These experiments indicate that the number of crayfish had dropped to approximately 1250 animals in 2000 and remained low since then. Together, with the mark and release data from 1997 (Frutiger et al. 1999), they also allowed us to describe the correlation between CPUE and population size (Figure 1), which furthermore enabled us to asses the size of the crayfish for the years 1996, 1998 and 1999 (Figure 2).

For the future we suggested to continue observing the crayfish population in the pond and to re-stock the pond with eel as soon as the number of crayfish starts to increase.

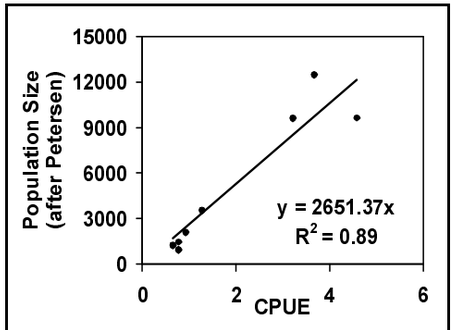


Figure 1. Relationship between CPUE and calculated population size (after Petersen, Krebs 1989), based on mark and release studies in 1997, 2000 and 2001.

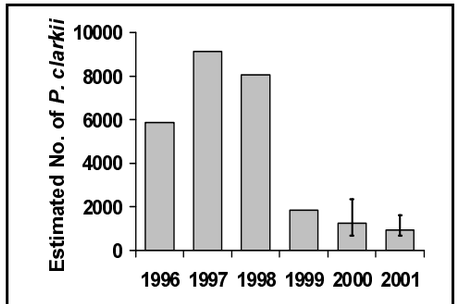


Figure 2. Estimated population size of *Procambarus clarkii* in Schuebelweiher, a 1.6 ha pond near Zurich, Switzerland.

The figures for 1996, 1998 and 1999 are calculated from the average CPUE (see Fig. 1), those for 1997, 2000 and 2001 are based on mark and recapture studies (error bars = 95% confidence limits). Note: In spring 1999, eel (*Anguilla anguilla*) were introduced into the pond.

REFERENCES

Frutiger, A., Borner, S., Büsser, T., Eggen, R., Müller, R., Müller, S. and Wasmer, H. R. 1999. How to control unwanted *Procambarus clarkii* populations in Central Europe? Freshwater Crayfish 12: 714-726.

Krebs, C. J. 1989. *Ecological Methodology*. Harper & Row, New York. 654p.

PAPERS OF INTEREST TO ASTACOLOGISTS

1. Kawai, T., Nakata, K. and Kobayashi, Y. 2002. A study of the taxonomic status and introduction of two *Pacifastacus* crayfish species from North America to Japan. Journal of the Natural History of Aomori 7:59-72.

2. Kraus-Epley, K.E. and Moore, P.A. 2002. Bilateral and Unilateral Antennal Lesions Alter Orientation Abilities of the Crayfish, *Orconectes rusticus*. Chemical Senses 27(1): 49-55.

3. Nakata, K., Tanaka, A., Hamano, T. and Kawai, T. 2002. Distribution of the signal crayfish Pacifastacus leniusculus in Lake Shikaribetsu, Hokkaido, Japan. Bull. Higashi Taisetsu Mus. Nat. Hist. 24:27-34.

4. Rodriguez, EM; Lopez greco, LS; Medesani, DA; Laufer, H; Fingerman, M. 2002. Effect of Methyl Farnesoate, Alone and in Combination with Other Hormones, on Ovarian Growth of the Red Swamp Crayfish, *Procambarus clarkii*, during Vitellogenesis. General and Comparative Endocrinology, 125(1): 34-40.

5. Skiebe, P; Dreger, M; Meseke, M; Evers, JF; Hucho, F. 2002. Identification of Orcokinins in Single Neurons in the Stomatogastric Nervous System of the Crayfish, *Cherax destructor*. Journal of Comparative neurology 444(3): 245-259.

6. Yasuda-Kamatani, Y. and Yasuda, A. 2002. Cloning and Expression of a cDNA for a Putative G Protein-Coupled Receptor from the Hepatopancreas of the Crayfish, *Procambarus clarkii*. General and Comparative Endocrinology, 125(1):25-33.

ISSN 1023-8174

Crayfish NEWS

Vol.24 No.2 March 2002

The official newsletter of the International Association of Astacology

The eastern white river crayfish, *Procambarus acutus acutus*, the subject of ongoing research at Delaware State University

Crayfish research at Delaware State University

IAA member **Bill Daniels** sends the following update from Delaware.

This past winter, research continued on developing intensive hatchery production of the native eastern white river crayfish, *Procambarus acutus acutus*, for stocking into production ponds in the springtime. Mature male and female crayfish were collected from ponds at Delaware State University in Dover, Delaware, U.S.A, in late September and separated into shallow trays. Females were stocked at either 100 or 200 per tray and males were later added at a ratio of one male to each 5 females. The crayfish were kept under ambient winter conditions receiving light through windows and filtered pond water from a local reservoir. In mid-March, crayfish were placed under controlled lighting (14 hours of light daily) and the temperature was adjusted to 20°C (68°F) to simulate spring-like conditions.

This species of crayfish has routinely been induced to spawn using this technology and, as expected, they began laying eggs within a few weeks. These eggs hatched within three weeks and

(Continued on page 3)

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

Secretariat

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

Tel: *(+1 318) 4825239*
Fax: *(+1 318) 4825395*
E-mail: jhuner@usl.edu

Web page:

http://www.uku.fi/english/organizations/IAA/

Officers:

- *Glen Whisson, President, Aquatic Science Research Unit, Curtin University of Technology, GPO Box U1987 Perth 6845, Western Australia*
  E-mail: g.whisson@curtin.edu.au
- *Keith Crandall, President-elect, Department of Zoology, Brigham Young University, Provo, UT 84602-5255 USA*
  E-mail: kac@email.byu.edu
- *Francesca Gherardi, Secretary, Department of Animal Biology and Genetics, University of Florence, via Romana 17, 50125 Firenze, Italy*
  E-mail: gherardi@dbag.unifi.it
- *David Rogers, Past President, 9 The Moat, Castle Donington, Derby DE74 2PD, UK.*
  E-mail: d-rogers@lineone.net

Statements and opinions expressed in *Crayfish News* are not necessarily those of the International Association of Astacology

President's Corner

Chair of the IAA 14 Organising Committee, **Dr Pedro Joaquin Gutierrez Yurrita**, informs me that preparations are progressing well and that registrants now represent all continents, including representatives from countries participating for the first time (e.g. Ghana, Cuba, Uruguay, Colombia, Chile). The Council for the Advancement of Technology and Science of Querétaro has sponsored four full grants for Professors from countries with economic problems (Cuba, Colombia, Russia), eight half grants for European participants (UK, Italy, Spain), and 4 full grants for Mexican students.

A workshop is planned for 3 August concerning ecology and conservation of native crayfish species from North America. A complete programme will be e-mailed shortly. The topic for the roundtable discussion on 7 August (during the field excursion to Teotihuacán) will concern ancient uses of crayfish by Mexican indigenous people. It will cover the problems of trading *Cherax quadricarinatus* within many countries of Latin America, Africa and Europe for aquaculture. Delegates from South America, Mexico, and Cuba will present environmental impacts caused by the introduction of *Cherax quadricarinatus* into their countries, as well as culture technology.

After many unexpected hurdles, the production of *Freshwater Crayfish 13* is in its final stages. Thanks to those of you who have been understanding, given the unfortunate situation that has held up production. Production of the IAA History booklet is also nearing completion. Both should be available prior to IAA 14.

Congratulations to IAA member **Pavel Kozak**, who has been award his PhD. A summary of Dr Kozak's thesis will be printed in a future issue of *Crayfish News*.

The e-mailing of *Crayfish News* continues to evolve. One or two members would like to have an A4 format, as opposed to one that can be printed and folded. My thoughts are that our first step is to try and reduce the need for posted hard copy issues. A printable version achieves this. If I can find time I will try and produce another format as well. Please let me know if you would prefer an A4, continuous, format. Also, if you are happy to **only** receive the electronic version, please let me know and I will not print and post an additional copy.

We have received candidates for the IAA elections. Information and ballots will be posted to you shortly.

Glen Whisson
IAA President

though isozyme analyses on specimens of *P. clarkii* in Japan are very scarce, the lack of enzyme variation strongly supports only the single introduction reported in the literature.

The author is preparing a more detailed work on this topic for a peer-reviewed journal. However, he feels that such background information will be of interest to all astacologists and particularly those involved with *P. clarkii*.

Successful suppression of an unwanted *Procambarus clarkii* population by predaceous fish

by **Andreas Frutiger**, Swiss Federal Institute for Environmental Science and Technology, Duebendorf, Switzerland

In 1989, the Red Swamp Crayfish (*Procambarus clarkii* Girard) was illegally introduced into a 1.6ha pond near Zurich, Switzerland. The population thrived and in 1996 exceeded 9,000 animals. For several reasons it seemed unlikely that this unwanted species could be eradicated (see Frutiger et al. 1999). Therefore, control measures were taken to reduce the population to a low level. Trapping campaigns of 1780 – 2671 UE (units of effort = traps x nights exposed) were conducted throughout summer 1997 to 1999. Additionally, 70 (marked) pike (*Esox lucius*) and 561 eel (*Anguilla anguilla*) were introduced into the pond in 1999.

Intensive trapping had little effect on the crayfish population. In contrast, average CPUE, which had exceeded 3 in 1997 and 1998, dropped below 1 after the introduction of predaceous fish (Table 1). We assume that this decrease was primarily due to eel predation, because pike seemed hardly to feed on crayfish. During control catches, only 3 pike out of 12 contained few crayfish remains in their guts. Additionally, only 1/3 of the captured pike were marked, showing that a healthy pike population was already present in the pond before 1999 and did not prevent the introduced crayfish from thriving.

Because of this substantial decrease in *P. clarkii* after the eel introduction, the intensive (and expensive) trapping was discontinued in 2000. To continue observing the development of the crayfish population, nonetheless, a mark and release experiment was conducted in September 2000 and 2001, respectively.

Table 1. Summary of measures to control and monitor the *P. clarkii* population in Schuebelweiher, a 1.6 ha pond near Zurich, Switzerland.

Year	Measure	average temperature (°C)	UE	CPUE	estimated population size
1996	Trapping	n.a.	624	2.21	5860*
1997	Trapping	21.5	2070	3.44	9129*
1998	Trapping	17.6	1780	3.04	8057*
1999	Trapping & pike and eel	19.0	2671	0.69	1828*
2000	mark-recapture experiment	n.a.	432	0.92	1250**
2001	mark-recapture experiment	18.0	318	1.10	936**

UE = Units of Effort (traps times exposed nights); CPUE = catch per unit effort (average number of crayfish captured per trap); *calculated from the average CPUE; **based on mark-recapture studies.

The introduction and current status of *Procambarus clarkii* in Japan
IAA member **Tadashi Kawai** comments on the history of *P. clarkii* in Japan.

The red swamp crayfish, *Procambarus clarkii*, was introduced into Japan about 70 years ago, and now it can be found all over the country. The history and present situation of the introduced *P. clarkii* in Japan is reviewed here.

Mr. Yoshinosuke Kawano managed the Kamakura Bullfrog Farm Co. in Kamakura City, Kanagawa Prefecture, Japan, in the late 1920s. In 1927, Mr. Kawano went to the U.S.A. to obtain good quality live bait and bullfrogs to improve a culture population. The choice for the live bait was *P. clarkii*. The crayfish were obtained from Mr. Percy Viosca Jr., manager of the Southern Biological Supply Co. in New Orleans, Louisiana, U.S.A. Mr. Viosca Jr. was a famous astacologist in New Orleans with many publications to his credit, and Professor G. H. Penn named *Procambarus vioscai* in his honor.

Mr. Y. Kawano purchased approximately one hundred *P. clarkii* and shipped them in beer barrels on the "Taiyo-Maru" to Japan. [The "Taiyo-Maru" was a Japanese mail ship built in Germany.] The Taiyo-Maru arrived in the port of Yokohama, Japan, on May 12th, 1927. On delivery to the farm, it was found that only about 20 individuals had survived the journey. These surviving crayfish were released into ponds on the bullfrog farm to provide food for the bullfrogs. However, the population of *P. clarkii* grew rapidly and the crayfish were soon being distributed from Kamakura City to many islands in the Japanese archipelago. These exotic crayfish easily adapted to the rice field environment in Japan due to its similarity to *P. clarkii's* endemic swamps of southern U.S.A. Twenty years after introduction, *P. clarkii* could be found in every major Prefecture in Japan.

Attempts were made in Japan to find additional uses for the red swamp crayfish such as: medicine and food for humans, bait for fishing, and as a predator for organisms detrimental to the rice fields and others. Unfortunately, the highly aggressive crayfish attacked the rice farmers and burrowed into the rice field banks causing them to collapse. All of these efforts in Japan failed to find an economic use for *P. clarkii* at that time.

In the last decade, *P. clarkii* has become one of the most famous freshwater organisms to be found in Japanese aquaria. **Mr. Shiro Nishimura** and a colleague, who are IAA members, have established an Aquarium Society based on crayfish with its own home page. Now Japanese people are so familiar with *P. clarkii* that they call it "American Zarigani" or "Makkachin". Zarigani in Japanese means the "reward creeping crab" and "Makkachin" means a red animal. In 2000, 73 years after its introduction, *P. clarkii* is now distributed throughout Japan.

The Kamakura Bullfrog Farm and business closed many years ago, and the farm was converted into a baseball ground. However, the family of Mr. Y. Kawano have preserved a number of the direct descendants of the original introduced population of *P. clarkii* in their house pond.

Some papers have reported that there was only the one introduction (described above) of red swamp crayfish being introduced into Japan. Given the recorded success of that population and its distribution, subsequent introductions would not seem to have been necessary. Al-

(Continued from page 1)
the first crayfish were ready to stock into the ponds by mid-May. On average, the crayfish produce between 250 to 300 hatchlings per female (~20-25 g). Hatchery production is crucial to intensive pond production of crayfish for bait or food markets.

Use of these crayfish as bait for saltwater angling may provide an environmentally friendly market, as any escaping crayfish would die quickly in the saltwater environment, and a higher valued product. Preliminary tests have indicated that these crayfish survive long enough in the coastal environment to catch fishes that are typically caught using other live saltwater baits like peeler crabs and shrimp.

Disease assessment in Louisiana crayfish
IAA member **Ray McClain** from the Louisiana Agriculture Experiment Station sends the following update.

The Louisiana crayfish industry experienced historically low levels of production during the 2000 and 2001 seasons. Historical drought conditions, especially during the summer and fall reproductive periods, and the introduction of a new pesticide in the rice industry have both been implicated as causative factors. Because of the difficulty in linking either of these factors to all farm production failures, some have questioned whether disease could also have been a contributing factor, as has been evident in many types of crustacean aquaculture, particularly penaeids, in recent years.

There is no evidence linking disease outbreaks to production failures in pond-reared crayfish in Louisiana; however, the possible role of diseases has not been thoroughly investigated. A project sponsored by the Louisiana Crawfish Promotion and Research Board was initiated in 2001 to provide a preliminary assessment of disease status of brood crayfish. Examination of the hemolymph from 226 adult procambarids (mostly *P. clarkii*) collected from four populations during the summer of 2001 revealed non-pathogenic bacteria loads in 20% of the specimens, indicating stress, but only one individual tested positive for a pathogen (*Vibrio mimicus*). Histological samples from each specimen have also been prepared and will be examined by Dr. Brett Edgerton, a very capable crayfish pathologist. It should be noted that normal rainfall patterns returned to Louisiana in the summer and fall of 2001 and harvest trends to date indicate that the current crayfish season appears to be "typical" of an average production year.

New homepage on freshwater crayfish disease
Brett Edgerton recently relaunched his internet homepage on Diseases of Freshwater Crayfish. The website is aimed at all with an interest in the subject—from general biologists, microbiologists, conservation biologists, pathologists, aquariasts and farmers. Specifically for the farmer there is a section on the significance of disease in crayfish aquaculture. Of primary interest to pathologists and virologists is a gallery of nearly 100 micrographs of disease conditions and viruses of freshwater crayfish which he has collected through-out his career.

The URL is: http://www.geocities.com/crayfishdisease

News from Portugal
IAA member **Dr Alexandra Marçal Correia** send the following update from Portugal.

Since the introduction of *Procambarus clarkii* into Portugal in the late 1970s, populations have expanded very rapidly due to the abundance of warm, shallow wetlands and agricultural areas, combined with the ecological plasticity of the species, and to human transplantations.

At this point the known distribution of *P. clarkii* includes several river basins (e.g. Mira, Guadiana, Sado, Tejo, Mondego, Vouga, Douro) and various Azorean lagoons. Presently, the wide distribution of *P. clarkii* does not overlap with that of the autochthonous species (*Austropotamobius pallipes*) which has a range confined to northeast Portugal.

In Portugal, *P. clarkii* is considered a pest mainly in rice fields because of its burrowing activity that provokes physical damages to dams and levees causing loss of water from rice fields. Damage to rice occurs by interference with the establishment of germinated rice seeds and on the early stages of rice growth.
Although, substantial work on crayfish and rice has been produced, the consequences of the introduction of *P. clarkii* on Portuguese riverine and aquatic communities are still poorly understood, namely its impact on amphibians and cyprinid fishes. Nevertheless, various studies have documented its population dynamics, its role as a vector of the crayfish fungus plague *Aphanomyces astaci*, and as a prey of diverse avian, mammal and fish predators, its trophic ecology, and ecotoxicology.

The list of references for Portuguese studies on *P. clarkii* is already extensive and represent the work from different teams from Universities of Porto, Aveiro, Coimbra, Lisboa and Évora. In spite of the significant efforts made to improve our background knowledge on the mechanisms underlying the effects of the introduction *P. clarkii* on Portuguese natural and semi-natural ecosystems, further research has to be developed to gain additional biological insight on this issue.

Address change
IAA member Premek Hamr has new contact details:

Premek Hamr
2217 Hillview dr.
Bethany, Ontario.
L0A 1A0 CANADA
Email: hamr@sympatico.ca

First virus discovered in *Austropotamobius pallipes*
IAA member **Brett Edgerton** sends the following information and request.

An intranuclear bacilliform virus was discovered in a population of *Austropotamobius pallipes* in France which was undergoing serious decline. Over two summers the population was eliminated from much of the watershed under study.

Investigations on moribund and apparently healthy crayfish collected in each summer revealed a high incidence of the IBV. However, the level of infection by the IBV was typically low in the tissues examined and it could not be confirmed that the virus was the sole cause or a contributing factor of the mortality. A manuscript describing the history of the mortality and the pathology and

Mislabeled-crawfish roundup nets 117,000 pounds of meat
IAA member **Robert Romaire** sends the following interesting article.

The statewide roundup of mislabeled crawfish in Louisiana continued Monday as the state Department of Agriculture reported more than 117,000 pounds of frozen tail meat found and held during the weekend. Warehouses are the next big target of inspection sweeps. The department is making no claims that anything is wrong with the meat, only that the packages containing it do not conform to Louisiana's crawfish-labeling law.

The state is stopping sales of crawfish meat based on apparent violations of state law requiring crawfish meat packaging plainly state the country and city of origin of the contents. Through Monday, state inspectors from the Department of Agriculture, Department of Health and Hospitals and Department of Wildlife and Fisheries had found mislabeled crawfish in 60 businesses across the state, including two in Baton Rouge and four in Lafayette.

Area businesses in which the mislabeled crawfish were found are Sam's and Louisiana Seafood Exchange in Baton Rouge and Sam's, Conco Cold Storage, Super Kmart and Bruce Foods in Lafayette. Conco was found to have the greatest concentration of the mislabeled packages thus far, with nearly 59,000 pounds. Those businesses are not likely to face penalties just for having the mislabeled crawfish on the premises, said state Agriculture Commissioner Bob Odom. "We don't normally charge stores," he said. The Agriculture Department will try to track responsibility for the packaging back to the company that originally packed and distributed the meat, Odom said. "They're subject to getting fined," he said. Before any serious talk of potential fines can begin, the Agriculture Department must hold hearings on the apparently mislabeled crawfish tails, and Odom said he would like to start those hearings next week. "We have to give them every opportunity to come in and correct their packaging," he said.

If the packages are found to have been mislabeled and cannot be brought into compliance with state law, the Agriculture Department can seize and destroy the meat. For the companies caught in the middle, such as Baton Rouge's Louisiana Seafood Exchange, the mislabeled crawfish packages are a huge inconvenience. Robert Walker, co-owner of Louisiana Seafood, said the crawfish shipments come in numbers too large to check every bag for proper labeling. He said his wholesale company has complied with the stop-sale order and has used its tracking system to help the state find where any potentially mislabeled packages might have been sold from Louisiana Seafood.

Part of the problem is that Louisiana is the only state that has such a labeling law for crawfish, he said. Neither the federal government nor any other state has such restrictions, and some foreign and out-of-state distributors might sometimes ship products in packages that are out of compliance, Walker said. "These are big companies that operate outside Louisiana and, subsequently, outside the United States," he said. "They are not subject to the laws of Louisiana." Walker said his company tries to make sure the businesses it buys from understand and comply with state law. "Our standpoint is if this is the business we're in and that's the rules of being in business, then you've got to follow them," he said. "The alternative is not being in business."

Source: *The Advocate*, 16/4/02. WorldCatch News Network.

species (6 nets total). We have come to realise that cobbler only inhabit two tributaries on the southern side of the Weir, while trout and redfin are dispersed in a more even manner.

Redfin or European perch are highly fecund having upwards of 50,000 eggs/kg and reproduce readily in impoundments. It is therefore understandable that they are abundant in the system. The trout inhabit areas of the Weir where insect populations are concentrated. Gut contents analysis supports this observation.

Our SCUBA diving team has noted that the predominant benthic macrophyte is extremely thick and extends upwards for several meters. This weed mass seems to act as a barrier, dividing the Weir into distinct spatial zones, highly correlated with depth and substrate. Being tactile foragers, cobbler may avoid thick weed areas, thereby confining themselves to deeper, rocky zones. This could partially explain why the yabby population has not expanded as expected. They are segregated according to the weed mass and the corresponding density of predators.

The largest redfin perch that has been caught in the system was 980g, however the average size has been around 250g. As they are gape-limited in their feeding behaviour, they are restricted in the size of crayfish they can consume, with gut contents suggesting they rarely consume crayfish larger than 30 mm carapace. This would favour adult marron, with the prevalence of dense aquatic weed possibly acting as a nursery for juveniles of all species.

The marron population is also under pressure from recreational fishing or 'marroning'. Drakesbrook is very close to a populated area (Waroona) and is a relatively close to the Perth metropolitan area, placing the marron population under substantial pressure. There are plans to make the Weir a 'snare only' area by 2004, further reducing pressure on the marron population.

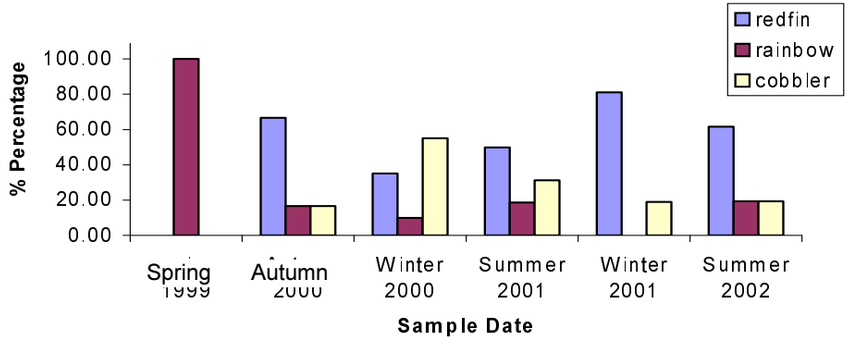


Figure 2. Finfish composition at Drakesbrook Weir

morphology of the virus has been submitted for publication in Journal of Fish Diseases.

While in Europe, I would like to be involved in any investigations of mortality in crayfish populations in order to investigate the involvement of viruses and other pathogens. So, if you notice a serious mortality this summer, and regardless of whether crayfish plague is suspected, I would really like to hear from you.

News from Russia

IAA member **Valeri Fedotov** sends the following update from Russia.

There are two diplomas, both regarding the role of crayfish in water ecosystem, recently completed by young researchers at the Laboratory of Experimental Ecology of Water Systems in St. Petersburg Scientific Center for Ecological Safety (Russian Academy of Science). Short summaries 1&2 are provided below.

Short Summary 1

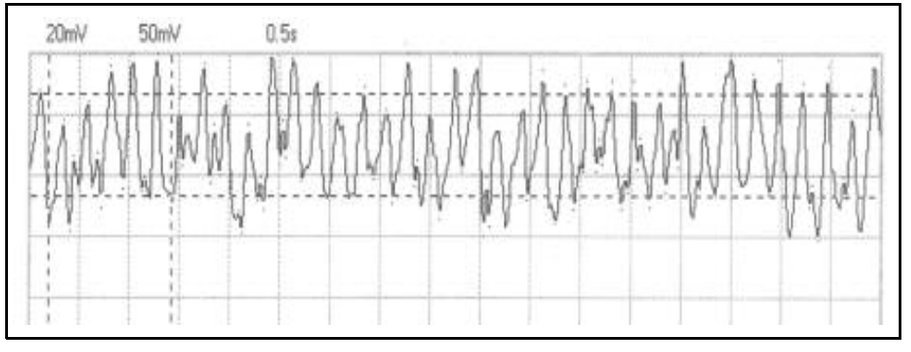
Topic: Study of crayfish introduction influencing on the processes of eutrophication in small fresh water bodies (Lake Beresno, Pskov Region of Russia as a case study).

Author: D. A. Zhuravlev
Supervisor: Dr. V. P. Fedotov
Contents: 80 pages, 4 tables, 14 appendixes and 27 references.

The process of eutrophication and the reasons for macrophyte growth in small fresh water bodies were considered. Ecological effect of crayfish on phosphorus cycling in fresh water ecosystem was discussed. Food consumption, turnover rates and assimilation in the crayfish *Astacus astucus* L. was considered.

The place of crayfish in trophic chain and its potential impact on primary production in Lake Berezno (Pskov Region) was investigated. Quantitative assessment for macrophyte production, its mass and area distribution and dynamic for last few years was made.

Twenty-four hour cardiac rhythm of *Pontastacus leptodactylus borioorientalis*



Laser light cardiogram of one day old *Pontastacus leptodactylus borioorientalis*, which was obtained using a PC S64i (Velleman) compatible oscillograph.
24 hour heart rate: 242.53 ± 27.79 beats/min

Post-embyonic *Pontastacus leptodactylus* from the Volga and Msta basins in Russia

Short Summary 2

Topic: Design for the experimental setup intended to determine the "critical" anthropogenic impacts on benthic invertebrates within the study of assimilative capacity of small water bodies.

Author: A. S. Kurakin
(antoncat@mail.ru)
Supervisor: Dr. S. V. Kholodkevich

Contents: 111 pages, 11 tables, 15 figures, 2 appendixes and 27 references.

The concept of water body assimilative capacity was considered as the basis for ecological water management as well as some problems concerning its determination. Ecological role of benthic organisms was discussed as of possible ecological "targets" when assimilative capacity of water body is practically examined. Advantages of non-invasive methods were underlined for recording the heart activity to evaluate the physiological response of benthic animals to chemical pollutants. To determine the "critical" concentrations influencing on benthic invertebrates, an experimental setup was designed and built for use with decapod and mollusks.

Ecological effect of growing crayfish population as well as an artificial crayfish introduction on the process of eutrophication by macrophytes in Lake Berezno was examined. Designed project of crayfish farm for juvenile breeding was outlined.

Submitted and successfully protected on specialty "Environmental Engineering" at St. Petersburg State Technical University in February, 2001.

Crayfish harvesting in Russia

IAA member **Ossi Lindqvist** forwards the following information on to members:

The Caspian Research Institute of Fishindustry recommended that the Astrakhan Fihindustrial Company carry out experimental harvesting of crayfish from the Lower Volga for the purpose of determining directions and methods for future commercial harvesting. This occurred from September to December 2001. On the basis of positive results of the experimental harvesting, it is predicted that 15-20 tons of crayfish can be efficiently caught in the October-November period.

The Company is seeking contact with any organisation interested in purchasing these live crayfish.
Safaraliev R.V., General Manager, Astrakhan Fihindustrial Company
INN 3016034882 Astrakhan, 43 Svusking str., SB Astrakhan branch 8625
Email: Aprik@telekompnet.ru

Drakesbrook Weir is about 120 km south of Perth and only 3 km from the town of Waroona. We have sampled this site 6 times since September 1999. Drakesbrook contains three species of crayfish, marron (*Cherax tenuimanius*), gilgies (*Cherax quinquecarinatus*) and yabbies (*Cherax albidus*). The marron and gilgies are native to the region while the yabbies are exotic to Western Australia, having been introduced from central and eastern Australia.

Three species of finfish have been sampled: cobbler (*Tandanus bostocki*), redfin perch (*Perca fluviatilis*) and rainbow trout (*Oncorhynchus mykiss*). Cobbler is native, trout and perch exotic.

Figure 1 shows the changing composition of crayfish trapped at Drakesbrook over the last three years. Surprisingly, the proportion of the invasive yabby is decreasing. Anecdotal evidence suggests that yabbies out-compete marron when sharing a system (yabbies can breed more than once per year and tend to be more voracious). We are unsure why marron numbers have not deteriorated in the presence of yabbies. Contributing factors may include the large amount of benthic macrophytes in the system (representing a large food supply and a complex crayfish habitat), the feeding habits of the finfish present (suited to smaller crayfish), or the healthy gilgie population present.

Gilgies have most likely shared systems with marron for thousands of years and consequently could be more likely to synergise with their larger cousin. On the other hand, yabbies are similar in size to gilgies and it may be an antagonistic relationship between these two species that is suppressing expansion of the yabby population.

The composition of finfish sampled since 1999 is depicted in Figure 2. Redfin perch are predominant followed by cobbler, despite the fact that neither were caught during the first sampling trip. Fish are trapped using 30 metre multi-meshed gill nets that are set in triplicate for both benthic and surface

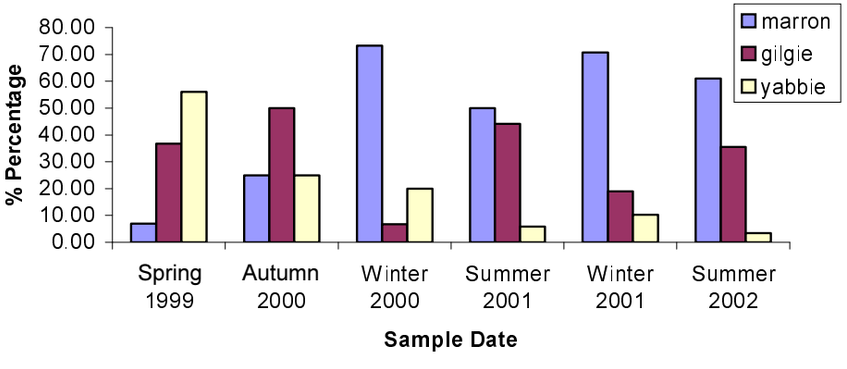


Figure 1. Crayfish composition at Drakesbrook Weir

Redclaw farming conference 2002
This year's conference is being held in Cairns, North Queensland, on 31 May 2002, with a post-conference farm tour on 1 June. Although it is probably too late to attend the conference, you may be interested in further information. Contact: **Max Wingfield,** e-mail: max.wingfield@dpi.qld.gov.au

IAA resolution and discussion paper on import risk analysis
At IAA 13 in Perth, I was requested by the IAA board to prepare a discussion paper on Import Risk Analysis for consideration in formulating a new IAA resolution. I have now completed that paper - an oral presentation was given at the European meeting in Poitiers and the paper has been submitted for publication in the proceedings of that meeting. In order to progress the resolution issue, I will email a copy of the paper to interested parties so that there is time to consider the issue prior to the Mexico meeting. Please email me if you would like a copy of the manuscript.

Brett Edgerton
E-mail: brett.edgerton@zoofisch.vetmed.uni-muenchen.de

Human impacts on marron populations in Western Australia
This four-year study, funded by The Natural Heritage Trust of Australia, has attempted to describe anthropogenic impacts on the freshwater ecology at eight sites in south-west Western Australia, home of the marron, *Cherax tenuimanus*. Impacts include increased salinity associated with land clearing and agriculture, decreased water quality due to mining activities, and the influence of introduced predatory fish species, such as trout, redfin perch and European carp. To date, thirty-five sampling trips have been undertaken, with each site being sampled bi-annually. Data have been recorded from over 4800 crayfish.

To provide further insight into the study, Project Leader **Glen Whisson** and Technical Officer **Leyland Campbell** describe one of the study sites, Drakesbrook Weir (Lake Moyanup).

To test the experimental setup, it was decided to record changes in heart rate of crayfish *Astacus astacus* L., exposed to 0 - 60 mg/l copper ions in freshwater at 150 C.

Submitted and successfully defended on specialty "Environmental Engineering" at St. Petersburg State Technical University in February, 2001.

During 2001, the following papers concerning crayfish were published by Russian astacologists:

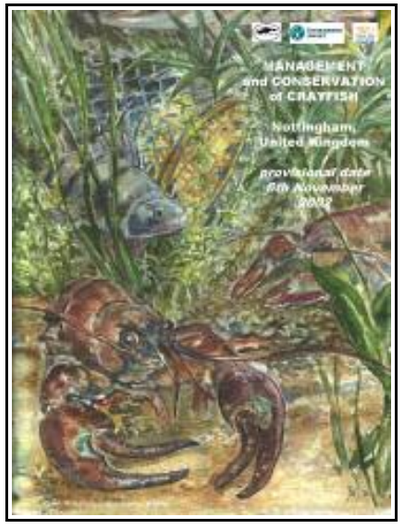
E.V. Kolmicov "Biological basics for regulation of crayfish (*Pontastacus*) in delta Volga"
V.B. Ushivcev "Crayfish of Caspian Sea (Crustacea, Decapoda, Astacidae) in conditions up level of the Sea: Spread, properties of catch and biology"
B.R.Borisov "Morpho-fuctional organization, postembrional development of *Pontastacus leptodactylus* (Eschsholtz, 1823) (Decapoda, Astacidae)and his trophic connections in basin Volga and Msta".

Query on crayfish pheremones
IAA member **Steve Kolb** [e-mail: skolb@treko.net.au] asks members to shed some light on the role of pheremonal communication in freshwater crayfish.

Steve writes: "Sexing yabbies is laborious and slow, but it does achieve faster growth. The hybrids are an option, but again lots of mucking around and cost. The work done with other crustaceans shows that pherormones could play a role as a sexual attractant.

Ideally, farmers could place a little of what we can call "factor x" in a bottle in a trap and all the males would come running. Can any IAA members shed some light on this issue?"

Crayfish conference for Nottingham
IAA member **Jonathan Brickland** from the UK Environment Agency sends the following Call for Papers for a conference to be held in Nottingham at the end of the year.



Call for papers:
We are organising a crayfish conference in Nottingham, England in late October/ early November 2002, this is a follow up to the two day conference held in Leeds in 2000. The conference will include reports from research and case studies regarding the conservation of native crayfish species and problems associated with managing alien crayfish populations.

The conference will be a one-day event and we are hoping to attract good quality speakers from home and abroad, some expenses will be available. If you are interested please could you send a brief abstract of your proposed presentation to the e-mail address below:

crayfish.conference@environment-agency.gov.uk

Biology of Freshwater Crayfish.
Edited by **D.M. Holdich** for Blackwell Science Ltd., Oxford. 702 pp plus 51 colour plates

GENERAL BIOLOGY

CRAYFISH OF COMMERCIAL IMPORTANCE

(Continued on page 7)