Aquatic Mammals 2002, **28.2**, 188-197

Mixed-species associations of striped dolphins (*Stenella coeruleoalba*), short-beaked common dolphins (*Delphinus delphis*), and Risso's dolphins (*Grampus griseus*) in the Gulf of Corinth (Greece, Mediterranean Sea)

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Abstract

Surveys to assess cetacean presence were conducted in July 1995 and 1997 in the Gulf of Corinth, which is an almost-enclosed sea in Greece, Eastern Mediterranean. The dolphin sighting frequencies were high (0.043 sightings/km). Four dolphin species were encountered: striped dolphins (*Stenella coeruleoalba*), short-beaked common dolphins (*Delphinus delphis*), Risso's dolphins (*Grampus griseus*) and bottlenose dolphins (*Tursiops truncatus*). Bottlenose dolphins were encountered only once. Thirteen dolphin sightings were single-species (striped dolphins) and seven were mixed-species with either two species (striped and common dolphins in five sightings), or three species (striped, common, and Risso's dolphins in two sightings) in the group. In all mixed-species sightings, Risso's dolphins and common dolphins were always and by far the minority species present. To date, no single-species groups of Risso's or short-beaked common dolphins have been observed in the Gulf of Corinth. Interspecific rake marks on the Risso's dolphins, and behaviours observed through video analysis, indicate potentially complex and regular interspecific interactions. Our results support the idea that interspecific interactions between sympatric cetacean species in the area are common, and apparently complex.

Key words: mixed-species groups, *Stenella coeruleoalba*, *Delphinus delphis*, *Grampus griseus*, striped dolphin, short-beaked common dolphin, Risso's dolphin, Gulf of Corinth, Greece, Mediterranean Sea.

Introduction

Interspecific associations or interactions have been reported for at least 33 cetacean species belonging to four odontocete and two mysticete families: Delphinidae [*Delphinus delphis* (Forcada *et al*., 1994; Bearzi, 1997; García *et al*., 2000), *D. capensis*, *Globicephala macrorynchus* (Weller *et al*., 1996), *G. melas* (Bloch & Lockyer, 1988; Shane, 1995; Baraff & Asmutis-Silvia, 1998), *Grampus griseus* (Würsig & Würsig, 1980; Bloch & Lockyer, 1988; Shane, 1995; Shelden *et al*., 1995), *Lagenorynchus acutus* (Baraff & Asmutis-Silvia, 1998), *L. hosei*, *L. obliquidens* (Shelden *et al*., 1995), *L. obscurus* (Norris & Prescott, 1961; Würsig & Würsig, 1980), *Lissodelphis borealis* (Shelden *et al*., 1995), *Orcinus orca* (Norris & Prescott, 1961; Bloch & Lockyer, 1988; Jefferson *et al*., 1991), *Peponocephala electra*, *Pseudorca crassidens*, *Sousa chinensis* (Sayman & Tayler, 1973; Cockeron, 1990; Karczmarski *et al*., 1997), *Stenella attenuata* (Perrin *et al*., 1973), *S. coeruleoalba* (Forcada *et al*., 1994; García *et al*., 2000), *S. frontalis* (Herzing & Johnson, 1997), *S. longirostris* (Perrin *et al*., 1973), *Steno bredanensis*, *Tursiops aduncus* (Sayman & Tayler, 1973), and *T. truncatus* (Cockeron, 1990; Ross & Wilson, 1996; Bearzi, 1997; Herzing & Johnson, 1997)], Monodontidae [*Delphinapterus leucas*, *Monodon monoceros* (Orr & Harwood, 1998)], Phocoenidae [*Phocoena phocoena* (Ross & Wilson, 1996), *Phocoenoides dalli* (Shelden *et al*., 1995)], Physeteridae [*Physeter macrocephalus* (Bloch & Lockyer, 1988; Shelden *et al*., 1995; Weller *et al*., 1996)], Balaenopteridae [*Balaenoptera acutorostrata*, *B. borealis*, *B. edeni*, *B. musculus*, *B. physalus* (Shelden *et al*., 1995), and *Megaptera novaengliae*], and Eschrichtiidae [*Eschrichtius robustus* (Shelden *et al*., 1995)] (for long lists of mixed-species cetacean sightings in the eastern Pacific Ocean and the Gulf of California see Hill & Barlow, 1992; Carretta & Forney, 1993; Mangels & Gerrodette, 1994; Carretta *et al*., 1995).

Interspecific interactions among cetaceans in captivity (Wood, 1953; Caldwell *et al*., 1971; Terry,

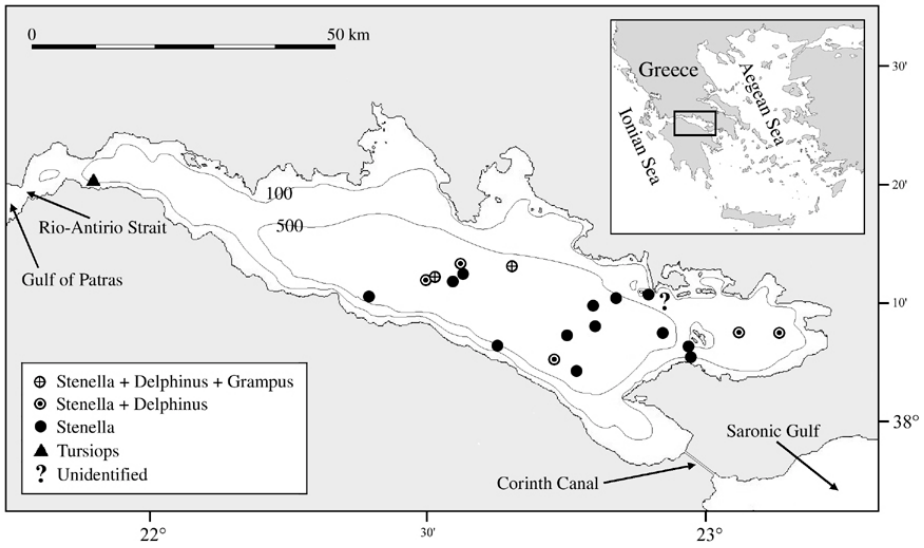

Figure 1. The Gulf of Corinth with all dolphin sightings made during the surveys of 1995 and 1997. The position of the Gulf of Corinth in Greece, between the Ionian and Aegean Seas, is given at the top right. Water depths of the contour lines are given in meters. Species composition of the sightings is explained by the legend at the bottom left.

1984; Sylvestre & Tasaka, 1985) and cetacean interactions with humans in the wild was reviewed by Lockyer (1990). Complex interspecific interactions of other social mammals including primates (Klein & Klein, 1973; Struhsaker & Leland, 1979; Struhsaker, 1981; Terborgh, 1983; Waser, 1982, 1987), and interactions between other terrestrial species (Fagan, 1981) have also been reported.

Individual cetaceans participating in mixed-species groups can: 1) swim side-by-side while maintaining the borders of their own single-species sub-group, 2) mix in a way that yields no obvious, stable grouping of the different species, or 3) mix and also interact with individuals of the other species in detailed and complex ways. This paper reports the occurrence of mixed-species associations among three dolphin species (*Stenella coeruleoalba*, *Delphinus delphis*, and *Grampus griseus*) in the wild and specific behaviours observed during these groupings in an isolated sea area: the Gulf of Corinth in Greece.

Materials and Methods

The Gulf of Corinth (GOC) is a small, long, and almost enclosed sea (approximate coordinates 38º N – 022º E), which lies between the Ionian and Aegean Seas of the Northeast Mediterranean (Fig. 1). The GOC opens to the Gulf of Patras and the Ionian Sea to the west through the 2-km wide Rio-Antirio Strait (maximum depth 66 m). Passage to the waters of the Saronic Gulf and the Aegean Sea to the east is possible through the long (5.8 km), narrow (25 m), and shallow (minimum depth 7 m) Corinth Canal. Very steep slopes particularly along the southern coasts characterize the GOC. The depth increases rapidly to reach a maximum of 935 m centrally. Shallow coastal areas are practically absent with the exception of a very limited area in the western part of the Gulf and the inner area of two bays on its northern coasts (Fig. 1). From a total of 2336 km^2 of sea surface only 22.5 % lies over depths up to 100 m, while 38.4 % lies over depths of 500-935 m. The Gulf of Corinth is open for cetacean exchange only to the west. Cetacean intrusions from the Saronic Gulf (east) are virtually non-existent. There is a 24-h guard on both sides of the canal and only one sighting has been reported since 1980. This was a young Risso's dolphin that has been photographed the 7 August 1995, while trying to cross the canal from the Saronic Gulf towards GOC. Although this animal spent 14 h close to the entrance and within the canal, it eventually returned to the Saronic Gulf, according to the personnel who tried to drive the dolphin back to the open sea.

Our surveys in the GOC took place in three consecutive seasons in July 1995, 1996 and 1997; however, data from 1996 have been discarded due to unfavorable sea conditions during all the days in the field. Cruises were conducted aboard a 12-m sailing boat. The entire GOC was divided in four major areas (and 53 sub-areas), and courses were determined daily, so that the effort under sea state

Table 1. Characteristics of the 22 sightings recorded under good sea conditions (Sea state<3). Distances from the coast are given in kilometres and depths in meters.

Species	n	%	Average distance (range)	Average depth (range)
Sc	13	59.1	5.0 (0.8-9.1)	639 (300-880)
Sc+Dd	5	22.7	5.4 (3.9-7.0)	666 (340-890)
Sc+Dd+Gg	2	9.1	8.2 (7.1-9.2)	835 (760-910)
Tt	1	4.5	1.1	120
Unidentified	1	4.5	2.1	300

Sc: *Stenella coeruleoalba*, Dd: *Delphinus delphis*, Gg: *Grampus griseus*, Tt: *Tursiops truncatus*.

<3 (Beaufort scale) was distributed homogeneously in all areas and sub-areas. Searching effort and sightings were used for the analysis only when a sea state <3 occurred and at least one experienced biologist was observing. Observers used binoculars to continuously scan 180° of the horizon in front of the vessel. Routes and geographic coordinates of the sightings were recorded with the aid of a Global Positioning System (GPS). Minimum distances from the closest coast and approximate depths for all sightings were calculated *a posteriori* by plotting the geographical coordinates of the sightings on a bathymetric map of the Hellenic Hydrographic Service. For three of the mixed-species sightings, a total of 21 min of surface video were taken using a Sony Video 8 camera. The videotape was reviewed for the occurrence of all visible behaviours between species including bowriding, chases, physical contact, and other visible behaviours. Furthermore, photographs of dorsal fins and other body marks of Rissos's dolphins were taken with a 70-210 mm zoom lens for identification purposes.

Results

Sighting frequency and distribution

During a total searching effort of 103.5 h, 781 km of route were surveyed. Sea state <3 was encountered during 59.8 h or 512 km and resulted in 22 sightings and 16.7 h of observation on four dolphin species (Table 1). The total sighting frequency recorded was 0.043 sightings/km. Bottlenose dolphins were observed only once (school of nine individuals), in the western part of the GOC, close to the Rio-Antirio Strait. No bottlenose dolphins have been observed in the central or east part of the GOC. Out of 21 other dolphin sightings, 13 (61.9 %) were single-species (striped dolphins), seven (33.3 %) were mixed-species, and one was unidentified (Table 1). Mixed-species sightings included either two-species (striped and common dolphins) or three-species (striped, common, and Risso's dolphins) groups. Distances from the closest coast for all sightings ranged from 0.8 to 9.2 km (Table 1). Both observations of the three-species groups occurred in the central area of the GOC in the deepest water (760 and 910 m respectively) and furthest from the coast (Fig.1). The depths of the mixed-species sightings ranged from 340 to 910 m.

School Size and Species Ratios

Total school size for all sightings (except bottlenose dolphins) ranged from 10 to 60 individuals, with the exception of a single striped dolphin that was observed once. Calves and/or juveniles were observed among all mixed-species schools. Five single-species sightings (striped dolphins) had only adult individuals. In all mixed-species sightings, striped dolphins were always and by far the most abundant species of the sighting (Table 2). In two-species sightings, the common dolphins comprised 7-20% of the total group. The ratio of striped to common dolphins ranged from 4.5:1 to 11:1. In all three-species sightings, a single Risso's dolphin was

Table 2. Species proportions and ratios for the seven mixed-species sightings. Proportions are given in numbers of individuals and percentages in parenthesis. For sightings with min/max group size estimates, species ratios were calculated using the average group size.

Total no.	*Stenella coeruleoalba*	*Delphinus delphis*	*Grampus griseus*	Ratio (Sc:Dd:Gg)
10	7 (70 %)	2 (20 %)	1 (10 %)	7:2:1
20	18 (90 %)	1 (5 %)	1 (5 %)	18:1:1
12	11 (92 %)	1 (8 %)	-	11:1
21	18 (86 %)	3 (14 %)	-	6:1
15-18	12-15 (80-83 %)	3 (17-20 %)	-	4.5:1
55-60	51-56 (85-95 %)	4-8 (7-15 %)	-	8.9:1
31-35	26-30 (84-86 %)	5 (14-16 %)	-	5.6:1

observed among the striped and common dolphins. Visual observations in the field, confirmed later by photo-identification techniques, showed that the Risso's dolphins were two different individuals. Using as criteria the number of, and distance between, scar lines both Risso's had many tooth scars clearly originating from small delphinids (presumably striped or common dolphins) and only a few tooth scars from Risso's dolphins (Fig. 2a, 2b). No single-species Risso's or common dolphin groups have been observed in the Gulf of Corinth to date.

Behaviour between Species

A single two-species sighting and two three-species mixed sightings were analyzed from videotapes. Twelve visible behaviours were observed and tallied for each video sequence (Table 3). In most cases, the species performing the behaviour was recognizable. In the two three-species sightings, the majority of interactions occurred between the Risso's dolphin and either short-beaked common dolphins or striped dolphins, or both (Fig. 3). Most interesting was the longer sequence where the Risso's dolphin was observed clearly focusing on the single short-beaked common dolphin. Other interesting features of this sequence included (1) the Risso's dolphin usually positioned itself behind the group, and usually directly behind the short-beaked common dolphin in the larger striped dolphin group, (2) the Risso's dolphin actively chased, herded, and led the short-beaked common dolphin back to the boat, (3) the short-beaked common dolphin swam below the Risso's dolphin after herding, and (4) the Risso's dolphin chased the striped dolphin after the striped dolphin and the short-beaked common dolphin were observed charging each other. Some of these behaviours could be interpreted as potentially aggressive or playful. In addition, many coordinating behaviours, such as synchronized swims (Fig. 3) and surfacings were observed between species.

Discussion

The GOC is a unique body of water and contains a unique mixture of pelagic and coastal sympatric dolphin species. Due to its deep waters, the steep slopes along its coasts, the systematic occurrence of wind-driven upwelling currents (Lascaratos *et al.*, 1989), and the entrance of waters from the Ionian Sea, the GOC shows some characteristics of an open sea although it is an isolated gulf. This could explain why a purely pelagic cetacean species (the striped dolphin) and a species which usually occur in the deep waters of the continental slope (the Risso's dolphins) inhabit the waters of the GOC.

The dolphin sighting frequency (0.043 sightings/km) that we recorded in the GOC is very high compared to those recorded in the neighboring coastal and pelagic Ionian Sea. After conversion to the same units, Politi *et al.* (1994) reported 0.017 sightings/km for striped dolphins in the pelagic waters of the north Ionian Sea and 0.021 sightings/km for a coastal area inhabited by resident short-beaked common dolphins and bottlenose dolphins. Frantzis *et al.* (unpublished data) recorded 0.022 sightings/km for these two species in the Gulf of Patras and the neighboring islands. High sighting frequencies for dolphins in the GOC might indicate an important production of fish and/or squid. Papaconstantinou (1986) compared the GOC with neighboring seas and reported trawler catches of demersal fish significantly higher than in the Gulf of Patras and the Ionian Sea. Although no data exist regarding pelagic fish and squid, abundance of prey is in accordance with the presence of other pelagic predators, such as large sharks and albacore (*Thunnus alalunga*) observed during our surveys in the GOC. It is worth noting that once, during our surveys, we observed a school of albacore in close association with a school of 15-18 striped and common dolphins for more than half an hour.

Mixed-species dolphin groups in the GOC account for 35 % of all groups (mixed and single-species) composed of striped dolphins. The only sightings of short-beaked common dolphins or Risso's dolphins were in these mixed groups, in which they were always and by far the minority species present. To date, this seems to be the norm in the GOC, since: (a) single-species groups of these two species have not been observed during the present study, nor in the recent surveys in summer 2001 (Frantzis & Paximadis, unpublished data), and (b) the GOC is a relatively small and closed sea area that we have covered many times by our surveys. With the available data, it is impossible to say whether this is the result of a decline or not. It has to be noted however, that evidence of rarefaction has been recently recorded for a resident short-beaked common dolphin community in the neighboring waters of the Ionian Sea (Politi & Bearzi, 2001). Besides, this species faced a dramatic decline in numbers during the last three or four decades and almost completely disappeared from large portions of its former range in the western Mediterranean Sea (Notarbartolo di Sciara & Gordon, 1997; Forcada & Hammond, 1998).

Sympatric short-beaked common and striped dolphins have been observed to form mixed groups in two more areas of the Mediterranean Sea. (Table 4). In the Alboran Sea (western Mediterranean), where common dolphins are still abundant, mixed groups account for 17 % of common dolphin sightings (García *et al.*, 2000). In all these mixed groups striped and common dolphins never include

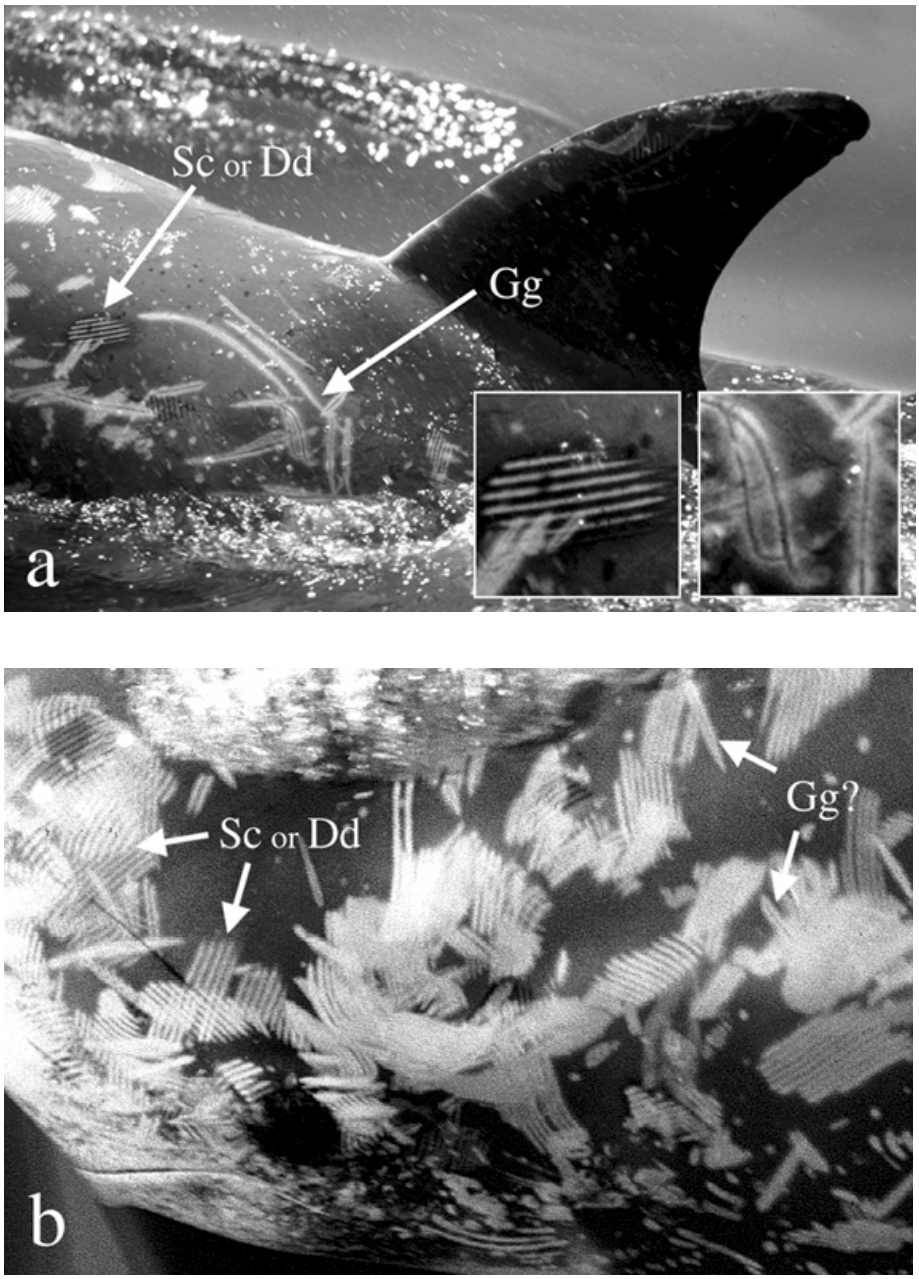

Figure 2. Tooth scars on the skin of Risso's dolphins encountered. (a) The two types of scars that have been observed are magnified in the smaller photos at the bottom right. Scars originating from interactions with small delphinids, presumably striped or common dolphins (*Sc* or *Dd*), look like rake marks and typically consist of 5-15 closely spaced, thin, parallel lines (left). Scars originating from Risso's dolphins (*Gg*) consist of 1-2 longer and thicker, parallel or crossing lines, with white contour and a darker inner area (right). Such tooth scars are typically found on single-species Risso's dolphin groups. (b) A high number of scars provoked by small delphinids and only a few tooth scars from Risso's dolphins have been observed on the skin of Risso's dolphins. The left side of the head area is shown in the photo.

Table 3. Behaviours that were observed and tallied for three video sequences recorded during one two-species sighting and two three-species mixed sightings

Date	14/7/97	12/7/97							14/7/97							
Length of video	5 min	6 min							10 min							
Species present	*Sc/Dd*	Sc/Dd/Gg							Sc/Dd/Gg							
Species behaving	Only Sc	Sc	Dd	Gg	Gg/Sc	Gg/Dd	Sc/Dd	Gg/Sc/Dd	Sc	Dd	Gg	Gg/Sc	Gg/Dd	Sc/Dd	Gg/Sc/Dd	Comments
Behaviour																
Bowriding	1	2	0	2	1	0	1	0	1	0	4	1	3	0	4	
Parallel swim	2	0	0	0	1	0	0	0	0	0	0	1	5	0	0	
Synchronized surfacing	1	0	0	0	4	0	0	1	1	0	0	0	1	0	0	
Tail slap	2								1	0	0	0	0	0	0	
Synchronized turn	0								0	0	0	0	2	0	0	
Inverted swim	4								0	0	0	0	1	0	0	*Dd* inv. swim to *Gg*
Charge	1								0	0	0	0	0	1	0	
Leap	3								4	0	1	1	0	0	0	
Follow	0								0	0	0	1	3	0	1	*Gg* follows others
Chase	2								0	0	0	4	5	0	1	*Gg* chases others
Open mouth	0								0	0	0	1	0	0	0	*Sc* open mouth to *Gg*
Physical contact	1								0	0	0	0	1	0	0	
Total behaviors	18	2	0	2	6	0	1	1	7	1	8	9	21	1	7	

Sc: *Stenella coeruleoalba*; Dd: *Delphinus delphis*; Gg: *Grampus griseus*.

Figure 3. Synchronized swim of two striped dolphins, one short-beaked common dolphin (top middle), and one Risso's dolphin (top right), during a three-species sighting.

individuals of the other species in their small single-species sub-groups consisting of 10-20 individuals (Forcada *et al*., 1994; Cañadas & Sagarminaga, pers. comm.), with the exception of one rare interspecific adult-calf pair observed (Cañadas & Sagarminaga, pers. comm.). Moreover, no significant differences between the number of striped dolphins and the number of common dolphins have been recorded within these mixed groups (García *et al.*, 2000). In the Archipelago Pontino-Campano of the southern Tyrrhenian Sea (central Mediterranean), where common dolphins are much less abundant than in the Alboran Sea, mixed groups with striped dolphins account for 25 % of all common dolphin sightings (Mussi, pers. comm.). In that area the common dolphins appear in three possible states: (a) as single or few individuals among groups of striped dolphins, (b) as a mixed group of about 80 common dolphins mixing with about 200 striped dolphins, and (c) as a single-species dolphin group of about 80 individuals (Mussi, pers. comm.). This group of about 80 common dolphins is encountered every year since 1997, either alone, or in mixed groups, and seems to be always the same according to preliminary photo-identification results (Mussi, pers. comm.). If we consider the data from all three Mediterranean areas where mixed groups of striped and common dolphins have been observed, the factors that seem to determine the kind and degree of association and interaction between these two species are: (1) the relative abundance of each species, (2) the capacity

Table 4. Percentages of mixed groups composed of short-beaked common dolphins and striped dolphins in three different areas of the Mediterranean Sea. The column 'total sightings of Sc and Dd' represents the total of mixed-species plus single-species groups composed of either of the two species.

Sea area	Total sightings of Sc and Dd	Single-species Dd sightings	Mixed-species Sc+Dd sightings	Mixed / Total Dd sightings %	Data origin
Alboran Sea	1073	392 (37%)	78 (7%)	17%	García *et al*., 2000
S. Tyrrhenian Sea	366	41 (11%)	14 (4%)	25%	Mussi, pers. comm.
Gulf of Corinth	20	0 (0%)	7 (35%)	100%	This work

Dd: *Delphinus delphis*, Sc: *Stenella coeruleoalba.*

of common dolphins to form single-species groups, and (3) the potential dependence of common dolphins on striped dolphins, when the former cannot form single-species groups. The three Mediterranean areas examined (Alboran Sea, southern Tyrrhenian Sea, and Gulf of Corinth) seem to belong to a gradient of decreasing relative abundance of common dolphins. Whenever the number of common dolphins is high enough to allow the formation of large single-species groups, then this species occur in both situations of single-species groups and mixed groups of single-species sub-groups (Alboran Sea). As their number decreases, some small common dolphin groups start to depend on striped dolphins and move to mixed groups, while others can still maintain their single-species group, which temporarily mix with striped dolphins (southern Tyrrhenian Sea). With further decrease, we can assume that the ratio of mixed/single-species groups of common dolphins encountered gets higher until it reaches a maximum, when no single-species groups can be formed anymore. This seems to be the actual situation in the GOC either as the result of a decline or not.

Mixed-species behaviour for a multitude of species within the family Delphinidae have been observed, including two species of pelagic dolphins (*S. longirostri*s and *S. attenuata*) during foraging in the Eastern Tropical Pacific (Perrin *et al.,* 1973) and during social and rest behaviour in Hawaii (K. Marten, pers. comm.), and sympatric Atlantic spotted dolphins and bottlenose dolphins, during foraging, traveling, play, alloparenting, and aggression in the Bahamas (Herzing & Johnson, 1997). In the family Monodontidae aggressive behaviour between narwhals and belugas has been observed (Orr & Harwood, 1998). Long-term associations of lone individuals of one species with groups of a second species have been observed repeatedly. These include a lone short-beaked common dolphin with bottlenose dolphins during alloparental behaviour in the northern Adriatic Sea (Bearzi, 1997), a short-beaked common dolphin calf with striped dolphins in the southern Tyrrhenian Sea (Mussi, pers. comm,), a calf striped dolphin with short-beaked common dolphins in the Alboran Sea (Cañadas & Sagarminaga, pers. comm.), a young spinner dolphin with bottlenose dolphins in Tahiti (M. Poole, pers. com.), and a lone long-finned pilot whale with Atlantic white-sided dolphins in the Gulf of Maine (Baraff & Asmutis-Silvia, 1998). Non predator-prey mixed-species interactions be-tween: (1) Families Delphinidae and Phocoenidae (Stacey & Baird, 1991; Ross & Wilson, 1996), (2) Families Delphinidae and Physeteridae (Weller *et al.,* 1996), and (3) odontocetes and mysticetes (Shelden *et al.,* 1995) also have been observed.

The presence and interaction of two separate individual Risso's dolphins with two smaller dolphin species in the GOC–as indicated by interspecific rake marks on the Risso's dolphins and the behaviours observed–is strikingly similar to some of the behavioural patterns and size relationships between the larger bottlenose dolphins and smaller spotted dolphins in the Bahamas. First, the large size of Risso's dolphins may allow physical domination during chasing and herding of the smaller striped/common dolphins in the GOC as it does with bottlenose dolphins in the Bahamas that harass smaller spotted dolphins. Second, the ratios of Risso's dolphin to striped/common, or common to striped dolphin, could indicate behavioural mechanisms at work. In the Bahamas, the ratio of spotted dolphins to bottlenose dolphins usually determines the behavioural outcome of an interaction. When there are less than six spotted dolphins to one bottlenose dolphin, the latter dominates and threatens. If the ratio is $\geq$ 6:1, the spotted dolphins succeed in chasing the bottlenose dolphins away and gaining stability within their group (Herzing & Johnson, 1997). The idea that two or three, sympatric species interact on a regular and perhaps intimate basis is gaining evidence as field workers access previously unstudied populations. Risso's dolphins have been observed in aggressive interactions at least with long-finned pilot whales (Shane, 1995). However, it is not known whether the individual Risso's dolphins found in the GOC mixed-species groups are an anomaly and loners, or if they often meet and associate with their conspecifics in or out of the GOC.

Hybridization is a potential issue when two sympatric cetacean species interact on such an intimate level. It remains to be seen if behavioural isolation mechanisms are sufficient to keep sympatric species that occasionally live in mixed groups, as separate species. Although difficult to document in the wild, many hybrids (a few fertile) have been observed in captivity with *Tursiops* partners (Sylvestre & Tasaka, 1985). In free-ranging mysticetes, a fertile hybrid between a blue and fin whale has also been documented (Arnason *et al.*, 1991). Recent work by LeDuc *et al.* (1999) showed that the striped and common dolphins are closer taxonomically than previously believed. We have observed unusual pigmentation patterns on some short-beaked common dolphins in the GOC, very different from forms described by Heyning & Perrin 1994 and Perrin *et al.*, 1995 (e.g. yellowish thoracic patch confined in a very limited area starting well behind the eyes, at the level of the flippers). Unusual pigmentation patterns were also observed on some striped dolphins (e.g. pale gray flank field absent or limited and similar in shape to the yellowish thoracic patch of common dolphins and hourglass

pattern on sides). Such intermediate, between the typical ones for these species, pigmentation patterns do not necessarily imply hybridization, especially for striped dolphins, for which varying pigmentation patterns have been recorded in the Mediterranean Sea (Acquarone & Notarbartolo di Sciara, 1992). However, it would be interesting to check the hypothesis of potential hybridization among these dolphins, through the uninvasive method of skin swabbing (Dawn Harlin *et al*., 1999) and subsequent genetic analyses of skin samples.

To the best of our knowledge, striped dolphins, short-beaked common dolphins, and Risso's dolphins had been observed only once in mixed groups in the wild until now (Mangels & Gerrodette 1994). Our work shows that interspecific interactions between these three dolphin species are common and complex in the particular environment of the GOC. Due to the presence of all four common Mediterranean dolphin species in a relatively limited sea area, the GOC is an excellent natural laboratory for the study of their comparative ecology and the behavioural interactions among them. In addition, the GOC offers a rare opportunity to follow and study a population unit of striped dolphins, with methods (such as the photo-identification) that are practically impossible to apply in the open sea.

Acknowledgments

We are particularly grateful to George Paximadis for his invaluable help and participation to all surveys in the GOC. We thank Prof. G. Verriopoulos for providing and steering his sailing boat for the needs of the 1995 and 1997 surveys and for hosting the research team in the University of Athens during the above period. We thank Gilda Hassidis and Evanthia Karpouzli for their participation and help in the fieldwork of 1997. Special thanks to Anna Cañadas, Ricardo Sagarminaga and Barbara Mussi for their personal communications. We also thank all those who have contributed with ideas and information through the Marmam list, after a relevant message sent in 1997.

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