(Continued from page 5)

habitats, or the reintroduction by breeding and subsequent release, are also being carried out.

A sustainable preservation of protected populations in their particular habitats can only be ensured if effective exclusionary methods can be developed and the necessary means are available. Such measures could also be used to avoid immigration, and eliminate or limit populations of American crayfish if necessary. If we do not develop such methods a long term protection cannot be guaranteed.

Despite the great number of project being carried out, at present, such exclusion methods have not yet been developed (the use of poison is not a solution, because of Swiss law). Currently, measures that temporarily change the water condition (e.g., pH) and alternating current (possibly at high frequencies) are being considered. We are looking forward to sharing our experiences with the European crayfish community. We are willing to share our results, to participate in further developments or tests, and hopefully develop or receive successful and innovative strategies to our problems. Please let us know of similar projects and efforts.

Peter Jean-Richard
Aarau, Switzerland
pjraarau@swissonline.ch

Photo Captions:

Photo 3. Freezing project: dead crayfish after winter time.

Photo 4. Manure project: flood the brook with manure.

Abnormal Colors and Shapes of the Body and Appendages of *Austropotamobius torrentium* (Schrank, 1803) in Romania

The shape of the carapace and appendages in crayfish represent useful elements in species identification and taxonomy. We think it is important to know every possible modification of the carapace, and consequently the specimen's morphology, so as to avoid the misidentification of species. We also wanted to quantify injuries, which usually result from aggressive behavior between individuals, or possibly other factors, which ultimately lead to variation among individuals and can lead to erroneous identifications.

In Romania, there are three native species of crayfish, belonging to the family Astacidae : *Astacus astacus, Astacus leptodactylus* and *Austropotamobius torrentium* (Pârvulescu 2009). Recently, Pârvulescu 2009 and Pârvulescu et al. 2009 reported a new non-indigenous species from the family Cambaridae, *Orconectes limosus*, occurring amongst the Romanian fauna. Surveys were conducted during the 2008-2009 field seasons in the montane and sub-montane waters of SW Romania (Anina, Semenic Dognecea, Almãj, Locvei, Ţarcu, Godeanu, Retezat and Vulcan Mountains.) under the auspices of the CNCSIS-Exploratory research project PCE-4, "**The stone crayfish (*Austropotamobius torrentium*), distribution in Romanian habitats, ecology and genetics of populations**". The project collected 283 adult individuals of *Austropotamobius torrentium* by hand, directly from the river bed. After, macroscopic analysis, the specimens were released in the exact shelter where they were caught. Sixteen crayfish were found that showed an aberrant shape or appearance of the appendages. In addition, historical specimens from the collection of the "Grigore Antipa" National Museum of Natural History were also examined (160 specimens collected between 1935-1966 from streams from Maramureşului, Bihor, northern and southern slopes of Meridional Carpathians, Mehedinţi Mountains and central Transylvania). These injuries appeared to be the result of mechanical processes (Nakatani et al 1998, Okamoto 2006).

Color modifications.– Color is not an important element in crayfish species identification keys, but may sometimes differ from the normal brown (Souty-Grosset et al 2006).

(Continued on page 7)

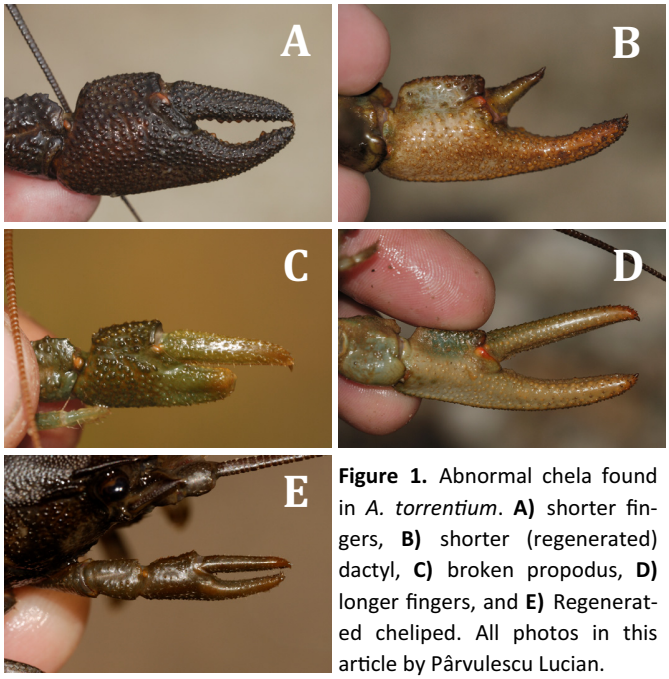


Figure 1. Abnormal chela found in *A. torrentium*. **A)** shorter fingers, **B)** shorter (regenerated) dactyl, **C)** broken propodus, **D)** longer fingers, and **E)** Regenerated cheliped. All photos in this article by Pârvulescu Lucian.

(Continued from page 6)

Variability starts with a white-yellow color, found in a single female, orange and olive-green, found rarely and finally almost black, a rather frequent color.

Although not technically a change in color, we report here a situation where we found tufa-coated crayfish (Fig 2d) in an entire population from the Valea Mare River, situated near the town of Moldova Veche (6.89° dH water hardness). This situation only appears to become a problem when the mouthparts become so encrusted that the crayfish is unable to feed (Baldry 2008).

Body modifications.– These changes are more visible in the rostrum and cephalothorax, probably because of the aggression endured during shell recovery after molting. Also, modifications to the telson were also rarely encountered in the examined specimens, usually due to aggressive behavior between individuals, or damage caused by falling stone.

Appendage modifications.– Of all the appendages, chelipeds appear to be the most vulnerable to aggression or mutation (Coughran 2008). We found individuals with one or both chelipeds missing, situations where the chelipeds were already regenerated as a result of prior aggressive encounters, or extension or shortening in the shape of the fingers (Figure 1 A-E). In the "Grigore Antipa" Museum collection, we also found six specimens with abnormal regenerated chelipeds, including one specimen with a hypertrophy of a cheliped. When grouped by sex, modifications of the claws tend to reflect the level of aggression manifested. Interestingly, in males, the number of individuals with aggression marks on the claws was equal to the number of individuals with regenerated chelipeds. In females, the ratio was 1:3.

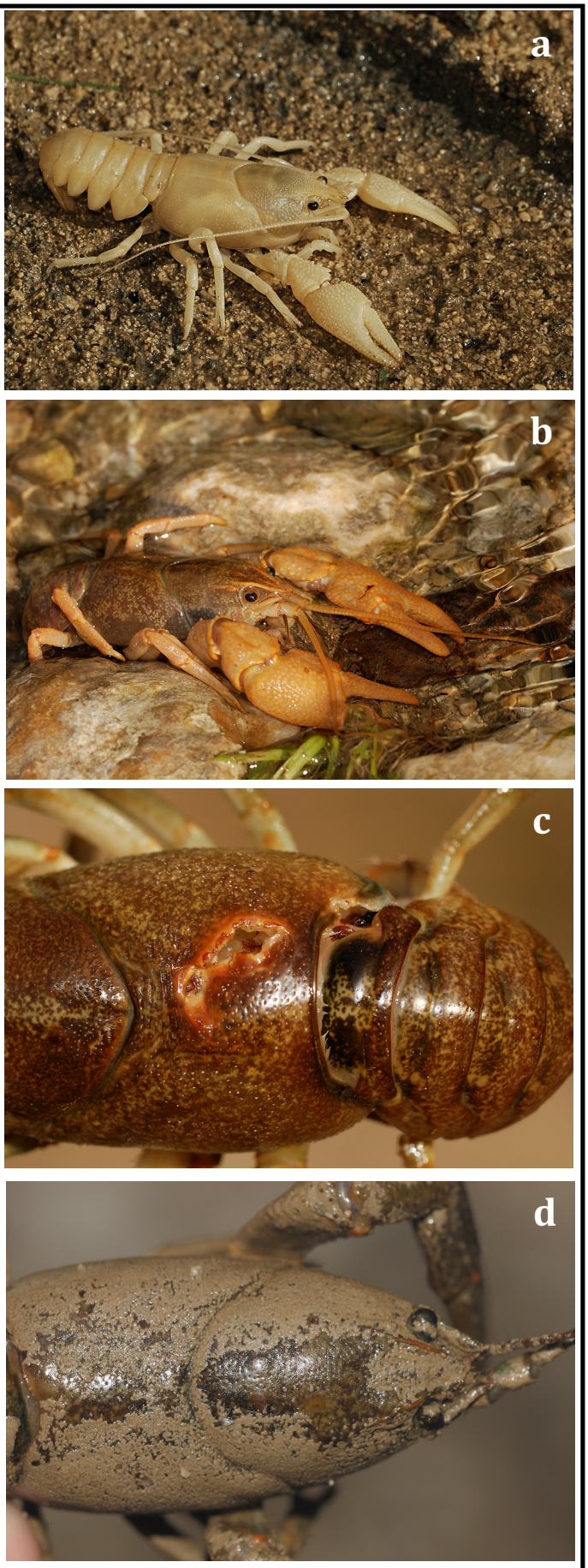


Figure 2. Color differences and carapace abnormalities a) White-yellow color, b) Orange color, c) Thoracic lesions, and d) Travertine deposits.

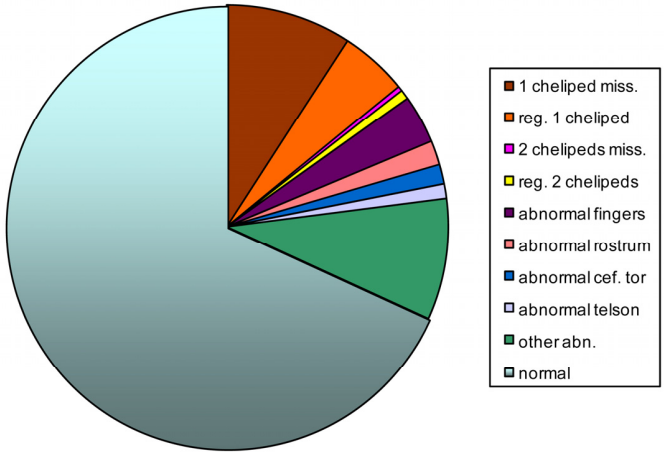


Figure 3. Distribution of abnormal appendages or other aberrations based on 283 wild caught stone crayfish.

(Continued from page 7)

In conclusion, we observed that approximately one third of stone crayfish specimens captured from the natural environment showed an abnormal body shape or appearance (Figure 3). The possible causes for this phenomenon, besides just natural variability, are aggression between individuals and small natural accidents.

Lucian Pârvulescu
Chemistry, Biology and Geography Faculty
West University of Timisoara

Ana Petrescu and **Iorgu Petrescu**
Grigore Antipa National Museum of Natural History
Bucharest

References:

Baldry D (2008): A brief encounter with tufa-coated signal crayfish near Divonne-les-Bains, central-eastern France. *Crayfish News* 30(3): 5-7.

Coughran J (2008): Snip, Snip... (Snip)? An unusual 'pseudo-claw' in the simple crayfish, *Euastacus simplex*. *Crayfish News* 30(3): 4.

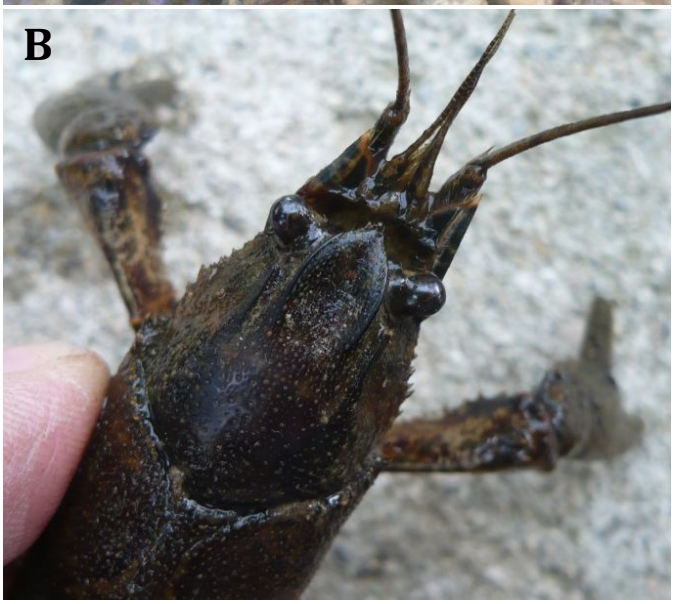
Nakatani I, Okada Y, Kitahara T (1998): Induction of extra claws on the chelipeds of a crayfish *Procambarus clarki*. *Biology Bulletin* 195: 52-59.

Okamoto K (2006): Malformed regeneration of partly cut swimming leg as a marker for swimming crab *Portunus trituberculatus*. *Fisheries Science* 72: 1121-1123.

Pârvulescu L (2009): *Ghid ilustrat pentru identificarea speciilor de raci din România*. Editura Tempus, Timişoara.[pdf]

Pârvulescu L, Paloş C, Molnar P (2009): First record of the spiny-cheek crayfish *Orconectes limosus* (Rafinesque, 1817) (Crustacea: Decapoda: Cambaridae) in Romania. *North-Western Journal of Zoology* **5**(2)*: on-line first* (Article No.: 051207). [pdf]

Souty-Grosset C, Holdich D M, Noël P Y, Reynolds J D, Haffner P (Eds). (2006): *Atlas of Crayfish in Europe*. Muséum national d'Histoire naturelle, Paris (Patrimoines naturels, 64).



Abnormalities seen in *Orconectes limosus* from France. A) Crayfish at pond outflow, B) blunt rostrum on female and C) lateral damage. Photos taken and submitted by David Baldry.