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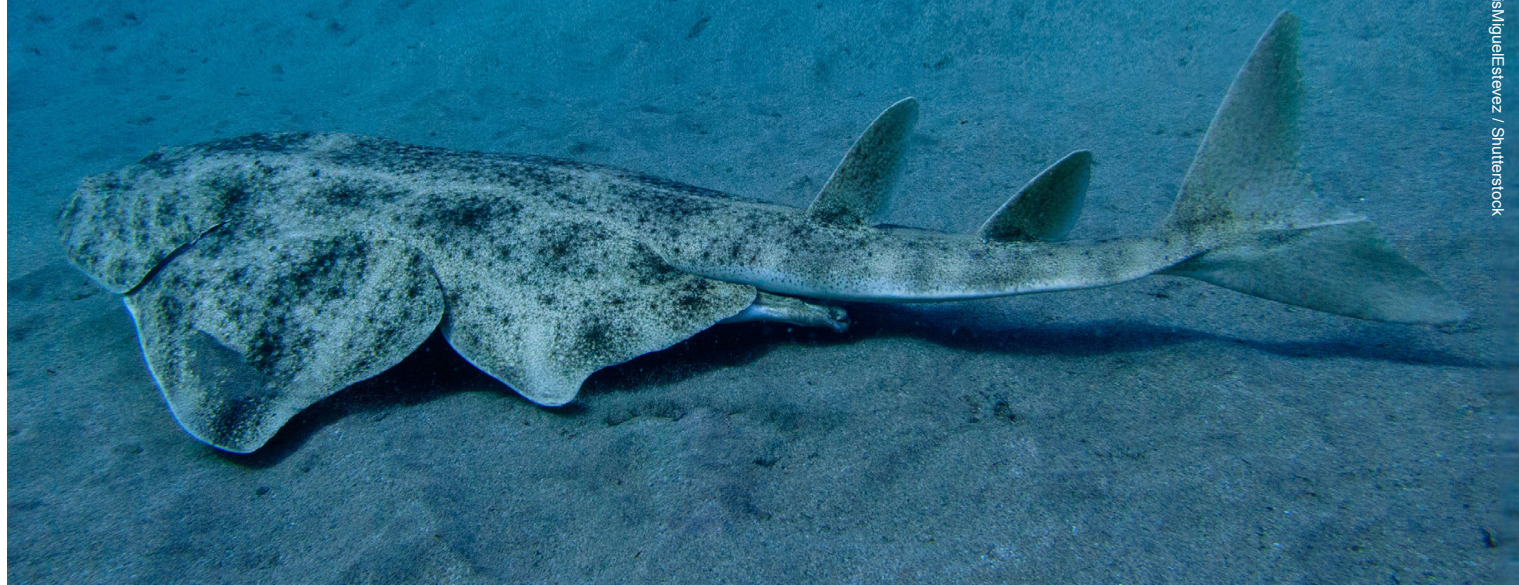


ANGEL SHARK
PROJECT



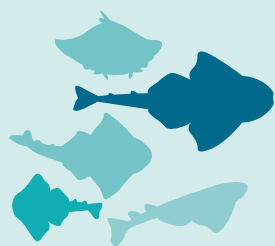
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Angel Shark *Squatina squatina* © LuisMiguelEstevez / Shutterstock



ANGELS OF THE ADRIATIC – NEXT STEPS FOR A POTENTIAL HOTSPOT

Once common across the Mediterranean, angel sharks have suffered widespread decline. This short report underlines the urgency of acting to save one of the last remaining populations in the Mediterranean.



**X22
SPECIES**

**OF ANGEL SHARKS
IN THE FAMILY
SQUATINIDAE**

1: ANGEL SHARKS: CRITICALLY ENDANGERED ICONS

Angel sharks are bottom-dwelling ambush predators that can reach a length of 2.4 metres.¹ They bury themselves into soft sediment waiting for prey – fish, crustaceans, molluscs etc. – which they ambush with a rapid lunge.^{2,3}

There are at least 22 species of angel sharks in the family Squatinidae, identified as the third most threatened family of elasmobranchs (sharks, skates and rays) in the world.⁴ Given their flat shape, angel sharks are sometimes confused with other flattened species including anglerfish, rays and guitarfishes.

Three species of angel shark can be found in the Mediterranean Sea: the angelshark (*Squatina squatina*), the sawback angelshark (*S. aculeata*) and the smoothback angelshark (*S. oculata*). Once widespread, all three species are now listed as Critically Endangered on the IUCN Red List.⁵

Like other shark species, angel shark life history is characterized by ‘K-selection’: they grow slowly, mature late, reach a large body size and produce few young. These characteristics have made angel sharks particularly susceptible to fisheries and habitat loss, especially as they live in shallow coastal waters.^{3,4,6}

2: MEDITERRANEAN BIODIVERSITY AND PROTECTED AREAS

Biodiversity under threat

Despite covering less than 1% of the global ocean, some 7% of all marine species are found in the waters of the Mediterranean.⁷ But today the semi-enclosed sea is under intense pressure from multiple threats and the growing human population of the 21 countries that border it. Unsustainable exploitation of its once-rich resources, widespread destruction of its varied habitats and the increasingly serious impacts of climate change threaten the very future of this unique region.⁸

Angel sharks are protected through various legislation and regulations in the Mediterranean. Unfortunately, because they live in shallow coastal areas, they still end up being accidentally caught and their demersal habitat is frequently impacted by development.⁹

Unfortunately, because angel sharks live in shallow coastal areas, they still end up being accidentally caught



Angel Shark bycatch © Branko Dragčević / IOF

Marine Protected Areas across the Mediterranean – more work needed

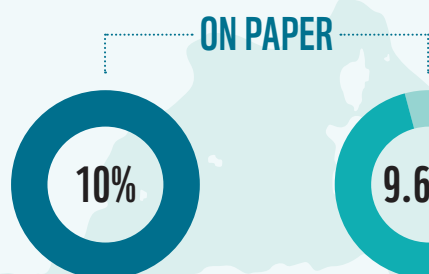
Establishing a representative network of marine protected areas (MPAs) is an essential tool for conservation.¹⁰ Protecting a range of key habitats allows natural systems to function and biodiversity to thrive, and can boost species numbers – including sharks, if it's done right.¹¹ However, the results of this project show that only 27.8 % of angel shark records in the Mediterranean Sea were found to occur within an MPA – and none of these MPAs were found to have a management plan, or an implemented management plan, making this potential de-facto protection from threats ineffective.

Under the Convention on Biological Diversity, Mediterranean countries have pledged to protect 10% of their coastal

and marine waters by 2020. While on paper this target appears within range, with 9.68% of the surface of the Mediterranean now covered by designated MPAs, sadly the reality of the situation falls far short (see figure below).¹² This means a large proportion of designated MPAs are not performing effectively, and countries are failing to ensure proper management and monitoring. For more detail on the situation, see [*WWF's recent MPA scorecard report*](#).

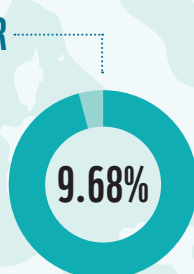
Increased conservation targets to protect at least 30% of coastal and marine areas, stronger indicators of effectiveness, better monitoring mechanisms and improved governance systems are some of the requirements to reverse the trend and build a healthy marine ecosystem in the Mediterranean.

Marine protected areas in numbers

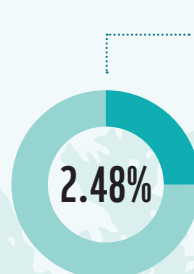


2020 TARGET

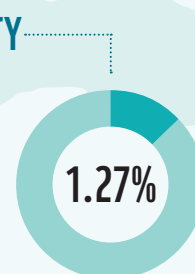
Mediterranean countries have pledged to protect 10% of their coastal and marine waters by 2020.¹²



9.68% of the surface of the Mediterranean now covered by designated MPAs.¹²



MPAs with a management plan only cover 2.48% of the surface.¹²



MPAs where a management plan is actually being implemented cover a mere 1.27%.¹²

3: OUR FOCUS – THE ADRIATIC

Threats to the Mediterranean are reflected in the Adriatic. The Adriatic has the most extensive continental shelf (10-200m) of the region, which makes it ideal for coastal species such as the angel shark, but also for demersal fisheries.¹³

Two species of angel shark have been recorded in the Adriatic, *S. squatina* and *S. oculata*. *S. squatina* was once highly targeted throughout the area, supporting important fisheries where it was caught using specialized nets called 'squaenere' or 'sklatare' (derived from local words for the species).¹⁴ But landings declined drastically after the 1960s.¹⁵

There's a general lack of knowledge about angel sharks in the Adriatic. We still know very little about their movements, breeding areas, habitat use or population sizes. In fact, no angel sharks have been captured in a scientific trawl survey since 1958, so we needed to use other methods to build our knowledge.¹⁵



View on Adriatic, Croatia © Ante Gagic / WWF

4: ANGEL SHARK STUDY IN CROATIA

One of the aims of our project was to investigate how far the current MPA network could help the recovery of angel sharks in Croatian waters of the Adriatic Sea.

To achieve this, we gathered as much information as possible on angel shark sightings in the Adriatic, to build a picture of their historic (1947-2009) and recent distributions (2010-2020), the split between the two categories being the length of one angel shark generation.⁵

We used two methods to gather data:

- Collation of Adriatic sightings from the *Angel Shark Sightings Map*, an interactive resource developed by the Angel Shark Project that allows citizen scientists to report angel shark sightings.
- The Institute of Oceanography and Fisheries in Croatia and WWF conducted an online local ecological knowledge (LEK) survey, allowing commercial fishers, recreational fishers and divers along the Croatian coast to record their interactions with angel sharks.

Key findings from our study in Croatia



- Only *S. squatina* records were found in the Adriatic Sea, adding to the documented uncertainty as to whether *S. oculata* remains in the region.



- Both adult and juvenile *S. squatina* records were identified, suggesting they use part of the Adriatic to give birth.



- Historical records of *S. squatina* are spread over a larger area than recent sightings.



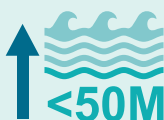
- Most recent records are in the northern and central Adriatic, and data collected reveals a previously unknown *S. squatina* hotspot in the Molat Island archipelago, which may be used as a nursery area.



- More than a quarter (28.7%) of sightings were in MPAs, most of them Natura 2000 sites, but none of these have an effective management plan in place.



- Two-thirds (65.5%) of *S. squatina* records within MPAs were recent – if the major threats are tackled in MPAs it's still possible to provide de-facto protection for this species.



- 62% of all sightings were in depths of less than 50m, on soft sediments. *S. squatina* presence in shallower areas may be due to better protection from predators and greater prey abundance.

Figure 6a – Historic (1947–2009 inclusive)

Angel shark records (*S. squatina*) at 20 x 20 km resolution, in relation to **designated MPAs** in the Adriatic Sea.

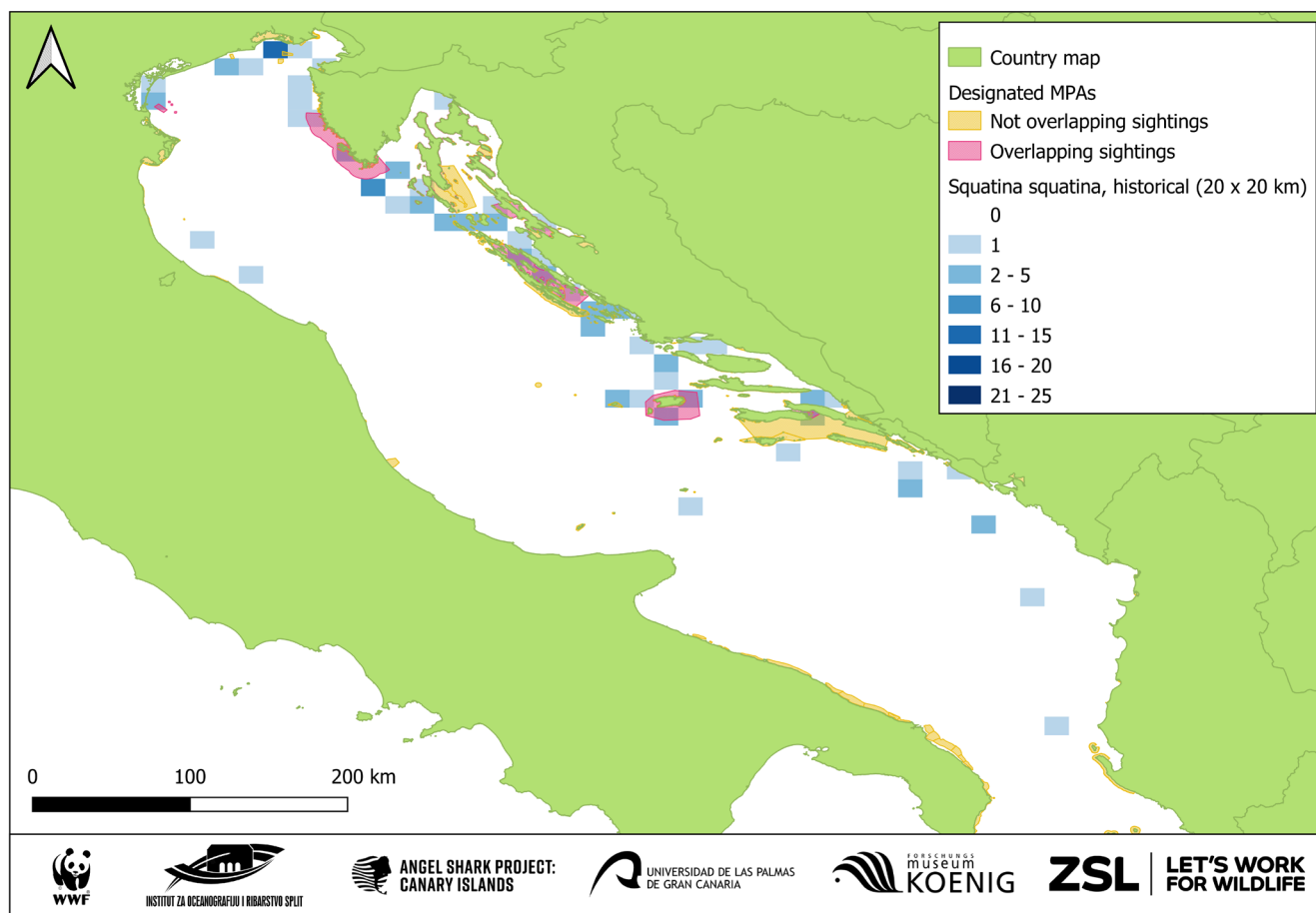
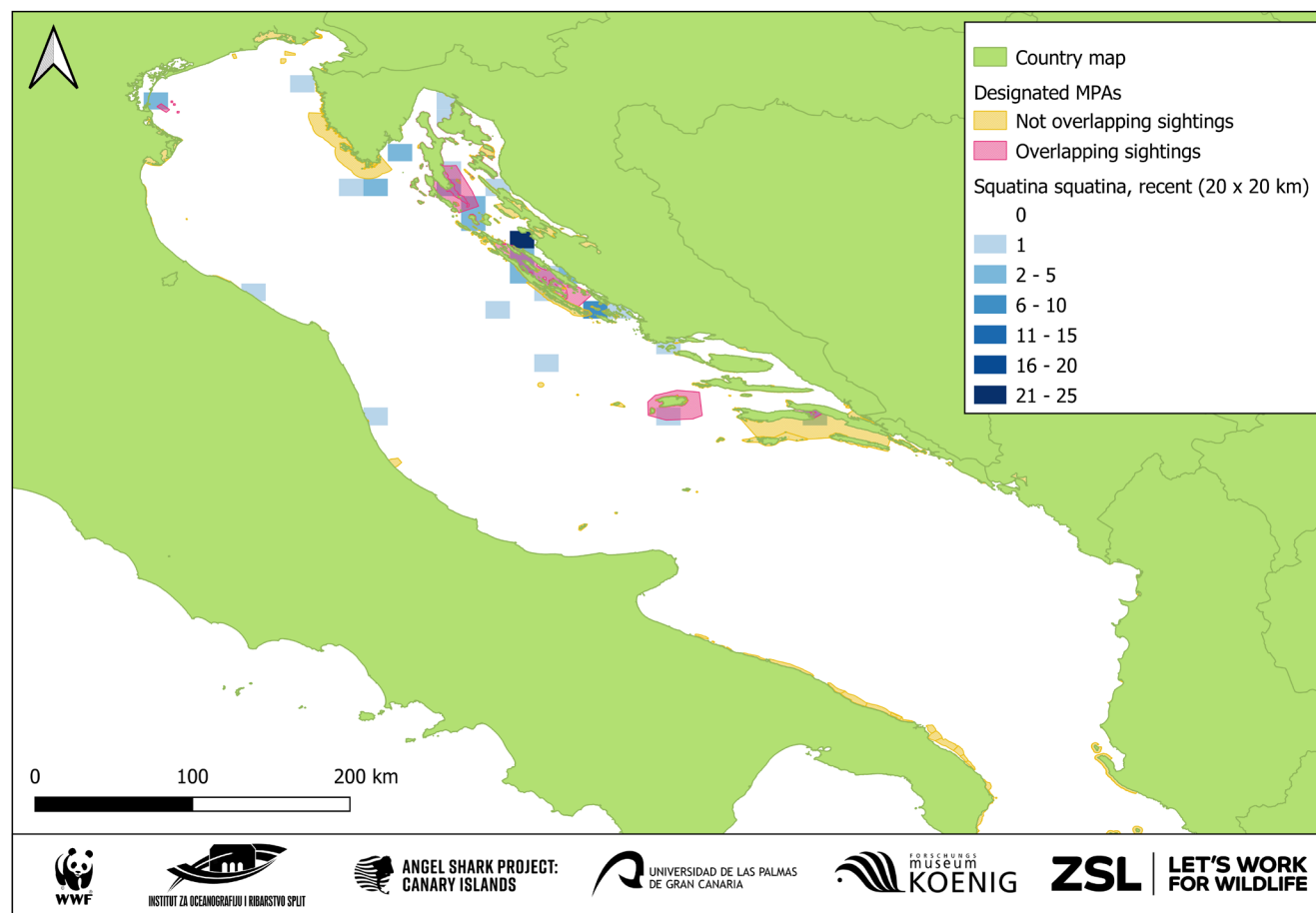


Figure 6b – Recent (2010–2020)

Angel shark records (*S. squatina*) at 20 x 20 km resolution, in relation to **designated MPAs** in the Adriatic Sea.



5: TAKING ACTION

The findings of our study show that there's potential for angel sharks to recover in the Adriatic and the wider Mediterranean if concerted, coordinated conservation actions are put in place. Our data gives a baseline for future work in Croatian waters, as summarized in six key recommendations:



1. Work with the government of Croatia and Natura 2000 management officials to improve their understanding of angel shark presence in the region, and include them in management plans where appropriate.



4. Use data to help develop an angel shark sub-regional Action Plan (SubRAP) for the Adriatic Sea with Angel Shark Conservation Network partners.



2. Conduct further research at possible hotspots to strengthen our baseline knowledge of angel sharks in the region.



5. Develop angel shark LEK case study template so research can be replicated elsewhere in the Adriatic and the wider Mediterranean.



3. Train fishers in best practice guidance to safely release angel sharks, and work with communities around the Molat Island archipelago to gather data on this species.



6. If angel shark hotspots are confirmed with further study, identify mechanisms to develop area-based conservation measures to protect these habitats, e.g. Fisheries Restricted Areas.

ACKNOWLEDGEMENTS

We wish to thank all survey respondents who contributed their knowledge and provided vital information on angel shark sightings in Croatia.

SOURCE MATERIAL

This summary is based on Pike, C., Barker, J., Dragicevic, B., Ugarkovic, P., Kristinic, P., Kanski, D., Meyers, E., Jiménez Alvarado, D., Gomei, M. & Niedermüller, S. 2020. *Saving the last Angel Sharks of the Mediterranean Sea: X-ray report on spatial protection, with a focus on the Adriatic Sea*. WWF Mediterranean. You can download the full report and bibliography at https://angelsharknetwork.com/wp-content/uploads/sites/16/2020/12/AS_Adriatic_2020.pdf

ANGEL SHARK PROJECT

The Angel Shark Project is a collaboration between Universidad de Las Palmas de Gran Canaria, Zoological Research Museum Alexander Koenig, and Zoological Society of London.



www.angelsharkproject.com

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Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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