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The ghost labyrinth: quantifying illegal Fish Aggregating Devices (FADs) in the Southern Tyrrhenian Sea cetacean corridor.

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Introduction: Illegal, unreported, and unregulated (IUU) fishing constitutes one of the most relevant threats to marine ecosystems. IUU is a wide definition that entails a significant amount of fishing activities which concerns all types, aspects and stages of the catch and utilization of fishes (1). Fish Aggregating Devices (FAD) are man-made fishing devices that exploit the behavior of pelagic fish in order to attract them and catch by

Materials and method: The study area extended on 43.895 km2 including the Aeolian Islands (Fig1). Data were collected in summer and fall throughout 2017 and 2022, during Sea Shepherd dedicated campaigns carried out by two different ships (R/V Conrad end R/V Sea Eagle). GPS position of each aFADs encountered was recorded. FADs vertical minimum mooring length was derived from the bathymetry and distance between each

surrounding nets. One the most relevant part of marine litter known as Abandoned, Lost and Discarded Fishing Gear (ALDFG) is generated by FADs (2), and these derelict gears may represent a direct threat for marine megafauna due to entanglement in the FAD mooring line (3). The southern Tyrrhenian Sea (STS, Mediterranean Sea) represents an important area for marine mammals, being a corridor for latitudinal movements of different marine mammal populations (4). Nevertheless, no studies investigated the magnitude of anchored-to-the-seabed FADs (aFADs) presence in the STS ecosystem and the threat it represents for the marine mammals species. To address this gap we present a preliminary study about the distribution and composition of aFADs in a STS subarea. (*Fig1*)

Results: A total of 21162 Km were sampled during 230 days and 1739 aFADs were recorded (Fig. 1). All the aFADS encountered were not correctly or at all labelled. The median aFADs mooring depth was 1388m (mean = 1366, range = 526 – 3518). The 60% of aFADS encountered were at a distance \leq 1000m among each other's (5% of the total was at a distance \leq 100m). A subsample of 346 aFADs was divided in PFAD, MFAD. KDE and MCP analysis showed that in the area surrounding Aeolian Islands there was a tendency to adopt biodegradable or partially biodegradable materials (MFAD); differently, in the external area emerged a dominant trend characterized by the utilization of plastic materials (PFAD) (Fig.2).





FAD was calculated. A subsample of aFADs was divided into two categories according to the composition of the floaters: plastic floaters only (PFAD) and floaters made by a mixture of plastics and biodegradable components (MFAD). Distribution range estimation of the two aFADs categories was calculated by means of kernel density (KDE) and 95% minimum convex polygon (MCP).

Discussion: Considering the depth of the seabed at each FAD position, the minimum total length (all aFADs comprised) of the monofilament plastic line used to anchor the FADs exceeds 2500 km (which corresponds to the distance between Paris and Moscow). Since the majority to all these plastic materials (mostly polypropylene) are not retrieved by fishermen throughout the year, they turn into ALDFG categorization becoming an issue for the International Convention for the Prevention of Pollution from Ships (MARPOL). Moreover, since they are not correctly labelled, they also fall into the IUU category. Only the 4% of the 343 aFAD analyzed were partly made of biodegradable materials. Although administrative national acts (see Circ. n.10385 MIPAAF) establish the utilization of biodegradable FADs, such result demonstrated that most of the operators do not follow the rules. To conclude, this fact may result in the accumulation of plastic materials close to the Strait of Messina, which is an important ecological corridor for marine megafauna (4, 5).

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