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THE NORTH AMERICAN CRAYFISH *PACIFASTACUS LENIUSCULUS* AS RISK ASSESSMENT FOR NOBLE CRAYFISH *ASTACUS ASTACUS*

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Crayfish farming in Latvia is focused to cultivate native noble crayfish *Astacus astacus* to renew the balance in natural waters and the North American signal crayfish *Pacifastacus leniusculus* for human consumption.

The European noble crayfish is the only native species and the population is decreased due to crayfish plague, initiated by fungi *Aphanomyces astaci*.

The American signal crayfish was introduced in Latvia for aquaculture in 1971 and has spread by human introduction, with corresponding losses of native noble crayfish from crayfish plague and competition.

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

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INTRODUCTION

The cultivation of European crayfish is at risk from diseases, especially crayfish plague, initiated by fungi *Aphanomyces astaci*. This pathogen is responsible for the elimination of many native crayfish freshwater populations in Europe. The results of several investigations indicate that this fungi is endemic to North America and is present in North American native crayfish - *Pacifastacus leniusculus* (Dana, 1852), *Orconectes limosus* (Rafinesque, 1817) and *Procambarus clarkii* (Girard, 1852) (Unestam 1972, Huang et al. 1994, Diéguez – Uribeondo et al. 1995, Diéguez-Uribeondo & Söderhäll 1999).

The fungi were implemented to Europe by introduction of North American signal crayfish. As a result, wide mortalities extinguish population of native crayfish species. Introduction of North American crayfish in Europe led to the spread of crayfish plague in many countries and till now the North American crayfish species continues to be the threat to native Europe crayfish species.

The crayfish farming in Latvia starts in early of 19th century. Up to this time several outbreaks of crayfish plague eliminated the most of native noble crayfish *Astacus astacus*. Therefore the North American signal crayfish *P. leniusculus* was imported from Lithuania. First implementation was in 1971, crayfish individuals were introduced in Brasla River, but unsuccessfully because in the next years it wasn't found. In 1983 signal crayfish was imported one more time in a lake Primmas in Limbazi region and after introduction in 2004

the signal crayfish population was found in 4 localities rather far from the locality where they were introduced (Arens & Taugbøl 2005). This population was introduced due to its resistance to crayfish diseases, specially, crayfish plague and due to its rapid growth. The population of North American crayfish is breeding in several crayfish farms for human consumption.

The noble – crayfish is the prevalent crayfish species and widely distributed in all regions of Latvia. This species is breeding for restocking purposes to renew the balance of crayfish populations in natural waters.

These two species are mainly breeding in farms. The aim of rearing is to renew the balance of native crayfish in natural waters.

The aim of this study is to investigate the North American signal crayfish and to detect the presence of the agent of crayfish plague fungus *A. astaci.*

MATERIAL AND METHODS

Samples of five signal crayfish were taken in April 2012 from a pond in Ogre region. All individuals were clinically healthy, male, 2+ years. All crayfish individuals were preserved in 70% ethanol for further microscopic and molecular investigation at the Department of Mycology in Real Jardín Botánico (Madrid).

Microscopic examination

Soft abdominal cuticle and the telson of the sampled crayfish were dissected using scissors and forceps. They were cleaned of the attached muscles and connective tissues as described in Cerenius et al. (1988). Excised tissues were examined at 100x using a Zeiss Axiovert 25 inverted microscope. The number of microscopic melanized spots in the abdominal cuticle of each crayfish was counted. Areas with melanized spots were cut in small pieces (ca. 0,5 mm^2, 30 – 50 mg) for DNA extractions.

Light photomicrographs were captured using a Qimaging Micropublisher digital camera and the software Syncroscopy-Automontage® as described in Diéguez – Uribeondo et al. (2003).

Molecular test

Total genomic DNA from excised cuticle and the sequence analysis was prepared as described in Aquiloni et al. (2011).

RESULTS AND DISCUSSION

Microscopic observations of soft abdominal cuticle showed the presence of orange melanized areas so called spots (Fig. 1., 2.). These melanized spots were detected in all individuals. They were different in size and shape. In one individual around melanized spots there were haemocytes.

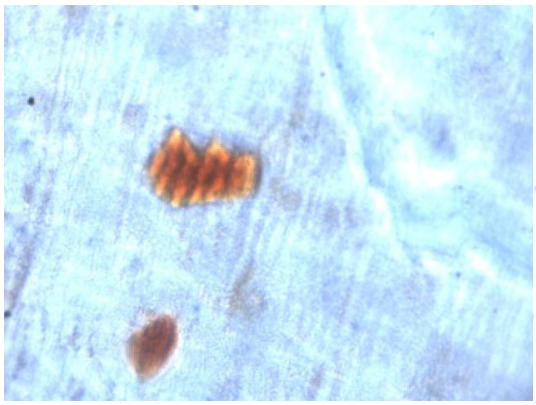

Fig.1. Orange spots in the cuticle.

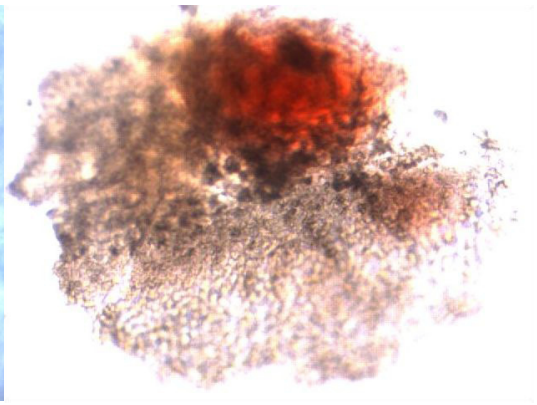

Fig.2. Orange spot with haemocytes around.

There were observed hyphae in the soft abdominal cuticle in all five individuals. All exscinded pieces with orange melanized spots tested by PCR were positive for *A. astaci*.

This study demonstrates for the first time that the crayfish plague pathogen *A. astaci* is confirmed by molecular method in North American signal crayfish in Latvia. In preceding years investigations of the North American signal crayfish shows the presence of hyphae, considering it`s specific location, suggested that these hyphae are *A. astaci*. Crayfish mortality was recorded. The presence of these fungi is well known in North American crayfish species, and due to implementation in Europe this fungi causes the devastating disease in many countries. The North American signal crayfish *P. leniusculus* was imported from Lithuania. First implementation was in 1971, crayfish individuals were introduced in Brasla River and few years later in 1983 signal crayfish was imported one more time due to its resistance to crayfish plague and rapid growth. Pathways and potential spread of disease differ between species, but all involve human action. All the native crayfish species have potential risk for harm, compared to those of signal crayfish and spiny-cheek crayfish.

Crayfish farming is focused to renew the balance of native noble crayfish in natural waters and breeding signal crayfish for human consumption. In future proper measures have to provide education and in formation of crayfish farmers to save native noble crayfish population from crayfish plague outbreaks.

CONCLUSIONS

All signal crayfish gave positive test to *A.-astaci* and are carries of the fungi.

It is very important to provide information and education of crayfish farmers for further to improve management strategy in crayfish breeding in Latvia.

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