

Investigating dolphin ecology and interactions with fisheries in a 'natural laboratory': the Amvrakikos Gulf, Greece



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Background

On the west coast of the Greek mainland lies the Amvrakikos Gulf, home to one of the highest densities of bottlenose dolphin (*Tursiops truncatus*) in the Mediterranean. The Gulf is a virtually closed basin and one of the most productive coastal areas of Greece (figure 1). Its nutrient-rich waters sustain threatened marine life including the loggerhead turtle (*Caretta caretta*), classified as Endangered (IUCN Red List), and birds such as the rare Dalmatian pelican (*Pelecanus crispus*), classified as Vulnerable (IUCN Red List). The area

became a National Park in 2006 and has been designated as a Ramsar Wetland of International Importance and an Important Bird Area.

However, port and dam construction in the region threatens marine life. The reduced width of the Preveza Channel, that links the Gulf to the open sea, has amplified the impacts of nutrient enrichment and chemical pollution from agriculture, livestock grazing, and fish farming in the Gulf. Long-term monitoring of dolphins and other animals in the area is necessary to understand how these activities will affect them and the ecosystem they live in.

Although bottlenose dolphins are a relatively common cetacean species

in Mediterranean Sea coastal waters, their distributions have been observed to be increasingly fragmented into small units. They are considered a species of special interest for conservation under the European Union's Habitats Directive, and their status in the Mediterranean was recently assessed as Vulnerable (IUCN Red List).

Project overview

The aim of this project is to understand how the bottlenose dolphin population in the Amvrakikos Gulf interacts with the environment, and how human activities affect the dolphins. Project study objectives include:

- Dolphin population numbers and trends, movement patterns, ecology, behaviour, habitat use and social organisation
- Prey availability as one of the main factors that determine the abundance of bottlenose dolphin in Mediterranean coastal waters
- Operational interactions with fisheries, including gear destruction by dolphins (as well as sea turtles) and dolphin interactions with fish farms
- Interactions between dolphins and seabirds
- Comparisons between bottlenose dolphin and other cetacean species in the Ionian Sea outside the Gulf

The project is run by Dr Giovanni Bearzi and Joan Gonzalvo from the Tethys Research Institute, a European NGO dedicated to the study and conservation of the marine environment, which has generated one of the largest datasets on Mediterranean cetaceans. Tethys started working in the Amvrakikos Gulf in 2001, and Earthwatch support began in 2006.

To date, over 200 Earthwatch volunteers have participated in the project. They

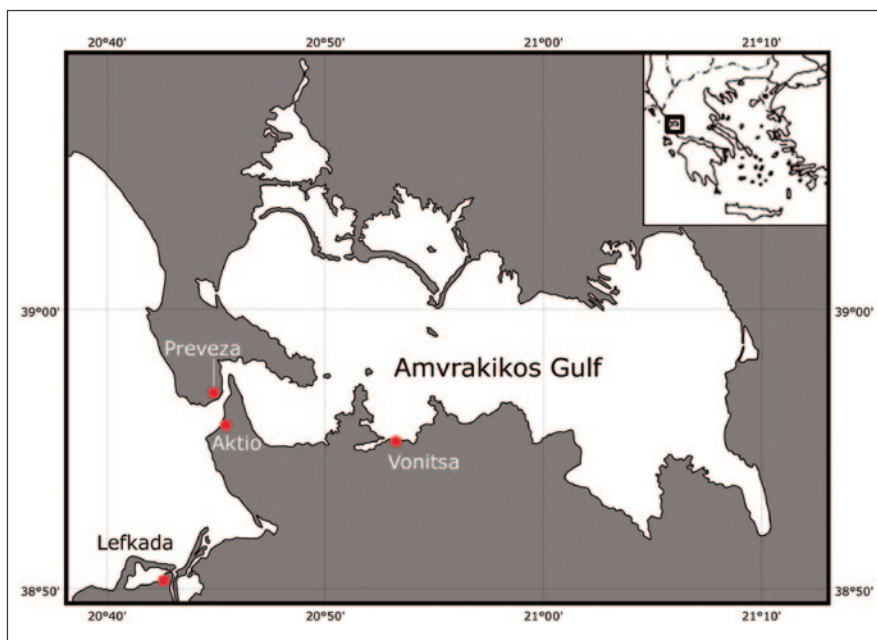
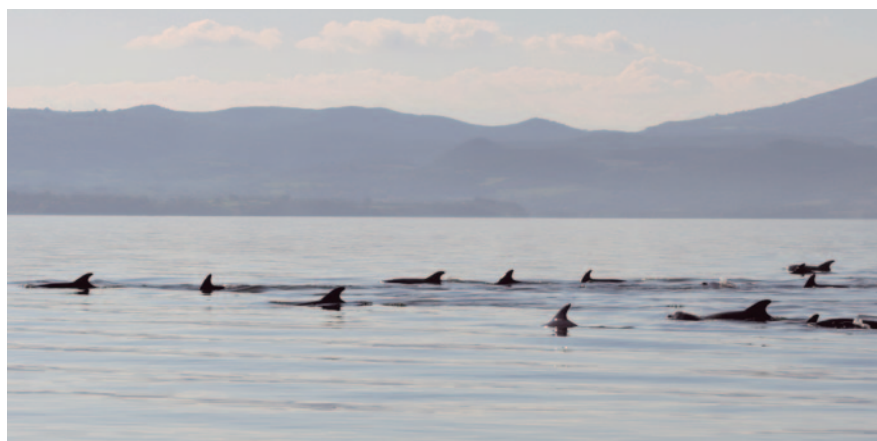


Figure 1. The location of The Amvrakikos Gulf on the west coast of mainland Greece.

Year	Months at sea	Days at sea	Km surveyed total	Time spent with dolphins	Sightings		Behavioural samples
					Tt	Cc	
2001	1	2	–	–	–	–	–
2002	2	8	320	16h 34min	10	–	–
2003	2	15	628	48h 41min	20	8	–
2004	6	51	1,846	91h 03min	56	31	–
2005	4	50	1,911	72h 13min	90	26	728
2006	9	107	5,090	99h 32min	70	46	928
2007	12	136	7,065	139h 45min	101	104	1,422
2008 (until Sept)	9	84	3,992	93h 29min	64	100	962
Total	45	453	20,852	565h 44min	411	315	4,020

Table 1. Summary of research effort conducted in the Amvrakikos Gulf (2001 - September 2008). *Tt* = *Tursiops truncatus*; *Cc* = *Caretta caretta*.

have collected data on dolphins, turtles, seabirds and other marine animals, and have substantially contributed to the processing and analysis of photo-identification archives, where dolphins can be identified through long-term natural marks on their dorsal fins.

Increasing knowledge for the development of effective management actions for the conservation of marine species is part of Earthwatch’s Ocean Research Area.

Outcomes and actions

Research results have confirmed that dolphins inhabiting the Gulf are members

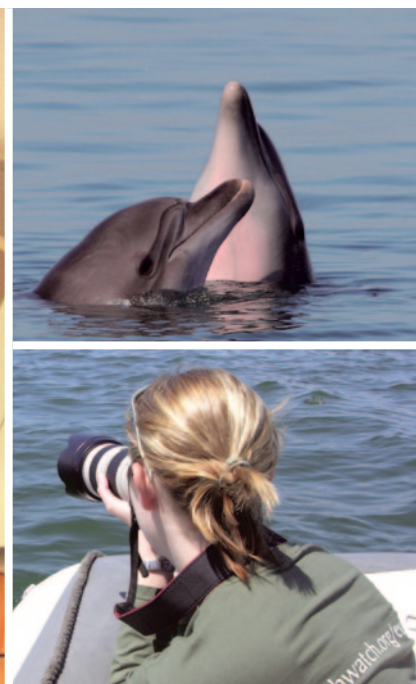
of a largely closed population of around 150 individuals, with high levels of site fidelity. Despite increasing eutrophication and other problems faced by the Gulf, this population appears to be faring relatively well. However, continuous monitoring is necessary to determine how the dolphins and their ecosystem will respond to changes in the future.

In 2009, data from the research in the Amvrakikos Gulf will be included in a 10-year report from Tethys, which will cover all their research in the eastern Ionian Sea. From 2001 until September 2008, over 411 group sightings of bottlenose dolphins were made in the Amvrakikos

Gulf and about 30,000 photos were taken to allow for individual photo-identification (Table 1). The table also highlights the doubling of research time which support from Earthwatch teams has allowed since 2006.

The research has had conservation impact on a regional and national scale. The results of the study have been submitted to international bodies such as the United Nations Environment Programme’s (UNEP) Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS), recommending that a Marine Protected





Area be created in the Amvrakikos Gulf to improve the current level of environmental management and ensure long-term dolphin conservation. Collaboration with the Whale and Dolphin Conservation Society (WDCS), OceanCare and other international conservation organisations has triggered a number of actions intended to increase dolphin protection and aid marine conservation in this and other parts of Greece. Such actions have included a call for action and detailed management proposals to stop overfishing in coastal Ionian waters, which has been co-signed by 13 European organisations.

The project has also developed strong relationships with the local community in the city of Vonitsa, where the field station is based, through engaging local fishermen and school children. Events such as 'dolphin days' to teach children about dolphins and conservation, beach-cleaning, dolphin lectures, meetings, and the distribution of educational booklets have all helped to gain local support in the area. Local fishermen are an important source of knowledge regarding the past status of dolphins and the Gulf ecosystem, as well as reporting strandings and occurrences of animals becoming injured or trapped in nets. Effective communication with them is an essential part of the project.

Earthwatch volunteers have helped the researchers significantly expand the scope of the project, with long-term benefits to Mediterranean dolphin populations and the local community.

Lead scientist profiles

Dr Giovanni Bearzi holds a PhD in Zoology. He has been conducting and co-ordinating dolphin research projects since 1986, particularly in the Adriatic and Ionian Seas. Winner of the Henry Ford European Conservation Award (1996) for dolphin research and conservation in Croatia. In 2001 he was awarded a Pew Marine Conservation Fellowship. Until 2006 he taught Cetacean Conservation at the University of Venice, Italy. He is founder and coordinator of the Cetacean Alliance and is currently Director of Tethys Research Institute.

Joan Gonzalvo Villegas has collaborated with Tethys since 1999 and joined the Board of Directors in 2007. In 2000, he joined the Group for the Study and Conservation of Marine Mammals at the University of Barcelona. In 2006, while gaining his PhD, he moved to Greece to conduct year-round research in the Amvrakikos Gulf and adjacent waters. He has acted as consultant to ACCOBAMS and their Regional Activity Centre for Specially Protected Areas to develop Action Plans for cetacean conservation in Syria and Lebanon.

Additional key scientists

- **Marina Costa** – Cetacean Research and Rescue Unit, UK
- **Silvia Bonizzoni** – Tethys Research Institute
- **Stefano Agazzi** – Tethys Research Institute

Collaborative organisations

- Tethys Research Institute

Project websites

http://www.earthwatch.org/europe/exped/bearzi_research.html

Key publications

Bearzi, G., Agazzi, S., Bonizzoni, S., Costa, M. & Azzellino, A. (2007) Dolphins in a bottle: abundance, residency patterns and conservation of bottlenose dolphins, *Tursiops truncatus*, in the semi-closed eutrophic Amvrakikos Gulf. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **18**(2): 130-146

Bearzi, G., Agazzi, S., Gonzalvo, J., Costa, M., Bonizzoni, S., Politi, E., Piroddi, C. & Reeves, R.R. (2008) Overfishing and the disappearance of short-beaked common dolphins from western Greece. *Endangered Species Research*, **5**: 1-12

Bearzi, G., Fortuna, C.M., Reeves, R.R. (2009) Ecology and conservation of common bottlenose dolphins *Tursiops truncatus* in the Mediterranean Sea. *Mammal Review*, **39**(2): 92-123