FOLIA
Amazónica
Revista del Instituto de Investigaciones
de la Amazonía Peruana

Nota científica

FIRST RECORD OF *Neoergasilus japonicus* (HARADA, 1930) (COPEPODA: CYCLOPOIDA) INFECTING A FISH SPECIES IN SOUTH AMERICA

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ABSTRACT

The parasitic copepod *Neoergasilus japonicus* (Harada, 1930), native to eastern Asia, was collected from *Colossoma macropomum* (Cuvier, 1818) cultivated in a fish pound in the department of San Martin, Peru in July 2017. The parasite specimens were found attached to the base of the dorsal fin. *Neoergasilus japonicus* is widespread in different fish species across the world, being in this study recorded for the first time parasitizing a fish in South America. It is probably that exotic fish hosts associated with the fish-culture industry, such us the tilapia, is the responsible for the transportation and introduction of this parasite into this part of the world.

KEYWORDS: copepod parasite, exotic species, gamitana, Peru, tilapia

PRIMER REGISTRO DE *Neoergasilus japonicus* (HARADA, 1930) (COPEPODA: CYCLOPOIDA) INFECTANDO UNA ESPECIE DE PEZ EN AMÉRICA DEL SUR

RESUMEN

El copépodo parásito *Neoergasilus japonicas* (Harada, 1930), nativo de Asia oriental, fue colectado de espécimenes de *Colossoma macropomum* (Cuvier, 1818) cultivados en un estanque localizado en el Departamento de San Martín, Perú, en Julio de 2017. Especímenes del parásito fueron encontrados adheridos a la base de la aleta dorsal. *Neoergasilus japonicus* está ampliamente distribuido en diferentes especies de peces a través del mundo, siendo en este estudio reportado por primera vez parasitando un pez de América del Sur. Probáblemente hospederos exóticos, asociados a la industria de la piscicultura como la tilapia, sean los responsables del transporte e introducción de este parásito en esta parte del mundo.

PALABRAS CLAVE: copépodo parásito, especies exóticas, gamitana, Perú, tilapia

INTRODUCTION

When a non-native fish is introduced, the host switch of parasites between native and non-native hosts can be expected depending on many factors related to the host-parasite system (Bittencourt *et al.* 2014). In a new habitat, the establishment success of an exotic parasite species depends on the acceptable abiotic conditions and complexity of the parasites' life cycle (Galli *et al.* 2005; Ribeiro and Leunda 2012).

Neoergasilus (Harada, 1930) is one of the 27 genera of Ergasilidae Burmeister, 1835 (Copepoda: Cyclopoida). At present, nine parasitic species are known belonging to the genus *Neoergasilus* (Walter and Boxshall 2015). Described as *Ergasilus japonicus* by Harada 1930, from Taiwan*, Neoergasilus japonicus* is most commonly found attached to the fins and on the scaleless areas at the base of the fins (Mugridge *et al.* 1982; Beyer *et al.* 2005). They are also frequently found on the opercular flaps, on the operculum and on the gills (Mugridge *et al.* 1982).

N. japonicus displays little host specificity and has been recorded from a wide variety of freshwater fish families including cyprinids, percids, centrarchids, ictalurids and cichlids (Pónyi and Molnar 1969; Lescher-Moutoué 1979; Mugridge et al. 1982; Tuuha et al. 1992; Abdelhalim *et al.* 1993; Hayden and Rogers 1998; Hudson and Bowen 2002; Knopf and Hoelker 2005; Diaz-Pardo *et al.* 2002). *N. japonicus* was cited as a parasite from redbelly tilapia *Coptodon zillii* (Gervais, 1848), Mozambique tilapia *Oreochromis mossambicus* (Peters, 1852), and Nile tilapia *O. niloticus* (Linnaeus, 1758) (Nagasawa and Uyeno 2012).

Although it is an originally described from Asia, *N. japonicus* has been also recorded in Hungary (Ponyi and Molnar 1969), Czechoslovakia (Hanek 1968), Britain (Mugridge *et al.*1982), France (Lescher-Moutoué 1979), Finland (Tuuha *et al.* 1992), Italy (Alfonso and Belmonte 2010), Russia (Dogiel and Akhmerov 1952, Gussev and Smirnova 1964), India (Kumari *et al.* 1988), Iran (Mirzaei and Khovand 2015), in North America for the first time in 1993 from aquaculture ponds at Auburn University in Alabama (Hayden and Rogers 1998), Cuba (Prieto 1985), Mexico (Suárez-Morales *et al.* 2010; Suárez-Morales *et al.* 2013). Until the present, it has never been registered in South America.

N. japonicus has a natural dispersion in freshwater systems, but most of the records of this parasite in different parts of the world may be attributed to introductions by humans (Gozlan *et al.* 2010). According to Hudson and Bowen (2002), this widespread distribution has to be related to aquaculture practices, aquarium trade (transporting infected fishes) that allowed the species to spread in Europe in a period of 20 years, and later to Northen America. As examples, the sunbleak *Leucaspius delineatus* (Heckel, 1843) (introduced accidentally to the U.K. by the aquaculture trade) was reported carrying this non-native parasite to this country (Beyer *et al.* 2005); most of the fish were brought to Iran from Southeastern Asian countries, such as China and Thailand. Suárez-Morales *et al.* (2013) reported that in Mexico, the occurrence of *N. japonicus* could be an anthropogenic introduction, as well Cuba, that received a strong aquaculture from the Soviet Union, by the introduction of fish species (Coto 2006). Also in Mexico, the presence of this parasite was explained as a result of the introduction of tilapias in aquaculture systems (Zambrando and Macías-García 1999). This also could happen in South America, since the use of tilapia in this part of Peru may have been responsible for the introduction of *N. japonicus*. This can also be supported by the fact that this parasite was found only in fresh water and seemingly could not disperse across saline waters to expand its range.

Figure 1. Localization of "Instituto de Investigaciones de La Amazonía Peruana" (IIAP-San Martín), were specimens were collected.

In Peru, species of tilapia were introduced in 1978 (Ortega *et al.* 2007). The biggest production of this fish in this country is reported in the department of San Martin, with more than 400 operating farms, reaching over 1100 MT/month (Baltazar 2007).

As was expected by Suárez-Morales *et al.* (2010), this parasite is advancing to other areas of the Neotropical region. In the present study, we report the occurrence of *N. japonicus* in *Colossoma macropomum* (Cuvier, 1818) for the first time in South America, more specifically in the Peruvian Amazon.

MATERIAL AND METHODS

A total of eight adult female copepods were recovered from the parasitological examination of one specimen of tambaqui *Colossoma macropomum* (Cuvier, 1818) from a fish pond located in the facilities of the Instituto de Investigaciones de la Amazonía Peruana (IIAP), Tarapoto, Peru in the department of San Martin, Peru (6°28'42.9"S 76°22'36"W) (Fig. 1) visited in July 2017.

Parasites were collected directly from the host by removing them with the aid of pincers under

a stereomicroscope. The specimens were fixed and preserved in 70% ethanol. For the taxonomic identification of the parasites, the sample was transferred to the Laboratory of Molecular Ecology and Evolutionary Parasitology (LEMPE) of the Federal University of Parana (UFPR) in Curitiba, Brazil. The specimens were mounted in Hoyer's medium in order to clarify and visualize their structures. The morphological study was performed with the aid of a microscope with phase contrast and DIC (Olympus BX 51) and a digital camera (Olympus QColor 5).

RESULTS

Eight specimens of the copepod *N. japonicus* (Fig. 2) were identified parasitizing the dorsal fin (five specimens) and anal fin (three specimens) of one individual of *Colossoma macropomum* (Cuvier, 1816).

DISCUSSION

Neoergasilus japonicus was mainly reported parasitizing the dorsal fin of their hosts, especially its posterior basal part (Nagasawa and Sato 2015). According to these researchers, this can be possible due to the ability of the infective females that can easily attach to these sites which offer low turbulent conditions in the water. In the present study, more than 50% of the parasites registered were found on the dorsal fin of its host, supporting the author quoted above.

According to Suárez-Morales and Mercado-Salas (2013), this parasite is probably more widespread than currently recognized. As mentioned before, tilapia is one of main fish introduced and cultivated in Peru. Its contact with *C. macropomum* in cultures may have facilitated the host-switch. Thus, *C. macropomum* can be parasitized not only by native parasites, but also by exotic ones. In this way, we recognize that further studies are necessary in order to evaluate: the degree of infection of *N. japonicus* in *C. macropomum;* dispersal mechanism of the parasite; ability to invade and establish in other different habitats together with the impact in those new habitats; ability to infect other fish species and their impact; records of infection by this parasite in other native fish species and the impact on other copepod parasite communities

Figure 2. *Neoergasilus japonicus* (Harada, 1930), adult female, dorsal view. Scale bar 300 µm.

that may be affected by competition for the use of the same resources (hosts).

ACKNOWLEDGMENTS

We thank the National Institute of Amazonian Research (IIAP), to provide us its facilities and the fish used in this study.

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Recibido: 5 de mayo de 2018 **Aceptado para publicación:** 28 de mayo de 2018