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CRAYFISH IN LATVIA

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There are four crayfish species present in Latvia - the European species noble crayfish (*Astacus astacus*), narrow-clawed crayfish (*Astacus leptodactylus*), the North American signal crayfish (*Pacifastacus leniusculus*) and spiny–cheek crayfish (*Orconectes limosus*). In total there is information on crayfish from 258 localities in Latvia. Most of these locations are lakes (175), but many crayfish populations are also detected in rivers and streams (66). A few species are found in reservoirs, ponds and gravel-pits (Taugbøl, 2004). *A. astacus* is the dominant crayfish species in Latvia, and 220 out of 258 populations contain only noble crayfish. In 26 localities narrow-clawed crayfish is the only species, whereas signal crayfish is detected as the only species in 4 cases. Noble and narrow-clawed crayfish are reported to coexist in 8 places. The numerous lakes and rivers in Latvia offer good natural conditions for crayfish breeding. Early in last century many Latvian rivers and lakes supported good populations of crayfish, representing a substantial economic value. From 1930th, the situation changed dramatically. The crayfish plague disease reached Latvia and eliminated many crayfish populations. Also physical habitat alterations, pollution and overfishing contributed greatly to the decline of crayfish populations. Crayfish species from genus *Astacus* are more susceptible to this infection in opposition to more resistant signal crayfish to invade. Sometimes crayfish served as bacteria carriers and can cause fish diseases (e.g. aeromonosis, flavobacteriosis).

Significant role in crayfish breeding has welfare of aquatic animals, including feeding, preventive measures against diseases. It is very important to provide welfare management for aquatic animals (crayfish and fish) to protect disease outbreaks.

Key words: Crayfish, crayfish plague, bacteria, population.

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INTRODUCTION

Latvia is rich with water reservoirs. There are four large rivers – Daugava, Gauja, Lielupe and Venta, 3 052 lakes and water bodies, 12 500 smaller rivers and streams, many ponds and dams.

Crayfish farming begins in Latvia in early in the last century, when many Latvian rivers and lakes supported good populations of crayfish, representing a substantial economic value. But from 1930th the situation changed very dramatically. The crayfish plague disease reached Latvia and eliminated the largest of crayfish populations. Physical habitat alterations, pollution and overfishing contributed greatly to the decline of crayfish variety. In the 1950th the total annual crayfish yield in Latvia was approximately 14 tonnes according to official data. The yield has further decreased during the last decades and

there was no legal crayfish catch in Latvia in the 1990th (Arens 1998).

The latest investigation about crayfish farming in Latvia was carried out during Latvian – Norway project "Protection and long-term exploitation of crayfish population in Latvia" during 2002 – 2004 (Arens & Taugbøl 2005).

The aim of this paper is to summarize and to define the status of freshwater crayfish population in Latvia and set an objective to the future investigations.

MATERIAL AND METHODS

Existing data and new data have been collected and categorized from inquiries and field investigations. In total there was information on crayfish from 258 localities in Latvia. Most of them are lakes (175), but crayfish was registred in rivers and streams (66), in water bodies, ponds and gravel – pits (Arens 2004).

Crayfish were collected with traps during June to October from 2002 – 2004. Male and female were taken separately. Weight was measured by placing live crayfish on absorbant paper for several minutes and then weighting them to the nearest 0,1 g. Length measurements include total length – distance from tip of rostrum to tip of telson with the crayfish placed on its back. The identification was estimated by morphological signs. Population were classified as weak, medium and good according to catch per unit effort (number of crayfish per trap night; <0,5 weak, 0,5 – 2,5 medium, >2,5 good) and an evaluation based on local knowledge (Arens 2004).

RESULTS

During the project there were recognized three crayfish species present in Latvian water reservoirs: European species noble crayfish, narrow-clawed crayfish and the North American signal crayfish (Arens 2004; Arens & Taugbøl 2005). In 2006 there was detected one more species – the spiny–cheek crayfish *(Orconectes limosus)* in Lielupe river basin.

Table1. Number of crayfish localities in rather water reservoirs in Latvia regions (Arens & Taugbøl, 2005)

Regions	Water reservoirs					
	Lakes	Rivers	Waterbody	Ponds	Gravel - pit	Total
Kurzeme	30	35	4	3	2	74
Latgale	63	5	0	0	0	68
Vidzeme	61	14	1	1	1	78
Zemgale	21	12	4	1	0	38
Total	175	66	9	5	3	258

Table 2. Number of crayfish localities with the different species in different regions of Latvia (Arens & Taugbøl, 2005)

Regions	Crayfish species				
	Noble crayfish *Astacus astacus*	Narrow-clawed crayfish *Astacus leptodactylus*	Signal crayfish *Pacifastacus leniusculus*	Mix populations of noble crayfish *Astacus astacus* and narrow-clawed crayfish *Astacus leptodactylus*	Total
Kurzeme	74	0	0	0	74
Latgale	63	4	0	1	68
Vidzeme	59	10	4	5	78
Zemgale	24	12	0	2	38
Total	220	26	4	8	258

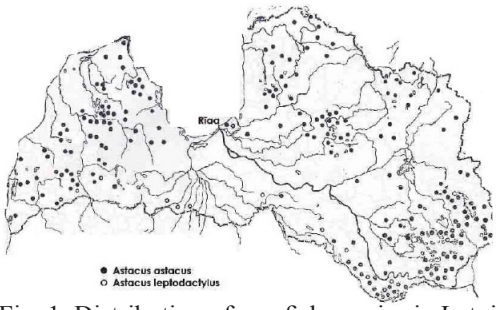

Fig. 1. Distribution of crayfish species in Latvia in 1967 (Jurane 1967).

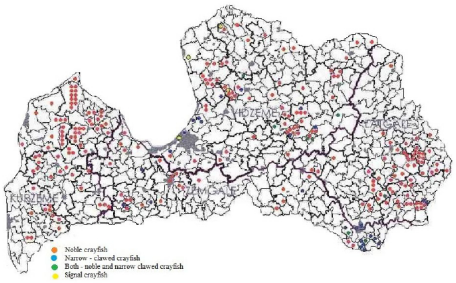

Fig. 2. Distribution of crayfish species in Latvia in 2004 (Arens 2004).

Only noble crayfish is the native species and it is distributed throughout the country. *A. astacus* mainly was found in Kurzeme region in comparison with Latgale region where it was registered only in 5 rivers. On the average the noble – crayfish was determined in all regions similar but in Zemgale region it was insignificant – only 38 localities (Table 1) (Arens 2004, Arens & Taugbøl 2005). In Latgale and Vidzeme regions it was more detected in lakes in comparison with rivers. It can be explained with water guality, food foundation or better habitat conditions.

The noble – crayfish is the prevalent crayfish species and widely distributed in all regions of Latvia. It was discovered in 220 from 258 locations. The situation was the same as described by Jurane (1967), when *A. astacus* populations were detected in 194 sites, in comparison with 228 in 2004. The most obvious change was that more noble crayfish populations were established in the area south of Riga (Fig.1 and 2). Approximately 36% of the present populations were classified as good or medium, 32% - as weak but about the rest there was no information (Arens & Taugbøl 2005).

In 26 localities there were only narrow-clawed crayfish, and only in 4 cases the signal crayfish was the only species (Table 2) (Arens 2004; Arens & Taugbøl 2005).

The narrow-clawed crayfish was expanded its distribution since the 1960s when it was reported in 13 localities but at that time no coexisting populations of noble and narrow – clawed crayfish were registered (Jurane 1967). In 2004 there were 34 crayfish locations, and 8 of them were coexisting with noble crayfish. Since 1960th *A. leptodactylus* was distributed around Riga and in Vidzeme region (Fig.1 and 2).

The signal crayfish was admitted into Primmas Lake (Limbaži district) in 1983, but in 2004 it was registred in another 3 localities – two rivers and one gravel – pit that are far enough from the lake it was introduced. It indicates that *P. leniusculus* spread with the help of man not in natural way. The signal crayfish was abundant in the lake it was introduced in (Arens & Taugbøl 2005).

The spiny–cheek crayfish for the first time was detected in 2006 in one locality in Lielupe river basin. At the end of 19th century the spiny – cheek crayfish for the first time was imported in Poland, but the naturalization was unsuccessful. The second experiment in 1911 – 1913 crowned with progress and *O. limosus* accustomed in the greatest part of freshwaters of middle of Europe. In Poland the spiny–cheek crayfish becomes as the native species and it was registered in 2/3 of Poland's freshwater bodies. This species is also recognized in the Neman River, in intermediate boundaries between Lithuania, Poland and Belarus. It fast distributed around these territories and, possibly from Lithuania reached water bodies of Latvia. But there is no information on population distribution at present in our country.

DISCUSSION

Start of crayfish farming in Latvia was regis-

tered at the beginning of 20th century. At that time there were performed investigations about crayfish biology, breeding and cultivating. As the results of these studies there were created noble crayfish population resistant to the diseases and introduced crayfish larva gain methods in production. But from 1930th the situation changed very dramatically. The crayfish plague disease reached Latvia and eliminated the largest of crayfish populations. Physical habitat alterations, pollution and overfishing contributed greatly to the decline of crayfish variety (Mazitis 1955, Mazitis 1967, Mazitis 1971). And only from 1995 investigations about crayfish breeding and cultivating technologies were renewed (Mazitis 1995, Arens 2003). At that time the plague occurred also in other countries. During the last 100 years in which the plague has occurred in Europe, it has not been possible to develop effective controlling it in natural waters. During this period high selection pressure has been applied to *A. astacus*, but neither in this nor in other European species has evidence been obtained of populations developing resistance to the disease (Svärdson 1992).

Due to the destructive nature of crayfish plague and its rapid spread by a variety of means, methods for combating it and other crayfish diseases were based on prevention and education. Monitoring outbreaks of the plague and crayfish mortalities and alerting people of them was important for disease control, as well as for protection of natural populations and aquaculture farms against new epizootics (Nylund & Westman 1995).

During the project results of the previous investigations, official data and new data have been collected and categorized. As a result of previous examinations with hybridization there were created against disease resistant noble crayfish species. Because crayfish diseases especially plague, continue to be the greatest threat to the crayfish farming. Crayfish diseases have spread over the entire range of the native noble crayfish in Finland due to careless catching and stocking.

Information on crayfish mortalities and disease outbreaks in natural waters, as well as in crayfish culture, was essential for preventing the spread of disease (Nylund & Westman 1995). In many waters, crayfish plague re – occurs at 20 – year intervals. It is possible to monitor the progress of crayfish plague in large lakes (Nylund & Westman 1995). Crayfish plague is very often introduced into a new watercourse by contaminated crayfish traps or fishing equipment, boats, rubber boots and crayfish cages, but plague spores can be spread with any kind of object as long as the latter remains moist. Plague spores and mycelia can survive in the mucus of fish skin. The plague possibly be distributed by natural fish to different parts of the same watercourse and thereby infect other crayfish (Nylund & Westman 1995).

Many problems associated with controlling crayfish diseases in conjunction with noble and signal crayfish stockings have been largely ignored.

The renewing program of crayfish population was the main task of the project. The crayfish population renovation was performed previously in separate lakes - Ušura Lake and Zvirgzdu Lake after dramatically crayfish extinction. In 2004 the noble – crayfish was renewed and it was widely distributed in whole territory (Arens 2004). Similarly crayfish catching is permitted in very few places annually determined by the Ministry of Agriculture. In 2010 such places were Aģe Lake, Dziļezers, Kuksi Lake, Lade Lake, Lielauce Lake, Puduļi Lake, Salaca River in the territory of Salacgrīva, Tērvete (Gulbji) storage pond and Vaidava Lake. Also the permitted volume of catch differs by places. The requirements of fishery regulations must be met by catching crayfish. The minimum length of a crayfish to be kept in a catch and by measuring from the "tip of the nose" until the end of tail plates is 10 cm. Catching crayfish is forbidden in the period from 1st October until 30th June, but female crayfish with visible spawn must be spared for the entire year. Crayfish must not be used as bait for fishing (Arens 2004).

Also pollution and habitat deterioration have destroyed the living conditions for crayfish in many freshwater localities. Many rivers and streams lost natural environment. Although pollution has been reduced or ceased in many watercourses and habitat deterioration occurs at a much lower

scale, these impacts still represent a major threat (Arens & Taugbøl 2005).

Within the framework of the project there were created three Crayfish Centres, with aim to provide information and education of crayfish farmers for optimal and sustainable using and conservation of natural noble crayfish populations. Sustainable using includes the reestablishment of lost and strengthening of weak populations and in this connection production of stocking material is of great importance (Arens & Taugbøl 2005).

CONCLUSIONS

There were recognized 4 crayfish species in Latvia water reservoirs at present. The noble - crayfish is the dominant species, distributed widely in the country.

The main threat to crayfish populations are diseases, especially plague, continues to be limited factor to the crayfish farming. It is necessary to manage the breeding, selection and keep track of water quality as one of important factors for crayfish living conditions.

The Crayfish Centres renew the balance of crayfish populations in natural waters but it isn't sufficiently due to the diseases problems and sometimes poor water quality.

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