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Inside this issue:

TWO OF THE BEST IN FLORENCE

Meeting attendees. Photo by Francesca Gherardi.

Why organise one conference in a week when you can organise two? IAA-President **Francesca Gherardi** and her hard-working team of students (**Claudia Angiolini, Laura Aquiloni, Claudia Baldini, Silvia Bertocchi, Sara Brusconi, Barbara Renai, Elena Tricarico**, etc) did a remarkable job of organising the final CRAYNET conference entitled 'European crayfish as heritage species – linking research and management strategies to conservation and socio-economics', immediately followed by an international workshop on 'Biological invasions in inland waters.' The acronym used for the second meeting was INWAT, and it only transpired afterwards that this also stood for 'The International Network of Women Against Tobacco'! We don't think any of them turned up though! Both meetings were very well attended and provided a wide variety of oral presentations and posters. For those attending both meetings, not much time was left for viewing the wonders of Florence in the excellent weather, but even walking from the hotels to the venues was a rich experience.

The CRAYNET meeting (2-4 May) was sponsored by the EU (Fifth European Framework) and was held in the atmospheric Palazzo Giugni-

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Keeping Your IAA Membership Information Current:

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IAA President Francesca Gherardi (Italy)

President's Corner

Dear IAA members:

This spring has been exceptionally busy for astacologists all over the world. In Europe, most of them took part in the Final CRAYNET Conference that I hosted in Florence at the beginning of May; many of them worked hard to submit their contributions to the Conference Proceedings on time. Following the examples of the previous CRAYNET Conferences (Kilkenny, Halden, and Innsbruck), a special issue of the Bulletin Française de la Pêche et de la Pisciculture (BFPP) will collect these papers in a volume entirely devoted to the conservation of the European crayfish species. Hopefully, this will become a reference publication for the European astacologists and a necessary tool for those people (scientists, managers, educators) interested in preserving freshwater biodiversity on our continent.

Meanwhile, we heard of much ferment in the community of astacologists and conservation biologists from other continents. In Japan, **Usio Nisikawa** is struggling to convince the government to include three allochthonous species of crayfish (*Cherax tenuimanus*, *C. quadricarinatus*, *Astacus leptodactylus*) in the list of "noxious animals" of the Japanese "Plant Protection Act". From Tasmania, **Todd Walsh** launched a petition that may help conservation of the habitat for the giant Tassie lobster (*Astacopsis gouldi*), one of the most unique and impressive freshwater crayfish.

Experience taught us an important lesson: our efforts have much higher chances of success when we work as a team within a group of people moved by the same passion for the field. A society provides important tools for disseminating and sharing information, is an invaluable venue for discussion, and has the potential to magnify individual strength and experiences. This is why I recommend all the members of our society to take an active part in it and in its management, and to give their precious contributions to its initiatives, including Crayfish News and IAA Symposia. I am glad to announce that the number of our full members is increasing. I welcome, with great pleasure, the official entry in our Society of the 146 members of Forum Flusskrebse who will share with us, from now on, the common love for crayfish and commitment to their conservation.

Francesca Gherardi
IAA President

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.

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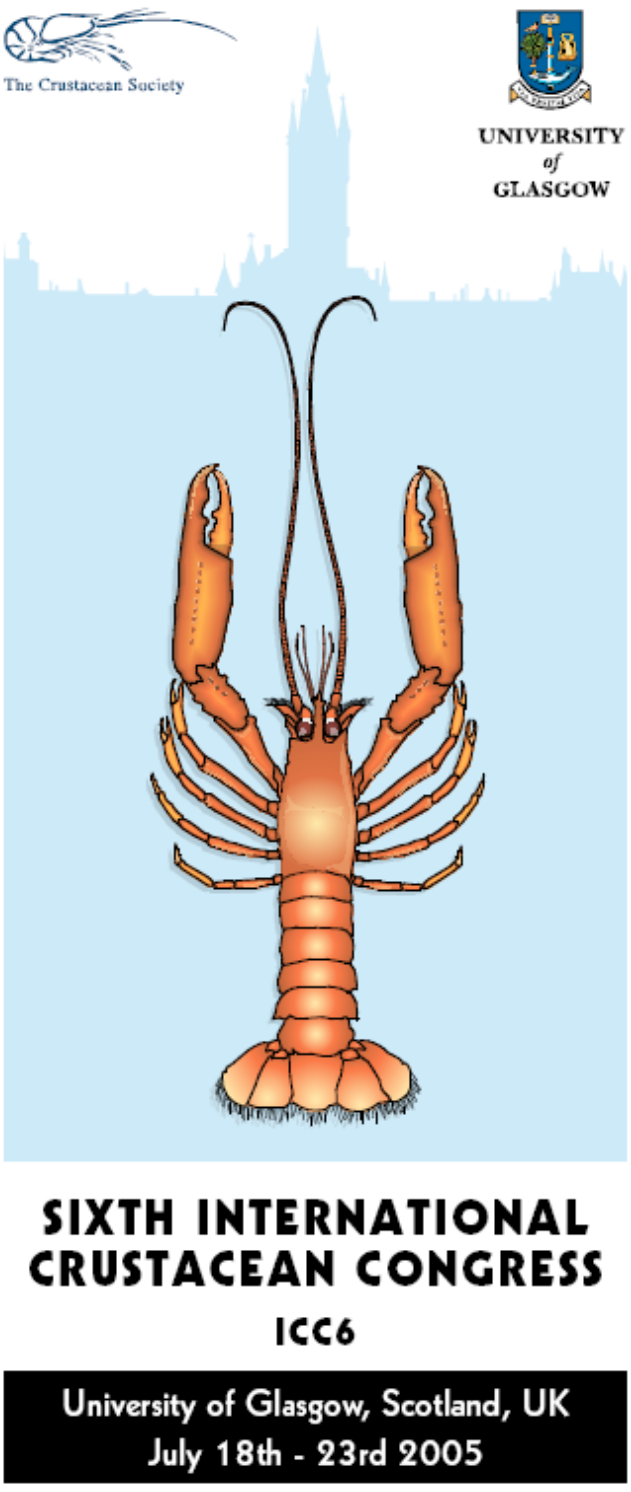
This issue edited by James W. Fetzner Jr. and Francesca Gherardi

Short Articles

CLASH OF THE TITANS IN WASHINGTON STATE, USA

Signal crayfish (*Pacifastacus leniusculus*) and red swamp crayfish (*Procambarus clarkii*) are perhaps two of the most cosmopolitan species of crayfish in the world. Not long ago, I documented the presence of red swamp crayfish in Washington State, USA (Mueller 2001), which is within the native range of signal crayfish. I discovered the invader during a routine fish survey at a small, but popular fishing hole called Pine Lake, which is located due east of Seattle on the Sammamish Plateau in King County. Since then, red swamp crayfish have been found in two other lakes in King County: Lake Washington and Steel Lake. Currently, there is no information about these populations and, regretfully, very little information about the biology and life history of signal crayfish in its native range (Lewis and Horton 1997; Lewis 2002 and references therein; Mueller 2002). In fact, most of what is known about signal crayfish comes from studies of introduced (intentional or otherwise) populations in the UK and Europe. A cursory look at the scientific literature and the popular press reveals that both species are fully capable of 'dishing it out' wherever they have been introduced. But with the encroachment of red swamp crayfish into the Pacific Northwest, I wanted to know: can signal crayfish take it? Can they stand up to red swamp crayfish or will the exotic species displace the native one? How are red swamp crayfish faring here? To answer these questions, I decided to enroll in graduate school after working in fisheries and aquaculture for the past 20 years and turn my query into a MS thesis project through the Environmental Science Program at Western Washington University.

In the ensuing months, I will carry out field observations and examine interactions and shelter competition between signal crayfish and red swamp crayfish at 'ground zero' (i.e., Pine Lake) as a way of determining the impact of the invader on the native crayfish of Washington.



Pine Lake is an ideal location to study crayfish in a natural setting. The oligotrophic lake is clear (mean Secchi depth = 4.6 m), shallow (mean depth = 6.0 m), and of modest size (35 ha). There is little disturbance from boat traffic, and it is generally protected from inclement weather. However, before designing the field

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Photo 1. Karl Mueller holding a signal crayfish captured in a cylindrical funnel trap at Pine Lake, King County, Washington, USA.

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trials (scheduled for mid-2006), I thought it would be useful to collect some baseline information about Pine Lake's crayfish resources. Hence, during early spring 2005, I slogged through the obligatory scientific collection permit process, and in May, started sampling crayfish at the lake using cylindrical funnel traps (courtesy of **Scott Lewis** - the fellow who wrote the chapter on *Pacifastacus* in **David Holdich's** 2002 tome, *Biology of Freshwater Crayfish*) and my gloved hands while scuba diving and snorkeling. To date, I have visited Pine Lake twice for several days in May and June, and am now on the eve of my third trip, which is scheduled for late July. Barring any unforeseen circumstances, I will continue sampling crayfish here on a monthly basis through fall, and possibly through next spring.

My preliminary findings thus far are that 1) the introduced red swamp crayfish is smaller yet more abundant and ubiquitous compared to the native signal crayfish, 2) low density populations of both species exist at the lake (not surprising, given Pine Lake's trophic status and the fact that it contains eight species of fish - all of which are known crayfish predators!), 3) red swamp crayfish are faster and less vulnerable to 'predation' by the guy with the submersible light compared to signal crayfish, and 4) diving appears to be more effective than trapping when sampling crayfish in this system.

I am really looking forward to next year's field trials. Who will win - the more robust native signal crayfish or the 'craftier' invading red swamp crayfish? Will there even be a winner? After all, both species are considered aggressive. Field observations and field experiments are generally lacking in crayfish research (Bergman and Moore 2003). I hope to fill this void in some small way, shed some light on interactions among native and invasive crayfish species, and at the same time, provide some much needed information about signal crayfish in its native range.

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Photo 3. – Large red swamp crayfish captured while night diving at Pine Lake, King County, Washington, USA.

Photo 2. – Now that's a signal crayfish!

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UNIVERSITY OF LOUISIANA AT LAFAYETTE AG WETLAND WATERBIRD HABITAT PROJECT – JULY 2005

With his retirement, **Jay Huner**, Director of the University of Louisiana at Lafayette's Crawfish Research Center, is concluding his three decade study of the significance of Louisiana's ag wetlands as waterbird habitat. Louisiana boasts 600,000+ acres of ag wetlands. Ag wetlands are lands used to raise water-based crops, primarily rice, but including aquacultural crops such as crawfish and finfishes. Because rice requires soils that hold water and readily available water, it is not surprising that pond aquaculture developed in rice growing areas of Louisiana with crawfish in the coastal areas and finfishes being grown in central and northeastern Louisiana.

Crawfish aquaculture fits into rice culture nicely because the same fields are used to produce rice in warm months and crawfish in cool months. Crawfish is integrated into rice production in one of two ways: both crops are grown in the same 12 month period or rotations involve rice-crawfish-fallow-rice-crawfish or rice-crawfish-row crop-rice-crawfish. Currently about 130,000 acres of ag wetland fields is involved in crawfish production with expansion in the central and northeastern sections of the state where finfish operations have been converted to crawfish because of poor market conditions. Crawfish is also expanding into the rice growing areas of the northwestern areas of the state within the Red River Valley. Crawfish and/or finfishes are also often grown in monoculture in marginal, heavy clay bottom lands originally cleared several decades ago for soybean culture.

Crawfish ponds attract waterbirds because they provide excellent resting/loafing sites for all species and also provide food resources, plan and animal, that rival, even exceed in values, those found in natural wetlands. In fact, the loss of over 1.5 million acres of coastal wetlands since the 1950s make the so called "artificial" ag wetlands along the coast of Louisiana that much more significant for local, regional, continental and inter-continental populations of waterbirds. Waterfowl have always been associated with rice lands. However, so, too, has the state's entire suite of waterbirds including grebes, cormorants, wading birds, shorebirds, gulls, and terns although their presence has, been more "take for granted" than highlighted because of the immense economic and social significance of waterfowl hunting.

Crawfish ponds are shallow water wetlands filled with water in the fall (September-November) so that female crawfish bearing young can emerge from burrows and drained in the spring (March-June) or even in the summer (June-August). Once ponds are filled, they quickly develop an invertebrate fauna including crawfish that is very attractive to carnivorous birds. Large, mixed flocks of egrets, herons, and ibises are found feeding in such ponds in the fall. They are joined in the winter and spring by large numbers of cormorants, gulls, and terns. Crawfish ponds become especially significant to shorebirds and wading birds when they are drained in spring or summer. Thousands of yellowlegs, Dunlins, peeps, dowitchers, and other shorebirds concentrate in the ponds when they are drained in the spring. Where ponds are drained in July or August, major concentrations of shorebirds can be found as "fall" migrants return to the region from arctic nesting grounds on their trips to their southern hemisphere wintering grounds. Interestingly, a very significant presence of wintering shorebirds utilizing ag wetlands has been well documented over the past two decades!

Regardless of when crawfish ponds are drained, they become a sea of white, blue, gray, and pink wading birds foraging on stranded crawfish, fish, tadpoles, and macroinvertebrates. This dependable food source provides sustenance to wading bird preparing to nest, nestlings during the nesting season, and post breeding birds dispersing from rookeries. In fact, Huner's team of professional field ornithologists has demonstrated conclusively that the dramatic increase in wading birds diversity and numbers in southern and central Louisiana since the 1950s is, in large part, due to the expansion of crawfish farming during the second half of the 20th century.

Huner and his collaborators have docu-

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ECOLOGICAL NOTES ON *PROCAMBARUS DIGUETI*, AN ENDANGERED SPECIES THAT INHABIT THE SMALL BASIN OF THE CAMÉCUARO NATIONAL PARK, MÉXICO

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Introduction

Procambarus digueti (Bouvier, 1897) is probably the most ancient crayfish species from México, and inhabits only few streams of the drainage system of the Duero River, the drainages that begin inside Camécuaro National Park (in the State of Michoacán, West-Central México). As a result of the great environmental changes that are suffering the Camécuaro National Park hydrological system (springs, streams and lake), crayfish populations have been greatly reduced in abundance and in number of individuals per population, or have become extinct (Gutiérrez-Yurrita & Latournerié 1999). In addition, crayfishing is out of control, and though is banned inside the National Park, no control policies are applied. This furtive activity is increasing every year and has shifted crayfish population from the lake to critical low levels.

Although *P. digueti* (called "chapo" by the local human population), is of great importance in taxonomy, ecology and evolution of Mexican crayfish species (Gutiérrez-Yurrita 1994), no more that five ecological studies have been conducted concerning its biology, conservation or ecological requirements. This study is an extract of the thesis presented by Carlos Pedraza entitled "Population analysis of *Procambarus digueti* Bouvier (Decapoda, Cambaridae) in Camécuaro and Lower Duero river sub-basins, Michoacán (October 2004)". The main objective of the thesis was to gather information concerning ecology and biology of *P. digueti* such as growth rates at different seasons, sex ratio, population cinematics and dynamics, recruitment and reproductive periods, phenology of the reproduction, natural mortality rates at different periods of the hydrological cycle and fishing mortality throughout the years 2003-2004. All of this information was included into the General Strategy to Manage Camécuaro National Park and to conserve its natural biota and surroundings. This note is addressed to present how environmental factors influence the ecology distribution of *P. digueti* individuals and its inference on crayfish conservation practices.

Study area

The study was conducted in the Lake of the Camécuaro National Park and in the Camécuaro stream, into the Central-Occidental Plateau of México (Michoacán). Camécuaro stream is a 2 km long, slow-flowing stream, which originates from a great spring in the Camécuaro National Park, the lake of Camécuaro. The dominant aquatic vegetation comprised coon tail or common hornwort *Ceratophyllum demersus* L., water-hyacinth *Eichornia crassipes* (Mart) Solms. The plankton community was dominated by Zygnematacea, Ulotrichacea, Naviculaceae and Gammaridae. The aquatic fauna was dominated

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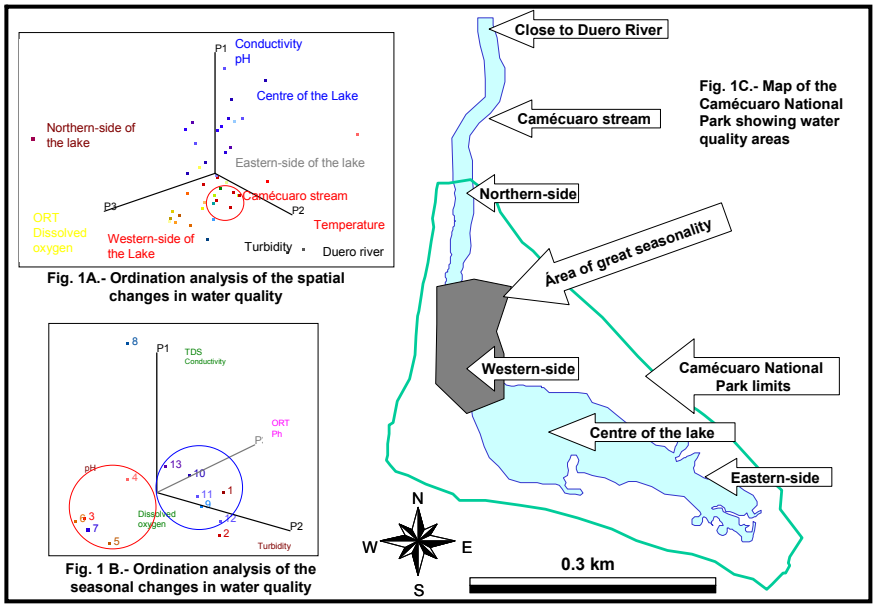

Figure 1. Statistical analysis of the spatial and seasonal water quality and their geographical and ecological meaning into the Camécuaro hydrological system (lake and stream).

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by other crustacean: crayfish *Cambarellus montezumae* (Saussure) and crab *Pseudothelphusa jouyi*; and by some insects (Odonata, Carabidae and Notonectidae). Rainbow trout (*Oncorhynchus mykiss* (Richardson)) and black bass (*Microterus salmoides* Lacépede) are the most important predators. Water depth is about 1.8m in the stream and 3-6m depth in the lake; temperature is between 19 and 22°C; dissolved oxygen is between 6 to 12mg l^{-1}; pH from 6.8 to 7.9; turbidity is from –10 to 1° and conductivity is from 17 to 45 $mScm^2$.

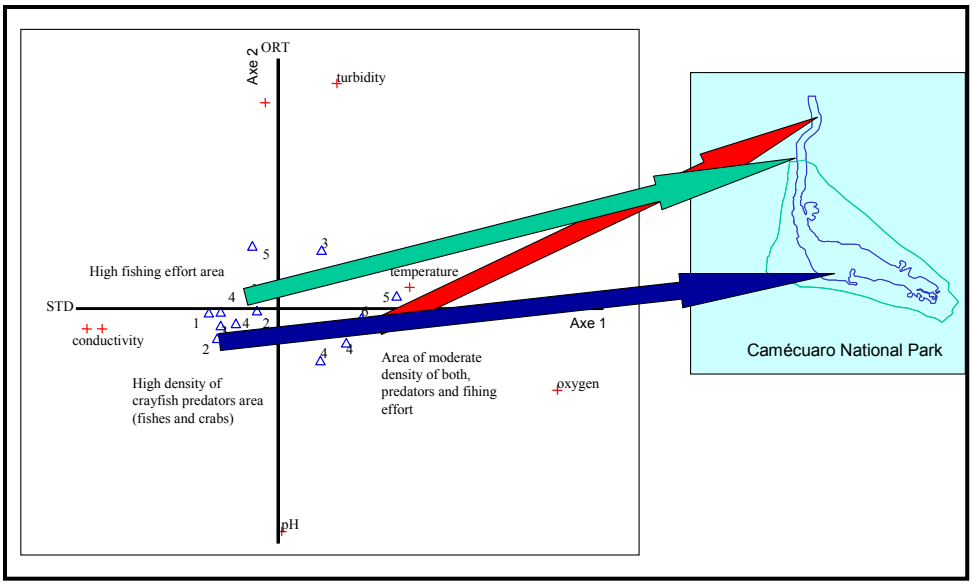

Figure 2. Canonical correspondence analysis that shows crayfish abundance regarding water quality and density of predators and fishing effort (cumulative variance according two first axes = 84%). Red crosses represent water parameters and triangles represent crayfish density.

Methodology

Crayfish were collected every 15 days during one hydrologic cycle (March 2003 to February 2004). Length data of crayfish were grouped in 0.3cm size increments. Initial estimates of the number of recruitment classes present and of mean length, variance, and proportion of crayfish in each recruitment class were obtained with a graphical separation technique by using probability paper (Cassie 1954). Growth rates of each recruitment class were estimated from a variation of the von Bertalanffy's growth model devised by Pauly and Morgan (1987): $L_t = L\infty\ (1\text{-}e^{-k\ (t'-\ to)\ +\ K/Q\ \{sen\ Q\ (t'\ -\ ts)\ -\ sen\ Q\ (to\ -\ ts)\}})$ where L_t is the length of the organism at a given moment t; $L\infty$ is the maximum possible length of the organism; t is the time at given instant; t_o is the time at given instant when the individual would has a length equal to zero; k is the intrinsic growth rate; ts is the start of the oscillation with respect to t=0. Q=2p/(1-NGT) where NGT is the duration of non-growth within a year. In this model we assume that anabolism and catabolism coefficients of the growth rates were constant all over the year according to the von Bertalanffy's metabolic rule (the metabolism of an organism is proportional to its weight by a 2/3 power) (Bertalanffy 1957).

Data analysis

Environmental data (physicochemical) were analysed by different multivariate statistics: ordinate analysis and canonical analysis of correspondences. Growth data were analysed by constructing a series of seasonal growth curves. Influence of environmental data on crayfish growth was determined by plotting two-dimensional contour plots of k (growth rate) and $L\infty$ (asymptotic length).

Results and discussion

The ecology of nearly all species changes as a function of external factors, such as the climate or the water regime, and of internal factors, due to the physiology of the organisms (Adão & Marques 1993). The combination of these factors may cause strong variations in the population dynamics of the species (Anastácio & Marques 1995). Figure 1 shows how environmental factors differentiate the hydrological system into several areas (Fig. 1C), depending on the level of each parameter and on the interaction among several parameters. For instance, the red circle shown in Fig. 1A represents the intersection of several levels of temperature, conductivity, water density and ion composition and dissolved oxygen that by interacting one each other create the best microhabitat to *P.*

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digueti; this means that in this area of the aquatic system (Camécuaro stream) relative density of crayfish is highest. In addition, seasonal water quality changes are more remarkable in the same area (Fig. 1B), being conductivity and ion composition the most striking factors to determine crayfish distribution. Red circle (left one) represent dry season and blue circle (right one) represent wet season. Concerning management of crayfish populations, it is worthy to notice that this area of the lake is one of the most invaded area by exotic fishes (black bass and rainbow trout, among others), and a very important crayfishing area. As a result, introduction of these species have been exerting a great negative impact on crayfish population, due to their great predatory activity (Gutiérrez-Yurrita 1994). In Figure 2 we can observe that the canonical correspondence analysis shows crayfish abundance regarding water quality, predatory effect and fishing effort (cumulative variance according two first axes = 84%). Red crosses represent water parameters and triangles represent crayfish density. As Gutiérrez-Yurrita & Latournerié (1999) pointed out, population dynamics of *P. digueti* was significantly correlated to the flooded regime (the main environmental process that led great changes in water quality) and a lesser extent to the water conductivity and ion composition. Predators and fishing effort probably contrib-

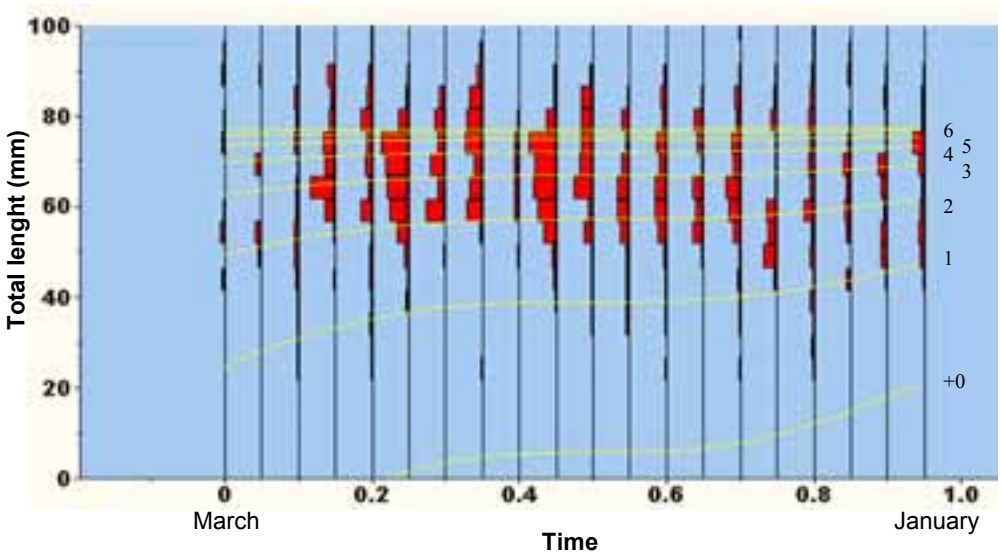

Figure 3. Seasonal growth curves of *P. digueti* in Camécuaro hydrological system. Each line corresponds to a different cohort class. Length-frequency histograms show size class structure dynamics on crayfish populations during 2003-2004 . Useful ranges to construct the model: k = 0.606-0.625 and La=77.85-78.35

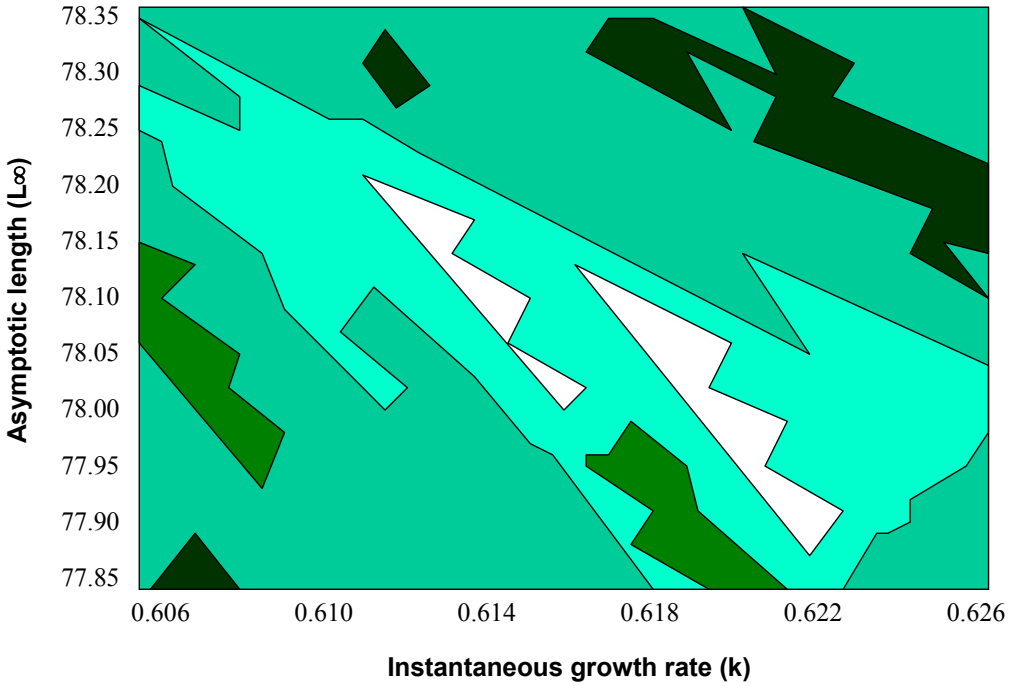

Figure 4. Two dimensional contour plot of k (growth rate) and L∞ (asymptotic length) from von Bertalanffy's seasonal growth model of *P. digueti* during a complete hydrological cycle. Light areas represent low values of the score function (best environmental conditions to growth) and the dark areas represent high values of the score function (worst environmental conditions to growth).

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uted to the variations observed in the population's distribution in both scales, seasonal (Correia & Bandeira 2004) and spatial, since overexploitation of crayfish may conduct populations to a critical level in numbers (Gutiérrez-Yurrita & Montes 2004).

Figure 3 shows population dynamics for *P. digueti*: five primary YOY recruitment classes (+0, 1, 2, 3, 4) were present from April to May. Secondary recruitment classes were identified from July to August (5, 6). *P. digueti* exhibited a long reproductive period (from spring to autumn) and a short reproductive period (late winter). Reproductive behaviour was synchronous in the same way reported by Gutiérrez-Yurrita (1994) for other places of the Duero Basin. Population growth rates were higher in spring and in autumn than in summer and in winter. Further, NGT was just found in summer period. These data are correlated to hydrological period occurring in the Camécuaro Lake and stream, and consequently, environmental data (water quality) may exert a strong influence on the chapos' growth rate.

The two dimensional contour plot of k (growth rate) and $L\infty$ (asymptotic length) from von Bertalanffy's seasonal growth model (Figure 4), shows how environmental factors influence growth rates of *P. digueti* during a complete hydrological cycle. Since light areas represent low values of the score function we can assume that two periods of maximum growth were detected in this population of *P. digueti*, as was previously showed by Fig. 3. The amplitude of each area shows growth response to the environmental change.

The study of the ecology of *P. digueti* is of great importance in understanding future events in the population dynamics of this species. These studies are also of the greatest importance in determining the final structure (size classes) and global population dynamics (migratory and reproductive behavior, etc.), which to a certain extent determines the management strategy to be implemented. ☤

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mented approximately 80 species of waterbirds utilizing ag wetland habitats in Louisiana and the upper coast of Texas. They have developed seasonal checklists for ag wetland sites in the Sorrento, Church Point, Catahoula, and Perry areas of Louisiana. These lists also document the birds associated with fringing riparian areas and forests with the total number of species recorded

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now exceeding 275 birds which compares very favorably with the Louisiana's state list of slightly more than 450 birds.

Louisiana's aquaculture community has always expressed concern over possible damage done by waterbirds to crawfish crops through competition for food resources, direct predation, or trap displacement. These are valid concerns but funding necessary to quantify such effects has yet to be secured despite continuous efforts to locate such funds.

Huner's professional collaborators have included the following individuals: David "Rock" Boudreaux, Rex Caffey, Carroll Cordes, Bruce Fleury, Bill Fontenot, Albert P. Gaude', III, Clint Jeske, James Kushlan, Paul Leberg, Billy Leonard, Tibor Mikuska, Michael Musumeche, Ron Nassar, Wayne Norling, Gregory Richard, Robert Romaire, Tom Sherry, and John Westra. Huner has also worked closely with the following farmers: Jim Boyce, Jr., the Marin Durand family, Fred Kyle, David Lacour, Jim McCahill, Leroy Richard, Jr., Perry Smith, Jr., and Chester Wimberly. Huner's survey work has been funded by the Louisiana Crawfish Promotion and Research Board and the Coypu Foundation.

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SUBMITTING INFORMATION AND ARTICLES TO CRAYFISH NEWS

Wondering how you can submit an article or other information to Crayfish News?

(These instructions are also available on the IAA website at: http://iz.carnegiemnh.org/crayfish/IAA/cnsubmit.htm)

There is usually an announcement sent out to members via e-mail that gives the deadline for newsletter submissions. This announcement usually provides members with about one month to get materials together and submitted. Authors can submit their articles in several different ways.

- by e-mail to one of the editors **James Fetzner** or **Francesca Gherardi** **OR**
- by uploading files directly to the IAA website (see "How to Upload Files to the IAA Website" on page 5 for specific details).

Pre-Submission Checklist:

1. Please submit your files as a **ZIP or RAR archive**, especially if you have multiple files (documents + images, etc.). This will allow us to keep all of your files together and greatly minimize errors on our part when trying to sort out what files go with what article. If you are unsure how to create such a file, please click here or contact one of the editors.

2. **Please name the zip archive** something like "Crayfish_News_YourLastNameHere.zip".

   NOTE: Please use underscores (_) to separate items in file names (rather than spaces), as this greatly helps in transferring files electronically.

3. **Please submit photos and other images separately** (not inserted inside Word documents). *Photos should be high-resolution color copies.*

4. **Please include table, photo, and image captions** (including the name of the photographer and any copyright information, etc., if applicable) at the end of your document. Also, please note the image file name associated with the caption. It is really nice to get photos along with articles, but when we have no idea what is contained in the photo, or who people are, it makes them less interesting. If you submit photos of crayfish please include the species name, and the location from which it was obtained, and any other information you think would be of interest to other IAA members.

5. **Contact information** -- Please include your name and contact information with your article/submission. At a minimum, this should be your e-mail address and institution. This will give IAA members interested in your research the ability to contact you. Also include a personal website address, if you have one.

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News From Around The World

IAA16, GOLD COAST 2006
June 2005 Update.

Greeting from the ever sunny (but now freezing) Gold Coast of Queensland. We are currently deep into Winter and the temperatures have plummeted to a very chilly 19°C (above zero), nevertheless the palm trees are still swaying in the breeze: the breeze is just a bit cooler…

With just over a year before IAA16 will commence here on the Gold Coast it would greatly assist our planning and preparations if we could obtain a preliminary indication of the number of delegates that we might expect to attend. The timing of the Symposium remains unchanged, IAA16 will be commencing in the first week of August 2006.

If you are planning to attend IAA16, or think it is likely that you may attend IAA16 would you please kindly indicate your "expression of interest" to me (please include any accompanying persons) via E-mail to the following address: j.furse@griffith.edu.au

Obtaining a rough idea of numbers will greatly assist us in selecting/tailoring the venue for the Symposium, and with the planning of other activities.

A call for abstracts will be made a little later in the year, so start thinking.

Until then, take care.

Regards and cheers,

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THE PROBLEM OF INTRODUCING ALIEN CRAYFISH

NEWS FROM MEXICO

For the first time in the Mexican history, our government is taking into account for developing national ecological plans, the problem of introducing aquatic species without control, studies or scientific approval. I was invited to participate in a special forum in our Senate to talk about risks, benefits and ecological impacts of introducing crayfish species from Australia. They said that after several talks, discussions and consensus, a new National Commission concerning the problems of the exotic species will be created.

This is of great importance because I think this is the first step to recognize that exotics are a real problem to conserve and preserve ecological processes of many fragile ecosystems in tropics, arid zones and high mountains springs. And, that crayfish play a major role in the functioning of these ecosystems.

At present, translocations and introductions of exotic crayfish species (and other fauna and flora) are facilitated through a lack of government departmental policy and by the strong support by those people who have seen only the benefits of having a new resource on their lands and rivers with minimal investment and work required. However, although the Mexican government recognizes the urgent need to develop human resources, institutional capabilities, as well as an appropriate legal framework and public policies to enable the country to take an active part in the new economy associated with the use of biological diversity, genetic resources and biotechnology of culturing native species; the reality is that public administration has not established regulatory frameworks to create incentives for the conservation and sustainable use of biological resources, taking into account existing sub regional efforts and initiatives; in addition, our government has reduced the funds to encourage and extend scientific, technical, and biotechnological research, includ-

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ing exchanging experts, training human resources and developing research-oriented institutional capabilities in order to add value to the goods and services generated through biodiversity and ecosystems, while ensuring the development of biotechnology; and finally, there are no activities or programs to combat the illegal acquisition of genetic resources, by exchanging information about negative practices by private or academic institutions, and develop mechanisms to control the final use of the genetic resources. On the contrary, the Mexican government is promoting the introduction and translocation of exotic crayfish without environmental impact studies prior to the introduction, or with a very light studies concerning import risk analysis.

The forum will be on June 10th. Let's see what happens.

Pedro Joaquín Gutiérrez-Yurrita
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NEWS FROM JAPAN

Dear Astacologists:

I have recently found that the Ministry of Agriculture, Forestry and Fishery of Japan (MAFF) considers three species of crayfish (*Cherax tenuimanus*, *C. quadricarinatus*, *Astacus leptodactylus*) are exempt from the list of "noxious animals" in the Plant Protection Act. This means that one can legally import live crayfish of these species to Japan. A part of the reason is that there seems to be no scientific evidence of their hazardous impacts on aquatic plants. Another, but more convincing reason is that there seems to be a force from pet/aquarium industries. I am trying to convince that importation of live crayfish is dangerous regardless of species because they are omnivores, ecosystem engineers and/or transmitters of disease and parasites. Unfortunately, impact on biodiversity is out of the scope of the Plant Protection Act.

Ideally, importation of live animals such as crayfish should be regulated through an act that concerns impacts on biodiversity rather than on mere agricultural plants. Starting from June 2005, Ministry of the Environment of Japan is going to place the Invasive Species Act that regulates live import, aquarium trade, possession and/or breeding for the specified, invasive alien species. This act concerns alien impacts on biodiversity, human health and/or economic damage. However, an important aspect of this act is that eradication will be obliged for the listed species. As far as crayfish are concerned, only signal crayfish (*Pacifastacus leniusculus*) is going to be discussed as a candidate. Red swamp crayfish, which are already prevalent throughout the Japanese archipelago, would not be considered.

We would like the Ministry of the Environment (MOE) to list the entire crayfish (suborder) in the future to prevent new arrival of exotic crayfish. At the moment, the Plant Protection Act by MAFF is the only law that regulates live crayfish import into Japan. This is better than nothing but we would not like to have the safe list because this can be misleading.

I would be grateful if you know of any relevant papers or reports that document impacts of *Cherax tenuimanus*, *C. quadricarinatus* and *Astacus leptodactylus*. Any gut content, stable isotope and/or experimental studies from either their native or exotic ranges are fine.

Thank you for your cooperation.

Regards,

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AN OPINION FROM GERMANY

Dear Colleagues:

We all consent to the fact that the introduc-

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tion of invasive alien species endangers the existence of the native species. This applies to freshwater crayfish, too.

However, if the aliens already do settle in the country, a control or elimination, as fixed by the signature of 152 UN-Members in the Convention of Rio 1992, is extremely difficult, yes, almost impossible in an aquatic milieu.

Especially dangerous for all the world's freshwater crayfish are the American species as they are vectors of the crayfish plague against which only they themselves have developed resistance. All other crayfish die when infected with that disease.

As the American Red Swamp Crayfish (*P. clarkii*) is already widely spread in Japan, it can be expected that the introduction of the three species *Cherax quadricarinatus*, *A. leptodactylus*, and *C. tenuimanus* will not harm much, as these crayfish will die because of the crayfish plague sooner or later. Measured against the ecological damages produced by *P. clarkii,* the negative effects on the ecosystem exerted by these three species are rather harmless. However, the transmission of specific parasites is possible and it has to be checked if native crayfish species are present and could be endangered by that.

If no native crayfish are present, the danger by these three species is probably low. If, however, ecological damages should occur it would be easy to eliminate the three species by an infection with the crayfish plague without damage for other organisms.

Unfortunately in Europe we cannot apply this method to fight against invasive American crayfish due to their resistance against the plague.

Restrictions and prohibits are – as experience teaches – mere "paper tigers". They are 30 or 40 years too late anyway. Not so long ago **Jay Huner** reported proudly in several international journals that the Red Swamp Crayfish has already been successfully introduced into 48 countries and at the founding of the IAA the spreading of the American Signal Crayfish was the first reason. Only the Resolution of Lausanne marked a turn in the IAA, thanks to the initiative of **Pierre Laurent** and **Ossi Lindqvist**. For the first time, the protection of endemic European species came in the foreground of discussions. As in most cases too late.

Best regards,

Max Keller Sr.

keller-hosp@my-box.de

AN OPINION FROM FINLAND

Dear Colleagues:

Thank you for this request, which deals with very important issues. My strong impression is that we should stop altogether moving animal species from place to place, and especially from another continent. The history of alien crayfish species movements and their diseases make a very sad story. *Procambarus clarkii* was introduced to Spain from North America, and it proved ecologically very harmful especially in the rice fields. The signal crayfish has been introduced (from North America) into nearly every country in Europe, though it is known to be a carrier and infector of the crayfish plague to the European species. Now it happens that e.g. in Sweden the signal crayfish seems to be slowly disappearing, for some unknown reasons, though we suspect also a virus infection. (When stressed, the signal crayfish may also succumb to the plague, though originally it was thought to be fully resistant. We showed the partial resistance of the signal crayfish against the plague as early as 1974 here in Kuopio.)

The crayfish as all other animals do carry a wide array of parasites, bacteria and viruses that cause diseases in them, which may also exert serious population losses. Our knowledge of them is still very incomplete and deficient. The viruses carried by crustacean animals have become (slowly) known only very recently, and they may cause a global threat not only to freshwater crayfish, but also to other crustaceans like shrimps and prawns, both freshwater and marine. So the Japanese colleague should be very cautious since any animal introduction is a potential vector of unknown diseases, which later may be impossible to eradicate, and

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which may cause serious economic damage e.g. to their shrimp and prawn farming, etc. This is in addition to the immediate ecological effects the introductions may cause in the ecosystem. - It is a common experience that even if an animal species is used as a pet only, it can be soon found in the wild where they can establish wild populations, with very unforeseen consequences.

Dr. Brett Edgerton is one of the foremost world experts in crustacean virology. My colleagues in Finland have been working with him. My impression is that the disease factor may be the most important one when the Japanese authorities are contemplating introductions of Australian crayfish. Thus I enclose here a list of relevant papers by **Dr. Edgerton** and his colleagues, which all address the various aspects of the (viral) disease situation in crayfish. Hopefully this list and the information contained therein can help you to consider this serious matter once more again in Japan. I am glad to answer any more questions you may have. ☤

Sincerely,

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NEWS FROM THE U.S.

Dear Colleagues:

The purpose of this note is to get some feedback regarding any regulations against interstate sale of crayfish and whether e-bay crayfish sales is a significant topic is of concern.

I did a quick search on e-bay and found that several vendors are shipping live crayfish interstate at a price low enough to allow them to be used for bait. My understanding is that there is a consensus in the crayfish research community (IAA) that introduction of crayfish presents a significant ecological and economic danger based on the now near-worldwide distribution of *Procambarus clarkii* (in part possibly due to the pet trade) and the role of American crayfish as vectors for *Aphanomyces astacii*, a fungus lethal to European species. In addi-

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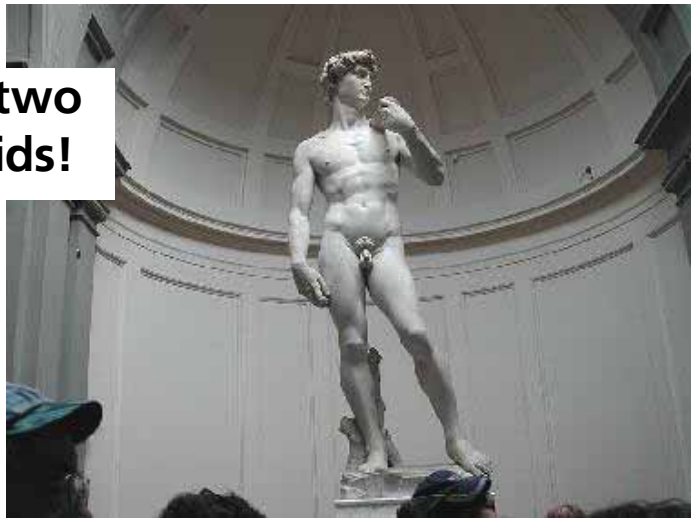
The two Davids!

Ex-IAA President David Holdich at the Piazzale Michelangelo.



Michelangelo's statue of David in the Gallery of the Academy.

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Ammannati. None of the locals asked had ever heard of this Palazzo so it was lucky that it was also called Via degli Alfani 48! In all, 29 oral presentations were given including keynote lectures by **Ian Cowx**, **Keith Crandall**, **Bernadino Fantini**, **Felicita Scapini**, and **Kenneth Söderhäll**.

Over 100 delegates attended the various sessions on 'Ecology & Behaviour', 'Management', 'Parasites & Disease' and 'Biodiversity.' We learned that the white-clawed crayfish, *Austropotamobius pallipes*, can live in habitats with deep anoxic mud; that the signal crayfish, *Pacifastacus leniusculus*, can probably be eliminated from enclosed waters by the use of natural pyrethrum – but at great cost; that the spiny-cheek crayfish, *Orconectes limosus*, is spreading rapidly in the River Danube; and that we must no longer use the word 'aphanomycosis' for crayfish plague, or call the disease causing organism, *Aphanomyces astaci*, a fungus.

The last session of the meeting was held to discuss the status of Chapter 3 of the planned atlas on crayfish distribution. Presentations were made by **David Holdich**, **Trond Taugbøl**, **Leopold Füreder**, **Przemek Śmietana**, **José Carral** and **Manfred Pöckl** on the ICS and NICS being dealt with, and requests were made for additional information. Details given about the narrow-clawed crayfish, *Astacus leptodactylus* species complex, indicated that many of the so-called 'species' in Eastern Europe may in fact just be morphological varieties. It was decided that for the purposes of the atlas that named would be retained. The status of *Austropotamobius italicus* was discussed and it was decided that until further proof was obtained this should remain a subspecies of *A. pallipes* – at least for the purposes of the atlas. Finally, **Patrick Haffner** and **Pierre Noël** of the Paris Natural History Museum provided an update on the status of the database being used to compile the atlas. Preliminary maps were shown, which indicated that there had been a very good response to the request for distribution data, although there were still some gaps, particularly for *Astacus astacus* and *Astacus leptodactylus* in Eastern Europe.

On the social side, delegates were treated to some fine singing by the University of Florence choir and a performance of Renaissance dancing (with audience participation!). One evening delegates congregated on the famous Ponte Vecchio bridge before proceeding to the conference dinner, which was held at a typical Italian restaurant, where the Chianti flowed very freely! Julian Reynolds was able to raise his voice above the noise to announce the three poster prize winners, who were given three, two and one bottle of Chianti respectively.

A lot of new information was forthcoming from the presentations and subsequent discussions at CRAYNET, which it is hoped, along with the results from the meetings in Kilkenny (Ireland), Halden (Norway) and Innsbruck (Austria), will give astacologists enough ammu-

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View of Florence and the Ponte Vecchio from the Piazzale Michelangelo. Photo by David Holdich.

Night time view of the Giotto's bell tower with Brunelleschi's Dome (Duomo) in the background. Photo by David Holdich.

Fresco in the Tribuna di Galileo, Zoological Museum 'La Specola', where the last session of the INWAT meeting was held, showing Galileo demonstrating his telescope. Photo by David Holdich.

Julian Reynolds announces the poster winners during the CRAYNET dinner at a typical Italian restaurant. Much Chianti was consumed by delegates! Photo by David Holdich.

An unusual feature on the Ponte Vecchio – railings adorned with hundreds of padlocks, some with messages on them! Photo by David Holdich.

Renaissance dancers entertain CRAYNET delegates in the Palazzo Giugni-Ammannati, where the main meeting was held. Audience participation was encouraged! Photos by David Holdich.

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tion, I believe that I have read that the range expansions of some *Orconectes* species may be related to inter-watershed bait shipment. E-bay does not prohibit the sale of potential food or aquarium species (including crayfish) but does follow the USDA and CITES rules and in some cases requires that warnings be included in the advertisements for auction items.

Perhaps my concern that e-bay may serve as a means of further introductions is unwarranted or unrealistic given the fact that so many species have already become established outside of their range and the availability of crayfish in the aquarium trade, however I think it is worth asking here if anyone can reference any national or state laws or regulations that prohibit importation of crayfish and asking if readers think that it is worthwhile attempting to educate e-bay and encourage e-bay to, at a minimum, require a warning against releasing crayfish into the wild.

Dave O'Neill
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CRAYFISHING AT LAKE JUODIS, TRAKAI DISTRICT, LITHUANIA

In early October 2004 **Dr John Foster** and **Mr Mike Leeson** of the Environment Agency of England and Wales visited Lithuania for a holiday. While there, they met **Dr Aloyzus Burba**, the well known freshwater crayfish expert and scientist with the Lithuanian Institute of Ecology. **Dr Burba** involved them in a fisheries survey of commercially important introduced American signal crayfish in Lake Juodis (Black Lake) in the Trakai District of Lithuania. They trapped and measured many signal crayfish including berried females (females with eggs) despite the weather becoming very cold. There was snow a day or two later. The field data contributed to the scientific knowledge of crayfish in Lithuanian waters.

John Foster
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Dr John Foster (Environment Agency of England & Wales) and Dr Aloyzus Burba (Lithuanian Institute of Ecology) with signal crayfish at Lake Juodis, Lithuania.

CRUSTACEAN AND ARTHROPOD RELATIONSHIPS

Stefan Koenemann *Institut fur Tierokologie und Zellbiologie, Hannover, Germany*

Ronald Jenner *University of California, Davis*

Series: Crustacean Issues **Volume:** 16

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- Proposes innovative ideas to reevaluate the phylogeny of major arthropod groups
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Compared to other arthropods, crustaceans are characterized by an unparalleled disparity of body plans. Traditionally, the specialization of arthropod segments and appendages into distinct body regions has served as a convenient basis for higher classification; however, many relationships within the phylum Arthropoda still remain controversial. Can Crustacea even be considered a monophyletic group? If so, then which are their closest relatives within the Arthropoda?

The answers to such questions will play a key role in understanding patterns and processes in arthropod evolution, including the disappearance of certain body plans from the fossil record, as well as incidences of transition from aquatic to terrestrial environments. Crustacea and Arthropod Relationships, written by a team of internationally recognized experts, presents a wide variety of viewpoints, while offering an up-to-date summary of recent progress across several disciplines. With rich detail and vibrancy, it addresses the evolution and phylogenetic relationships of the Arthropoda based upon molecular, developmental, morphological, and paleontological evidence.

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Decapoda, the K/P-event, and the Palaeocene recovery. *Oelandocaris oelandica* Müller, 1983, and its significance to resolving the stem lineage of Crustacea. Evolution of eye structure and arthropod phylogeny. Appendage loss and regeneration in arthropods: A comparative view. Resolving arthropod relationships: insights from evo-devo studies. Heads, Hox and the position of trilobites. Relationships between hexapods and crustaceans based on mitochondrial genomics. Comparative morphology and relationships of the Agnostida. Relationships between insect and crustaceans based on 18S rDNA.

Gould, Schram, and the palaeontological perspective in Zoology. The position of crustaceans within the Arthropoda - evidence from nine molecular loci and morphology. Playing another round of metazoan phylogenetics: historical epistemology, sensitivity analysis, and the position of Arthropoda within the Metazoa on the basis of morphology. Early Palaeozoic non-lamellipedian arthropods. What are ostracods?

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nition to obtain funds for further meetings.

INWAT was held (5-7 May) at the Aula Magna dell'Università & Museo Zoologica "La Specola" and was sponsored by the Ente Cassa di Risparmio di Firenze, the Provinces of Arezzo, Firenze, Grosseto, Pisa and Pistoia, the Università degli Studi di Firenze, Castelli del Grevepesa, and the IAA, and under the auspices of the Ministero dell'Ambiente e della Difesa del Territorio, Unione Zoologica Italiana, and IUCN (Invasive Species Specialist Group).

Registration on May 4th was followed by a sumptuous welcome party. On May 5-6th 200 delegates attended sessions on 'Integrating Science & Management', 'Monitoring & Modelling Invasions', followed by profile sessions on Crustacean, Mollusc, Vertebrate and Plant Invaders. Amongst the 34 oral presentations given were keynote lectures by **Stephan Gollasch**, **Piero Genovesi**, **Jaimie Dick**, **David Holdich**, **Anthony Ricciardi**, **Ian Cowx**, **Riccardo Scalera**, **Sandro Bertolino**, and **Geoffrey Howard**. A large collection of posters was also displayed, although it should be said that 25% of them were on crayfish, much to the surprise of the non-astacologists! It was a nice change for astacologists to mix with people interested in other invasive groups of organisms, who in their turn learned a lot about invasive crayfish. The winning poster was by **Javier Diéguez-Uribeondo** and **José Luis Múzquiz** on the use of crayfish plague to control the Australian yabby, *Cherax destructor*, in Spain.

The INWAT social dinner was held at Castello da Verrazzano in Greve, Chianti. This was a splendid location, although due to weekend traffic the coaches did not arrive until dusk, and delegates only caught a brief glimpse of the grounds and building. However, they were soon tucking into pasta and wild boar followed by guinea fowl accompanied by three excellent Chianti wines.

The last session of INWAT consisted of two panel sessions entitled 'Prevention, Eradication and Control' and 'Defining, Classifying and Predicting Invasive Species'. Both were well attended and resulted in lively discussion before delegates retired for a final brunch. Some stayed on to go on the field trip the next day. This was to Camaldoli (Foreste Casentinesi).

Once again congratulations to Francesca and her team for organising two excellent conferences that will be remembered by the delegates for a long time. ☤

David Holdich
david.holdich@ntlworld.com
May 2005

Literature of Interest to Astacologists

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