PROPOSAL OF A MONITORING PLAN FOR THE EUROPEAN EEL, *ANGUILLA ANGUILLA L. 1758,* IN SICILY.

BORGHESAN FABIO[1], GIAMPICCOLO MONICA[2] , DUCHI ANTONINO[3*]

1. *Free Lance Biologist. Via Patrizio 3A, 35020, Saonara. Tel. 3478320822; email: borghesan.fabio@gmail.com*
2. *Free Lance Biologist; via G. Saragat 12, 97100 Ragusa. tel 3391242541; email: dott.mgiampiccolo@gmail.com*
3. *Free Lance Biologist; Inidpendent researcher, via Giordano Bruno 8, 97100 Ragusa, tel. 3475613774; email: a duchi@tin.it; *corresponding author*

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Abstract

We outline a monitoring plan for European eel that has been proposed in 2021, as part of of the preparatory activities for the elaboration of the Regional Eel Management Plan for Sicily (project FEAMP OP 2014/2020, MEASURE 2.49, Sicilian Regional Administration), to be included in the National Management Plan (Regulation EC 1100/2007). Sampling methods and time-frames diversified for juveniles, yellow and silver eels were suggested. Furthermore, for each area of the island, the most suitable environments (rivers, lakes, marshes) to be investigated were identified. The proposed monitoring plan turned out to be valid, in fact it was accepted by the Sicilian Administration and was carried out by the University of Catania, with only a reduction in the number of environments.

Introduction

The European eel, *Anguilla anguilla* L. 1758, is classified as critically endangered by the IUCN (Pike et al., 2020). The European Union issued Regulation EC No. 1100/2007 (Council of the European Communities, 2007) and its subsequent amendments, establishing guidelines for the species' conservation and urging member states to develop national management plans. These plans must analyse the status of populations within identified river basins and define measures to achieve, monitor and verify the main objective.

Italy has complied with EU obligations through the drafting of the National Management Plan (PNG) for the European eel. For functional and administrative reasons, the management unit (EMU) in Italy corresponds to the Region. Not all regions have produced a specific Regional Management Plan. In regions that chose not to develop a regional plan—including Sicily—a total fishing ban for eel was imposed. Indeed, Ministerial Decree 25 July 2019 (Official Gazette 220, 19 Sept 2019) Art. 6 mandates a complete closure of professional and recreational eel fishing in all freshwater, lagoon and marine waters for non-participating regions.

Historically, the species was present throughout Sicily's river basins, lakes and coastal brackish waters, where it was the most frequently caught species (Vinciguerra, 1896; Scotti, 1898; Sicher, 1898; De Pietro & Duchi, 2022). Currently, only one recent study reports its distribution and threats, limited to the Province of Ragusa and used as a case study (Duchi, 2021).

During 2020–2021 a bibliographic review of historical knowledge on the species' presence in Sicily was carried out. This highlighted known distribution, main issues and areas with insufficient data. However, existing information come from surveys not specifically designed for eel, meaning sampling methodologies may have missed the species. Targeted, well-planned sampling activities are therefore required. Based on this, a knowledge-building monitoring plan was proposed to the Sicilian

Regional Administration in 2021, outlining methods (based on those implemented by regions that have defined their own management plans), timing and locations for field work. The proposal is detailed below.

Proposed Survey Methods

The sampling methods and schedules are diversified for juvenile (glass-eel), yellow eel and silver eel stages (Table I).

Glass-eel / elver stage

• Station selection: Glass-eels in the early migration phase use passive transport by tidal currents and later respond to river flow cues near the estuary. Migration typically occurs in relatively regular waves, roughly fortnightly, depending on site hydrodynamics.

• Monitoring season: Ideally year-round; less critical months are July/August to October.

• Monitoring period: Minimum 5 days per month for 7–8 months, or adjusted according to catch trends and prior experience.

• Capture gear: Nylon glass-eels fyke net ("bertovello") with varying mesh sizes for wings and the final sack. Terminal chamber mesh = 2 mm; wings ≈ 2–3 m long with ~ 4 mm mesh; the trap contains 2 or more funnel-shaped throats. At least two traps should be deployed, remaining continuously in the water and checked every 12–24 h. Optional lentisk bundles (vegetal strips anchored in water) may be added.

• Parameters recorded on samples: Collected glass-eels must be anaesthetised before measuring total length, total weight and pigmentation stage (glass eel) using the Strubberg (1913) scale.

Yellow and Silver eel stages

• Monitoring season: Yellow eel – April to May; Silver eel – October/November to February/March.

• Monitoring period: Minimum 5 days per month for two consecutive months.

• Capture gear:

◦ Rivers: fyke net; preferably semi-lunar shape (e.g., 80 cm mouth width, 12 mm mouth mesh, 8 mm terminal sack mesh, four chambers, 8–10 hoops decreasing from 20 to 15 cm). Deploy 5–10 units per site, aligned parallel to the bank, number depending on river width.

◦ Lagoons (in tideways or sea-mouths): Net barrier (14 mm mesh) 10–15 m long placed perpendicular to the shore, ending with a 2.5–3 m long fyke net (8 mm terminal mesh) equipped with wings (14 mm mesh). Multiple barriers/traps may be used according to site conditions. Deploy in the afternoon and check every 12 h after night passage.

◦ Electrofishing: Continuous and continous-pulsed electric fishing gear (0.3–1.5 A, 150–380 V), used exclusively in fresh water due to low efficiency in brackish water. Operation restricted to trained and authorised personnel.

• Parameters recorded on samples: Fish must be anaesthetised before measuring total length, total weight and "argentination index". Total weight should be recorded separately for each trap.

• Environmental parameters: Time, temperature, salinity, weather conditions, lunar phase – recorded on dedicated sheets and stored electronically.

Table 1 – Monitoring diversification

STAGE	EQUIPMENT	PERIOD
Glass-eel /elver	Nylon glass-eels fyke net ("bertovello")	≥ 5 days/month for at least 7–8 months

Yellow – Silver eel	River: fyke net ("bertovello"); preferably semi-lunar shape ; Lagoon: 10–15 m net barrier + 2.5–3 m fyke net with wings Electrofishing (fresh water only)	≥ 5 days/month for 2 consecutive months

Sampling sites

Based on the available updated knowledge, the most significant water bodies for monitoring were identified. On the whole we proposed 23 water bodies distributed along the different sides of the island, both freshwaters and transitional waters. The proposed list is outlined in Table 2 and shown in Figure 1.

Table 2 – Proposed water bodies for monitoring

Side	Water bodies
Eastern	Tellaro, Anapo, Ciane, S. Leonardo, Simeto, Fiumefreddo, Alcantara
Northern	Naro, Pollina, Imera settentrionale, San Bartolomeo, Jato
Southern	Mazzarò, Arena (Delia), Modione, Belice, Platani, Imera meridionale, Irminio
Transitional waters	Faro and Ganzirri, Pantano Grande di Vendicari, Pantano Longarini, Stagnone di Marsala

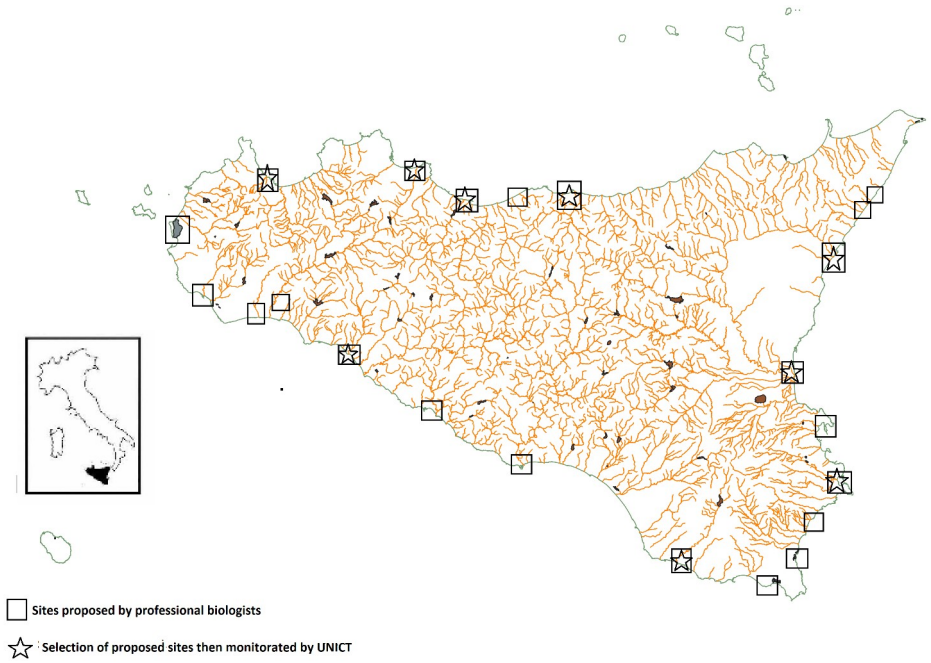

Figure 1. Water bodies to be sampled, proposed and implemented

Conclusions

The monitoring proposal was validated by the Sicilian Region. The plan, with the same methods but reduced number of sites, was entrusted to the University of Catania (D.D.G. n. 958/Pesca 5.12.2022 Regione Sicilia) Nine rivers and one transitional environment were selected (see Table 3 and Figure 1).

Table 3 – Water bodies monitored by the University of Catania

Side	Water bodies
Eastern	Anapo, Simeto, Alcantara
Northern	Pollina, San Bartolomeo, Jato
Southern	Belice, Platani, Irminio
Transitional waters	Ganzirri

Clearly, the data collected—of great importance if monitoring follows the described criteria—should be expanded both temporally and territorially to eventually cover all areas originally proposed by the experts.

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References

Consiglio della Comunità Europea. (2007). Regolamento N. 1100/2007 del Consiglio del 18 Settembre 2007 che istituisce misure per la ricostituzione dello stock di anguilla europea. Giornale Ufficiale della Comunità Europea (L248), 17-22.

De Pietro, R., & Duchi, A. (2022). Pantani Gelsari e Lentini (Sicilia, Italia), potenziale polmone per l'Anguilla europea (*Anguilla anguilla* L., 1758) nel Mediterraneo centrale: una proposta di intervento. Italian Journal of Freshwater Ichthyology, 8, 33–40.

Duchi, A. (2021). Rivers in search of the European Eel: Distribution and threats of the Critically Endangered *Anguilla anguilla* L. in Sicily: The province of Ragusa as a case study. Cybium, 45(1), 31–37.

Pike, C., Crook, V. & Gollock, M. 2020. *Anguilla anguilla*. The IUCN Red List of Threatened Species 2020:e.T60344A152845178.https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T60344A152845178.en. Accessed on 06 April 2025.

Scotti, L. (1898). La distribuzione dei pesci d'acqua dolce in Italia. Giornale Italiano di Pesca e Acquicoltura, 4–179.

Sicher, E. (1898). I pesci e la pesca nel compartimento di Catania con due note sui generi *Laemargus* e *Maena*. Atti Accademia Gioenia, 11, 1–70.

Strubberg, A. C. (1913). The metamorphosis of elvers as influenced by outward conditions. Medd. Komm. Havunders. Ser. Fisk. 4: 1-11.

Vinciguerra, D. (1896). Relazione intorno alla pesca di acqua dolce e di mare in Sicilia e dei modi per aumentarne il prodotto. Bollettino di Notizie Agrarie, 29, 105–128.