

short communication/kratko priopćenje

LONG-TERM INSHORE OBSERVATION OF A SOLITARY STRIPED DOLPHIN, *STENELLA COERULEOALBA*, IN THE VINODOL CHANNEL, NORTHERN ADRIATIC SEA (CROATIA)

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Rako, N., Holcer, D. & Fortuna, C. M.: Long-term inshore observation of a solitary striped dolphin, *Stenella coeruleoalba*, in the Vinodol Channel, Northern Adriatic Sea (Croatia). *Nat. Croat.*, Vol. 18, No. 2., 427–436, 2009, Zagreb.

The striped dolphin (*Stenella coeruleoalba*) is not a common cetacean species in the northern Adriatic Sea. Its presence is generally related to deeper offshore areas beyond the continental shelf. Despite this fact, the analysis of data collected over the past 5 years indicates unusual site fidelity of a single individual in the relatively shallow Vinodol Channel of the northern Croatian Adriatic Sea. Summarizing the available data on its recent occurrence, this paper contributes to the current limited knowledge on striped dolphin presence and associations not only in this region.

Key words: striped dolphin, *Stenella coeruleoalba*, Vinodolski Channel, sighting, Adriatic Sea

Rako, N., Holcer, D. & Fortuna, C. M.: Dugoročno praćenje samotnog prugastog dupina (*Stenella coeruleoalba*) u priobalnom području Vinodolskog kanala, sjeverni Jadran. *Nat. Croat.*, Vol. 18, No. 2., 427–436, 2009, Zagreb.

Prugasti dupin (*Stenella coeruleoalba*) ne predstavlja uobičajenu vrstu za hrvatski dio sjevernog Jadrana. Obično nastanjuje duboka i otvorena mora iza kontinentalnog šelfa. Unatoč tome, analiza podataka sakupljenih tijekom proteklih 5 godina ukazuje na neuobičajenu privrženost jedinke prugastog dupina relativno plitkom području Vinodolskog kanala u hrvatskom dijelu sjevernog Jadrana. Sveukupni podaci o njegovom pojavljivanju predstavljeni su u ovom radu, pridonoseći time dosadašnjim ograničenim saznanjima o prisutnosti prugastih dupina, i to ne samo na ovom području.

Ključne riječi: prugasti dupin, *Stenella coeruleoalba*, Vinodolski kanal, opažanje, Jadransko more

INTRODUCTION

The striped dolphin (*Stenella coeruleoalba*) is considered the most abundant cetacean species in the Mediterranean Sea (AGUILAR, 2000). However, the information on its real distribution is still fragmented, given an unequal research effort, especially in the easternmost parts of the basin (MARCHESSAUX, 1980). This worldwide species is known to inhabit highly productive, deeper offshore waters beyond the continental shelf (ARCHER II & PERRIN, 1999). This distribution seems reflected in the Mediterranean Sea too (e.g. NOTARBARTOLO DI SCIARA *et al.*, 1993; FORCADA & HAMMOND, 1998; CAÑADAS *et al.*, 2002). Striped dolphin tends to occur in sea depths greater than 600 m, where it feeds mostly on cephalopods, epipelagic fish (AGUILAR, 2000) and crustaceans (WÜRTZ & MARRALE, 1993; MEOTTI & PODESTÀ, 1997; ARCHER II & PERRIN, 1999; ÖZTÜRK *et al.*, 2007). Only exceptionally it is found in areas less than 200 m (NOTARBARTOLO DI SCIARA *et al.*, 1993; CAÑADAS *et al.*, 2002; FRANTZIS *et al.*, 2003; FORTUNA *et al.*, 2007).

The Striped dolphin is a gregarious species, found worldwide in large herds of hundreds of individuals (ARCHER II & PERRIN, 1999). In the Mediterranean Sea, their groups tend to be rarely bigger than a few dozen individuals (FORCADA *et al.*, 1994; FORTUNA *et al.*, 2007), except than in the Alboran Sea where the mean group size was estimated to be around 116 (CAÑADAS *et al.*, 2005). Formation of larger aggregations of striped dolphins is thought to be related to the enhancement of their feeding success (QUÉROUIL *et al.*, 2008). This seems especially true for the coastal areas where being less abundant they form mixed associations with other dolphin species (FRANTZIS & HERZING, 2002; QUÉROUIL *et al.*, 2008).

The Striped dolphin has never been considered as part of the native Croatian fauna (HOLCER *et al.*, 2002; MACKELWORTH *et al.*, 2002). The first record of a striped dolphin in the inshore waters of the northern Croatian Adriatic was documented only in 1996 (BEARZI *et al.*, 1998) when one specimen was observed in the vicinity of the Island of Lošinj. However, more frequent reports of striped dolphins along the northern Adriatic coastline have been made since then (FRANCESE *et al.*, 1999; 2007) possibly suggesting an expansion of the species distribution range as it has been reported for other Mediterranean areas (NOTARBARTOLO DI SCIARA & DEMMA, 1994). Strangely most of these sightings were of single individuals.

Since 2004, most of the sightings of striped dolphins in the northern Croatian Adriatic Sea were reported for the shallow Vinodol Channel in the Kvarner region. This paper summarises the available data on recent occurrence of this species in this specific area and proposes potential explanations for these long-term observations.

The narrow Vinodol Channel is located in the northern Croatian Adriatic Sea (Fig. 1). It represents the northernmost part of well-known Velebit Channel. Vinodol Channel separates the mainland from the Island of Krk and in its widest point does not exceed 5 NM. It is characterised by a rocky shore, steep bottoms and the bathymetries with depths less than 70 m. South of this Channel, in the deeper Velebit Channel, depth increases to 80–95 m, with a rare extreme submarine depression at 107 m depth (NOVOSEL *et al.*, 2002).

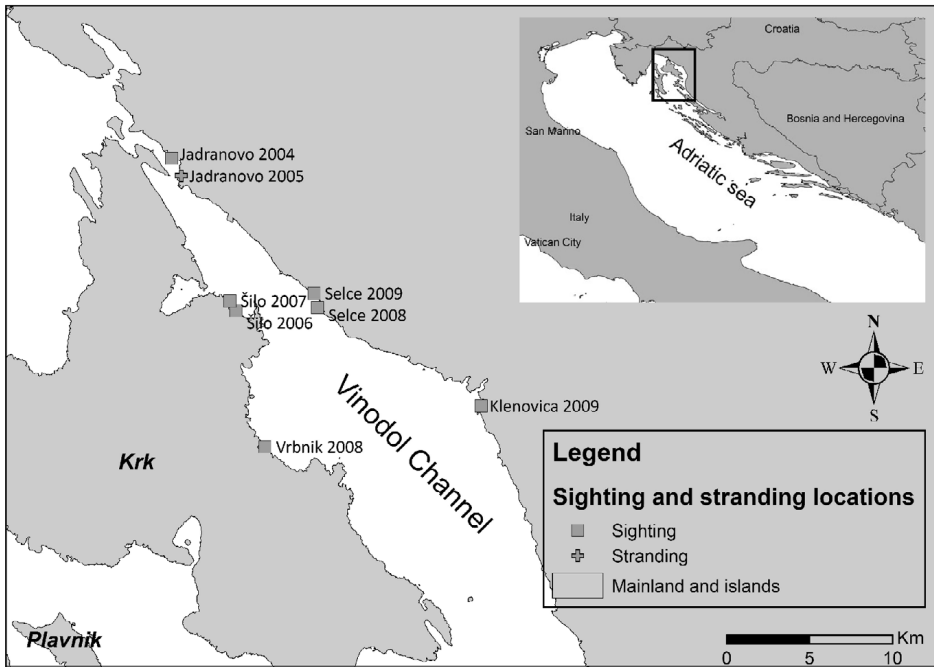


Fig. 1. Unusual sightings (\square) and a stranding (+) of striped dolphins (*Stenella coeruleoalba*) in Vinodol Channel, Northern Adriatic Sea.

The primary pelagic fish species are the sardine (*Sardina pilchardus*), the sprat (*Sprattus sprattus*) and the mackerel (*Scomber scombrus*). Deeper areas (> 50 m) are known fishing grounds for Norway lobster (*Nephrops norvegicus*) (LEGOVIĆ, 2002).

The eastern coast of the channel hosts a popular tourist Riviera. Recreational vessels and tour boat excursions dominate heavy summer tourism.

Direct and indirect evidence of the unusual presence of a striped dolphin in the Vinodol channel was collected over the period 2004–2009.

Photographs that came from the majority of reported sightings were analyzed in details and compared paying particular attention to the distinctiveness of the shape of the dorsal fin and the pigmentation on the body of the animals.

Data on stranded dolphins from the Blue World stranding records data base were also examined for the area of Vinodol Channel.

Behavioural data were taken during the last reported encounter of striped dolphin in the Vinodol channel applying the method of continuous sampling for the collection of inter – breeding interval.

In the course of data collection, information on further sightings of striped dolphins was also collected from the Marine Police and harbour authorities surveying the area. In addition we undertook local interviews of the inhabitants of Jadranovo, Crikvenica, Selce and Novi Vinodolski.

RESULTS AND DISCUSSION

In total, seven sightings were recorded in this shallow inshore area within the study period. Three sightings of a single striped dolphin were documented by our team. Other four sightings were reported by tourists and other NGOs, and included photographs. In one of these four sightings, the striped dolphin was seen alone, and on three other occasions it was accompanied by another specimen. Records are summarised in Tab. 1.

Tab. 1. Summary of documented sightings and strandings in Vinodol Channel

Date	Location	Specie	ID Code	Number of individuals	Photos (Y/N)
13.08.2004	Jadranovo	<i>Stenella coeruleoalba</i>	SC1	1	Y
02.04.2006	Šilo (Krk)	<i>Stenella coeruleoalba</i> + unidentified species, <i>Delphinidae</i> (fam.)	SC1 + Unknown	2	Y
05.02.2007	Šilo (Krk)	<i>Stenella coeruleoalba</i>	SC1	1	Y
09.03.2008	Selce	<i>Stenella coeruleoalba</i> , <i>Delphinus delphis</i>	SC1 + DD1	2	Y
01.05.2008	Vrbnik (Krk)	<i>Stenella coeruleoalba</i> , <i>Delphinus delphis</i>	SC1 + DD1	2	Y
25.06.2009	Selce	<i>Stenella coeruleoalba</i>	SC1	1	Y
17.07.2009	Klenovica	<i>Stenella coeruleoalba</i>	SC1	1	Y
DATE	LOCATION	SPECIES	GENDER		AGE CLASS
16.07.2005	Jadranovo	<i>Stenella coeruleoalba</i>	SC2 (stranded)	female	juvenile

Photo-identification analysis of the available data shows that a single specimen of striped dolphin (SC1), initially seen in the Vinodol Channel in August 2004, was later observed in all of the encounters indicating unusual signs of site fidelity for that shallow inshore area.

In April 2006, the SC1 was seen accompanied by another dolphin. The species of the accompanying dolphin remained unidentified due to the lack of data.

During 2008, SC1 was accompanied by another rarely encountered dolphin species in the Adriatic Sea, a short-beaked common dolphin (*Delphinus delphis*) (DD1). This pair (SC1-DD1) was seen twice in the area, in March and May of 2008.

In 2009, SC1 was re-sighted alone in front of the town of Selce on the 25th June and again in front of Klenovica on the 17th July.

These encounters were documented by our research team. Photo-identification and behavioural data were collected.

Information gathered from the harbour authorities and marine police surveying that area revealed that one small dolphin was observed close to the coast in previous years. The harbour authorities had a report on a small dolphin (probably SC1) seen diving close to one gillnet, and possibly entangled in it, few years ago. After

investigating this report they concluded that the animal did not become entangled, but was most likely feeding on fish in the net. They had no reports on dolphin presence near the coast in the recent times.

Marine police surveying that area confirmed that a striped dolphin (most likely SC1) was seen together with another unusual dolphin (probably DD1) throughout 2008 and observed alone in the years previous to that (Robert Jelenović, pers. comm.). He also reported that a local fisherman from Jadranovo fed this animal. Unfortunately, the fisherman was unavailable for an interview and we could not confirm this event. However, interviews to some other local inhabitants confirmed the presence of another dolphin not much bigger in size, seen together with the small and unusually looking dolphin (probably SC1) during 2008 and 2009 in the vicinity of the coast.

On 25th June 2009 SC1 was observed alone, 20 m away from the main hotel beach in Selce, swimming and diving around a buoy. During this encounter, the animal was also seen chasing schools of fish (most likely garfish, *Belone belone*), and displaying milling behaviour on two occasions. Analysis of the photographs taken on this date by the Blue world researchers revealed that SC1 is female. In addition the analysis of pictures taken during this encounter also showed a healed wound on the back of the animal just behind the head, in front of the dorsal fin. Judging by the shape of the scar, the animal was most likely injured with a five-pronged fishing spear. This scar was not present on pictures taken before 2009, hence it can be concluded that the injury occurred early 2009.

SC1 was again sighted on 17th July in front of Klenovica, photo-identified and observed from a stationary boat for 1 h and data on its behaviour were also collected. Again, the animal was observed close to the coast diving in circles around a moored boat and three adjacent buoys, always maintaining a constant distance from nearby swimmers that tried to approach it.

In the last five years a single specimen of striped dolphin was photo-documented seven times in the shallow waters of the Vinodol channel. In addition, numerous anecdotic reports by locals and marine police patrolling the region confirmed regular sightings of small cetaceans in the Vinodol channel throughout the year.

Even though the information on this species is still rather sparse, the Mediterranean striped dolphin appears to confirm a preference for deep areas, usually beyond the continental shelf. Although, in the Adriatic it has been occasionally seen in shallower inshore waters (BEARZI *et al.*, 1998; FRANCESE *et al.*, 2007), there is no recorded evidence of a prolonged stay in this type of marine environment. In addition, also in the Mediterranean Sea this species shows a preference for living in large aggregation, usually larger than 15 individuals. Therefore, it is rather unique to observe a solitary striped dolphin residing for five years in a relatively small, shallow and enclosed area.

This event is more atypical in an area such as the Vinodol Channel that is heavily affected by summer tourism dominated by fast recreational vessels, and, therefore, it represents the opposite to a safe and undisturbed environment usually favoured by this species.

»Solitary« dolphins are generally described as animals living near shore, not necessarily exceptional or in any way handicapped. Whilst this phenomenon is well

documented for bottlenose dolphins, it is unknown for striped dolphins (DUDZINSKI *et al.*, 1995; WILKE *et al.*, 2005). The usual reasons that cause an animal to become solitary may include dispersal migrations, social constraints or reduced prey availability (GOFFMAN, 2006).

Many solitary dolphins establish strong social bonds with humans over time. The striped dolphin from Vinodol Channel has not yet been observed approaching or being involved in any social interaction with humans. However, the animal showed a particular interest for buoys and moored vessels. According to some authors, the inspection of buoys, ropes, chains and/or moored vessels represents a stage in the process of the animal's habituation to a new environment (WILKE *et al.*, 2005; GOODWIN & DODDS, 2008) Hence, it is possible that the attraction for such objects seen in striped dolphin from Vinodol Channel had a similar meaning.

Data on stranded animals found in the Vinodol Channel, has revealed the past presence of other striped dolphin (SC2) in 2005. Due to the nature of this narrow semi-enclosed Channel, it is possible that SC1 became lost or remained trapped for some time before becoming habituated to the region. Such events have already been described by GOODWIN & DODDS (2008) and SIMMONDS & STANSFIELD (2007). It is also possible that it became solitary due to the loss of the companion or a group.

The presence of this animal in the near shore region of the Vinodol Channel has already resulted in widespread media exposure. With increasing popularity of human-dolphin interactions, numerous reports of harassment of dolphins have been observed worldwide (DUDZINSKI *et al.*, 1995; FROHOFF, 2004). In the case of this striped dolphin, the animal has already been wounded just behind the head with what appears to have been a five-pronged fishing spear (Fig. 2). The existing Croatian Law on nature protection (Zakon o zaštiti prirode NN 70/05, NN 139/08) is providing generic protection to dolphins from harassment and harm, but in this case it should be particularly strenuously applied. Adequate monitoring and control of further human-dolphin interactions is essential for effective management of such issues.

The behaviour of this animal during the last two encounters does not indicate significant irregularities from normal behaviour. The animal showed no signs of

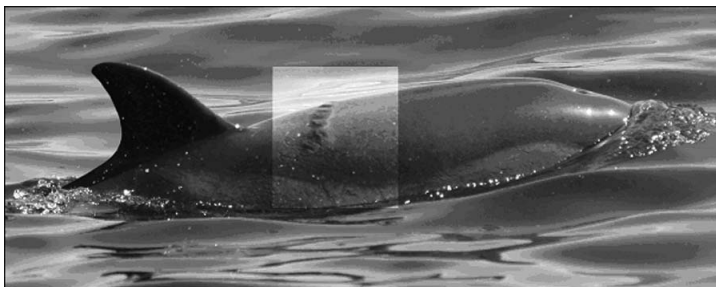


Fig. 2. Striped dolphin (*Stenella coeruleoalba*) (SC1) photographed on 25.6.2008 in the Vinodol Channel with highlighted wound on the upper body part which appears to be inflicted with a five-pronged fishing spear.

physical exhaustion. In between dives it was displaying milling behaviour, which is consistent with attempts to conserve energy in times when they are unwilling to rest due to boat disturbance (CONSTANTINE, 2002).

Throughout 2008, the animal was seen accompanied by a single short-beaked common dolphin. Although once abundant, short-beaked common dolphin is considered as geographically extinct in the Croatian Adriatic, with rare sightings of individual animals (HOLCER, 2006). In general, striped dolphins often share their distribution range with short-beaked common dolphins (FORCADA & HAMMOND, 1998; AGUILAR, 2000; FRANTZIS & HERZING, 2002; CAÑADAS *et al.*, 2005). It is believed that different species usually join to benefit from cooperation, either by increasing the level of protection or by increasing efficiency in prey foraging (BARAFF & ASMUTIS-SILVIA, 1998). It is therefore possible that these two specimens of common and striped dolphins, lost in an odd environment, joined together. The assumption is also supported by the fact that dietary habits of these two species are at least partially overlapping (VIALE, 1985; ORSI RELINI & RELINI, 1993).

Although there is no time limit that allows us to claim when an animal becomes resident in a certain area, 5 years period of permanency suggests a strong site fidelity to this inshore area of northern Adriatic Sea, making this case quite unique.

More frequent reports of occasional striped dolphins have been also made recently in other parts of the Croatian Adriatic Sea. Reports of its presence may indicate the possibility of striped dolphins occupying the ecological niche of once abundant short-beaked common dolphins (AGUILAR, 2000; CAÑADAS *et al.*, 2002) or may be related to a better familiarity with sighting reporting procedures. So far there are no scientific studies to support this hypothesis, however it remains the fact that none of the reported dolphins have stayed in the observed areas for longer periods.

As this uncommon species is becoming sighted more regularly along the eastern Adriatic coast further focused research and exchange of information is required to assess the present status of this species not only along the Croatian coastline.

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SAŽETAK

Dugoročno praćenje samotnog prugastog dupina (*Stenella coeruleoalba*) u priobalnom području Vinodolskog kanala, sjeverni Jadran

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U periodu 2004.–2009. zabilježeno je 7 opažanja prugastog dupina, *Stenella coeruleoalba*, na području relativno plitkog Vinodolskog kanala, u sjevernom dijelu Jadranskog mora. Sva opažanja na navedenom području bila su dokumentirana fotografijama. Detaljnom analizom fotografija ustanovljeno je da se radi o istoj jedinki odraslog prugastog dupina koja se na tom području pojavljuje kroz proteklih 5 godina. Opis pojavljivanja navodi se iz nekoliko razloga:

- 1) prugasti dupin nije uobičajena vrsta u hrvatskom dijelu sjevernog Jadrana;
- 2) radi se o jedinki inače vrlo društvene vrste koja se obično nalazi u većim skupinama od nekoliko desetaka životinja i to na dubokim područjima otvorenoga mora, iznad kontinentalne padine;
- 3) ovo je prvo do sada zabilježeno dugogodišnje pojavljivanje jedinke prugastog dupina u plitkom obalnom području Jadrana što ovaj slučaj čini posebno zanimljivim.

Prugasti dupin vrsta je reda Cetacea (kitovi) koja se smatra samo povremenim gostom Jadrana. Sve učestalija opažanja zabilježena u posljednjem desetljeću ukazuju na progresivno širenje areala prugastog dupina što je već zabilježeno i u drugim područjima Sredozemnog mora. Unatoč tome, u sjevernom Jadranu do danas su zabilježena samo povremena pojavljivanja osamljenih jedinki koja se nikada nisu duže zadržavala na tom području. Prugasti dupin iz Vinodolskog kanala jedinstveni je slučaj dogogodišnjeg obitavanja jedinke ove vrste u plitkom obalnom području koje po svojim obilježjima odudara od dubokih morskih prostranstava koja ova vrsta najčešće nastanjuje.

Većem broju podataka o opažanju prugastih dupina u hrvatskom dijelu Jadrana pridonosi i bolja informiranost javnosti o proceduri njihova prijavljivanja, kao i sve uspješnije raspoznavanje vrsta neuobičajenih za Jadransko more.