

Vessel-based surveys as a tool to fill critical knowledge gap on *Grampus griseus* in the north-eastern Aegean Sea

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Abstract—Data on Risso’s dolphin are very scarce, possibly due to its wide-ranging movements in the Mediterranean basin. Available data suggest the presence of this species in deep waters, shelf-break areas where the slope is steepest, around offshore islands and archipelagos. A total of eight sightings were recorded during vessel-based surveys carried out along opportunistic line transects from March 2017 to October 2019. The results of the monitoring activity showed that the occurrence of this species in the water surrounding Samos Island is unpredictable and that the characteristics of the environment of each sighting are various, as already shown by previous Mediterranean studies. Nonetheless, the results of this study are promising concerning Risso’s dolphin presence and conservation in the waters surrounding Samos Island.

Keywords—Risso’s dolphin, Aegean Sea, conservation, vessel-based survey

I. INTRODUCTION

The species Risso’s dolphin (*Grampus griseus*, Cuvier 1812) is one of the eight regular cetacean species of the Mediterranean Sea [1]. The Mediterranean subpopulation of Risso’s dolphins is considered genetically different from the North-East Atlantic one [2].

The Mediterranean population is assessed as “Data Deficient” by IUCN Red List [3]. Indeed, data on its distribution, abundance, ecology, population dynamic, status and trends are very scarce, possibly due to the species wide-ranging movements across the Mediterranean basin [4].

In the Mediterranean Sea, Risso’s dolphins are relatively widespread [5] but only a few dedicated studies [4] [6] on a few sightings or strandings records are available in the literature.

Risso’s dolphins are relatively large, the body is torpedo-shaped measuring 3m-4m in length, with no documented sexual dimorphism. The species’s most distinctive morphological trait, the head, is blunt with no beak. Risso’s dolphins have reduced dentition specialized for taking cephalopod prey. Indeed, no teeth are usually present in the upper jaw while two to four pairs are present in the lower jaw.

Their body pattern, especially in adult specimens, is typically characterized by the abundance of white marks making the individual identification easily distinguishable. At sea, the best identification characteristic is the coloration and scarring body pattern. Adults range from uniform grey to nearly white as the animals age, typically covered with white scratches, spots and blotches. At birth, they are uniformly grey. The scarring is believed to be caused by intraspecific social interactions and from interactions with the prey.

These characteristics are usually the target of the capture-mark-recapture photography identification (P-ID) to identify single individuals and understand population characteristics and trends [7]. This technique is commonly used during vessel-based survey. The latter represents the most common methodology to assess dolphin population characteristics.

In Greek waters, sightings have been reliably and consistently reported in different areas [8]. From the available data referring to the eastern Mediterranean Sea, the relatively homogeneous distribution of sightings suggests the presence of this species in deep waters, shelf break area where the slope is steepest, around offshore islands and archipelagos [1], [4]. It has been observed also in the Ionian Sea at a depth of 66 m and on one occasion at 7 m in Corinth Canal without passing through [9]. In the semi-closed Gulf of Corinth it has been observed in mixed-species group with striped dolphins (*Stenella coeruleoalba*) and short-beaked common dolphins (*Delphinus delphis*) [9], [10]. However, due to the low sighting frequencies, the species is not consistently observed in any particular area [5]. In this ecological context, investigation on the diet of this species based on stranded specimens has shown a prevalence of teutophagic diet [11] [12] [13] composed most commonly of prey species from the *Histioteuthidae*, *Ommastrephidae*, and *Sepiidae* families in all the studied areas [14], [4], [15], [16], [17].

The main threats for Risso’s dolphins consist in fishery interaction, with episodes of by-catches in longlines and gillnets recorded in Spain [18] in Italy [19] and in Greece [20], mortality in driftnets directly observed from boats in the Turkish side of the Aegean Sea; direct killing in Greece [20]; and, like other odontocetes, chemical pollution [21], [22], [23], [24].

Through vessel-based survey, this study aims to provide updated data and related characteristics about the presence of

Grampus griseus in the Greek Aegean Sea, filling the knowledge and research gap on this species.

II. MATERIALS AND METHODS

A. Study area

The study area is located in the waters surrounding Samos Island, north-eastern Aegean Sea (Greece). The bathymetry is variable within the investigated area: the southern region is characterized by a shallow plateau with depths that rarely exceed 100 m; while the northern side is characterized by an extended plateau with small underwater depressions up to 1000 m in depth and featuring a steep deep trench that reaches up to 1500 m in depth [25]. This area is poorly studied and the data about cetacean population are mostly about other species such as the short-beaked common dolphin (*Delphinus delphis*) [25].

B. Data collection and analysis

Sighting data were collected during vessel-based surveys carried out along random line transects from March 2017 to October 2019. A visual scanning technique was adopted by four trained observers actively searching for cetaceans [19]. Each surveyor was in charge to scan a specific quarter of the sea in half-hour shifts during daylight. Monitoring activities and code of conduct during the navigation were in accordance with the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS) guidelines.

When a group of cetaceans of the same species was spotted at the same time showing similar behavioral characteristics and at distances of less than 1500 m from each other, the event was considered a sighting. During a sighting data about time of first contact, depth (m) and group size (number of individuals) were collected, and GPS coordinates were recorded every 3 minutes together with weather conditions. Other relevant data during sightings were recorded together with other complementary environmental data. Sighting effort stopped with sea states of 3 Douglas or more (the approximate equivalence to Beaufort wind force scale in offshore, current-free conditions, of 3 Douglas is Beaufort 3 to 4).

When possible, photographs of dorsal fins and other body marks were taken using a Canon EOS 1300D with an EF 75-300mm ZOOM Lens. The pictures were consequently processed in order to identify distinctive characteristics. Picture cropping and matching observation were conducted without using any software but manually.

III. RESULTS

A total of eight sightings were recorded during the study period at a mean depth ranging from 30 to 1200 m (Figure 1).



Fig. 1. Sightings distribution in study area between 2017 and 2019.

The sightings occurred in 3 consecutive years during 4 surveys (Table 1). In 2017, the sightings of 4 adults Risso's dolphins occurred in a mixed-species group with 6 striped dolphins. Furthermore, in 2017, a sighting of 1 juvenile individual was recorded in the southern water of Samos Island (32 m in depth) really close to the coast (13 m). The juvenile was recognized due to the absence of the typical scars as well as the size, and it appeared in not good nutritional condition. In 2018, the sighted group was composed by 5 adults, 2 juveniles and 1 calf (Figure 2).



Fig. 2. Risso's dolphin pod with adults, juveniles and a calf observed in 2018 (Tab. 1 n°3).

In 2019, 5 sightings occurred during the same day. Except for the sighting of the juvenile in 2017 and 2018, in all other sightings the individuals were identified as adults and were observed at a mean distance from the shore of 9 ± 3 km and at a mean depth of 1200 ± 300 m.

TABLE I. SIGHTINGS CHARACTERISTICS

	Date	Time	Location	Number of individuals	Other species
1	11.09.2017	09:28	Ikarian Sea	4	Yes (Sc)
2	19.09.2017	13:00	South Samos	1	No
3	24/04/2018	17:45	Ikarian Sea	8	No
4a	31/10/2019	08:55	Ikarian Sea	6	No
4b	31/10/2019	09:50	Ikarian Sea	4	No
4c	31/10/2019	10:20	Ikarian Sea	4	No
4d	31/10/2019	10:50	Ikarian Sea	3	No
4e	31/10/2019	12:45	Ikarian Sea	3	No

In all occasions, the animals were observed while regularly swimming except for the single juvenile observed in the behavior of milling [26] (Figure 3).



Fig. 3. Risso's dolphin juvenile observed in the southern water of Samos Island in 2017 (Tab. 1 n°2).

No behavioral interaction between different species were recorded.

Due to the field, animal behavior and work conditions, only few animals were possible to be captured for P-ID analysis. In particular, in 2017 and in 2019 a total of 2 and 4 individuals respectively were photographed showing optimal profile to get good quality and distinctive pictures.

The pictures taken in the different years didn't allow to obtain any match of individuals among sightings (Figure 4).



Fig. 4. One of the Risso's dolphin observed in 2017 (Tab. 1 n°1).

IV. DISCUSSION

The occurrence of this species in the water surrounding Samos Island is unpredictable and various are the environmental characteristics of each sighting's location.

When observed in mixed-species groups, the other species recorded was always the striped dolphin, like in the Ionian Sea [9] and off Turkish coast in the northern Aegean [14]. Only 1 single juvenile was sighted very close to the shore in not good nutritional condition and in a different area compared to the other sightings. In regards to the other sightings, the depth and the distance from the shore are in accordance with previous studies on the species [3], [6], [8], [9], [29].

The behavior shown during the sightings, due to the aforementioned factors, was of relevant mention only in the case of the single juvenile in 2017. This specimen in the behavior of milling could probably have been disoriented due to the unusual habitat, compared to the usual one in Samos water, or due to the poor nutritional condition. No other particular behavior was recorded, neither in 2019 when the same group was sighted in 5 occasions in the same region during different morning times. Neither when the animals were in mixed groups with other species, any particular behavior was observed as recorded in other Greek waters [9]. The presence of juveniles observed in 2017 and juveniles and a calf 2018 may represent the evidence of a reproductive subpopulation migrating through this area or possibly using this area as a breeding or nursery habitat.

The low density of this species compared to others in the same region, such as the short-beaked common dolphin

[18], has precluded sustained and focused investigations also in this area. Nonetheless, the results of this study are promising in Risso's dolphins' increased knowledge on their presence and for their conservation in the waters surrounding Samos Island.

More systematic surveys covering bigger regions and involving extensive efforts (e.g. mark recapture photo-identification monitoring) become fundamental in accordance with Resolution 5.9 of the 5th Meeting of the Parties to ACCOBAMS, which reiterates the priority of obtaining more recent estimates of abundance of cetacean species, and the Marine Strategy Framework Directive (MSFD 2008/56/EC) which requires regular reports on population dynamics, range and status of cetacean species in European waters.

V. CONCLUSION

The present study sets the baseline of the first data recorded in this region of the north-eastern Aegean Sea regarding Risso's dolphin occurrence. Further investigation and efforts could show more characteristics of the presence of this species in this area and the use of the habitat helping the development of targeted conservation strategies and the identification of important areas for the species.

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VII. REFERENCES

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