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Short communication

Occurrence of *Cyprinus carpio* (Linnaeus, 1758) in a World Biosphere Reserve, the Mar Chiquita Coastal Lagoon (Argentina)

By M. González-Castro[1,2], J. J. Rosso[1,2], N. A. Lajud[1], D. L. Castellini[1] and J. M. Díaz de Astarloa[1,2]

[1]*Grupo de Biotaxonomía Morfológica y Molecular de Peces (BIMOPE), Instituto de Investigaciones Marinas y Costeras, Universidad Nacional de Mar del Plata, Mar del Plata, Argentina;* [2]*Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina*

Introduction

Paleogeographical, morphological, ecological, physiological, linguistic, archeological and historical evidence demonstrated that the wild ancestor of the common carp *Cyprinus carpio* Linnaeus, 1758 originated in the Black, Caspian and Aral sea drainages and naturally dispersed east into Siberia and China and west as far as the Danube River (Balon, 1995). This species has been introduced in all continents (Lever, 1996). In most countries where it was introduced, a wide array of negative impacts on native biota and ecosystems has been documented (Bernstein and Olson, 2001). Because of its historical use in aquaculture and as an ornamental fish, this species has become widely dispersed. It is recorded in more than 50 localities in Argentina: in the Paraná, Uruguay and Plata river basins (Liotta, 2014), as well as in the Mirim lagoon (Rio Grande do Sul, Brazil) (Garcia et al., 2004). In the Pampa plain the distribution of this species is restricted to freshwater ecosystems of the Salado River Basin (Rosso, 2006).

Mar Chiquita, an irregularly shaped brackish-water coastal lagoon, is located in the Buenos Aires province of Argentina and considered since 1996 by the Coordination Council of the Man and Biosphere Program of UNESCO as a World Reserve of Biosphere. The fish fauna of Mar Chiquita comprises more than 30 species, which are reported to make extensive use of the lagoon in a permanent, seasonal or occasional way (Díaz de Astarloa et al., 2000; Cousseau et al., 2001; González-Castro et al., 2006, 2009). This coastal lagoon is a critical environment that acts not only as a nursery area for fishes, but also plays a crucial role as the spawning area of several estuarine-dependent marine fish species (González-Castro et al., 2009).

Materials and methods

Sampling was conducted as part of the regular monitoring of the lagoon in channelized reaches of lotic ecosystems entering the Mar Chiquita Coastal Lagoon near the northwestern extreme (Zone III, according to González-Castro et al., 2009). Fish were collected with three 25 m long, 1.5 m high-monofilament-gill nets with 120, 68 and 57 mm mesh sizes. The nets were deployed at the conjunction of the channels with the lagoon, thus covering the entire cross-section of the sampled reaches. At the time of collection the water temperature was 22.5°C and salinity 1 PSU.

Taxonomic identification of the specimens was based on Ringuelet et al. (1967). Meristic and morphometric characters were measured on the left side of each specimen (Table 1). The specimens were preserved in the fish collection of the Instituto de Investigaciones Marinas y Costeras (IIMyC-CONICET), Argentina, under catalogue numbers as given in Table 1. Samples of muscular tissue were stored in 95° ethanol (tissue vouchers) at −20°C as part of the UNMDP collection.

Results

In the present paper three specimens of the exotic common carp *C. carpio* were recorded for the first time in the inner zone of Mar Chiquita coastal lagoon (37°35′25″S; 57°22′21″W) (Fig. 1a,b) on 20 January 2014. Specimens were collected during summer samplings in lotic channelized tributaries of the lagoon. Body colouration, standard counts and measurements fit previous descriptions of the species, e.g. Ringuelet et al. (1967). Two specimens were adults: one male in the maturing reproductive phase, and one female in advanced

Table 1
Morphometrics, meristics and biological data of recorded *Cyprinus carpio* specimens

	Specimens		
	1	2	3
Morphometrics			
Total length (mm)	398	360	122
Standard length (mm)	314	285	97.5
Biological data			
Sex	Male	Female	–
Reproductive phase	Maturing	Advanced maturation	Immature
Code collection	UNMDP 3489	UNMDP 3490	UNMDP 3491

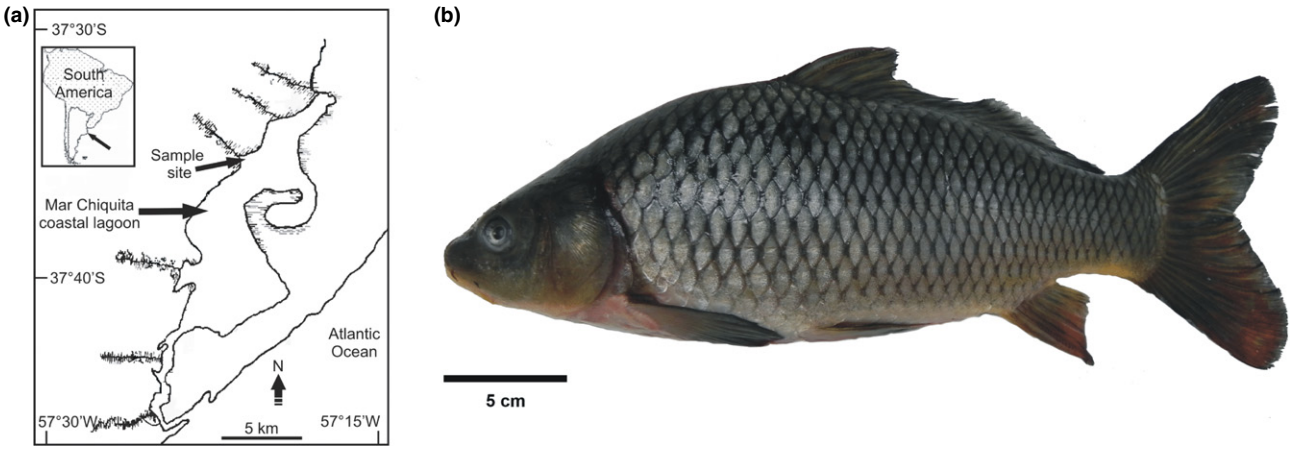

Fig. 1. (a) Capture site of three *Cyprinus carpio* specimens, 20 February 2014, Mar Chiquita coastal Lagoon, Argentina. (b) *Cyprinus carpio* UNMdP 3490. Scale bar 50 mm

maturation, according to the terminology employed by Núñez and Duponchelle (2009). The third specimen was immature (Table 1).

Discussion

Mar Chiquita Coastal Lagoon has already been disrupted by an invasive exotic species, the tubeworm, *Ficopomatus enigmaticus*, which is widely spread throughout the entire lagoon. The introduction of this reef-building species has provoked a significant environmental change, affecting the ecology and dynamics of sediments (Schwindt and Iribarne, 1998). The presence of *C. carpio* is of great concern since it might represent the beginning of the second large invasion process in this coastal-estuarine ecosystem. Indeed, shallow waters with soft organic sediments that characterize a large portion of Mar Chiquita Coastal Lagoon (Iribarne, 2001) are particularly suitable for feeding and reproductive activities of common carp. In turn, salinity may act as the major constraint for carp invasion. Food digestibility, consumption rate and growth of *C. carpio* are inversely related to water salinity (Wang et al., 1997).

There is no hydrological connectivity between the Mar Chiquita Coastal Lagoon and freshwater ecosystems of the Pampa plain where *C. carpio* is currently distributed. Thus the records of *C. carpio* in the Mar Chiquita Coastal Lagoon which is confined to channelized environments suggest two plausible hypotheses: (i) a deliberate introduction of this species as a biological control for weeds and macrophytes (Mac Donagh, 1948); (ii) vast floods that are a common feature of the region could act as a vehicle for the introduction of this species from a nearby freshwater ecosystem where this species has been recently registered (Solari et al., 2009). Beyond these facts, whatever the route and motivation of the introduction, the presence of this extremely efficient invasive species in this World Biosphere Reserve is a potential threat to this biome.

Two of the three *C. carpio* specimens captured in Mar Chiquita lagoon were mature adults. Although the presence of juveniles among collected specimens of common carp may be due to a recent release, the occurrence of reproductive events in nearby environments must not be disregarded. During the first year of growth, this species reaches 170–200 mm standard length (SL) with a weight of 75–130 g (Colautti and Freyre, 2000). Therefore, assuming a natural reproduction event occurred in nearby areas, the 97 mm SL juvenile collected in summer should have hatched during the last reproductive season in the spring.

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Author's address: Mariano González-Castro, Grupo de Biotaxonomía Morfológica y Molecular de Peces (BIMOPE), Instituto de Investigaciones Marinas y Costeras, Universidad Nacional de Mar del Plata, Casilla de correo 1260, Correo Central, Mar del Plata, Argentina.
E-mail: gocastro@mdp.edu.ar