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Short communication

**PRELIMINARY OBSERVATIONS OF AN AMERICAN CRAYFISH
PACIFASTACUS LENIUSCULUS (DANA) POPULATION AT A NEW
SITE IN THE MAZURIAN LAKE DISTRICT**

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ABSTRACT. A population of *Pacifastacus leniusculus* was encountered in a river flowing from a Mazurian lake. It probably originated from individuals that had escaped from a farm where they were reared in 1979-1981. During a single night sampling (June 17-18), 104 crayfish individuals were caught. The sex ratio was 1:1, the males were molting, and the females were bearing offspring. The maximum male body length was 12.7 cm, and that of the females was 12.2 cm. Males over 8 cm in length participated in breeding. The lake and the river have been inhabited for years by *Orconectes limosus*. However, the presence of that expansive species did not disturb the fairly numerous population of *Pacifastacus leniusculus* in that section of the river.

Key words: *PACIFASTACUS LENIUSCULUS*, *ORCONECTES LIMOSUS*, RIVER, INTRODUCTION, COMPETITION

The American crayfish *Pacifastacus leniusculus* (Dana) is native to the Columbia River system located on the west coast of north American (Laurent 1989). It was successfully introduced into Californian waters, including two large lakes - Lake Tahoe and Donner Lake, situated in the subalpine zone (Goldman and Rundquist 1977). It was brought to Europe in 1960 when the first individuals of Lake Tahoe *P. leniusculus* were introduced into Swedish waters (Fürst 1977). The successful introduction of the American crayfish into some running and still waters in Sweden (Abrahamsson 1971, Ahlmer and Karlsson 1980), and the promising results obtained from rearing under controlled conditions (Abrahamsson 1972) encouraged farmers from the other countries to undertake their breeding. Attempts to introduce *P. leniusculus* were made in Finland (Westman 1972), Hungary, England, Ireland (Hobbs et al. 1989), Switzerland (Büttiker 1987), Germany, Austria, Italy, France, Luxembourg, Spain, Denmark, the Netherlands, Yugoslavia, Bulgaria, Cyprus (Huner 1987), Lithuania (Cukerzis 1989), and the Czech Republic (Ircing and Prášil 1980). The first batch of *P. leniusculus* was introduced to Poland in 1972 (Kossakowski et al. 1978).

In 1972-1979, forty-thousand *P. leniusculus* juveniles were introduced into various Polish waters. All of them were supplied by the Swedish farm SIMONTORP AQUACULTURE AB in Blentarp. Initially, it was believed that the introduction into open waters, and attempts at pond rearing were unsuccessful (Kossakowski et al. 1983). Observations by Krzywosz et al. (1995), however, revealed that *P. leniusculus*, which had been introduced in 1979, was present until the early 1990s in a gravel pit reservoir in Stare Juchy near Ełk in northern Poland. They disappeared in the 1980s due to competitive pressure exerted by *Orconectes limosus* (Raf.). However, the presence of the short-lived *P. leniusculus*, whose natural mortality increases beginning in the fifth year of life, over such a long period indicates that the crayfish must have successfully bred in the gravel pit reservoir.

During field studies in 2000, a *P. leniusculus* population was encountered in a river flowing from a Mazurian lake. Since *P. leniusculus* is dangerous to native Polish crayfish species, the authors do not wish to specify the exact location in order to prevent any uncontrolled introductions. The analysis of unpublished data obtained by Kossakowski, who participated in the first American crayfish introduction in Poland, revealed that crayfish juveniles brought from Sweden were pre-reared in 1979-1981 at a farm situated upstream from the current inhabitation site. At that time, some of the crayfish must have escaped and settled in the river. Therefore, the *P. leniusculus* population has inhabited the river for over 20 years.

The aim of the present study was to describe a natural population of *P. leniusculus* encountered in Poland for the first time as well as to describe their environmental conditions. The presence of the population in the natural environment over a long period of time probably indicates that American crayfish, often infected with *Aphanomyces astaci*, may pose a deadly threat to the native Polish crayfish species.

The crayfish were sampled using 17 traps with fish bait on the night of June 17-18, 2000. The samples were taken along a 200 m forest river section, almost devoid of aquatic vegetation, situated in a deep, strongly shaded ravine, with numerous snags. The average width of that river section was about 5 m, and the depth about 0.4 m.

Crayfish body length was measured from the rostrum to the end of the telson. Physio-chemical water quality parameters were measured (Standard Methods 1975, Hermanowicz et al. 2000). The chlorophyll concentration was measured using the alcohol method (Nutsch 1980). The phytoplankton species composition and abundance were also assessed.

A total of 104 American crayfish individuals were caught. Fig. 1 presents the size and sex structure of the sample. One specimen of *Orconectes limosus* was also captured. As has been observed in earlier studies, the crayfish traps are selective with larger specimens deterring smaller ones, and only crayfish over 9 cm in length are considered as a representative sample. The largest male was 12.7 cm long, and the largest female was 12.2 cm. Assuming that these crayfish had a similar growth rate to those reared in the Experimental Farm of the Inland Fisheries Institute near Giżycko in northern Poland (Krzywosz 1994), the oldest individuals were six years of age which is quite old for this species. The American crayfish is rather short-lived compared to the native Polish crayfish species whose life-span extends for as long as seven years. Many of the males were molting or had just molted. Hatching or newly

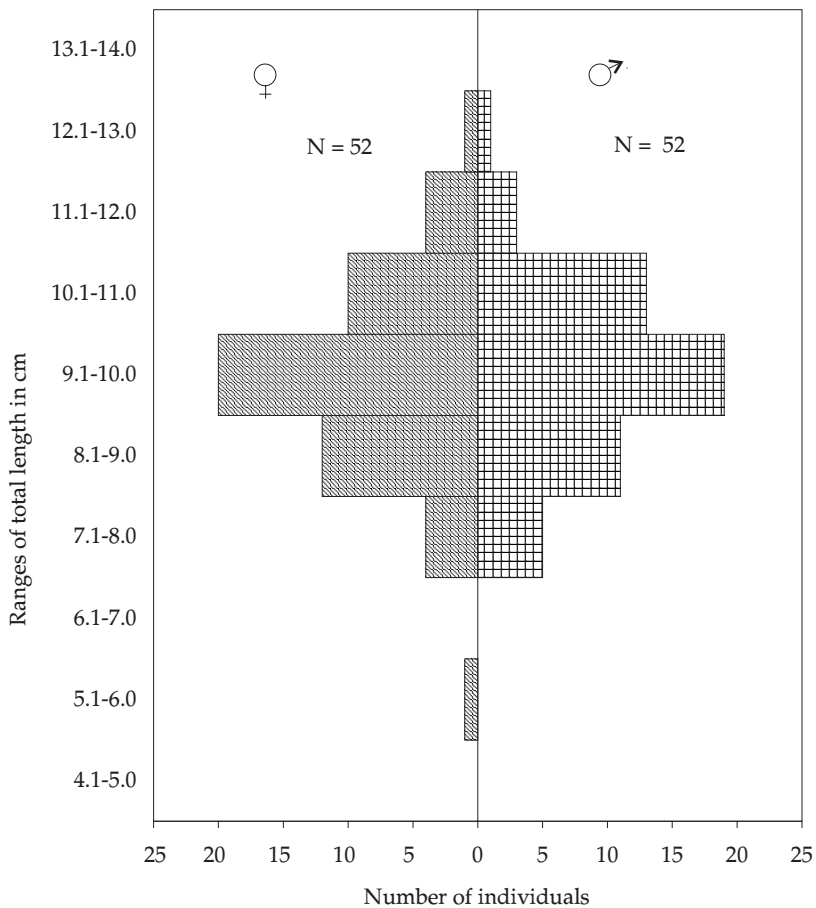


Fig. 1. Size and sex structure of the *Pacifastacus leniusculus* population.

hatched young were found under the abdomens of numerous females. Breeding females comprised 8.3% of all the females caught in the 8.1-9.0 cm length range, 40% in the 9.1-10.0 cm range, and 50% in the 10.1-12.0 cm range.

According to the fishermen, *O. limosus* are fairly abundant in the lakes both upstream and downstream from the study site. Their scarcity (one individual) in the sample taken from the river indicates either unfavourable environmental conditions or competitive pressure from *P. leniusculus*.

The water quality parameters were within the ranges of purity class one (Table 1). The low water temperature for the season was caused by the hypolimnetic water uptake from the lake by the nearby fish farm which had begun several days before the sampling.

TABLE 1

Water quality parameters	
Parameter	Value
pH	7.7
Temperature [°C]	12.3
O ₂ [mg l ⁻¹]	10
N-NH ₄ [mg l ⁻¹]	0.266
N-NO ₂ [mg l ⁻¹]	0.015
N-NO ₃ [mg l ⁻¹]	0.044
P-PO ₄ [mg l ⁻¹]	0.037
P-tot [mg l ⁻¹]	0.119
ChSt (Mn) [mg l ⁻¹]	6.4
Ca [mg l ⁻¹]	60
Mg [mg l ⁻¹]	7.8

The chlorophyll *a* concentration (0.5 µg l⁻¹) did not exceed the range for clean waters (Kudelska and Soszka 1996). The abundance of phytoplankton in the river was low (348 × 10³ individuals l⁻¹), 26 species were identified, predominantly diatoms (Bacillariophyceae), green algae (Chlorophyta), and cryptophytes (Cryptophyceae) (Fig. 2). The low abundance and species composition of phytoplankton were also typical of clean waters. The results of the study indicate good water quality in the lake which is situated upstream, and that it is almost unaffected by the fish farm.

The *P. leniusculus* population has been present at the study site for probably more than 20 years. This species has not been outcompeted by *O. limosus*, but rather exerted competitive pressure upon it. It seems that *P. leniusculus* may be more successful under certain conditions than is *O. limosus*, the predominating species in Polish

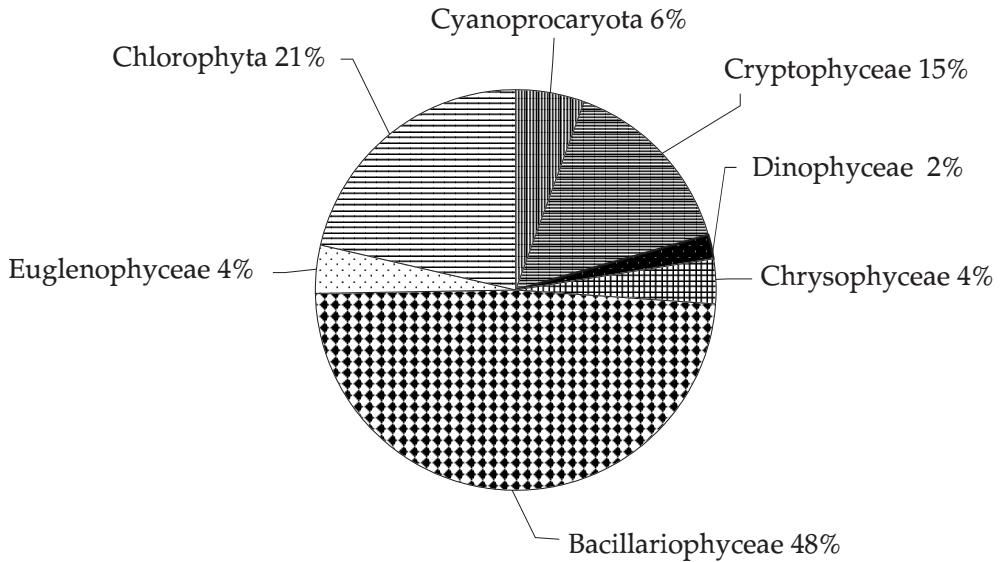


Fig. 2. Percentages of various phytoplankton taxa densities at the study site.

waters. However, according to Polish wildlife protection regulations, this advantage cannot be exploited.

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STRESZCZENIE

WSTĘPNE OBSERWACJE RAKA SYGNAŁOWEGO *PACIFASTACUS LENIUSCULUS* (DANA) NA NOWO STWIERDZONYM STANOWISKU NA POJEZIERZU MAZURSKIM

Badano raka sygnałowego zlokalizowanego w rzece wypływającej z jednego z jezior mazurskich. Jego populacja uformowała się z uciekinierów hodowanych w latach 1979-1981 w obiekcie położonym nad tą rzeką. W połowach kontrolnych, przeprowadzonych w nocy z 17 na 18 czerwca przy użyciu 17 raczników, złowiono 104 osobniki przy stosunku samic do samców jak 1:1. Największy samiec mierzył 12,7 cm, a największa samica mierzyła 12,2 cm (rys. 1). Część złowionych samców była w trakcie wylinki lub świeżo po wylince. U części samic znajdowano jaja w stadium wylęgu lub młode raczki uczeplone pod odwłokiem matki. W rozrodzie uczestniczyły samice powyżej 8 cm długości. Wraz ze wzrostem długości ciała wzrastał udział samic biorących udział w rozrodzie.

Złowienie tylko jednej sztuki raka pręgowatego, przy jego licznych występowaniu w sąsiednich wodach, wskazywać może, że w zastanych warunkach rak sygnałowy nie ulegał jego presji.

Skład chemiczny wody oraz skład gatunkowy i liczebność fitoplanktonu wskazują na stosunkowo niską trofię wód na badanym stanowisku (rys. 2).

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