are included in the summary. According to Dr. Guo, age at sexual maturity for males is 0.7 yrs and females 0.8 yrs and the ecological life spans are 4.3 yrs for males and 5.3 yrs for females. There are two egg-laying periods each year, one in the spring, March to May, and another in the autumn, August to November.

CRAYFISH CULTURE RESEARCH IN THE NORTH-CENTRAL USA

The North Central Regional Aquaculture Center (13 Natural Resources Building, Michigan State University, East Lansing, Michigan 48824-1222 USA) is one of the several regional aquaculture centers in the USA. NCRAC has one project entitled "Culture of Crayfish in the North Central Region." The institutions involved include Southern Illinois University which is investigating polyculture of *Orconectes immunis*, *Orconectes virilis*, and *Procambarus acutus* in earthen ponds, Kansas State University which is investigating culture of *Orconectes nais* in earthen ponds, and Purdue

University which is investigating the baitfish segment of the crayfish industry in the region. According to the NCRAC Journal (Volume 3, No. 2, Spring 1994), "...Progress on the descriptive analysis of the region's indigenous crayfish species is being made. Each member of the work group has been assigned one to three species for summarization of existing information and for analysis of the potential for aquaculture. A bibliography of pertinent information is also being developed and, together with the survey results, will be used to summarize information gaps and research needs related to commercial crayfish aquaculture."

CRAYFISH AQUACULTURE RESEARCH PROGRESS REPORTS FROM THE RICE RESEARCH STATION, LOUISIANA USA

Member W. Ray McClain (LSU Rice Research Station, P.O. Box 1429, Crowley, Louisiana 70527-1429 USA) has recently completed a summary of recent crayfish research projects entitled "Crawfish Research Project - Annual Summary and Reports, 1992-1993." Report titles and authors follow: (1) Annual Summary of Environmental Conditions and Crawfish Production, W. R. McClain, K. R. Taylor, and J. J. Sonnier; (2) Effects of Supplemental Feeding on Crawfish Production, W. R. McClain, R. P. Romaine, R. C. Reigh, K. R. Taylor, and J. J. Sonnier; (3) Effects of Intercropping Crawfish in Rice Fields, W. R. McClain, P. K. Bollich, and D. C. Huffman; (4) Comparison of Crawfish Production from Permanent Ponds and Ponds in Crawfish/Rice Rotations, W. R. McClain, K. R. Taylor, and J. J. Sonnier; (5) Evaluation of Grading, Depuration, and Storage Time on Crawfish Mortality During Cold Storage; and (6) Maleic Hydrazide and Rice Biomass Production and Persistence for Crawfish, R. T. Dunand, W. R. McClain, R. R. Dilly, Jr., G. A. Meche, K. R. Taylor, and J. J. Sonnier. Dr. McClain's research has involved *Procambarus clarkii*, the only species currently present in his research area.

Although not included in the 1992-93 annual report, Dr. McClain has also been directing research during the 1993-94 season that may be of special interest to members involved in crayfish aquaculture regardless of species and location. That is, he has been attempting to develop methods to control crayfish numbers to permit production of large crayfish. Several techniques that are being tested and preliminary results follow: Method One used intense trapping of small crayfish early in the season as a means to reduce

numbers. This had no impact on size. Method Two used urea fertilizer as a toxicant to produce ammonia and kill a portion of the young crayfish population. There was a significant increase in crayfish size but this may have limited application in Louisiana's 10-20 ha production ponds. Finally Method Three simply involved draining ponds for a five day period in February. [Remember, Louisiana ponds are filled in Sept.-Oct. and drained in Apr.-Jun. with brood crayfish surviving in burrows.] Crayfish size was increased dramatically with this method.

RECENT CRAYFISH CULTURE PROGRESS REPORTS FROM THE CRAWFISH RESEARCH CENTER, LOUISIANA USA.

The following mimeographed reports are available from the Crawfish Research Center, P.O. Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504 USA.

Burras, L. and J. V. Huner. 1994. Climate, Location, and Soil Impact on Long-Term Crawfish Yields Throughout Louisiana. 9 pages.

Huner, J. V. 1994. Summary of Crawfish Production in the University of Southwestern Louisiana's Research and Demonstration Crawfish Ponds, 1988-1994. 6 pages.

In the first report, Burras and Huner note that soil types account for approximately 50% of the variation in crayfish production (*Procambarus* spp.) in Louisiana's 50,000+ ha crayfish culture industry. The report is based on state production data for the period 1982-1992 and concludes that neither climate nor location - latitude and longitude - impact production. In the second report, Huner notes dramatic changes in species composition from almost 100% *Procambarus clarkii* to almost 100% *Procambarus zonangulus* over an 8 year period. This was attributed to timing of pond flooding and apparent higher susceptibility to systemic vibriosis in *P. clarkii*.

COMMENTS ABOUT "THE FRESHWATER FARMER" MAGAZINE

"The Freshwater Farmer" Magazine is an aquaculture magazine is a joint quarterly publication of the Yabbie Growers Association of Australia, the Kangaroo Island Aquaculture Association, and the Aquaculture Association of South Australia. Editor is IAA member Martin Smallridge. Mailing address is: P.O. Box 1625, Adelaide, South Australia 5001,

Australia. This is a most useful magazine that includes much information for anyone interested in cultivation of Australian crayfish. Crayfish are a primary species featured in the magazine because they are a major base in Australia's emerging freshwater aquaculture industry. Pertinent citations will be included in the "Publications of Interest to Astacologists" section below. However, anyone interested in culture of *Cherax* spp. will very likely read each issue from cover to cover because there is so much information in each one that is not compartmentalized into an identifiable "article" with an author(s).

AQUACULTURE '95 CRAWFISH CULTURE SPECIAL SESSION

There will be a special "Crawfish Culture" paper session at the Aquaculture '95 meeting in San Diego, California USA, February 1-4, 1995. All presenters are IAA members. The purposes of the session are to summarize the status of crayfish aquaculture and to provide information on the most recent applied crayfish North American crayfish culture research. Presenters and topics follow.

(1) Freshwater Crayfish Cultural Methods: An Overview. Jay Huner, Lafayette, Louisiana USA; (2) Water Quality and Management in Crawfish Culture Ponds. Arnold Eversole & David Brune, Clemson University, South Carolina USA; (3) Crayfish Harvesting Methods and Strategies. Robert Romaine, Baton Rouge, Louisiana USA; (4) Management Strategies for the Production of Large Crawfish. Ray McClain & Robert Romaine, Crowley, Louisiana USA; (5) Non-traditional Practices for the Culture of the Red Swamp Crayfish *Procambarus clarkii*: Evaluation of Stocking and Feeding Strategies, and Intercropping with Freshwater Prawns *Macrobrachium rosenbergii*. Louis D'Abramo, Richard van Hoosen, & William Daniels, Mississippi State, Mississippi USA; (6) Nutritional Requirements of Crayfishes. Paul Brown, West Lafayette, Indiana USA; (7) Parasites and Diseases of Crayfish. Ronald Thune, Baton Rouge, Louisiana; (8) History, Biology, and Culture Methods of Australian Crayfish in the Western Hemisphere. David Rouse, Auburn University, Alabama USA; and (9) Successful Culture of Red Claw Crayfish, *Cherax quadricarinatus*, in Ecuador. Marcelo Salame, Guayaquil, Ecuador.

For more information on the meeting, contact: Sea Fare Expositions, 850 N. W. 45th Street, Seattle,

Washington 98107 USA. Tel: 206-547-6030/ Fax: 206-548-9346.

PROCAMBRUS CLARKII IN SCISTOSOME COMBAT

In the July issue of *New Scientist* an article describe how *Procambarus clarkii* is used to reduce the snail which host the schistosome larvae. When red swamp crayfish were introduced to Kenya some 25 years ago some crayfish escaped from the farms and it was noted that snails which carry schistosome larvae had gone from waterways inhabited by the crayfish. Crayfish eat the snails like popcorn and now an experiment is planned to test the effect of this approach on schistosome worm incidents in three villages with three controls. The scientist involved are well aware of the risks of releasing a new predator into the environment, but feels that in this case the risk is diminished because crayfish are already on the loose.

HOW MANY CRAYFISH SPECIES ARE THERE?

If you have access to e-mail then you may be interested in joining the international crustacean discussion group called CRUS-L. Anybody wanting details should contact David Holdich on e-mail: PLZDMH@pln1.life.nottingham.ac.uk. Note that the last part of pln1 is a number not a letter.

The group has initiated a survey into how many crustacean have been described and how many might remain to be discovered? David Holdich have agreed to try to find out how many crayfish species there are or might be. Interested? Contact David Holdich on the e-mail address or at the Dept of Life Science, University of Nottingham, Nottingham NG7 2RD, UK.

David Holdich also informs that all UK national telephone numbers are scheduled to change on 16 April 1995, but both new and old numbers will be available from August 1994 for 6 months. For example David Holdich's number will change from 0602 513219 to 0115 9 513219. The international access code will change from 010 to 00.

CRAYFISH RESEARCH IN BELARUS

V. Kulesh and A. Alekhovich (Institute of Zoology, Academy of Sciences Belarus, 27 Scorina str, Minsk 220072 Belarus) have initiated studies on *Astacus astacus* and *Astacus leptodactylus* which are both

aboriginal for Belarus. During the last 30 years there have been no studies on freshwater crayfish in Belarus and present conditions of the crayfish populations, resources, distribution and biology are unknown. Drs Kulesh and Alekhovich are interested in information from and cooperation with other astacologists.

NOBLE CRAYFISH NATURAL IMMIGRANT OR STOCKED BY MAN IN SWEDEN?

In the last issue of *Kräftinformation* 3/94 published by South Sweden Aquaculture Society (Utövägen 5, S-371 37 Karlskrona, Sweden) P. Petersen discuss the evidence for natural immigration of noble crayfish in Scandinavia. The following are major arguments for man introducing the species. (1) There have been no archaeological findings of noble crayfish in Sweden despite such findings in Finland in the layers from the Littorina Period. Crayfish remains have not been observed on Stone Age Living Areas. (2) Crayfish distribution have successfully been increased northwards in both Sweden and Finland during later decades. However if noble crayfish are natural immigrants climate were more favourable in previous period and might expect noble crayfish to have a wider natural distribution. (3) Written sources describe introductions and stocking of noble crayfish during the 16th century. There is now written record of noble crayfish prior to 1522. (In Norway crayfish is mentioned for the first time in 1752. Eds note). (4) There is a lack of genetic variation of Swedish noble crayfish populations as opposed to the situation in Polish populations. P. Petersen therefore favours an alternate hypothesis for noble crayfish immigration to Sweden. After the glacial periods noble crayfish was a late migrant who did not reach the Baltic Sea before it did become brackish and prevented natural immigration to Sweden. Thus the crayfish in both Sweden and Norway are the results of human introductions.

AGRICULTURAL BIOLOGICAL DIVERSITY INITIATIVE IN LOUISIANA USA

Much of the arable lands in North America has been converted to livestock and crop production on farms and ranches. However, there is much opportunity to provide habitat for all manner of organisms on these lands. This is evidenced by the development of many programs to assist the agricultural community in managing its lands to ensure that biological diversity is maintained.

The University of Southwestern Louisiana College of Applied Life Sciences has developed its 240+ ha Experimental Farm in St. Martin Parish - south-central Louisiana - with the realization that the maintenance and enhancement of Biological Diversity must be an important component of any agricultural research program. This unit is situated astride the natural loessal terrace and adjacent lowlands about 1.5 km west of Bayou Teche. Subunits include managed (aquaculture) and forested semi-natural, short-hydroperiod wetlands as well as livestock (beef, dairy, sheep, and goat) pasture, organic waste lagoons, hay fields, and crop lands.

Special attention has been paid to vertebrate biodiversity on this farm. To date, over 100 bird, 25 mammal, 30 reptile and snake, and 25 fish species have been documented on the farm. Crayfish species include *Cambarellus shufeldtii*, *Cambarus ludovicianus*, *Fallicambarus fodiens*, *Orconectes lancifer*, *Orconectes palmeri*, *Procambarus clarkii*, *Procambarus hinei*, and *Procambarus zonangulus*. The freshwater shrimp, *Palaemonetes kakadiensis* is very common, as well. All of these crustaceans are important foods for many of the wetland vertebrates on the farm.

[For further information, contact Jay V. Huner, Crawfish Research Center, P.O. Box 44650, University of Southwestern Louisiana, Lafayette, Louisiana 70504 USA].

RECENT PUBLICATIONS OF INTEREST TO ASTACOLOGISTS

Have you ever wondered why your most recent publications have not been referenced in the newsletter? What about information about a meeting that you are planning, held, or attended? There are two realistic answers. The first is that your editors, being human, misplaced the information that you sent for the newsletter. However, the second answer is much more likely to explain the situation. That is, you never sent the information in the first place! Do not say that you should have sent something. Send it! It really is never too late to use something that a member thinks is important!

Please note: IAA is not able to provide copies of these publications to members. Please use traditional library services. Address to many of the authors may be found in the IAA directory for orders of reprints directly from the author.

1. Anonymous. 1994. Yabbie nutrition. The importance of naturally occurring organisms. The Freshwater Farmer 1(3):10-11.

2. Bosworth, B. G., W. R. Wolters, & A. M. Saxton. 1994. Analysis of diallel cross to estimate effects of crossing on performance of red swamp crayfish, *Procambarus clarkii*. Aquaculture 121:301-312.

3. Brummett, R. E. & N. C. Alon. 1994. Polyculture of Nile tilapia (*Oreochromis niloticus*) and Australian red claw crayfish (*Cherax quadricarinatus*) in earthen ponds. Aquaculture 122:47-54.

4. DeMiguel, F.F. & H. Arechiga. 1994. Circadian locomotor activity and its entrainment by food in the crayfish *Procambarus clarkii*. J Exp Biol 190:9-22.

5. Edgerton, B., L. Owens, B. Glassons & S. Debeer. 1994. Description of a small dsRNA virus from freshwater crayfish *Cherax quadricarinatus*. Diseases of Aquatic Organisms 18(1):63-70.

6. Elser, J.J., C. Junge & C.R. Goldman. 1994. Population structure and ecological effects of the crayfish *Pacifastacus leniusculus* in Castle Lake, California. Great Basin Naturalist 54(2):162-169.

7. Eversole, A.G. & C.J. Kemton. 1994. Production of crawfish in earthen ponds of different depths. Progr Fish-Cult 56(2):117-122.

8. Fotenot, L.W., S.G. Platt & C.M. Dwyer. 1993. Observations on crayfish predation by water snakes, *Nerodia* (Reptilia, Colubridae) Brimleyana J North Carolina State Museum Natl History 19:77-82.

9. Geddes, M. C. & M. Smallridge. 1993. Survival, growth, and yield of the Australian freshwater crayfish *Cherax destructor* in extensive aquaculture ponds. Aquaculture 114:51-

10. Girardi, H. 1993. Sur la presence de *Procambarus clarkii* (Girard), 1852 dans le Bay (Gard) et la Durance (Bouches du Rhone) (Crustacea, Decapoda, Cambaridae). Bull. Soc. Et. Sci. Nat. Vaucluse: 11-16.

11. Gray, L. 1994. Bird predation. The Freshwater Farmer 1(3):12-13.

12. Huner, J. V. 1994. The American impression of yabbie farming. The Freshwater Farmer 1(4):12-13.

13. Huner, J. V. and L. Burras. 1994. Poor early season crawfish production in SW Louisiana viewed. The Aquaculture News 2(9):12.

14. Kawai, T. 1994. Distribution and habitat of the Japanese crayfish *Cambaroides japonicus* in Hokkaido, Japan. Bull. Higashi Taisetsu Museum of Natural History 16:21-24.

15. Kawai, T., T. Hamano, & S. Matsuura. 1994. Chilled loss of the Japanese crayfish, *Cambaroides japonicus* in a stream and a lake in Hokkaido, Japan. SUISANZOSHOKU H6:215-220.

16. King, C. R. 1994. Growth and survival of red claw crayfish hatchlings (*Cherax quadricarinatus* von Martens) in relation to temperature, with comments on the relative suitability of *Cherax quadricarinatus* and *Cherax destructor* for culture in Queensland. Aquaculture 122:75-80.

17. Laurent, P. J. 1994. Quelles ont ete nos importations d'ecrevisse en 1993? [How much crayfish did we (France) import in 1993?] L'Astaciculteur de France 39:7-12.

18. Manchino, Y. 1994. L'ecrevisse a pied blancs en Autriche occidentale? [White clawed crayfish in Western Austria?]. L'Astaciculteur de France 39:2.

19. Marlowe, R.L., R.M. Dillaman & R.D. Roer. 1994. Lectin binding by crustacean cuticle -The cuticle of *Callinectes sapidus* throughout the molt cycle, and the intermolt cuticle of *Procambarus clarkii* and *Ocypode quadrata*. J Crustacean Biol 14(2):231-246.

20. McClain, W. R. 1994. Soghum-sudangrass demonstrates good capabilities as a crawfish forage crop. Louisiana Agriculture 37(2):18-19.

21. Mitchell, B.D., R.O. Collins & C.M. Austin. 1994. Multi-level refuge utilization by the freshwater crayfish *Cherax destructor* Clark (Decapoda: Parastacidae): a potential harvest and sampling technique. Aquaculture and Fisheries Management 25:557-562.

22. Reiber, C.L. 1994. Hemodynamics of the crayfish *Procambarus clarkii*. Physiol Zool 67(2):449-467.

23. Tadashi, K. 1994. Habitat of the Japanese crayfish *Cambaroides japonicus* in the Bishamon River, Kushiro City, Hokkaido Prefecture. Memoirs of the Kushiro City Museum (Kushiro, Japan) 18:45-48.

24. Tadashi, K. 1994. Spawning behavior of the Japanese crayfish, *Cambaroides japonicus*. Memoirs of the Kushiro City Museum (Kushiro, Japan) 18:49-52.

25. Uiska, E., D.W. Dunham & H.H. Harvey. 1994. Cumulative pattern in pH change alters response to food in the crayfish *Cambarus bartoni*. Canadian J Zool 72(1):187-189.

26. Vigneux, E., P. Keith, and P. Noel. 1993. Atlas preliminaire des crustaces decapodes d'eau douce de France. Collection "Patrimoines Naturels" volume 14, Museum National D'Histoire Naturelle, Secretariat de la Faune et de la Flore, 57 rue Cuvier, F-75 231 Paris Cedex 05, 55 pages, prix 40 French Francs.

NEW MEMBERS AND ADDRESSES

A listing of all members and mailing addresses will precede or follow this newsletter closely. This is not the IAA Directory as it will only include names and addresses. The IAA Directory will be published in early 1995 once most members have had an opportunity to renew their dues and update their directory listings.

MISSING MEMBERS

[Please contact the Secretariat if you know the whereabouts of missing members.]

Guhr, Royce - last address - 401 1/2 East Avenue E., S. Hutchinson, Kansas 67505 USA.

Knudsen, Hans Christian - last address: Kaigaten 9, N-5016 Bergen, Norway.

Noblitt, Steve - last address: Department of Biology, Memphis State University, Memphis, Tennessee 38152 USA.

FRESHWATER CRAYFISH - AVAILABLE VOLUMES

I. Freshwater Crayfish I (1973) - Prof. Per Brinck, Ecology Building, Univ. of Lund, S-223-62 Lund, Sweden. Cost is \$US 20 plus \$US 5 for surface post-