

Davis, California USA (1981), and Lund, Sweden (1984) are available. For information, contact:

1. Freshwater Crayfish IV - Prof. Pierre J. Laurent, Avonnex a Marin, F-74200 Thonon les Bains Cedex, France. Payment is 63 Swiss Francs (surface mail expenses included). Make payment to the International Association of Astacology's bank account, Credit Lyonnais, 1 Place Bel Air, Geneve, Switzerland, Compte No. 39128.4.00.001.
2. Freshwater Crayfish V - Van Nostrand Reinhold, 115 Fifth Avenue, New York, New York 10003 USA. (Originally published by AVI Publishing Co., Westport, Connecticut USA). Cost is approximately \$35 US plus postage and handling. Check for exact price.
3. Freshwater Crayfish VI - Professor Per Brinck, Ecology Building, University of Lund, S-223-62 Lund, Sweden. Cost is \$30 US plus \$5 surface postage.

LOST MEMBERS--(1) William H. Horns, 1240 Girard St., N.W., Washington, DC 20009 USA & (2) Vasilis Georgousis, Gamla Bjorlandavagen 21, S-417 20 Gothenburg, Sweden. If anyone knows these two colleagues, please send an address to the newsletter editor.

MEMBERSHIP INFORMATION - INTERNATIONAL ASSOCIATION OF ASTACOLOGY--Membership is open to anyone interested in the study of freshwater crayfishes or their exploitation. Membership categories are: regular, \$25.00 US; student, \$12.50 US; and business, \$50.00 US. Members receive the quarterly IAA Newsletter and Directories of Astacologists as they are published. Current dues cover the period August 1987-April 1990. The next international symposium will be held in mid-April 1990 at Louisiana State University, Baton Rouge, Louisiana USA. To apply for membership, send checks (US banks) or international money orders (US dollars) made out to IAA to;

International Association of Astacology
P.O. Box 10809
Southern University
Baton Rouge, Louisiana 70813 USA

MEMBERSHIP LIST--A membership list as of 1 May 1988 will be mailed with this newsletter or shortly thereafter. It is not the Directory of Astacologists that was to be published in May. The Directory is being held until more members respond to the call for dues and return directory forms.



INTERNATIONAL ASSOCIATION
OF ASTACOLOGY
I.A.A.

P.O. Box 10809
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Baton Rouge, Louisiana 70813
USA



NEWSLETTER OF THE INTERNATIONAL ASSOCIATION OF ASTACOLOGY

Mar./Apr. 1988 Volume 10, Number 3

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FROM THE SECRETARY/TREASURER, MEMBERSHIP--Only about 50 % of the membership has responded to the call for dues and/or completed our Directory of Astacologists form which were enclosed with the Dec. 87/Jan. 88 newsletter. To avoid confusion, a colored directory/dues forms is enclosed for those of you have not, according to our records, paid your dues. Please respond at your earliest possible convenience so that we do not drop you from our membership rolls.

FROM THE PRESIDENT--IAA President Jim Payne wishes to announce the Executive Board of the International Society of Astacology for the term 1987-1990. Names and addresses are as follows:

- (1) Lawrence de la Bretonne, Jr., Louisiana Cooperative Extension Service, Knapp Hall-LSU, Baton Rouge, Louisiana 70803 USA.
- (2) Magnus Fürst, Institute of Freshwater Research, S-170 11 Drottningholm, Sweden.
- (3) Charles Goldman, Division of Environmental Studies, University of California, Davis, California 95616 USA.
- (4) Andres S. Habsburgo-Lorena, Fuente Milanos 2, 28035 Madrid 35, Spain.
- (5) Jozef Kossakowski, Profesorska 12/2, 10-080 Olsztyn, Poland.
- (6) Ossi V. Lindqvist, Department of Applied Zoology, University of Kuopio, P.O.B. 6, SF-70211 Kuopio 21, Finland.
- (7) Walter T. Momot, Department of Biology, Lakehead University, Thunder Bay, Ontario P7B 5E1, Canada.
- (8) Noel Morrissy, Western Australian Marine Research Laboratories, Box 20, North Beach, Western Australia 6020, Australia.
- (9) Julian Reynolds, Department of Zoology, Trinity College, Dublin 2, Ireland.

(10) Jostein Skurdal, Environmental Protection Department, Statsetatenes, N-2600 Lillehammer, Norway.

President Payne has charged the Executive Board with recruiting new members and providing information for the quarterly IAA Newsletter. Members are asked to communicate frequently with the board members nearest to them.

FRESHWATER CRAYFISH; A JOURNAL OF ASTACOLOGY VOLUME VII-- Reviewed copies of the proceedings have been sent to authors by Prof. Goeldin from Lausanne and he has requested that they be returned by mid-May of this year. Thus, we can expect publication in the near future. Cost will be in the neighborhood of 60 Swiss francs. More information will be provided in the next newsletter.

APHANOMYCOSIS IN ENGLAND--President-elect David Holdich (address on masthead) reports that aphanomycosis has appeared in stocks of Astropotamobius pallipes near Nottingham as a consequence of contact with chronically infected Pacifastacus leniusculus. The P. leniusculus were crayfish born in England and were infected there.

APHANOMYCOSIS IN IRELAND--There are sketchy reports that Aphanomyces astaci has been discovered in Ireland. Inquiries about the matter may be forwarded to Dr. Julian Reynolds, Dept. of Zoology, Trinity College, Dublin 2, Ireland.

LITHUANIAN ASTACOLOGISTS--Professor Jakov Cukerzis has sent the following list of Lithuanian astacologists to share with our IAA membership.

- (1) Cukerzis, Jakov. Address: Zirmunu 26-76, 232051 Vilnius, Lithuanian SSR, USSR. Specialty: ecologist (crayfish biology, ecology, ethology, biotechnics, taxonomy).
- (2) Mackeviciene, Guoda Liuciija. Address: P. Cvirkos 38/9-2, 232001 Vilnius, Lithuanian SSR, USSR. Specialty: biologist-ichthyologist, biochemist (crayfish physiology, biochemistry).
- (3) Tamkeviciene, Elena Karolina. Address: Justiniskiu 11-11, 232056 Vilnius, Lithuanian SSR, USSR. Specialty: trophologist (crayfish trophology, ecology, ethology).
- (4) Dorosenko, Yuriy. Address: Verkiu 57-1, 232021 Vilnius, Lithuanian SSR, USSR. Specialty: ethologist (crayfish ethology, ecology, biotechnology).
- (5) Mickeniene, Liogina. Address: Taikos 95-13, 232035 Vilnius, Lithuanian SSR, USSR. Specialty: microbiologist (microbiology of crayfish digestive tract).
- (6) Burbá, Aloyzas. Address: Justiniskiu 109-86, 232017 Vilnius, Lithuanian SSR, USSR. Specialty: ethologist (stresses caused by physical factors - electricity, chemistry, light).
- (7) Terentyev, Anatoliy. Address: Didlaukio 38-18, 232057 Vilnius, Lithuanian SSR, USSR. Specialty: biotechnician (crayfish biotechnics).

NEWS FROM JOZEF KOSSAKOWSKI IN POLAND--Professor Kossakowski writes that since he has retired, he has been keeping in touch with astacologists in Poland, USSR, Romania, Bulgaria, Hungary and GDR. He now sends the IAA Newsletter to 18 persons in those countries. This is a very valuable service for IAA and is most appreciated. Professor Kossakowski also serves as a member of the Executive Board of IAA. He may be contacted at: ul. Profesorska 12/2, 10-080 Olsztyn, Poland. In addition to the Lithuanian SSR colleagues previously mentioned, Prof. Kossakowski also corresponds with the following astacologists: (1) Anwand, Karl. Address: Inland Fisheries Institute, Mueggelseedamm 310, 1162 Berlin, G.D.R. Specialty: Ichthyologist.

(2) Avramova, Rayna. Address: 4, Solna, 8200 Pomorye, Bulgaria. Specialty: biology and ethology of crayfish. (Dr. Avramova is a regular IAA member.)

(3) Brodsky, Semen. Address: Ramot-A bloc 34/3, Sullam Yakov str., 97729 Jerusalem, Israel. Specialty: biology and taxonomy of crayfish. (Prof. Brodsky emigrated from the USSR several years ago.)

(4) Cherkashina, N. Ya. Address: Azov. NIIRKh, Beregovaya 21, 344701 Rostov USSR. Specialty: biology of crayfish especially Astacus leptodactylus.

(5) Ivanov, B. G. Address: VNIRO, V-Krasnoselskaya 17, 107140 Moskva, USSR. Specialty: President of scientific committee of invertebrates in USSR waters.

(6) Nefedov, V. N. Address: Volg.otd. Gos. NIORKh, Pugachevskaya 1, 400001 Volgograd USSR. Specialty: biology of crayfish.

(7) Orzechowski, Bogumil. Address: Dept. of Ecology and Environ. Prot., High Pedagogical School, Arciszewskiego 22 a, 76-200 Slupsk, Poland. Specialty: biology and ecology of crayfish especially Orconectes limosus.

(8) Papadopol, Michal. Address: Str. Conductei 5-13 bloc 57 ap. 10, 7586 Bucuresti, Romania. Specialty: biology of crayfish.

(9) Stavrovskiy, K. B. Address: Bulvar Lenia 9-13/14, 252186 Kiev, USSR. Specialty: biology of crayfish especially Astacus leptodactylus.

(10) Stypinska, Maria. Address: Warszawska 62/22, 10-084 Olsztyn, Poland. Specialty: biology and fecundity of crayfish.

(11) Thuransky, Miklos. Address: 25, Belgrad rkp. 1056 Budapest, Hungary. Specialty: biology and zoogeography of crayfish. (Mr. Thuransky is a member of IAA and an item about his work appears below.)

Prof. Kossakowski also writes that, "In Poland we catch crayfish from May to September. Polish resources of Astacus astacus L. and Astacus leptodactylus Esch. are very small, however, after many years, a little export was started, not very long ago."

RETIRED MEMBERS--John and Katherine Wright, both long time IAA members, have announced their retirements. They may be contacted c/o The Newberry Crayfish Hatchery, P. O. Box 4278, Santa

Barbara, California 93140 USA. Although retired from the actual cultivation of crayfish, the Wrights still welcome contact with other astacologists.

Richard Bobbjerg, another long time member, has also announced his retirement from Iowa State University. Persons wishing to stay in touch may contact him at 1710 Ridge Road, Iowa City, Iowa 52242 USA.

IAA TO CO-SPONSOR CRAWFISH SESSION AT THE AQUACULTURE LOS ANGELES '89 MEETING--A special session on crayfish will be co-sponsored by the Louisiana Crawfish Farmers' Association and the IAA at the mid-Feb. 1989 Aquaculture Los Angeles '90 meeting in Los Angeles, California USA. Co-ordinators for the session are Jack M. Whetstone (P.O. Drawer 1100, Georgetown, South Carolina 29442-1100 USA) and your secretary/treasurer Jay Huner. The tentative topics that will be addressed include: (1) Historical Overview of Crawfish Culture Intensification; (2) European Crawfish Culture Intensification; (3) Australian Crawfish Culture Intensification; (4) New Advances in Crawfish Forage Management; (5) Intensification of Crawfish Culture with Supplemental Feeds; and (6) Potential for Genetic Improvement in Crawfish Culture. All but one of the tentative speakers are IAA members and an effort is being made to encourage that individual to join IAA!

SYMPOSIUM ON CULTURING CRAYFISHES IN MISSOURI--This was held on April 8, 1988 at Southwest Missouri State University, Springfield, Missouri USA. Organized by Drs. Milton Topping and Robert Wilkinson, speakers included several IAA members. These were William Pleiger (Missouri crayfishes), Jay Huner (bait crayfish and soft-shell crayfish), Louis D'Abramo (crayfish culture at mid-latitudes), Walter Momot (selection of species for culture), and Harold Klaassen (culturing Orconectes nais). Dr. Klaassen's presentation was especially interesting because he reported on production of O. nais of as much as 1,000 kg per ha in permanent ponds greatly enriched with organic matter from cattle herds. This provides an alternative to Procambarus clarkii at mid-latitudes. All presentations were excellent and it is anticipated that a proceedings will be published. Inquiries should be directed to either Dr. Topping or Dr. Wilkinson at: Dept. of Biology, Southwest Missouri State University, Springfield, Missouri 65804 USA.

CRAYFISH IN UGANDA & KENYA--Dr. C. M. French (P.O. Box 21771, Nairobi, Kenya) is looking into development of crayfish fisheries in Uganda (Procambarus clarkii). He writes that crayfish are clearly present in Lake Kyoga but has not yet had the opportunity to ascertain population levels. He also notes that the catch of crayfish from Lake Naivasha in Kenya seems to be declining and that there may be a correlation between a general decline in water levels and, perhaps, pollution.

PROCAMBARUS CLARKII IN SINGAPORE?--Lee Eng Shiew (Primary Production Department, Ministry of National Development, 8th Storey, National Development Building, Maxwell Road, Singapore 0106) writes: "We wish to inform you that Procambarus clarkii is not cultured in Singapore and the transshipment volume is very small. As such, our Department do not monitor the trade in the species."

NORWEGIAN CRAYFISH STUDIES--1. Dag Hessen (Univ. of Oslo, Inst. of Biology, Division of Zoology, Box 1050, N-0316 Blindern, Oslo 3) writes that he now has two students doing their masters on crayfish metabolism (energy), including calcium requirements and energetic costs of molting. 2. Trond Taugbol (Mesna Aquafarm, P. O. Box 447, N-2601 Lillehammer) has been working with Jostein Skurdal on suitability of various stocks of wild Astacus astacus for aquaculture purposes. They have found wide variability in the adaptability of some stocks for aquaculture units.

HUNGARIAN CRAYFISH STUDIES--Miklos Thuranszky (25 Belgrad rkp., 1056 Budapest, Hungary) has sent the following reprint: Thuranszky, M. and L. Forro. 1987. Data on the distribution of freshwater crayfish (Decapoda: Astacidae) in Hungary in the late 1950s. *Miscellanea Zoologica Hungarica* 4:65-69. Mr. Thuranszky notes that this survey is being used for baseline comparison with a current crayfish survey that his colleagues and he are now conducting.

AQUATIC WEED PROGRAM REFERENCE SERVICE--The Aquatic Weed Program at the University of Florida (Room 2183 McCarty Hall, University of Florida, Gainesville, Florida 32611 USA) maintains an Aquatic Plant Information Retrieval System with a database of over 25,000 aquatic plant articles, reports, and books. It adds 200 citations per month. It currently has 7 citations dealing with freshwater crayfish. Individuals are encouraged to forward publications to the Aquatic Weed Program. Contributions and inquiries may be directed to Karen Brown, Information Specialist.

IMPACT OF PROCAMBARUS CLARKII IN SPAIN--The impact of Procambarus clarkii on the Donana National Park in southwestern Spain is much debated. The subject was covered in a recent paper by H. Delibes & I. Adrian: Effects of crayfish introduction on otter Lutra lutra food in the Donana National Park, SW Spain. *Biol. Conservation* 42:153-159. 1987. The authors conclude "...the hypothetical elimination of the introduced crayfish ... could be catastrophic in the short term for otters and other predators in the area. On the other hand, the decreasing faunistic diversity in the marismas following the crayfish introduction, and the resultant intensive commercial fishing, strongly demand a control of the crayfish populations and of fishing volume and methods."

SHELLFISH TOUR, SOUTH PACIFIC--Dr. Anthony J. Provenzano, Jr. (Dept. of Oceanography, Old Dominion University, Norfolk, Virginia 23058 USA) is leading a People to People program Shellfish Production and Research Delegation to the South Pacific. This is a program designed to foster communication between U.S. citizens and the peoples of the world. The trip begins on October 14, 1988 and ends November 3, 1988. It will include tours of shellfish facilities in New Zealand, Australia, and Fiji with emphasis on crayfish. Both east and west coasts of Australia will be visited if plans work out.

DESIGN MANUAL FOR INTENSIVE SOFT-SHELL CRAYFISH PRODUCTION SYSTEMS--Dr. R. P. Malone and his student D. G. Burden (Department of Civil Engineering, Louisiana State University, Baton Rouge, Louisiana 70803 USA) have prepared a comprehensive design manual for setting up recirculating systems for the production of soft-shell crayfish. Soft-shell crayfish have been a very popular, high value aquaculture product in Louisiana in recent years. This has required the development of cost effective, energy saving systems. The design manual is in a "pre-publication" situation at this writing but should be generally available within the next 60 days. Inquiries about the manual should be directed to the Sea Grant Publications, Louisiana Sea Grant College Program, Center for Wetland Resources, Louisiana State University, Baton Rouge, Louisiana 70803 USA. Prepublication cost (prior to 15 June 1988) will be \$8 US. Regular price will be \$10 US.

CRAYFISH CULTURE IN NEW YORK STATE, USA--Dr. Paul R. Bowser (Dept. of Avian and Aquatic Animal Medicine, Cornell University, Ithaca, New York 14853-6401 USA) writes that "...Crayfish aquaculture in New York is presently directed toward the baitfish market. There are approximately 500 acres of production ponds that yield a crop with a value of approximately \$250,000 annually. Crayfish are sold by the 1000. Hardshell sell for \$30-50/1000; softshells sell for \$80-150/1000...." [Note: Species known to be cultured in New York are Orconectes immunis and Procambarus acutus.]

CHILIEAN INTERESTED IN ASTATOLOGY--Luis Crenovich-B. (Ingeniero Civil, U. de CH, Paul Claudel 1044, Santiago, Chile) is most interested in developing crayfish resources in his country. Correspondence may be directed to him.

RESTORATION OF CRAYFISH POPULATIONS IN SWEDEN--Stellan Karlsson, a past president of IAA, shared some information about his firm's (Simontorp Aquaculture AB, S-270 35 Blentarp, Sweden) contributions to restoration of Swedish crayfish populations during the past 20 years. According to Stellan, about 200 tonnes of Pacifastacus leniusculus was produced in 1987 in Sweden, many the offspring of juvenile crayfish

produced by Simontorp Aquaculture AB. His firm has restored over 1,000 crayfish waters in Sweden.

SPANISH CRAYFISH JOURNAL--A crayfish conference was held 9-10 May 1986 in Vitoria, Spain. A proceedings has now been published in Spanish. It is part of a series and the reference is: Informes Tecnicos No. 4, Jornadas De Estudio Del Cangrejo De Rio, Vitoria, 9-10 de mayo de 1986. Eusko Jaurlaritza, Nekazaritza eta Arrantzu Saila, Gobierno Vasco, Dpto. de Agricultura y Pesca, Granja Modelo, Arkaute-Vitoria (Alava), 1987. For more information, contact: Jose Ramon Gonzalez Tapia, Granja Modelo, Arcaute, Apartado 46, Vitoria, Spain. The table of contents of this 156 page text are as follows: (1) Alava el medio fisico y el cangrejo de rio; (2) Repoblaciones astacologicas en la peninsula Iberica: Consideraciones y lineas metodologicas generales; (3) Especies y distribucion. Interes de su explotacion y mercado; (4) La afanomicosis, aspectos sanitarios del cangrejo de rio; (5) Estudio de la poblaciones astacologicas en los rios de la provincia de Burgos. Perspectivas; (6) Experiencias recientes en los rios ingleses, estrategias de recuperacion; (7) Cultivo del cangrejo autoctono; (8) Metodologia de cultivos para repoblacion. Cien anos de experiencias europeas; (9) La gestion de las aguas continentales; and (10) Conclusiones.

NORTH CAROLINA CRAWFISH PRODUCERS' ASSOCIATION FORMED--North Carolina is a southern US state with a mild climate and suitable conditions for crayfish aquaculture. A producers' association was recently formed to enhance information exchange, provide unity in marketing and promotional activities, and to serve as a voice in legislative matters. There are currently 100-120 ha in production averaging around 700 kg per ha per year of Procambarus clarkii. Price is between \$2.75-3.30 per kg. For information contact: Johnny Foster, AAS-Aquaculture Advisory Service, P. O. Box 1294, Garner, North Carolina 27529 USA.

OXYGENASE SYSTEMS IN CRAYFISH HEPATOPANCREAS AND GREEN GLAND--The microsomal mixed function oxygenase system from the hepatopancreas and green gland of the red swamp crayfish, Procambarus clarkii has been characterized with respect to 1) the constitution of electron transport proteins; 2) the ability to catalyze the metabolism of xenobiotics; 3) the binding affinity of specific ligands to the microsomal cytochrome P-450; and 4) the nature of the heme environment through electron perturbations induced by various ligands in a recent MS thesis by Catherine S. E. Jewell. The reference is: Jewell, C. S. E. 1987. Characterization of the microsomal mixed-function oxygenase system of the hepatopancreas and green gland of the freshwater crayfish, Procambarus clarkii. MS. Thesis, Louisiana State University, Baton Rouge, Louisiana 70803 USA. Ms. Jewell is continuing her studies with Dr. Gary Winston, Institute for

Environmental Studies, Louisiana State University, Baton Rouge, Louisiana 70803 USA. They have completed several manuscripts based on her thesis work and they are now being reviewed prior to publication.

PSOROSPERMIUM HAECKELI IDENTIFIED IN NORTH AMERICA--The first report of E. haeckeli in a North American crayfish was made in a doctoral thesis by B. J. Lee at Texas A&M University. The reference for the thesis is: Lee, Betty Jo. 1984. Histopathological effects of calcium, temperature and ammonia on selected organs of the crayfish, Procambarus clarkii. Ph.D. Thesis, Texas A&M University, College Station, Texas USA.

MOLTING AND GROWTH IN CRAYFISH; A REVIEW--This publication (D. E. Aiken & S. L. Waddy. December 1987. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1587, 34 pp.) is available from the authors at: Biological Station, St. Andrews, New Brunswick, Canada E0G 2X0. This is one of the most complete and current reviews on the subjects of molting and growth in crayfishes. Any astacologist would benefit by having a copy for reference.

NEW SYSTEM FOR PRODUCING SOFT-SHELL CRAYFISH--The following patent has been issued: Malone, R. F. and D. D. Culley. 1988. Method and apparatus for farming softshell aquatic crustaceans. U. S. Patent No. 4,726,321, Feb. 23, 1988. Dr. Malone may be contacted at: Dept. of Civil Engineering, L.S. State Univ., Baton Rouge, Louisiana 70803 USA.

RESTORATION OF AUSTROPOTAMOBIVUS PALLIPES IN ITALY--The following popular article was recently forwarded to the newsletter. Verbi, G. 1988. Il gambero d'acqua dolce. Udine Economica 3/88:40-47. It provides details and outstanding pictures of the efforts being made to restore A. pallipes populations in Italy. The English summary follows:

"Crayfish, like the trout and the cockle, used to be a traditional dish of the region but has now almost disappeared, partly due to crayfish pest, but mainly because of overfishing and the use of weed killers.

"There are now plans for the repopulation of Friuli's streams following a scientific census of surviving specimen. Dr. De Luise and Dr. Sabbadini members of IAA (International Association of Astacology) are following the project backed by the Chamber of Commerce and financed by the <<Pondo Gaspardis>>. Two areas in particular have been chosen for repopulation-one in the Pordenone area and the other in the Cividale area.

"The project, besides its obvious environmental advantages, may also lead to a relaunch of crayfish also at a gastronomic level with subsequent commercial advantages."

CHERAX SPP. NEWS FROM AUSTRALIA--Chris Austin (Australian Aquaculture, P.O. Box 105, Margaret River, 6285, Western Australia, Australia) recently sent two papers dealing with his studies of *Cherax* spp. The references are: Austin, C. 1987. Diversity of Australian freshwater crayfish increases potential for aquaculture. Australian Fisheries, May 1987, pp. 30-31 and Austin, C. 1986. Genetic considerations in freshwater crayfish farming. In: Freshwater Aquaculture in Australia. Rural Press, Brisbane, Australia. He also notes, "...In addition to at least 5 papers from my thesis I have several other papers in various stages of preparation which include: an electrophoretic and morphological study of hybridization in the marron; a multivariate morphometric study of sexual dimorphism in the marron, red claw and yabby; effects of temperature and salinity on growth and survivorship of juvenile red claw; and edible meat yield of 5 species of *Cherax*...."

RED CLAW MARRON--Quite a lot is being said about *Cherax quadricarinatus* with respect to its "superiority" to marron, *Cherax tenuimanus* and yabby, *Cherax destructor*, in aquaculture situations. Dr. Chris Austin made the following comments about the matter in a recent article in the Marron Growers Bulletin (Austin, C. H. 1987. Crayfish Confusion -- A Clarification. Marron Growers Bull. 9(3):5-6): "The statement ... that 'Queensland Marron [Red Claw] are certain to push Western Australian Marron out of the marketplace' would appear to be somewhat premature. Whilst the Red Claw undoubtedly has considerable aquaculture potential the apparently unlimited market for Australian crayfish should ensure that there will be room for more than one species. Common sense would dictate that the Marron would be more suited to farming in the cooler southern regions of Australia whereas the Red Claw would be more suited to the warmer northern regions. It may be that suitable strains of both Marron and Red Claw could be farmed in south-east Queensland with appropriate research and farm management practices."

AUSTRALIAN CRAYFISH CULTURE VIDEO--"Growing Freshwater Crayfish" is a video available to those interested in culturing *Cherax* spp. It was filmed at 7 producing crayfish farms across Australia and features breeding, stocking, management, aquatic vegetation, feeding, etc. According to Al Smith (P.O. Drawer 10141, Denver, CO 80210), it was produced by John Lunnay. Individuals interested in securing copies should contact Al. He writes that the price in U.S. dollars would be \$75.00 plus handling in either NTSC or PAL formats.

PIPE TRAP FOR CAPTURING BURROWING CRAYFISHES--Jim Norrocky (Route 1, Vickery, Ohio 43464 USA) has developed a pipe trap for inserting in burrows of burrowing crayfishes. Jim's work has been mentioned in past newsletters. We hope to publish a diagram of the trap in an upcoming newsletter. Jim requests

that anyone who has used a pipe trap (or any other kind of trap to capture burrowing crayfishes) to contact him. (For a reference see: Norrocky, M. J. 1984. Burrowing crayfish trap. Ohio Journal of Science 84(1):65-66.)

REPRODUCTION IN BURROWING CAMBARID CRAYFISHES--Jim Norrocky (address immediately above) reports the following observations for *Fallicambarus fodiens*. "I have collected *Fallicambarus fodiens* females locally from October to April carrying eyed eggs. This spring I put one of these females in the refrigerator at 42 F [5 C] and just yesterday [22 April] noticed that these eggs had hatched. Females in the ditch [source population] have been carrying young since the first week of the month and the eggs in the fridge may have hatched earlier. The embryology involved in eggs extruded in the fall which develop to the eyed stage, are carried over winter, then hatch at some point in the spring, should be a good project for someone with enough lab facilities to control temperature for extended periods. A note in the Newsletter might shake someone out of the wood work. I would be willing to provide the crayfish (when available) for payment of the freight."

DEVELOPMENT OF CRAYFISH FISHERY IN MINNESOTA USA--According to an article in a recent issue of Water Farming Journal (Metairie, Louisiana, April 1988, p. 10), a pilot crayfish harvest is planned in Minnesota this summer to ascertain if the state can produce some of the crayfish needed for the Swedish market. Swedish businessman Pelle Stalberg is directing the project which is being coordinated by Seafood Consultant Joe Regenstien of Cornell University and Jeff Gunderson of the Minnesota Sea Grant Program.

ABBREVIATED PROGRAM OF THE ANNUAL MEETING OF THE LOUISIANA CRAYFISH FARMERS' ASSOCIATION--The annual meeting of the LCFA was held on 26 Feb. 1988 in Lafayette, Louisiana. A number of seminars was presented and the results will be published in the April 1988 issue of Crawfish Tales, the official LCFA publication. Seminars included: Production - (1) Pond Construction; (2) Forages; (3) Water Quality; (4) Population Dynamics; (5) Harvesting Devices; (6) Traps & Baits; (7) Purged Crawfish; (8) Soft Shell Crawfish; (9) Flexibility in Pond Management; Marketing - (10) How to Promote and Advertise Your Product; (11) Participating in Trade Shows; (12) Restaurant Perspectives; (13) Marketing Soft Shell Crawfish Regionally & Nationally; (14) International Markets; (15) Freezing & Cold Storage; (16) Packaging; (17) Air Freight; (18) Regional/Nation-wide Marketing; Research Reports - (19) Paddle Wheel Aerators; (20) Status of Crawfish Feeds; and (21) Meat Yields in Red and White Crawfish. Subscriptions to the quarterly Crawfish Tales cost \$15 (US) and \$30 (international-air mail). Information may be obtained from the Louisiana Crawfish Farmers' Association, P.O. Box 91544, Lafayette,

Louisiana 70509 USA.

NATIONAL SHELLFISH ASSOCIATION MEETING/SPECIAL SESSION--CRAWFISH--NSA will hold its annual meeting June 26-30, 1988 in New Orleans, Louisiana USA. Topics and speakers for the special session on crawfish include: (1) Overview of International and Domestic Crawfish Production, J. V. Huner; (2) Commercial Crawfish Cultivation Practices, L. W. de la Bretonne, Jr.; (3) Forage and Feeding Systems for Commercial Crawfish Culture, M. W. Brunson; (4) Overview of Harvest Technology in Commercial Crawfish Culture, R. P. Romaine; (5) Crawfish Processing, M. W. Moody; (6) Louisiana Crawfish Products in Domestic and International Markets, K. J. Roberts; (7) Diversification of Crawfish Management Schedule, A. Eversole; and (8) Overview of Soft-shell Crawfish Research and Technology, D. Culley and L. Duobinis-Gray. For more information about the session, contact: R. P. Romaine, School of Forestry, Wildlife, and Fisheries, Louisiana State University, Baton Rouge, Louisiana 70803 USA.

L'ASTACICULTEUR DE FRANCE No 13, DECEMBRE 1987--The table of contents for this issue is: (1) Experience d'astaciculteur intensive, Y. Foex; (2) L'ecrevisse louisianaise: perspectives d'un voyageur du Nouveau Monde; (3) La Thelohaniose ou la maladie de la porcelaine vue de Limoges, P. Coste; (4) Compe rendue de l'Assemblee Generale du 3 Decembre 1987; (5) L'ARGUS de l'ecrevisse; and (6) Questionnaire a detache, a remplir et a retourner au secretariat avant fin janvier. Officers of the association are: President: G. Amato, 20 Rue du 8 Mai 1945, F-94700 Maisons Alfort, France; Treasurer: G. Francois, Les Clouzjoux, Brinion sur Sauldre, F-18410 Argent sur Sauldre, France; and Secretary: P. J. Laurent, au siege de l'Association, Avonnex a Marin, F-74200 Thonon, France. Membership fees are: 100 FF (France) and 200 FF (others).

INTERNATIONAL FISHERIES NEWSLETTER--The American Fisheries Society has instituted a new section in the area of International Fisheries. The first newsletter, vol. 1, no. 1, March 1988, included a nice article about IAA. Inquiries about the section should be directed to: Ms. Shirley Whitted, U.S. Dept. of Commerce, NOAA/NMFS (F-TS21), 1825 Connecticut Avenue, N. W., Washington, DC 20235 USA.

RECENT LITERATURE--

1. Hepworth, D.K. and D. J. Duffield. 1987. Interactions between an exotic crayfish and stocked rainbow trout in Newcastle Reservoir, Utah. N.A. J. Fish Mgmt. 7:554-561.
2. Rach, J. J. and T. D. Bills. 1987. Comparison of three baits for trapping crayfish. N.A. J. Fish Mgmt. 7:601-602.
3. Ridderstolpe, P. 1987. Aquaculture in combination with agriculture and nature conservation--crayfish culture in embogged arable land. Royal Institute of Technology, Dept. of

Land Improvement and Drainage, Meddelande Trita-Kut 1047, Stockholm, Sweden (In Swedish with English Summary).

4. France, R. L. 1987. Calcium and trace metal composition of crayfish (*Orconectes virilis*) in relation to experimental lake acidification. Can. J. Fish. Aquat. Sci. 44(suppl. 1):107-113.
5. France, R. L. 1987. Reproductive impairment of the crayfish *Orconectes virilis* in response to acidification of Lake 223. Can. J. Fish. Aquat. Sci. 44 (suppl. 1):97-106.
6. France, R. L. 1985. Increased microsporidian parasitism of the crayfish *Orconectes virilis* in an experimentally acidified lake. Water, Air and Soil Pollution 26:129-136.
7. Almar, M. M., J. Diaz-Mayans, M. D. Ferrando, A. Nunez, and F. J. Romero. 1988. Organ distribution of glutathione and some glutathione-related enzymatic activities in *Procambarus clarkii*. Effect of sex, size, and nutritional state. Comp. Biochem. Physiol. 89B:471-474.
8. Culley, D. D. and L. Duobinis-Gray. 1987. Molting, mortality, and the effects of density in a soft-shell crayfish culture system. J. World Aquacul. Soc. 18:242-246.
9. Brunson, M. W. and R. W. Taylor. 1987. Evaluation of three sorghums as potential alternative forages for crayfish culture. J. World Aquacul. Soc. 18:247-252.
10. Ellis, R. W., J. Long, L. Leitner, and J. Parsons. 1987. Estimation of crude protein, energy, and amino acid digestibilities in freshwater prawns (*Macrobrachium rosenbergii*) and crayfish (*Pacifastacus leniusculus*) with a fecal collection system. Prog. Fish-Cult. 49:302-303.
11. Harrell, R. M. 1987. Crawfish culture in Maryland. Maryland Sea Grant Extension Prog., Crawfish Aquaculture Workbook Series, Pub. No. UM-SG-MAP-87-02, College Park, Maryland, USA.
12. Ridderstolpe, P. 1987. The oxygen requirements of freshwater crayfish and natural oxygenation of water used in extensive culture. Information fran Sotvattens-Laboratoriet, Drottningholm (Sweden), Nr. 5. In Swedish with English Summary.
13. Rivas, J. D. L., J. C. G. Milcua, and R. Gomez. 1988. Further studies on the blue carotenoprotein from *Astacus leptodactylus*. Comp. Biochem. Physiol. 89B:65-68.
14. Kosiol, B., T. Bigalke, and K. Graszynski. 1988. Purification and characterization of gill (Na⁺, K⁺)-ATPase in the freshwater crayfish *Orconectes limosus* Rafinesque. Comp. Biochem. Physiol. 89B:171-177.
15. Fürst, M. and B. O. Andersson. 1988. Restoration of the crayfish fishery in Lake Hjälmaren. Information fran Sotvattens-Laboratoriet Drottningholm (Sweden), Nr. 3. In Swedish with English Summary.
16. Huner, J. V., O. V. Lindqvist, and H. Könönen. 1988. Comparison of morphology and edible tissues of two important commercial crayfishes, the noble crayfish, *Astacus astacus* Linné, and the red swamp crayfish, *Procambarus clarkii* (Girard) (Decapoda, Astacidae and Cambaridae). Aquaculture 68:45-57.
17. Tyler-Jones, R. and E. W. Taylor. 1988. Analysis of haemolymph and muscle acid-base status during aerial exposure

in the crayfish Austropotamobius pallipes. J. Exp. Biol. 134:409-422.

18. Marshall, G. A., M. W. Moody, and C. R. Hackney. 1988. Differences in color, texture, and flavor of processed meat from red swamp crayfish (Procambarus clarkii) and white river crayfish (P. acutus acutus). J. Food Sci. 53:280-281.

19. Rogers, R. L. and J. V. Huner. 1988. Observations on the crayfish fauna on the Southern University Campus, Baton Rouge, Louisiana. The Southwestern Nat. 33:120-121.

20. Delibes, M. and I. Adrian. 1987. Effects of crayfish introduction on otter Lutra lutra food in the Donana National Park, SW Spain. Biol. Conservation 42:153-159.

21. Adrian, M. I. and M. Delibes. 1987. Food habits of the otter (Lutra lutra) in two habitats of the Donana National Park, SW Spain. J. Zool, Lond. 212:399-406.

22. Huner, J. V. and V. A. Pfister. 1987. Growth of ditch caught juvenile commercial crayfishes (Procambarus acutus acutus and Procambarus clarkii) in ponds. Proc. Louisiana Acad. Sci. 50:56.

23. Tarter, D. D. Adkins, and M. Sheridan. 1988. Acid tolerance, under continuous-flow bioassay conditions, and a preliminary study of the effects of chitinolytic activity on iono-regulation in the crayfish Orconectes rusticus. The ASB Bull. 35:53.

24. Aiken, D. E. and S. L. Waddy. 1987. Molting and growth in crayfish: a review. Canadian Tech. Rept. Fish. Aquat. Sci. No. 1587.

25. Thuranszky, M. and L. Forro. 1987. Data on the distribution of freshwater crayfish (Decapoda: Astacidae) in Hungary in the late 1950's. Miscellanea Zoologica Hungarica. 4:65-69.

26. Verbi, G. 1988. Il gambero d'acqua dolce. Udine Economica 3/88:40-47.

26. Pomeroy, R. S. and K. H. Kahl. 1987. Crawfish in South Carolina: development and current status of the industry. South Carolina Ag. Expt. Sta. Bull. 661, Clemson Univ., Clemson, South Carolina, USA.

27. Flagg, C. T., S. M. Naqvi, and N. Z. Naqvi. 1987. Effects of monosodium methanearsonate (MSMA) herbicide on Louisiana crayfish, Procambarus clarkii (fecundity, hatching potential) & accumulation of arsenic in selected tissues. NIH Centennial MBRS-MARC Symposium, Crystal City, Arlington, Virginia. Abstract 494. (Naqvi address: Biology, Southern Univ., Baton Rouge, Louisiana 70813 USA.)

28.

28. Patrick, R. M. and M. W. Moody. 1988. Freezing Louisiana crayfish. Un-numbered Ext. Circ. Louisiana Coop. Ext. Serv., LSU, Baton Rouge, Louisiana USA.

29. Patrick, R. M. 1988. Preparing crayfish a healthier way. Un-numbered Ext. Circ. Louisiana Coop. Ext. Serv., LSU, Baton Rouge, Louisiana USA.

30. Brunson, M. W. and S. D. Linscombe. 1988. Selection and management of rice for crayfish. Un-numbered Ext. Circ.

Louisiana Coop. Ext. Serv., LSU, Baton Rouge, Louisiana USA.

31. Engkvist, R. 1988. Do juvenile siblings of the crayfish Pacifastacus leniusculus recognize each other? Information från Sötvattens-laboratoriet Drottningholm (Sweden) Nr. 5. In Swedish with English Summary.

BUSINESS MEMBERS

1. ECREVISSE ACADIENNE - Ecrevisse Acadienne is a Louisiana-based company that markets processed crayfish meat and whole boiled crayfish locally, regionally, nationally and internationally. Promotional brochures are especially useful for describing the Louisiana crayfish industry. For more information, contact: Mr. Charles S. Williams, Ecrevisse Acadienne, 1330 Whitney Building, New Orleans, Louisiana 70130 USA. Telephone: (504) 524-3660. Telex: 883044 CRAWFISH UD.

2. FRESHWATER LOBSTERS - Freshwater Lobsters is a Colorado-based firm that specializes in developing Australian crayfish culture ventures (Cherax spp.). Key personnel include Al Smith, General Manager, Dave Robinson, Tami Schneck, and Davey Schwalenberg. For more information, contact: Mr. Al Smith, Freshwater Lobsters, P.O. Box 10141, Denver, Colorado 80210; phone (303) 817-8536. Telex: 9102502071 (LOBSTER). FAX: (303) 798-7288.

3. REX MILLING COMPANY - Rex Milling Company manufactures a wide spectrum of livestock feeds and is a major manufacturer of artificial crayfish baits. It has recently added a line of crustacean feeds. It provides a free consulting service. The consultant, Mr. Wade Vincent, has had many years of experience in the crayfish industry. For more information, contact: Mr. Alvah Smith, Rex Milling Company, P.O. Box 2640, New Iberia, Louisiana 70561-2640 USA. Telephone: (318) 364-0466. Louisiana WATTS Line: (800) 643-3609.

4. MINISTERE DE L'AGRICULTURE PECHERIES DE ALIMENTATION - This ministry is developing crayfish resources in Quebec. Key contact person is Brigitte Portelance. She may be contacted at: Ministere de l'Agriculture Pecheries de Alimentation, 1665 Boul. W. Harrel Ouest, Edifice 21 Etage, Quebec G1N 3X7, CANADA. Telephone: (418) 643-3846.

POLICY ON BUSINESS MEMBERSHIPS--We value our business memberships as firms engaged in various astacological endeavors pay additional dues that help IAA to pursue services to regular members. All business memberships will be announced in the newsletter as they are received and given specific reference in our Directory of Astacologists.

FRESHWATER CRAYFISH IV, V, VI ARE STILL AVAILABLE--These proceedings of the IAA meetings in Thonon, France (1978),