



Helminth parasites of alien freshwater fishes in Patagonia (Argentina)

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ABSTRACT

A survey of the helminth parasites of alien freshwater fishes from Argentinean Patagonia is presented, based on samples taken from 2010 to 2017 and including previous published records. A total of 1129 fishes were collected, belonging to 11 species from 7 families. We surveyed 34 localities in 12 river basins, and found 43 parasite taxa (15 digeneans, 14 monogeneans, 5 cestodes, 5 nematodes, and 4 acanthocephalans), belonging to 22 families. Data are presented as a parasite/host list with information on host species and localities, site of infection, parasite life–history stage, origin, previous records in Patagonia, and accession numbers to vouchers. The most frequently found helminths were monogeneans and digeneans. Our data suggest that invading fish in Patagonia have transmitted fewer parasite species than they have received by spillover. Twenty–three (53%) of the parasites seem to be acquired by the exotic fishes from native hosts, while 15 helminths were co–introduced along with their exotic fish host and continue to parasitize these alien fish but did not invade native hosts; 4 of these species were introduced with carp, 3 with *Cheirodon interruptus*, 3 with *Corydoras paleatus*, 3 with *Cnesterodon decemmaculatus*, 1 with *Oncorhynchus tshawytscha*, and 1 with *Jenynsia multidentata*. The majority of these co–introduced parasites came from the Brazilian ichthyogeographic region (10 species). This is the first review of helminth parasites of alien fishes in Argentina; in total 12 new records of parasites for Argentina, 6 new records of parasites for Patagonia, and 29 new host–parasite records are presented here. This list is far from complete, however, given that some basins in southern Patagonia remain unexplored in terms of parasite detection.

1. Introduction

The introduction of species represents a major cause of biodiversity loss, and alteration and homogenization of freshwater ecosystems (Rahel, 2002). The influence of processes such as competition and predation of the new invaders on native fauna have been known for a long time (Elton, 1958). Along with invasion or the introduction of species into an area, there is often a parallel introduction (a hidden invasion) of parasites (Salgado–Maldonado and Pineda–López, 2003). Parasites account for nearly a quarter of IUCN's list of invasive species (Dunn and Perkins, 2012). The introduction of parasites can lead to novel host–parasite relationships changing the structure of pre–existent communities (Poulin, 2017). An alien parasite can disturb native host populations, depending on its ability to infect them, even when they are not phylogenetically close to the original hosts (Lebarbenchon et al., 2009; Telfer and Bown, 2012). The magnitude of the threat posed to native species will be related mostly to parasite virulence and pathogenicity (Lymerby et al., 2014). Co–introduced parasites are those

which have been transported with an alien host to a new locality outside their natural range, and co–invading parasites are those which have been co–introduced and then spread to new, native hosts (Lymerby et al., 2014) in a process called spillover (Kelly et al., 2009). On the other hand, native parasites may interact with exotic hosts, leading to a process known as spillover (Kelly et al., 2009; Poulin, 2017). Lymerby et al. (2014) found that more than 50% of invasion studies were on freshwater fish, and 49% of co–introduced were helminths. Seventy–eight percent of the co–introduced parasites were found in native fish and therefore can be classified as co–invaders. Ecologists and conservation managers have become increasingly aware of the threat posed by co–introduction of parasites along with alien hosts (Kelly et al., 2009).

Patagonia is a South American territory extending south in Argentina from 37°55'S and covering about 1,000,000 km² (Fig. 1). Freshwater environments in this region can be classified into two groups: those close to the Andes Mountains are oligotrophic or ultra–oligotrophic, belong to the Atlantic or Pacific watershed, and have cold,

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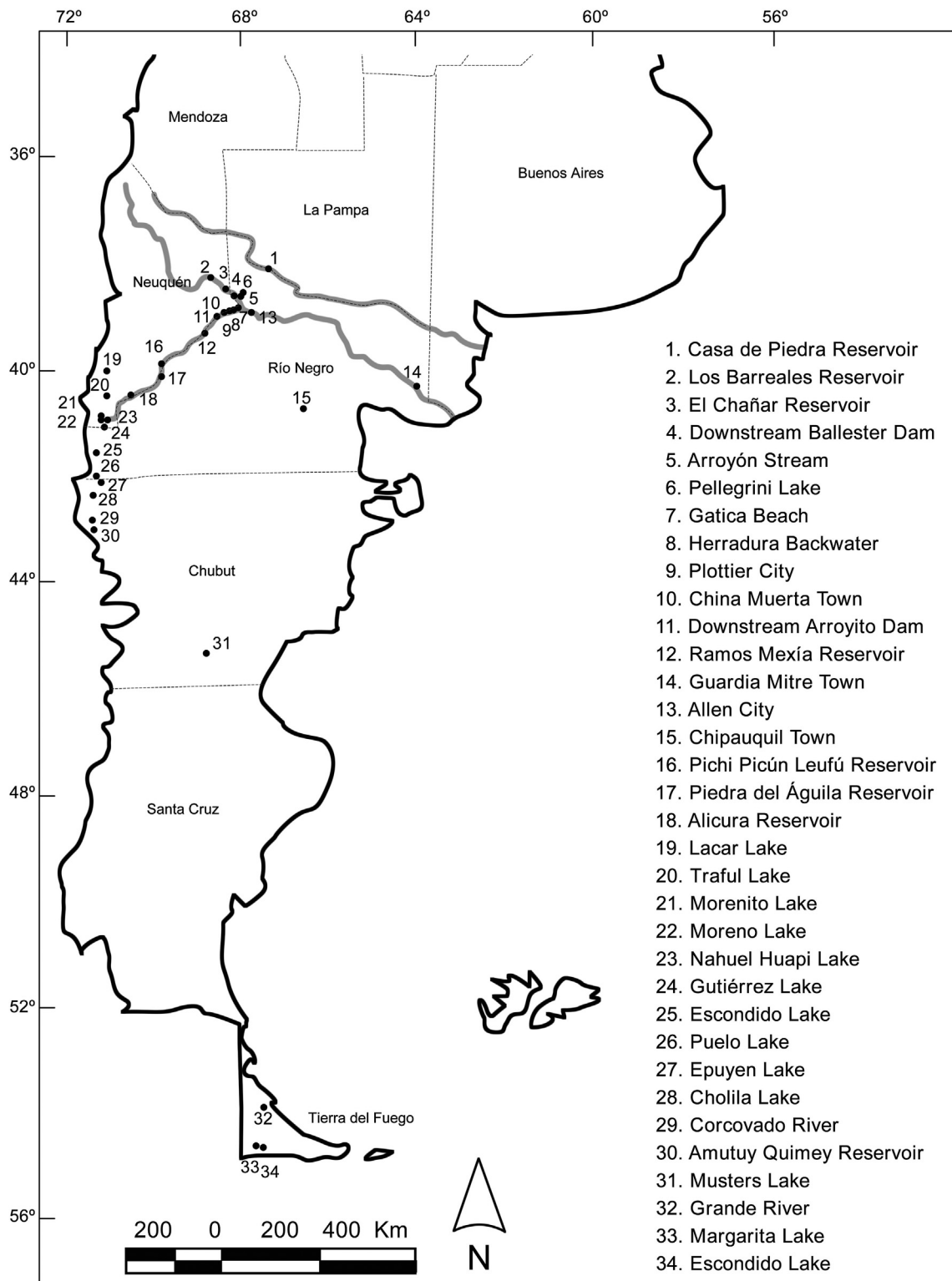


Fig. 1. Map of Argentinean Patagonia; the sampling localities of present study are shown.

well-oxygenated water with low conductivity (Modenutti et al., 1998). These freshwater environments are surrounded by Sub Antarctic forests, which are the southernmost forests in the world. The remaining aquatic environments on the Patagonian plateau, also known as the Patagonia Desert, are mainly rivers or reservoirs that belong to the Atlantic watershed, have warmer, less-oxygenated water and higher conductivity. The Colorado River is the northern limit of the Austral subregion and the Negro River represents the southern limit of the

Brazilian subregion, so there is an overlapping of Brazilian and Austral fish-fauna in the area between the two rivers (Almirón et al., 1997; Aigo et al., 2008). These rivers are the watersheds most likely to be influenced by introductions from northern ichthyogeographical provinces. The expected global changes for northern Patagonia could affect the provision of key ecosystem services at regional, national and global levels. For example, on a regional level the provision of aesthetic-recreational services by the Andean-Patagonian landscapes is key to

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