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Crayfish NEWS

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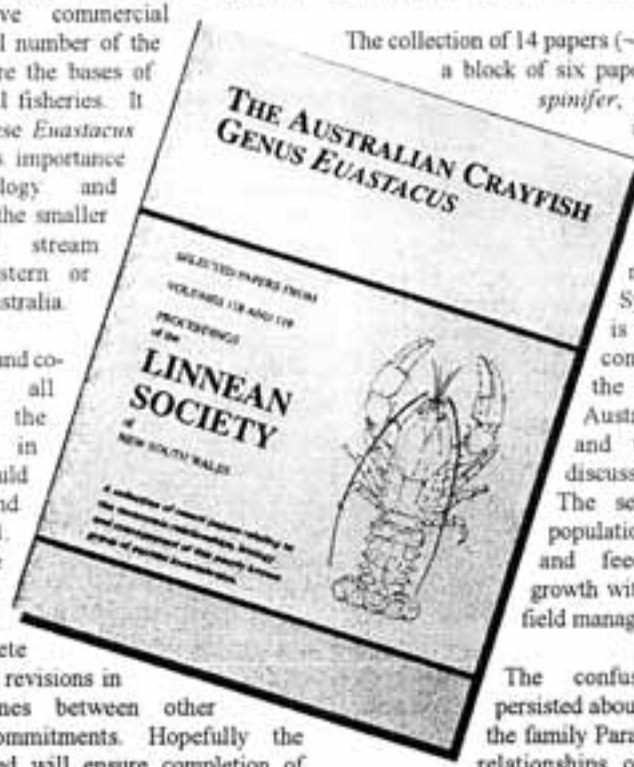
Research on Australian *Euastacus* species released

by John R. Merrick

As explained in the September 1997 Newsletter (19(4)) a number of papers on *Euastacus* were to be included in Volumes 118 and 119 of the *Proceedings of the Linnean Society of New South Wales*. Although this group (>40 species) does not have commercial potential a small number of the larger species are the bases of local recreational fisheries. It is also clear these *Euastacus* are of enormous importance in the ecology and conservation of the smaller and highland stream systems in eastern or south-eastern Australia.

The enthusiasm and co-operation of all contributors to the eight papers in Volume 119 should be appreciated and acknowledged. Considerable efforts were made by authors to complete manuscripts and revisions in short time-frames between other professional commitments. Hopefully the interest generated will ensure completion of additional short papers in the near future, as well as stimulating new research in priority areas such as genetic variation within species, habitat preferences and interactions with introduced species. After unforeseen printing delays Vol.119 was distributed in March 1998 and the limited issue of Selected Papers (reprints of all 14 papers under a separate cover) has now been produced; it was released at the end of May. Before giving price and contact details let me whet members' appetites.



The collection of 14 papers (~ 200 pp) includes a block of six papers on *Euastacus spinifer*, which is now recognised as the most widespread *Euastacus* on the east coast - north and south of Sydney. This series is one of the most comprehensive on the biology of an Australian crayfish and the first paper discusses reproduction. The sequence is then population structure, diet and feeding, moulting, growth with age and finally field management.

The confusion that has persisted about the taxonomy of the family Parastacidae, and the relationships of this genus in particular, is addressed by two papers using molecular techniques.

(Continued on page 4)

The International Association of Astacology (IAA), founded in Hinterthal, Austria in 1972, is dedicated to the study, conservation, and wise utilisation of freshwater crayfish. Any individual or firm interested in furthering the study of astacology is eligible for membership. Service to members include a quarterly newsletter, membership directory, bi-annual international symposia and publication of the journal Freshwater Crayfish.

Secretariat

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

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Officers:

President's Corner

The two-year term as IAA's President has passed a great deal faster than I ever expected. It has been filled with work, research, teaching applied zoology and naturally, crayfish. A lot has also been going on in IAA.

I want to extend my warmest thanks to IAA Board members, national correspondents and all those active members, who strive to develop IAA into a better serving organization and make our work around the world possible.

A special "Thank You" goes to Past President Jostein Skurdal for all his help and advice, and to Professor Walter Momot for the organizing of IAA's XI Symposium and the swift publishing of Freshwater Crayfish XI. As I write this, IAA's XII Symposium is only three weeks away and we can once again expect a memorable event - this time in the very homestead of the IAA Crayfish Fossil.

Regional co-operation among crayfish people has also been very active during the past two years. IAA has been able to moderately sponsor local meetings and workshops, but most importantly, the events were made possible with the dedicated work of active members. To further develop regional co-operation, a new IAA subsection was founded in the UK, for which our thanks go to members David Holdich and David Rogers. A great example of activity across borders was the 1997 Florence workshop organized by Member Francesca Gherardi under Professor Marco Vannini and David Holdich's supervision. IAA was pleased to take part in the workshop that dealt with the very important and acute issue of introductions of alien crayfish species in Europe.

During the term in office, IAA's Past President Jostein Skurdal determined as one of his main objectives to develop co-operation between the Nordic and Baltic countries. This goal was realized this spring by a Nordic-Baltic workshop in Estonia. The fruitful workshop was financed by NorFa and organized by IAA members Trond Taugbol and Janus Tuusti.

IAA's newsletter *Crayfish News* has received a new layout. The refreshed look also comes with photo publishing possibility, for which our gratitude goes to Glen Whisson, the editor.

IAA's www-site is now in the care of Ari Mannonen. In addition to IAA statistics and contact information, the site includes news on symposia and links to sites featuring topics such as bibliography and systematics, biology, conservation, culture and management, disease, other societies etc by developing the site further and keeping it updated with the newest information, we are able to reach a larger group of researchers and other crayfish people than ever before. Another channel for reaching the public is through posters that Member Martin Moore designed for IAA. They will be displayed at symposia, workshops and wherever crayfish people meet.

Lately, IAA officers have been receiving a growing number of inquiries on IAA activities and membership, research and cultivation related problems as well as questions on pet-crayfish care. The increasing interest from the public is the sum of many sources but not least due to the web-site and the everyday work our active members do to make IAA known around the world. This ground level work is very valuable even if the benefits can not be measured instantly.

IAA was established in 1973 in Hinterthal, Austria, and thus celebrates its 25th birthday this year. To honor the happy event, David Holdich is working on editing an anniversary booklet with memoirs dating all the way back to the Association's early days. I am sure, the booklet will be a delightful stroll down memory lane to those IAA "veterans" who have been active from the very beginning, and an intriguing history for those who joined more recently, not forgetting the yet-to-become members.

It makes me truly happy to see how many members have been with IAA from its early days and to watch the growing number of young members get involved. I leave my office with confidence to the new president, trusting that we will maintain our position as the leading forum in crayfish research and farming, and believing that IAA will also in the future stay true to the mission stated 25 years ago.

Paula Henttonen
IAA President 96-98

Editorial

John Merrick's cover story about Australian *Euastacus* crayfish refers to a limited edition of the *Proceedings of the Linnean Society of New South Wales*. I will bring a small number of copies to Augsburg for sale to interested members.

The last issue of the *Crayfish News* contained a typographical error on page 4: third paragraph should read 45% not 95%.

Given second semester university commitments for many colleagues around the world, the dates for IAA 13 have been set for 6 - 11 August 2000.

By the time this edition is in members' hands IAA 12 will only be a week or so away.

See you in Augsburg

Glen Whisson, editor
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NSW Linnean Society publication on *Euastacus*

(Continued from page 1)

Lawler and Crandall have completed a survey to verify the evolutionary status of the genus with respect to *Astacopsis*. Ponniah and Hughes have also used DNA to investigate the interrelationships of eight *Euastacus* species in Queensland. The synonymy of *Euastacoides* is verified and the retention of the northern species (*E. robertsi, E. fleckeri*) is confirmed.

Another two papers discuss southern Victorian species. Honan provides details of early development (both eggs and juveniles) in *E. bispinosus* and Morey documents another recreational species from west Gippsland. Aside from initial growth information (from long-term field surveys) on the poorly known *E. kershawi*, Morey's paper also discusses the effects and problems of fishery closures.

From south-eastern Queensland comes a long-awaited paper on the giant Conondale crayfish. Over a number of years Smith *et al.* have studied growth and abundance of *E. hystricosus* juveniles in relation to habitat changes caused by forestry and mining. Aspects of the biology and ecology of the small sympatric species, *E. urospinosus*, are discussed by Borsboom.

Diseases or parasites have not been considered in detail in any of the above papers, but the contribution by Sewell and Cannon describes new species of temnocephalans from *Euastacus* and *Cherax* species. The other short paper investigates the usage of *Euastacus*, as a food resource, by Aborigines in eastern New South Wales.

With that diversity there should be something of interest for everyone, but if not, then perhaps another more recent publication is relevant. This is a Research Report on the management of endemic crayfishes (*Euastacus australasiensis, E. spinifer*) of the Sydney region (see details below). It includes extensive background data on *E. spinifer* as well as previously unpublished observations on the small, sympatric *E. australasiensis*. While the focus is on the Sydney metropolitan area, many of the issues and strategies discussed apply to other invertebrates in other areas.

It is interesting to note the recent heightened awareness of the role of crayfishes internationally. Co-incidentally, the last Newsletter reported the status of Canadian crays and further recognition of the significance of US crayfishes as well as a special issue of papers on the European genus, *Austropotamobius*.

The Linnean Society issue of selected *Euastacus* papers is available at AUD $25/copy + postage. For further information look up the Linnsoc Home Page on the Internet:

http://bioscience.babs.unsw.edu.au/linnsoc/welcome.htm

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ISBN 1 86408 393 X

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FIRST DISCOVERY OF A POPULATION OF *ORCONECTES IMMUNIS* IN GERMANY

Uwe Dussling,
Fisheries Research Station, D-88085 Langenargen (Lake Constance), Germany

Christoph Hoffmann, Arbeitsgemeinschaft Landschaftsoekologie, D-76137 Karlsruhe, Germany

In October 1997, a single male of a previously unrecorded crayfish species was found during a field investigation in a small canal in the German upper Rhine valley. The canal is in the vicinity of the town Baden-Baden (48°46' N, 8°14' E) in south-western Germany (Baden-Wuerttemberg). The crayfish was finally identified as a first form male of the calico crayfish (*Orconectes immunis*).

In March 1998, a reproducing population of *O. immunis* was discovered at the mouth of a 6 km long stormwater discharge channel connecting a retaining basin to the canal described above. 10 males and 5 females, two of the latter berried, were collected over a stretch of 200 m. Further investigations at different sampling sites led to the discovery of numerous calico crayfish over a distance to approximately 3 km upstream from the stormwater discharge channel's mouth. Further upstream the occurrence of *O. immunis* sank rapidly and the uppermost 1.5 km of the channel had fallen dry. The whole channel had a muddy bottom with large stones and pieces of wood under which most calico crayfish could be found. There was also a good cover of macrophytes and the whole channel appeared to be a suitable habitat.

This is the first documentation of a population of *O. immunis* to be found in German natural waters. As far as we know further reproducing populations of *O. immunis* do not exist even in other European countries. *O. immunis* is unimportant for farming in Germany, but more and more foreign crayfish species have appeared in the aquarian trade during the past years. We presume the introduction of calico crayfish is due to the release of single specimens by aquarists since most people holding crayfish in aquaria are not aware of the risks involved in releasing foreign species into the wild. This example illustrates that some educational work has to be done. We hope the initiative described by Peter Debus in *Crayfish News (20/1&2)* will be a valuable contribution to the solution of the problem.

We would also like to thank Prof Horton H. Hobbs III who confirmed our identification of the *O. immunis* species.

DEVELOPMENT OF RECOMMENDATIONS FOR CRAYFISH KEEPING AND TRANSPORT

Birgit Oidtmann

In Germany an association of veterinarians (TVT, Tieraerztliche Vereinigung fuer Tierschutz) is developing recommendations for keeping and transporting animals.

I am a member of the fish section of this organisation and we are currently trying to develop a leaflet with recommendations on transport and live storage of crayfish.

I would like to get in touch with people in whose country such recommendations might already exist, or who can help with information on the requirements of crayfish concerning transport and live storage.

Keeping crayfish does include different types of keeping (eg. after cooling down the body temperature and transport on ice or after dry transport) so naturally we expect subsequent keeping recommendations to be adapted to these conditions.

If you have any information on this subject I would be grateful if you would contact me. Maybe you are also coming to the 12th International Symposium in Augsburg this year, which might be a good opportunity for further exchange.

email: B.Oidtmann@zoofisch.vetmed.uni-muenchen.de; or postal address:

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CRAYFISH THESIS COMPLETED

Member **Pedro Anastacio** has completed his doctoral dissertation. The reference is:

Anastacio, P.M., 1997. An ecotechnological approach to crayfish and rice production: data and submodels for C.R.I.S.P. (crayfish and rice integrated system of production). PhD. Dissertation in Ecology. 142 pp. Faculdade de Ciencias e Tecnologia da Universidade de Coimbra, Portugal.

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Summary of the thesis:

Three ecological engineering methods were proposed in order to control crayfish populations in the rice fields of the Lower Mondego river valley (Portugal): 1) harvest of crayfish; 2) use of a non harmful surfactant (Genapol OX-80) to decrease the metabolic rate of the crayfish through the control of the gas exchange in the gills; 3) a combination of (1) and (2).

Two steps are involved in the thesis project, namely data acquisition and modelling effort. Relevant data collected include crayfish condition throughout the year, crayfish rice interactions and monitoring of the rice field ecosystem. Laboratory and field work lead to the main conclusions that: 1) crayfish condition is dependent on the reproductive status; 2) rice destruction by crayfish occurs mostly in the early stages of rice development; 3) a density of 1 crayfish per square metre caused an average decrease in grain production of 41.61%; 4) the surfactant is not effective in the field. The structure of the rice sub-model is based on the production of carbohydrates by photosynthesis.

Simulation results were compared with the observed data on aerial rice biomass and also on the tiller density. In addition, the simulated final rice production parameters were compared with the observed values for both years. It can be stated that the model performs well with regard to the prediction of final production parameters. In the crayfish sub-model the crayfish population was subdivided into seven age classes of 80 days, each one constituting a state variable. Our most optimistic simulation, with a simulation of a 50% decrease in the mortality rates, resulted in a fourfold increase in captures, from 230 kg/ha/year to around 917 kg/ha/year. Without capture, a value of 121 kg/ha was simulated for the average crayfish biomass, which is close to the 124 kg/ha simulated with crayfish capture. Our simulated average crayfish biomass was of approximately 120 kg/ha without capture, which lies nicely inside the reported ranges from areas at approximately the same latitude.

A simple ecological model was built to simulate the algae biomass in a rice field. Simultaneously two other sub-models are provided: water and oxygen dynamics. Hydrology controls most of the relevant processes in our system, and the simulated water dynamics are in accordance with the timings observed in the field. At this stage, the simulation of the oxygen dynamics could only provide a tool for a future prediction regarding the periods with higher or lower oxygen concentrations.

NORDIC/BALTIC WORKSHOP ON CRAYFISH RESEARCH AND MANAGEMENT

Trond Taugbøl

The above workshop was held from 23-26 May 1998 at Sagadi Training Centre in Estonia. The aim was to review the current status of freshwater crayfish (distribution, development trends, threats, knowledge gaps) in the Nordic/Baltic area, and identify and discuss important management problems and actions. A major aim was also to enhance Nordic/Baltic co-operation and the network of crayfish researchers and managers.

The workshop gathered 38 persons from 9 countries (Denmark, Estonia, Finland, Latvia, Lithuania, Norway, Russia, Sweden and England). For the first time, all Nordic/Baltic "crayfish countries" was represented in such a regional crayfish meeting. A lot of new information on the crayfish situation in each country was provided, in addition to a number of other interesting presentations regarding freshwater crayfish. The presentations will be published in a specific workshop report, available for those interested.

As one of the organisers I am of course subjective, but I have a strong feeling that the workshop was very successful. First and foremost because of the participants themselves and the ability they had to socialize and create a warm and friendly atmosphere in which new contacts and friendship were formed. And not forgetting the workshop place itself, the beautiful, restored Sagadi Manor dating back to 1749, which provided excellent facilities for hosting the workshop.

THE PLIGHT OF THE GIANT FRESHWATER CRAYFISH

Les Gray

The Tasmanian giant freshwater crayfish, *Astacopsis gouldi*, has been in the Australian press quite a bit lately because of dramatically declining stock abundance brought about by fishing pressure and continual degradation of its habitat. The last issue of Freshwater Farmer reported on a complete ban on the fishing for this endangered species as of 1 January 1998, but unless other management arrangements are introduced, we may yet see an even greater decline in numbers and distribution.

Although it is unsuitable for aquaculture because of its extremely slow growth rate and a host of other biological reasons, as freshwater crayfish enthusiasts we should all be concerned and aware of this unique creature's struggle for survival.

The giant freshwater crayfish has been referred to by biologists as the 'freshwater thylacine' (Tasmanian tiger). Not only is the crayfish heading towards extinction like the thylacine, but just as the thylacine was the largest Australian predator on land, the crayfish is the largest animal and predator in its native freshwater habitat. These 'top predators' play an important role in ecology and losing them could have severe repercussions.

The largest authenticated record of the giant freshwater crayfish is 0.5 metres in length and 4 kilograms in weight. However, many fishermen tell of taking crayfish up to 6 kilograms. Locals from Smithton claim to

have seen a photograph of a crayfish one metre long. Crayfish would probably have grown larger prior to them being targeted by fishers.

It remains a mystery to science why this species grows so large, when most other Tasmanian freshwater crustaceans are much smaller. Usually animals evolve to a larger size to combat predators, perhaps in this case, water rats. The other Tasmanian species of freshwater crayfish (*Astacopsis franklini*) does not grow nearly as large yet faces the same potential predators.

Studies have shown that giant freshwater crayfish grow very slowly (as little as 5-10mm per year for some adults) and attain sexual maturity at a late age (9 years in males, 14 years in females). Reproduction in females occurs only every second year. These characteristics make crayfish particularly vulnerable to environmental disturbance and over-exploitation. The giant crayfish is also sensitive to changes in water quality. Studies by the Inland Fisheries Commission have found they are highly susceptible to some pesticides commonly used in agriculture and forestry operations. It is also likely that increased sedimentation caused by land clearance or forestry affects the crayfish. Removal of stream-side vegetation can result in increased light and water temperature. Consequently the crayfish is generally rarer in the lower reaches of rivers where clearance of vegetation is most prevalent.

Semi-decayed wood makes up a large component of the diet of the giant crayfish. One of the unintentional ways some farmers threaten these animals is by removing logs from rivers to prevent flooding. The crayfish also eat insects and leaves which drop into their streams, and have a voracious appetite for animal flesh, which makes them rather easy to catch.

Probably the last large legally caught giant crayfish was captured on 20 December 1997 just prior to the January ban. This particular specimen weighed in at 3.5 kilograms and was taken by two young anglers in the Black River near Circular Head.

Surprised at the size of the creature, they didn't think it was real when they first saw it. In the past, they had been accustomed to catching much smaller crayfish at around 0.5 to 1.0 kilograms. The crayfish was eaten at Christmas and the shell mounted on a board.

Environment Minister, Peter Hodgman, has said efforts over the past four years to aid the recovery of *Astacopsis gouldi* by reducing catch numbers had proven unsuccessful and that the recently introduced complete closure of the fishery was necessary to secure the future of the species.

Astacopsis gouldi is listed as vulnerable under both the Tasmanian Threatened Species legislation and the *National Endangered Species Act*.

"There are now real concerns about the future of this crayfish, which was once widely distributed across the State's north.

"The Parks and Wildlife Service's Threatened Species Unit and the Inland Fisheries Commission have been monitoring the population.

"It is now clear that the only way to responsibly manage this unique species is to wholly protect it by law," Mr Hodgman said.

Meanwhile, Todd Walsh who lives in the heart of giant crayfish country in Smithton, believes that the Department of Environment's recently imposed ban on fishing *Astacopsis gouldi* will not go far enough to ensure the species' survival.

Todd wants to establish a trial pilot restocking program in a north-west river. He has prepared a proposal, seeking funding from the Natural Heritage Trust for the project and hopes to work in cooperation with the Inland Fisheries Commission and the Threatened Species Unit of the Department of Parks and Wildlife in extending the work of the Inland Fisheries Commission's 1997 report on a recovery plan for the crayfish.

Todd's plan is to capture female, egg-carrying crayfish and grow the young through the stage where they are vulnerable to predator species. The young crayfish would then be tagged before release in a selected river, enabling ongoing study of environmental effects on the species. A comprehensive survey of numbers would be the first stage of Todd's project. Local evidence points to the animal having disappeared completely from many of its former haunts.

"There are thought to be localised groups in some rivers and good populations in virgin forest, but the spread of the species has been decimated from a lot of areas where it existed originally.

"There would be no sense in restocking in a pristine river system. I would choose a river with all the problems of run-off and forestry and keep data on what they are vulnerable to", Todd said.

"Having isolated pockets located in reserved areas is the wrong way to go."

Todd believes that with community support the giant freshwater crayfish rehabilitation project could also become part of an important tourist venture for the Circular Head area.

Although a ban on crayfish fishing has been introduced, there is still a need to develop a management plan to ensure its survival. This plan is needed to provide coordinated management of all the threats to the species, including land clearance, agricultural and forestry practices, as well as fishing pressure.

To make such a management plan work, State legislation is needed to give management authorities powers to control land clearance on private land where species are threatened and as a safeguard against the weakness of the Forest Practices Code.

Let's hope that all efforts by those attempting to save this truly unique creature are not in vain, and environment and fishery management arrangements will ensure the future survival of the giant freshwater crayfish.

Acknowledgments

The material contained in this article has been derived from a number of sources, in particular a short article by Peter McGlone of the Tasmanian Threatened Species Network, various newspaper articles which appeared in the *Sunday Examiner*, *Burnie Advocate* and the *Circular Head Chronicle*, and conversations with Todd Walsh.

Republished (in part) courtesy of *The Freshwater Farmer*, Vol. 5(4):12-13.

AVAILABILITY OF UNDERSIZED CRAWFISH

Jay V. Huner, Director, Crawfish Research Center, University of Southwestern Louisiana, Lafayette, Louisiana 70504-4650 USA

Crawfish are generally graded as follows:

Number One:
Large - Export - 10 to 15 per pound
Number Two:
Medium - Restaurant - 16 to 22 per pound [Sometimes divided into 16-20 and 20-23]
Number Three:
Small - Peeler - 23 to 35 per pound
Field Run: Ungraded
Reject: unacceptably small for peeling

Notes:

A. Some crawfish are very large - 5 to 10 per pound. These represent less than 5 % of all crawfish harvested and are sometimes called "Jumbos".

B. The absolute size range for any grade varies according to the over-all volume of crawfish. That is, when crawfish are abundant, even the Number One grade may be peeled and all others rejected. Conversely, even peeler crawfish can command high prices for boiling when crawfish are very scarce. Examples include the 1992-93 season when so much large wild crawfish was available that only the largest crawfish could be sold for any use. In the 1995-96 season, crawfish were so scarce that no crawfish have been rejected by buyers because of their size.

C. It is not uncommon for crawfish wholesalers to "blend" various grades together.

D. In a normal crawfish season, crawfish are in short supply from November through March. Most of the supply comes from crawfish ponds then. Most is sold alive for boiling. The bulk of the pond crawfish, however, start to enter the market in early April when wild crawfish begin to become abundant. Markets for live crawfish weaken and processors peel the smaller crawfish as a "salvage" operation.
Prices plummet for all but the largest crawfish.

This phenomenon - reduction in crawfish prices in April - is also the result of the need for processors to keep tail meat prices at affordable levels. Typical meat yield with "fat" on is 15%. Meat prices must be in the $4-6 per pound retail range to move any volume of crawfish meat. Regrettably, the influx of Chinese crawfish meat retailing at $3.50-4.50 per pound threw the domestic industry into a "tail spin". Even though a temporary tariff has been imposed on the Chinese product, the Louisiana crawfish industry has yet to recover from the damage to its markets for crawfish meat.

All crawfish meat is produced by hand peelers. Smaller crawfish are peeled because they are, in general, not acceptable as whole boiled crawfish. The absolute volume of meat produced per pound of whole crawfish increases dramatically as crawfish size decreases but the work required to peel them increases as well. Peelers must receive minimum wage but are paid according to the amount of meat produced during a working period. As a result, a peeler who produces a large volume of peeled meat is paid accordingly. Peelers prefer to peel Number One crawfish because such crawfish are easy to peel. However, the smaller the crawfish, the greater the quantity that is discarded by the peelers.

So, how much crawfish is "rejected"? The answer is simple - not very much! All crawfish processors have grading machines. When a particular farmer or fisherman begins to deliver crawfish that are "too small", they are graded. Those failing to meet the established grade are returned. The supplier then knows what he/she can sell and either grades his/her crawfish in the field or simply stops bringing them to the buyer. As a result, even though there are significant volumes of "rejected grade" crawfish, there is simply no way to generate accurate data on the volume of such crawfish as the industry is now structured.

QUANTIFYING REJECT GRADE CRAWFISH

In a normal crawfish year, crawfish farmers rarely continue to harvest crawfish past mid-April because their crawfish are too "small" and "hard" to compete with crawfish coming from the Atchafalaya Basin. Research conducted at the USL Crawfish Research Center and the LSU Ben Hur Aquaculture Center suggests that crawfish ponds "abandoned" in April because crawfish are too small, could probably yield as much as 500 additional pounds per acre if there was a reasonable market for the crawfish.

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