



I.A.A.
CENTER FOR SMALL FARM RESEARCH
COLLEGE OF AGRICULTURE & HOME ECONOMICS
SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA 70813 USA



NEWSLETTER OF THE INTERNATIONAL ASSOCIATION OF ASTACOLOGY

Dec. 87/Jan. 88 Volume 10 , Number 2

Jay V. Huner, Editor, P.O.Box 10809, Southern University, Baton Rouge, Louisiana 70813 USA

James F. Payne, President
Dept. of Biology
Memphis State University
Memphis, Tennessee 38152 USA

David Holdich, Pres.-Elect
Dept. of Zoology
University of Nottingham
Nottingham NG7 2RD ENGLAND

Jay V. Huner, Sec./Treasurer
Center for Small Farm Research
Southern University
Baton Rouge, Louisiana 70813 USA

Pierre J. Laurent, Past-Pres.
I.N.R.A.
75, Av. de Corzent
F-74203 Thonon, FRANCE

PRESIDENT'S MESSAGE--Our Association originated when a small group of scientists met in Austria to discuss their concerns about the fungal plague affecting populations of European crayfish and introductions of various exotic species. Both pure and applied scientists were part of this initial group and, over the years, interest in the basic aspects of crayfish biology combined with that directed toward applied topics has sustained our Association. Titles of papers from our proceedings are evidence of this. Today our membership remains varied, and I plan to expand the variety of interests because our Association should not become one devoted exclusively to one interest group.

We are establishing a permanent Office of the Secretariat at the University of Lund in Sweden, and this should provide much needed stability. In addition, our treasury is sound and increasing as is our membership, which now stands at nearly 300 members from 25 countries. During my term as president, I hope to expand membership in our Association to 500. We will develop a membership list with a statement regarding profession and area of interest of each member. All members will receive this listing, which should serve as an incentive for others to join. We will continue to produce an informative newsletter which promotes exchange of scientific information to sponsor activities at various scientific meetings regarding freshwater biology and aquaculture.

Our Association needs your support more than ever as we change officers and establish new activities for the coming years. Best wishes to all for a successful and productive new

year. I look forward to working with you to make our Association a more successful and influential voice in the scientific community.

James F. Payne

NECROLOGY--We are very sorry to have to inform you that Jonas Sestokas has died on 4 September 1987 at the age of 75. J. Sestokas has served the Institute of Zoology and Parasitology of the Academy of Sciences of the Lithuanian SSR faithfully for many years. He was an author of a number of papers on biology and crayfish culture and of a number of papers on biology and crayfish culture and of the bibliographical list "Lithuanian Astacology". He won the respect and admiration of everyone and will be greatly missed for his friendly personality.
- Prof. J. Cukerzis, Vilnius, Lithuanian SSR, 29 September 1987.

FROM THE SECRETARY/TREASURER, MEMBERSHIP--Only about 30 % of our members responded to the call for renewal of dues in the September 1987 newsletter. Please note the enclosed call for renewal of dues. All are asked to fill it out and return it because it requests information for our Directory of Astacologists to be published in May 1988.

FRESHWATER CRAYFISH: A JOURNAL OF ASTACOLOGY VOLUME VII--Past-President Pierre Laurent reports that satisfactory progress is being made in reviewing and editing the papers from our international symposium last August in Lausanne.

ORIGINS OF THE IAA'S NAME--Professor Per Brinck (University of Lund, Lund, Sweden) has shared the following information about the derivation of the term "Astacology": "...Astacus is an old Greek word, accepted by medieval authors for various decapod Crustacea and later by Linnaeus adopted for the European freshwater species *Astacus astacus*, as *Cancer astacus*. The generic name *Astacus* was given by Fabricius in 1775. When we discussed a possible name for the Association, we certainly did not want to select a very special name, covering a specific taxon (names of such units change through time), nor did we want to use a name that could restrict the working field of the Association. Although at that time the interest of the members of the Association focused on the application of the knowledge of freshwater crayfish, aiming at increasing and/or starting production of these animals (which is still a main interest for many) we did realize that in the future interest could switch to pure science and indeed come to include also related groups of decapods. It is clear that when dealing with physiology, pathology, structure, ecology etcetera much knowledge can be transferred from near-related groups. Similarly, farming exotic species, prawns and others might be attractive also for astacologists.

*So we found astacology to be a good indication of what we should do. It has the name of an important freshwater crayfish as a basis, but can be viewed from a more classic angle to

cover what we want now or later of research or/and application among decapod crustaceans...."

IAA CO-SPONSORS AMERICAN SOCIETY OF ZOOLOGIST ET AL. MEETING IN NEW ORLEANS, LOUISIANA--This meeting was held 27-30 December 1987. IAA co-sponsored a social reception with the Crustacean Society aboard the Research Vessel Pelican (Louisiana Universities Marine Consortium) which was docked nearby. Several presentations that will be of interest to astacologists will follow. Abstracts are to appear in The American Zoologists:

1. DeLong, M.D. & J.F. Payne. Memphis State Univ. Memphis, Tennessee. Variation in potential fecundity of three species of Procambarus (Decapoda: Cambaridae).
2. Wheatley, M.G. Univ. of Florida, Gainesville, Florida. Acid-base and ion regulation during hypoxia in the freshwater crayfish.
3. Huberman, A. & M.B. Aguilar. Instituto Nacional de la Nutricion Salvador Zubiran, Mexico City. The hyperglycemic hormones of the Mexican crayfish Procambarus bouvieri (Ortmann).
4. Laufer, H., E. Homola, & M. Landau. Univ. of Connecticut, Storrs, Connecticut. Control of methyl farnesoate synthesis in the crustacean mandibular organ.
5. Mohrherr, C.J., K.R. Rao, & J. P. Riehm. Univ. of West Florida, Pensacola, Florida. Erythropoietic activity of the AKH/RPCH peptide family in the dwarf crayfish Cambarella shufeldti.
6. McCumber, L.J. & T.M. Bishara. Francis Marion College, Florence, South Carolina. Cellular defense mechanisms in the crayfish.
7. Huner, J.V. & O.V. Lindqvist. Southern University, Baton Rouge, Louisiana & University of Kuopio, Kuopio, Finland. Special problems in freshwater crayfish egg production.
8. Corey, S. Univ. of Guelph, Ontario, Canada. The differences between potential reproduction and actual reproduction in three species of crayfish in Ontario.
9. Somers, K.M. Univ. of Toronto, Ontario, Canada. Characterizing size-specific fecundity in crustaceans.

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

HAAS CALIFORNIA CRAYFISH--Haas California Crayfish is IAA's newest business member. A division of Haas Botanical Corporation, the company is one of the major suppliers of signal crayfish to Europe (Germany, Austria, France, Belgium, and the Netherlands). Inquiries may be directed as follows:

USA	EUROPE
Suite 510	John I. Haas GMBH

1615 L Street, N.W.
Washington, DC 20036

Residenzstrasse 13
800 Munich 2, West Germany

CORRECTION--The September 1987 IAA Newsletter indicated that the publication "MARGARET RIVER MARRON FARM WESTERN AUSTRALIA" was 165 pages in length and available for \$4 Australian currency. You editor regrets that there was an error. The booklet is 16 not 165 pages long. However, it is, in his opinion, certainly worth the \$4 Australian charge. For further information, write, Margaret River Marron Farm, P.O. Box 105, Margaret River, Western Australia 6285, Australia.

EIFAC WORKSHOP ON FRESHWATER CRAYFISH--The European Inland Fisheries Advisory Council sponsored a Workshop on Freshwater Crayfish Culture in Europe that was held 16-19 November 1987 in Trondheim, Norway. Co-coordinators were Jostein Skurdal of Norway and Kai Westman of Finland. A number of experience papers dealt with crayfish culture in North America, Norway, Sweden, Finland, and Australia/New Zealand; crayfish stocks in Europe; crayfish diseases; water quality criteria for crayfish; and crayfish food and nutrition. Six working groups were: A) Bioengineering and Cultivation Environment; B) Water Quality and Effluents; C) Broodstock, Stocking, and Ecological Impact; D) Food, Nutrition, Reproduction, and Genetics; E) Diseases; and F) Trade, Marketing and Economics. A workshop proceedings will be published in early 1988. Inquiries should be directed to: Dr. Jostein Skurdal, Environmental Directorate, Statsetatens Hus, N-2600 Lillehammer, Norway.

CRAYFISH COLLECTION IN LOUISIANA--IAA member Joe B. Black (Department of Biology, Louisiana College, Pineville, Louisiana 71359-0552 USA) has an extensive crayfish research specimen collection. He reports that he has 879 catalogued and identified collections representing 20 states, Mexico, Australia, Finland, and Japan with paratypes of eight species. Inquiries should be directed to Dr. Black. Members with similar collections are encouraged to notify the newsletter editor about their collections if they wish to let this information to be known to the general membership.

JUVENILE HORMONE IN CRAYFISHES--Dr. David Borst and associates led by Dr. Hans Laufer have identified methyl farnesoate as an active juvenile hormone in several crustaceans including the crayfish Procambarus clarkii. It is produced in the mandibular organs. Several papers are referenced in the Recent Literature section of this newsletter. Dr. Borst may be reached at the Department of Biological Sciences, Illinois State University, Normal-Bloomington, Illinois 61761-6901 USA. Dr. Laufer can be reached at the Department of Molecular and Cell Biology, Univ. of Connecticut, Storrs, Connecticut 06268 USA.

POPULATION DYNAMICS STUDIES IN ONTARIO, CANADA--George Morgan and Walter Momot (Biology Dept., Lakehead Univ., Thunder Bay, Ontario, Canada P7B 5E1) have conducted a number of years of studies of the population dynamics of Orconectes virilis in the

Thunder Bay region. They are working on a number of manuscripts that will be certain to provoke discussions in astacological circles. Until these are published, individuals may wish to obtain Morgan's thesis or contact the two directly. The reference is:

Morgan, G.E. 1987. Population dynamics of an exploited population of Orconectes virilis in northwestern Ontario. Master's Thesis, Lakehead University, Thunder Bay, Ontario, Canada.

Morgan can be contacted directly at: Ontario Ministry of Natural Resources, P.O. Box 500, Bancroft, Ontario, Canada K0L 1C0.

MARRON CONTROVERSY IN NEW ZEALAND--According to Brian Jones (Fisheries Research Centre, MAFFish, Ministry of Agriculture & Fisheries, P.O. Box 297, Wellington, New Zealand), "...Marron have been imported into New Zealand to establish a marron farm in Northland. There has been, however, extensive criticism of the decision by the Minister and that has resulted in a Parliamentary sub-committee being set up to answer the question as to whether further imports should be permitted. Meanwhile, as a form of pressure, other entrepreneurs are building farms, too...." Further information will be presented in the Newsletter as it is received.

HOLDICH RECEIVES GRANT--IAA President-Elect David Holdich reports that the Nature Conservancy Council has awarded him a handsome grant to study native crayfish and alien introductions in Great Britain.

CRAYFISH SESSION, MIDWEST FISH AND WILDLIFE CONFERENCE, DECEMBER 5-9, 1987, MILWAUKEE, WISCONSIN--IAA Member David Lodge arranged this session. Titles and authors were:

1. Momot, W.T., Lakehead Univ., Thunder Bay, Ontario, Canada. Trophic ecology of crayfish and their significance in fisheries management.
2. Roell, M.J. & D.J. Orth. Virginia Polytechnic Univ., Blacksburg, Virginia. The energetic importance of crayfish to smallmouth bass, rock bass, and flathead catfish in the New River, West Virginia.
3. Lodge, D.H. Univ. of Notre Dame, Notre Dame, Indiana. The impact of rusty crayfish on benthic communities in northern Wisconsin.
4. Feminella, J.W., Univ. of California, Berkeley, California. Crayfish herbivory in freshwater marshes: impacts on macrophyte communities and implications for wildlife.

Dr. Lodge may be contacted at: Dept. of Biological Sciences, Univ. of Notre Dame, Notre Dame, Indiana 46556 USA.

DIPLOID CHROMOSOME NUMBER IN PROCAMBARUS CLARKII--Because the reference may be a bit difficult to obtain, your editor is reporting that Murofushi et al. (see reference in Recent Literature section below) report a 2n number for P. clarkii of

188. Earlier studies reported a 2n number of 192 for this species. Makoto Murofushi's address is: Mishima Junior College, Nihon University, Mishima, Japan.

INTERNATIONAL AQUACULTURE SYMPOSIUM, 23-25 NOVEMBER 1987, ISTANBUL, TURKEY--A crayfish session was a part of this symposium. Authors and titles were:

1. Baran, I., I.K. Oray, R. Rahe, & E. Soylu, Turkey. Investigation on a disease causing serious mortality on crayfish (Asiaticus leptodactylus) populations in Turkey, Part II, Present situation in Turkey.
2. Brinck, P., Sweden. The restoration of the crayfish production in a plaquestricken country: Sweden.
3. Karlsson, S., Sweden. Means and methods for crayfish culture and farming.
4. Furst, M., Sweden. Future perspectives on the freshwater crayfish in Turkey.
5. Secer, S., Turkey. Turkiye ic tatlisu istakozlarinda (Asiaticus leptodactylus Esc. 1823) gorulen mantar hastaliklari Uzerinde arastirma.
6. Gydemo, R. & L. Westin, Sweden. Observations of Theclopania contaeana infestation in an Asiaticus asiaticus pond population.
7. Gydemo, R. & L. Westin, Sweden. Investigation on eyestalk ablation in Asiaticus asiaticus.

Information about the session may be obtained from Prof. Hans Ackefors, Dept. of Zoology, Univ. of Stockholm, Stockholm, Sweden. Prof. Ackefors was chairman of the session.

THE CRUSTACEAN NUTRITION NEWSLETTER--This is an important subject to aquaculturists, fisheries managers, and ecologists. Volume 4, No. 1, dated 15 November 1987, is 90 pages long and includes an 11 page mailing list of people who are involved in crustacean nutrition including several IAA members. The newsletter has been published and mailed free by the World Aquaculture Society. However, it costs \$1.00 per issue to print and it is now necessary to subscribe at a rate of \$3.00 per year. Inquiries should be sent to Home Office Manager, World Aquaculture Society, 16 East Fraternity Lane, Louisiana State University, Baton Rouge, Louisiana 70803 USA. In your editor's opinion, this publication is a bargain at 3 times the stated price.

CULTURE OF AUSTRALIAN CRAYFISHES--This is a subject that has created considerable discussion especially when one considers the number of real or contemplated transplantations of several species of the genus Cherax. Two short contributions on the subject have been received from Australian members and are repeated here without editorial comment:

1. Crayfish Farming in Australia by Ric Fallu, Planner, Fish. & Wild. Serv., 240 Victoria Parade, East Melbourne, Victoria 3002.

The Australian crayfish most suited to culture are in

the genus Cherax. They have a wide range of tolerance of temperature and water conditions. As a general rule, they die when the temperature is somewhere between 0 and 5 C, they start eating between 12 and 15 C, grow best at around 25 to 27 C and start to die when the temperature exceeds 30 C. They are all tolerant of low oxygen concentrations and can handle salinities up to about half that of sea water.

Most importantly, all species have similar growth rates up to market size. Some grow larger than others but the difference is not marked until well after the two years of so required to get the fish to a size desired by Australian consumers.

Each species has minor differences in tolerances and these are predictable according to their natural habitat, eg, the tropical C. quadricarinatus has a marginally higher heat tolerance.

On the face of it, all the species that grow big enough should be of equal ease to culture. Experience is showing that this may not be the case and that minor differences may be important.

As in all farming industries, certain species or strains become the "flavour of the month" and stay in vogue until displaced by the next one. In Australia (and probably the rest of the world) farmers tend to want to use an animal exotic to their area. They seem to think that the grass is greener over the hill and that even though the local species has evolved to suit local conditions, a foreign animal must be better.

In the north Australian state of Queensland, there are suitable indigenous crayfish but the locals wanted a foreigner and the West Australian marron became the flavour of the month.

Whilst similar to other Cherax species, marron (C. tenuimanus) evolved in a riverine environment in the temperate parts of Western Australia. They have a lower tolerance to high temperatures and low oxygen concentrations. The differences in tolerance may not be great but in Queensland's warm climate and in the hands of relatively inexperienced farmers, marron have been dying by the pondful.

A marron boom started in Queensland about three years ago and now seems to have burst. The only people who have made real money are the suppliers of seed stock and real estate sharks who sold prepackaged farms.

Undismayed, some promoters are advocating another species. This time it is the redclaw (C. quadricarinatus). For marketing reasons, it is now sometimes being called "tropical marron" and this is a misleading name.

It is difficult to get much information on the tolerances of the redclaw but in some parts of Queensland at least, it is adapted to the local environment. Time will tell how successful redclaw farms will be.

Redclaw is a tropical species but farmers being what they are, there are proposals to farm it in the southern States of Australia. People wishing to do this ignore the fact that the local crayfish, the yabby (C. destructor) seems to have been the species used to engender the greatest success in freshwater crayfish farming in Australia.

2. Information on Purchasing Queensland Marron (Cherax quadricarinatus) Freshwater Australian Crayfish Traders, 42 Tasman Street, Stafford, Brisbane, Queensland 4053.

Queensland Marron are a large species of freshwater crayfish indigenous to the northern parts of Australia. They are sometimes known as red claw.

They have by some people been referred to as the Queensland equivalent of Western Australian Marron, because they are superficially very similar in appearance.

GENERAL DETAILS

GROWTH RATES - They can grow to 60 grams in six months, 250 grams in two years, and have maximum size of around 400 grams.
REPRODUCTION - They sexually mature during their first year and can have multiple spawning per year, eg. 3 to 5 clutches during the summer months. Each clutch can have more than 1,000 eggs, depending on the size of the female.

MEAT YIELD - Their meat yield is the highest of any freshwater crayfish in the world, with the possible exception of W.A. Marron which are about equal to them. The large claws and tail constitute about 60% of the animal.

BURROWING - This species does not excavate burrows as do most species of crayfish and so drain harvesting can catch virtually 100% of the pond's production. They also, hence, do not damage dam walls.

FEEDING - Because they are detritivores, they can be fed almost anything organic, but the most common feeds are poultry pellets, or some other animal feeds. Unlike almost all other forms of husbandry in crayfish farming, feeding is not a major expense.

WATER QUALITY - 1. Oxygen. Although they can survive in very low oxygen conditions, good growth and reproduction are only achieved with oxygen levels above 60% saturation. 2. PH of 6.5 - 9.0 is considered suitable. 3. Calcium Level of 60 - 100 mg/l are good but levels of several hundred mg/l are common in the streams which they natively frequent. 4. Temperature. If the water temperature goes below 14 C then growth is severely retarded. We have only experienced water temperatures up to 35 C but at this temperature, the crayfish were showing no signs of stress.

SURVIVAL - So far our grow out data for this species using 5/m square has produced results at harvest (6 months) of 60 - 94 %. The lower results came from poorly designed ponds. We believe that stocking densities of 10/m square will be highly successful in well designed and managed ponds. Stocking farm dams where there is no control of water quality, predation, and pond design, must always be considered as a lottery system. (Note: FACT does not export C. quadricarinatus outside Australia for stocking purposes. - R. Hutchings).

NEW CRAYFISH POSTAGE STAMP--Australia recently released a postage stamp (37 cents) showing a yabby (Cherax sp.) grasping a bit of meat on a string with one chela. The string is being held by one boy while another looks on. (Thanks to B. J. Mills

for sending the stamp to the editor.)

REPRODUCTION OF PROCAMBARUS ACUTUS ACUTUS IN DELAWARE--Bernard Petrosky (Dept. of Agriculture & Nat. Resources, Delaware State College, Dover, Delaware 19901 USA) reports that he has recovered newly released P. a. acutus from June into September in ponds at his higher latitude location. Very little information is available about reproduction in this species and Petrosky's data are certainly welcome.

ENGLISH STUDENT SEEKS ASSISTANCE--Mr. A. G. Thompson (11 Rochester Rd., North Hill, Plymouth, England) is reviewing the current status of the UK crayfish industry. This research deals with the market development of the species P. leniusculus together with an examination of production techniques. Mr. Thompson is also trying to determine the extent to which production has developed both geographically and quantitatively.

HUNGARIAN STUDENT SEEKS TO STUDY CRAYFISH ABROAD--Miklos Thuranszky, the only Hungarian IAA member, would like to spend some months working at a crayfish farm or at an institute where crayfish culture/biology are studied in any English-speaking country in the world. He indicates that financial assistance would be appreciated. He may be contacted by writing to him at: 25 Belgrad rkp., Budapest, Hungary.

ELECTROPHORETIC VARIATION IN FRESHWATER CRAYFISHES--Dr. Craig Busack (Dept. of Biology, University of Mississippi, University, Mississippi 38677 USA) has recently completed a study of the electrophoretic variation in various enzymes of Procambarus clarkii and Procambarus acutus acutus. It is in press, if not now published, in the journal Aquaculture. Title of that paper is: Electrophoretic Variation in the Red Swamp (Procambarus clarkii) and White River Crayfish (P. acutus) (Decapoda: Cambaridae). He writes that he is just finishing a biochemical systematic study of the several subgenera of the genus Procambarus (Pennidea - P. vioscai, P. quachitas, P. ablutus, P. lylei, P. penni, P. clemmeri, P. apiculifer, P. leoniapae, and P. verantus; Scapulicambarus - P. clarkii, P. howellae, P. troglodytes, P. okaloosae, and P. pennsylvanicus; and Ortmannicus - P. acutus and P. hayi). He has also included Cambarus diogenes and Cambarus striatus. Dr. Busack also notes that he has a Gambarellus study ready to go with specimens of C. puer, C. diminutus, C. leslei, and C. ahufeldtii. Finally, he has found time to work with Dr. J. Fitzpatrick of the University of Southern Alabama (Mobile, Alabama USA) on a new species of the genus Mohbauerus.

DISTRIBUTION OF PROCAMBARUS CLARKII TO BE STUDIED IN FLORIDA--Currently, it is not legal to move live P. clarkii east of the Appalachian River which is said to be the eastward limit of the natural range of the species. It is not clear, however, if this truly represents the eastward expansion of its range. M. R. Miltner of Florida Institute of Technology, Melbourne,

Florida 32901-6988, writes that his institute is now doing a survey to determine the exact range of the species in Florida. Persons with information about the distribution of this species in Florida are encouraged to write to Miltner.

STATISTICS ON FISHERIES FOR ORCONECTES RUSTICUS IN WISCONSIN USA--O. rusticus, the rusty crayfish, is a recent invader to Wisconsin and its introduction and expansion in the state have created considerable controversy. Although it is impossible to eradicate such species under normal conditions, harvesting offers some measure of control. IAA member Bob Pagel, Deerfield, Wisconsin, has been closed to the development of the fishery for the rusty crayfish. He reports that at least 90 tonnes were harvested during the summer 1987 season. These were sold for both food and fish bait (exported as it is illegal to use live crayfishes for fish bait in Wisconsin to prevent spread of unwanted species!). Prices range from \$1.10 to \$4.40 per kg depending on what they are to be used for and the market situation at the time.

MEETINGS/TRIPS OF INTEREST TO ASTACOLOGISTS--

1. 1988 International Crawfish Tasting and Trade Show - 26 & 27 February 1988, Lafayette, Louisiana. Information: Louisiana Crawfish Farmers' Association, P.O. Box 91544, Lafayette, Louisiana 70509 USA. Phone: Area Code 318, Number 235-7072.
2. Annual Meeting, Louisiana Crawfish Farmers' Association - 26 February 1988, Lafayette, Louisiana. Information: Contact LCFA at address given above.
3. Symposium on Culturing Crayfishes in Missouri - 9 April 1988, Springfield, Missouri. Information: Contact: Dr. Bob Wilkinson, Department of Biology, Southwest Missouri State University, Springfield, Missouri 65804 USA. Phone: Area Code 417, Number 836-5126. Both Orconectes and Procambarus will be considered.
4. The National Shellfisheries Association - 26-30 June 1988, New Orleans, Louisiana. Crayfish session is being organized. Information: Scott E. Siddal, Marine Sciences Research Center, State University of New York, Stony Brook, New York 11794-5000, USA. Phone: Area Code 516, Number 632-8668.
5. Shellfish Tour/New Zealand and Australia - October or November 1988. Dr. A. J. Provenzano, long time IAA member, will lead a delegation of North American shellfish researchers and producers to New Zealand and Australia for approximately three weeks of visits to crayfish farms and other aquaculture installations. The trip will be part of the People to People International Citizen Ambassador Program. IAA members interested in participation or who wish to obtain more information should contact Dr. Provenzano, Department of Oceanography, Old Dominion University, Norfolk, Virginia 23529-0276 USA. Phone: Area Code 804, Number 440-4285.

THESES AND DISSERTATION OF INTEREST TO ASTACOLOGISTS--The following theses and dissertation were completed recently at Louisiana State University, Baton Rouge, Louisiana 70803 USA.

1. Cevallos, V.H.O. 1987. Attractability of Commercial Crawfish Baits. MS Thesis.
2. Baum, T.J. 1987. Evaluation of Water Circulation and a Hoop Trap to Enhance Crawfish Harvesting. MS Thesis.
3. Lalla, H. 1987. Spray Purging of Crawfish. MS Thesis.
4. Jewell, C.S. 1987. Characterization of the Microsomal Mixed-Function Oxygenase System of the Hepatopancreas and Green Gland of the Freshwater Crayfish, *Procambarus clarkii*. MS Thesis.
5. Lutz, C.G. 1987. Estimation of Heritabilities, Genetic Correlations, and Response to Selection for Growth, Body Size, and Processing Traits in Red Swamp Crawfish, *Procambarus clarkii* (Girard). Ph.D. Dissertation.

RECENT LITERATURE--

1. Abstracts Published in the Program for the 19th Annual Conference & Exposition, World Aquaculture Society (WAS, 16 East Fraternity Lane, Louisiana State University, Baton Rouge, Louisiana 70803 USA). January 1988, Honolulu, Hawaii.
 - a. Alon, N.C., M.C. Rubino, & C.A. Wilson. Australian marron lobster (*Cherax tenuimanus*) aquaculture feasibility in the Caribbean. p. 14.
 - b. Braden, S.L. & R.C. Reigh. Digestibility of monosaccharides and polysaccharides in diets for red swamp crawfish (*Procambarus clarkii*). p. 20.
 - c. Brunson, M.W. & J.L. Griffin. Production of crawfish (*Procambarus* spp.) and grain sorghum (*Sorghum bicolor* (L.) Moench) in a double cropping system. p. 21.
 - d. Eversole, A.G. & R.S. Pomeroy. Rice-crustacean culture: potential in southeast Asia. p. 32.
 - e. Huner, J.V. & V.A. Pfister. Comparative morphology, length/weight relationships, and abdominal ("tail") muscle yields of two commercially important crayfishes, *Procambarus acutus acutus* and *Procambarus clarkii* (Decapoda, Cambaridae). p. 41.
 - f. Landau, H., H. Laufer, & E. Homola. Regulation of crustacean reproduction by the mandibular organ. p. 47.
 - g. Lewis, S., R. Gorden, H. Buck, P. Brown, M. Gould, & L. Dexter. Microbiologically modified alkaline hydrogen peroxide-treated straws as a feed for crayfish. p. 51.
 - h. Lotz, J.M. The effects of salinity on the growth and survival of *Procambarus clarkii* and *P. acutus*. p. 53.
 - i. Lutz, C.G. & W.R. Wolters. Response to selection for growth and correlated response in dressout percentage in red swamp crawfish, *Procambarus clarkii* (Girard). p. 53.
 - j. Malone, R.F. & K.M. Cange. Water quality management in soft-shell crayfish production facilities. p. 54.
 - k. O'Sullivan, D. Culture of the marron (*Cherax tenuimanus*) in Australia: a review. p. 60.
 - l. Reigh, R.C. & R.J. Craig. Digestibility of practical feedstuffs in diets for red swamp crawfish (*Procambarus clarkii*). p. 64.
 - m. Roberts, K.J. & L.E. Dellenbarger. Industry cooperation and public policy: the Louisiana crawfish experience. p. 65.
 - n. Sanguanruang, M. & R.P. Romaine. Assimilation and growth of juvenile red swamp and white river crawfish fed various diets. p. 68.
 - o. Sanguanruang, M. & R.P. Romaine. Diet and food assimilation of red swamp and white river crawfish in commercial ponds as determined by stomach content analysis and stable carbon isotope ratios. p. 68.
2. Brunson, M.W. 1987. Pre-flood evaluation of seven grasses (Gramineae L.) as planted forage for crawfish. J. World Aquaculture Soc. 18:186-189.
3. Naqvi, S.M., R. Hawkins, & N.H. Naqvi. 1987. Mortality response and LC50 values for juvenile and adult crayfish, *Procambarus clarkii* exposed to Thiodan®, MSMA, Oust® (herbicides) and Cutrine-Plus® (algicide). Environmental Pollution 48:275-283.
4. Kivivuori, L. 1986. The effect of temperature acclimation on the temperature selection in the crayfish (*Astacus astacus* L.). 8th Conf. European Soc. Comp. Physiol. Biochem.: Comp. Physiol. Environ. Adaptations, Strasbourg (France) 31.8-2.9.1986, p. 103.
5. Laufer, H., D. Borst, C. Carrasco, M. Sinkus, C.C. Reuter, L.W. Tsai, & D.A. Schooley. 1987. Identification of a juvenile hormone-like compound in a crustacean. Science 235:202-205.
6. Borst, D.W., H. Laufer, M. Landau, E.S. Chang, W.A. Hertz, F.C. Baker, & D.A. Schooley. 1987. Methyl farnesoate and its role in crustacean reproduction and development. Insect Biochem. 17:1123-1127.
7. Murofushi, M., Y. Deguchi, and T.H. Yosida. 1984. Karyological study of the red swamp crayfish and Japanese lobster by air-drying method. Proc. Japan. Acad., 60 Ser. B. 60(B):306-309.
8. Lignon, J.M. 1986. Structure and permeability of decapod crustacea cuticle. Kirsch, Lahlou (eds.), Comp. Physiol. Environmental Adaptations, Vol. 1 8th ESCP Conf., Strasbourg 1986, pp. 178-187 (Karger, Basel 1987).
9. Fanjul-Moles, M.L., E. Moreno-Saenz, N. Villabos-Hiriart, & B. Fuentes-Pardo. 1987. ERG circadian rhythm in the course of ontogeny in crayfish. Comp. Biochem. Physiol. 88A:213-219.
10. Copp, N.H. 1986. Dominance hierarchies in the crayfish *Procambarus clarkii* (Girard, 1852) and the question of learned individual recognition (Decapoda, Astacidae). Crustaceana 51(1):20.
11. Avenet, P. & J.M. Lignon. 1985. Ionic permeabilities of the gill lamina cuticle of the crayfish, *Astacus leptodactylus* (E.). J. Physiol. 363:377-401.
12. Scott, J.R. & R.L. Thune. 1986. Bacterial flora of hemolymph from red swamp crawfish, *Procambarus clarkii* (Girard), from commercial ponds. Aquaculture 58:161-165.
13. Bagatto, G. & M.A. Alikhan. 1987. Metals in crayfish from neutralized acidic and non-acidic lakes. Bull. Environ. Contam. Toxicol. 39:401-405.

14. Tierney, A.J. & A.J. Atema. 1986. Effects of acidification on the behavioral response of crayfishes (Orconectes virilis and Procambarus acutus) to chemical stimuli. *Aquat. Toxcol.* 9:1-11.
15. Graham, L. & R. France. 1986. Attempts to transmit experimentally the microsporidian Thelophania contegeani in freshwater crayfish (Orconectes virilis). *Crustaceana* 51:208-211.
16. Herbert, B. 1987. Notes on diseases and epibionts of Cherax quadricarinatus and C. tenuimanus (Decapoda: Parastacidae). *Aquaculture* 64:165-173.
17. Culley, D.D. & L. Duobonis-Gray. 1987. 24-hour molting pattern of the red swamp crayfish (Procambarus clarkii). *Aquaculture* 64:343-346.
18. Hobbs, M.H., Jr. & M. Whiteman. A new, economically important crayfish (Decapoda: Cambaridae) from the Neches River Basin, Texas, with a key to the subgenus Fallicambarus. *Proc. Biol. Soc. Wash.* 100:403-411.
19. Traub, M., G. Gellisse, and K. Spindler. 1987. 20 (OH) ecdysone-induced transition from intermolt to premolt protein biosynthesis patterns in the hypodermis of the crayfish, Astacus leptodactylus, in vitro. *Gen. Comp. Endocrinol.* 65:469-477.
20. Somers, K.M. & D.P.M. Stechey. 1986. Variable trappability of crayfish associated with bait type, water temperature and lunar phase. *Amer. Midl. Natur.* 116:36-44.
21. Stechy, D.M. & K.M. Somers. 1983. An analysis of four Ontario species of crayfish for aquaculture. 1st Int. Conf. on Warm Water Aquaculture Crustacea, Feb. 9-11, 1983. pp. 221-230.
22. Scott, J.R. & R.L. Thune. 1986. Ectocommensal protozoan infestations of gills of red swamp crayfish, Procambarus clarkii (Girard) from commercial ponds. *Aquaculture* 55:161-164.
23. Delibes, M. & I. Adrian. 1987. Effects of crayfish introduction on otter Lutra lutra food in the Donana National Park, SW Spain. *Biological Conservation* 42:153-159.
24. Huner, J.V. 1987. Catching crayfish. *Farm Pond Harvest.* 21(4):10-11 & 25-26.
25. Schirf, V.R., P. Turner, L. Selby, C. Hannapel, P. de la Cruz, & P.F. Dehn. 1987. Nutritional status and energy metabolism of crayfish (Procambarus clarkii, Girard) muscle and hepatopancreas. *Comp. Biochem. Physiol.* 88A:383-386.
26. Huner, J.V., O.V. Lindqvist, & H. Kononen. 1987. Comparison of morphology and edible tissues of two important commercial crayfishes, the noble crayfish, Astacus astacus Linne', and the red swamp crayfish, Procambarus clarkii (Girard) (Decapoda, Astacidae and Cambaridae). *Aquaculture* 67: (In Press).
27. Staniford, A.J., J. Kuzencovs, & B.J. Mills. 1987. Economics of commercial aquaculture of the yabbie (Cherax destructor). Special Publication of the South Australian Department of Fisheries, Adelaide, Australia. 59 pp.

FRESHWATER CRAYFISH IV, V, AND VI ARE STILL AVAILABLE--These proceedings of the IAA meetings in Thonon, France (1978), Davis, California (USA) (1981), and Lund, Sweden (1984) are available. Approximate prices are \$30 plus postage and handling

of about \$5. Because of fluctuating currency rates, persons interested in obtaining copies should inquire about costs should send inquiries to:

1. Freshwater Crayfish IV - Professor P. J. Laurent, I.N.R.A., 75, Av. de Corzent, F-74203 Thonon les Bains Cedex, France.
2. Freshwater Crayfish V - Van Nostrand Reinhold, 115 Fifth Avenue, New York, New York 10003 USA. (Originally Published by AVI Publishing Company, Westport, Conn. USA).
3. Freshwater Crayfish VI - Professor Per Brinck, Ecology Building, University of Lund, S-223 62 Lund, Sweden.

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