MODIFICATION OF THE FRESHWATER FISH COMMUNITY IN THE NATURE RESERVE "OASI DEL SIMETO" (SICILY-ITALY): PRELIMINARY DATA

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Abstract

There are no recent data on the fish fauna of Simeto, the river with the largest catchment area in Sicily. Based on this assumption, it is particularly interesting to search whether the fish community has suffered variations over the years or remained unaltered.A recent preliminary sampling investigation was carried out in the stretch of river flowing through the Natural Reserve "Oasi del Simeto", immediately upstream the Passo Martino small dam, at about 7 km north the river mouth. This sampling activity showed the presence of alien species, not previously reported in the area, including: *Sarmarutilus rubilio*, *Cyprinus carpio*, *Carassius spp*. *Ameiurus melas, Gambusia holbrooki, Micropterus salmoides*. There were identified no euryhaline species although past data displays positive findings on the upstream of the sampling area. The results show the symptoms of a significant shift in the fish species presence within this protected environment, which certainly deserves further study and, subsequently, interventions aimed at naturalistic requalification. In fact, this research brings first evidence on the impact of the Passo Martino small dam on fish fauna, particularly on euryhaline species, suggesting the removal of the small dam, which, among others, does not result to have a single tangible benefit.

Riassunto

Evoluzione del popolamento ittico nella riserva naturale “Oasi del Simeto” (Sicilia - Italia): indagini preliminari - I dati sulla presenza ittica nel Simeto, il fiume siciliano col più esteso bacino idrografico, sono ormai lontani nel tempo. E’ quindi particolarmente interessante verificare se i suoi popolamenti abbiano mostrato modificazioni o si siano mantenuti inalterati. Una recente, preliminare, attività d’indagine, è stata svolta nel tratto di corso d’acqua subito a monte della traversa di Passo Martino, sita a ca 7 km a monte della foce, all’interno della Riserva Naturale Orientata “Oasi del Simeto”. Le indagini hanno evidenziato la presenza di sole specie alloctone, non segnalate precedentemente nell’area: *Sarmarutilus rubilio*, *Cyprinus carpio*, *Carassius spp, Ameiurus melas, Gambusia holbrooki, Micropterus salmoides.* Non si sono riscontrate, invece, specie eurialine, che un tempo erano segnalate anche a monte del sito campionato. I risultati rappresentano un sintomo di una mutazione significativa della presenza ittica in questo tratto di fiume, all’interno di un’area protetta, che meritano sicuramente approfondimenti e, susseguentemente, interventi mirati alla riqualificazione naturalistica. Vengono infatti fornite prime indicazioni sul ruolo negativo esercitato dalla traversa di Passo Martino sulla fauna ittica ed in particolare sulle specie eurialine, suggerendo la rimozione dell’opera che, peraltro, non ha alcuna utilità.

Introduction

The fragmentation of the watercourses resulting from artificial barriers (dams, barrages, …) represents one of the main impacts on the river corridors worldwide (Belletti et al. 2020) and this occurs in Sicily as well (Duchi, 2021).
In the catchment area of Simeto, the most extensive river in Sicily, barriers have been built from the late 50's last century on, profoundly altering the flow regimes of the river and its tributaries, with negative impact on the natural environment, and determining, in particular, the loss of continuity of the water courses. Dams not only reduced the flow rates, but they also reduced drastically the solid transport, triggering a noticeable erosion process in the shoreline of the Gulf of Catania, where the river flows into the sea; a constant and unstoppable process, which shall further accelerate due to one decision of the Sicilian Region to build a further dam (Pietrarossa) (Di Stefano et al., 2013). All these works represent one of the main causes of the extraordinary impoverishment of the fish fauna in the Simeto River (Ferrito e Tigano, 1995), and may furthermore be summed up to some other interventions that affected the river environment, such as: a. the so called "hydraulic works", causing further alteration to the hydrological regimes and heavy alterations of the river morphology; b. the uncontrolled water diversion made by private citizens for agricultural purposes, which, during summer, determines the dry up of the riverbed, often even the last pool c. the so called "clean-up" interventions of the watercourse, which are performed in the name of an alleged "hydraulic safety", d. the abusive fishing and the introduction of alien species.
For the terminal part of Simeto, in particular, knowledge of the evolution of the fish community is a long way off, also taking into account the presence of the artificial barriers that have been built since then. For such reason it is important to check if the population in this stretch has suffered alterations during the years or remained unaltered. For this purpose, here are presented more recent data, resulting from fish monitoring activities carried out in the last stretch of the river, in the area immediately upstream a small dam located in this area.

Studied area – Materials and methods
The sampling activity regarded the final stretch of Simeto River, immediately upstream the Passo Martino small dam (Figures 1; 2a).

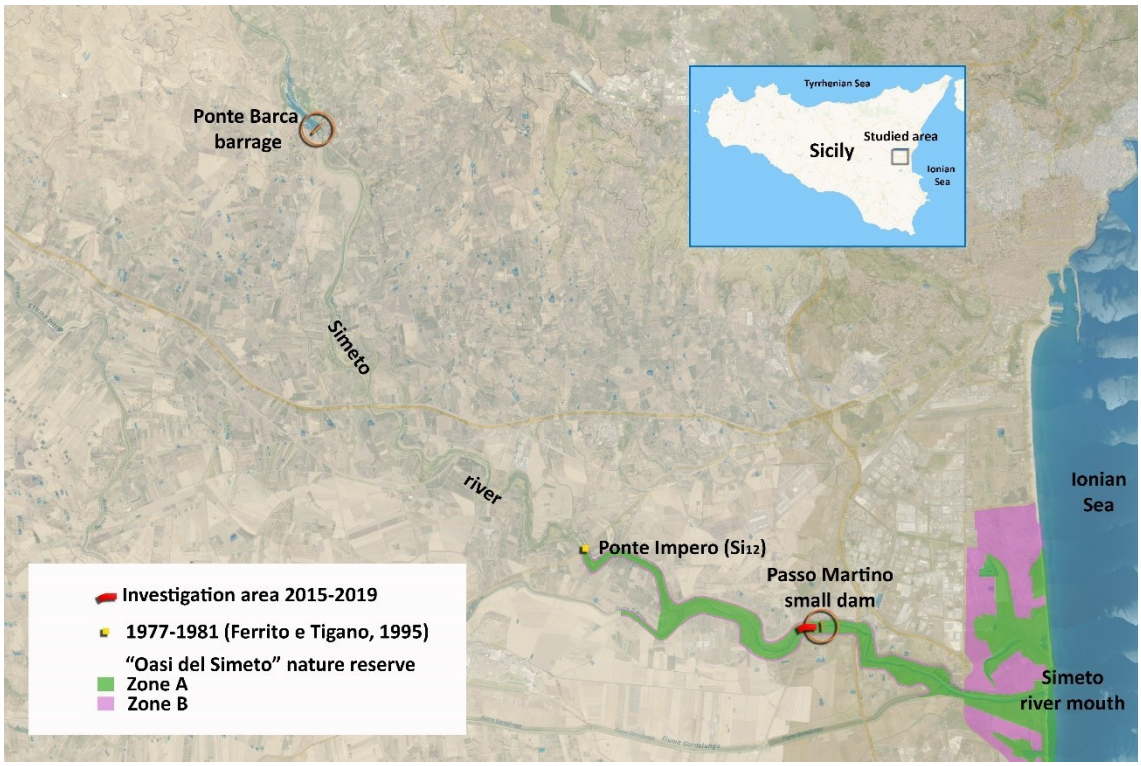

Figure 1. Studied area.

The work, made between 1984 and 1987, is located at just 7 km upstream the river mouth and interrupts the river continuity inside the natural reserve "Oasi del Simeto", and of two areas of the nature network Nature 2000: the SAC "Foce del Fiume Simeto e Lago Gornalunga" (ITA 070001) and SPA "Biviere di Lentini, tratto mediano e foce del Fiume Simeto e area antistante la foce" (ITA 070029).

At the beginning of the sixties, last century, the area of the river, object of the studies, had suffered a straightening intervention of the river corridor as well as the disappearance of the wide meanders which it had previously formed. The configuration of such "arrangement", consisting of two earthen embankments, two orders of floodplains and a lean riverbed stopped channel migration and the formation of secondary channels. The considerable differences in elevation between the riverbed and the floodplains has resulted in the disappearance of the trees and shrubs riparian community that used to represent one of the most interesting landscape and functional components of the lower river environments.

The sampling area extends on an approx. 500 m, starting a bit upstream of the small dam. Here, the river had a wetted width of approx. 20-23 m, and presented a clear potamal condition, further simplified by means of anthropization: slow flow, water depth of more than 2 m, low transparency, few shelters for the fish fauna, poor shading, summer temperatures of 24-26°C and conductibility of 1700-2000 µS/cm. Sampling of the fish fauna was conducted during individual days in September 2015, July 2017, and August 2019, using an electrofisher with DC/pulsed current and adjustable voltage and frequency (Scubla, EL6211-GI) mounted on a boat. Water stretches with lengths of 100-150 m were sampled, operating on both banks. To increase the catching efficiency, gillnets with a length of approximately 30 m were placed in the sections concerned. In addition, three fyke nets (without wings) were also used in the 2015 sampling, which were baited and placed on the bottom. The caught fish were subsequently returned to their environment:

some specimens were preserved for confirmation of the determination. The fish were determined according to Kottelat & Freyhof (2007).
The data of fish fauna was then compared with the data published by Ferrito and Tigano (1995). Considering that the said publication does not report data from this specific station, the comparison was made with the data resulted in the first upstream station: Si_{12} called Ponte Impero (Figure 1).

Results
The list of the species identified in the present study, in comparison with those reported during 1977-1981 by Ferrito and Tigano (1995) in the nearest upstream station (Ponte Impero - Si_{12}), is reported in Table 1.

Table 1. List of species reported in the station Si_{12} between 1977-1981 (Ferrito e Tigano, 1995) and of species identified in the present study.

Common Name	Scientific Name	Si_{12} (1977-1981)	Passo Martino (2015-2019)
Apennine Roach	*Sarmarutilus rubilio*		X
Crucian Carp	*Carassius spp.*		X
Common Carp	*Cyprinus carpio*		X
Black Bullhead	*Ameiurus melas*		X
Eastern Mosquitofish	*Gambusia holbrooki*		X
Largemouth Bass	*Micropterus salmoides*		X
Big-Scale Sand-Smelt	*Atherina boyeri*	X	
Flathead Mullet	*Mugil cephalus*	X	
Thinlip Grey Mullet	*Chelon ramada*	X	
Golden Grey Mullet	*Chelon auratus*	X	

As it results from the table, there were encountered six species, all allochthonous to Europe, Italy or Sicily, and which had not been reported previously in the investigated stretch, whereas the autochthonous euryhaline species present in the past, when they had travelled much further upstream than the Passo Martino site, were not sampled.

Discussion and conclusions
The observations, even though preliminary, state a significant shift in the area. Such shift was in fact evidenced by Tigano and Ferrito (1995), as, in the subsequent sampling to that reported in the Table 1 (1983-1992), the authors found the disappearance of the euryhaline fish fauna in the Ponte Impero - Si12 sampling site. But the same authors did not report any “substitute” species. The results of the present investigation may be related with the construction, between 1984 and 1987, of the small dam of Passo Martino, which probably contributed to changing the characteristics of the watercourse and preventing euryhaline species from ascending. This is confirmed by recent observations of the presence of shoals of mugilids immediately downstream of it, but not upstream (De Pietro, personal observation, 2012-2024; Figure 2b-c).

Figure 2. Passo Martino small dam (a). Shoal of mugilids immediately downstream the small dam (b-c).

Among others, during the sampling activities the presence of the Critically Endangered European eel *Anguilla anguilla* (L., 1758) was not recorded; it was instead recorded in the mouth stretch by the authors of the study of 1983-1992. However, given the rarity and elusiveness of this species and the non-targeted sampling effort, the presence of the European eel upstream (but also downstream) of the small dam should be particularly monitored, where possible by employing new methods, such as the environmental DNA, which are emerging just as valid as, if not more than, the traditional ones applied to this species (Itakura et al., 2018).
A significant change in the presence of fish within the protected area is therefore obvious, and this certainly deserves in-depth studies and, consequently, interventions aimed at its naturalistic regeneration.
In conclusion, the resulted data, although preliminary, update the knowledge of the ichthyofauna in this stretch of the Simeto River, within the regional reserve, and highlight the alteration suffered by the fish fauna. The differences encountered in the stretch immediately upstream the Passo Martino small dam reflect the negative impact that it may assume for the euryhaline species reported between 1977-1981 and, if further studies confirm it, as well as and in particular the European eel (*A. anguilla*), which was not reported. Consideration should therefore be given to eliminating the work, which is now completely useless. The restoration of the river flow continuity that would result from this operation would allow the free movement of fish fauna in the studied stretch upstream of the small dam for a length of about 36 km, meaning up to the Ponte Barca barrage (Figure 1), and would represent a first and important activity of natural restoration, albeit partial, of the aquatic ecosystems of the Simeto River.

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