

SHARK

Newsletter
of the IUCN SSC Shark
Specialist Group
#13 | April 2026

NEWS



IUCN SSC
Shark Specialist Group





Photo by Michael Scholl
Save Our Seas Foundation

Our Vision

A world where sharks, rays, and chimaeras are valued and managed sustainably

Our Mission

To secure the conservation, management and, where necessary, the recovery of the world's sharks, rays, and chimaeras by mobilizing technical and scientific expertise to provide the knowledge that enables action

Editor-in-chief
Michael Scholl
Chief Editor
Rima Jabado
Associate Editor
Alexandra Morata

Contributor Editor
Chelsea Stein

Proofreader
Michael Scholl
Rima Jabado
Alexandra Morata
Design & art direction
scholldesign.com

Published by
the IUCN SSC Shark
Specialist Group (SSG)
Dr. Rima W. Jabado
P.O. Box 29588 | Dubai
United Arab Emirates

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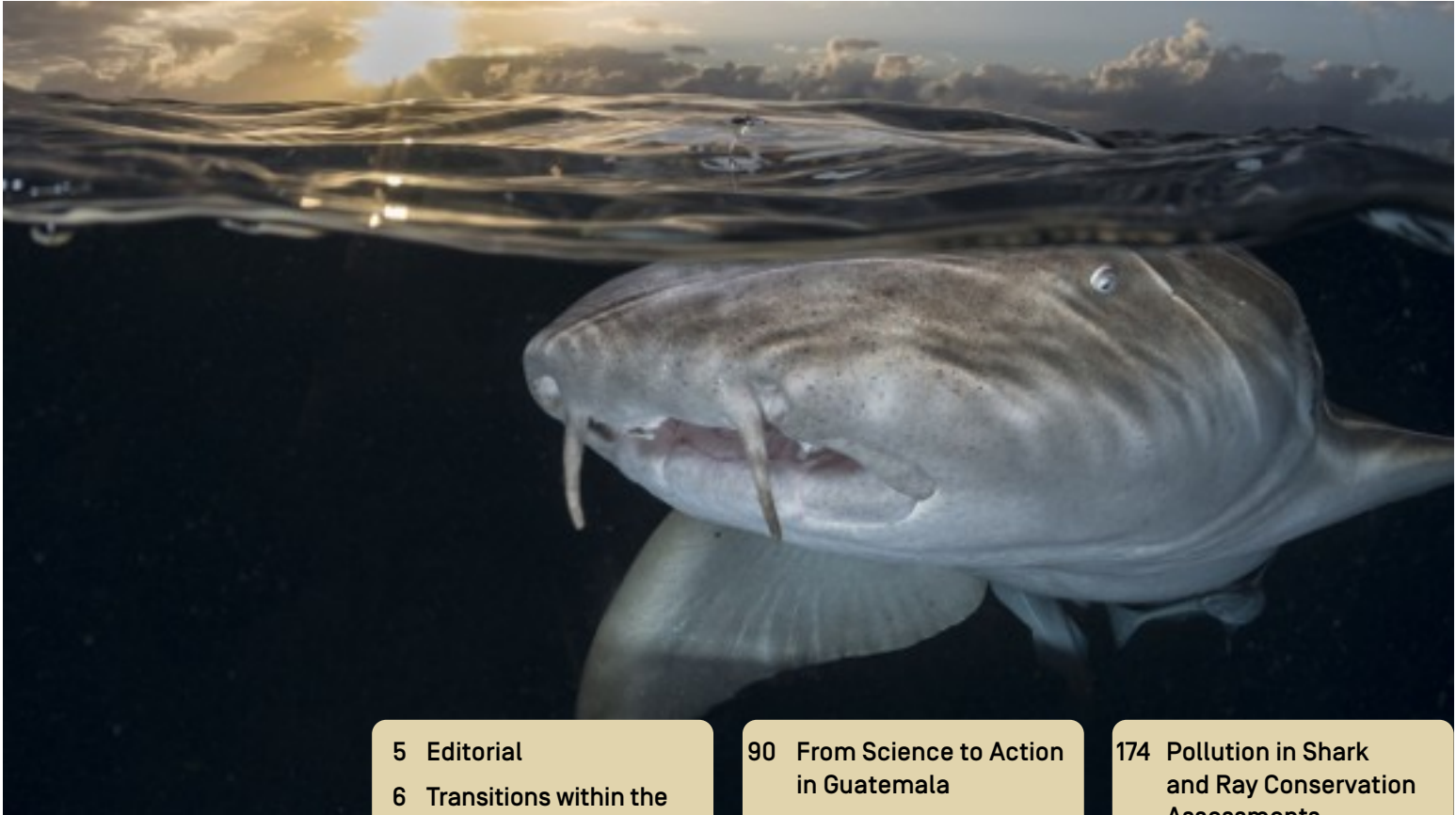


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Front and Back Cover:
Atlantic Nurse Shark
Ginglymostoma cirratum
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Atlantic Nurse Shark
Ginglymostoma cirratum

Editorial



Dear readers,

At the heart of the Shark Specialist Group (SSG) is a simple but powerful idea: conservation is collective. It depends on people who step forward, share expertise, challenge assumptions, and build bridges across regions and disciplines. This issue of Shark News reflects that collective spirit: from leadership transitions within the SSG to new scientific discoveries and remarkable wildlife observations. 🦈 Our Regional Vice-Chairs and Red List Authority Coordinator have played a critical role in guiding the SSG through the Global Shark Trends Project, scaling the Important Shark and Ray Areas (ISRA) initiative, and strengthening engagement with policy processes. To those stepping down, including Cassie Rigby as Red List Authority Coordinator, I extend my sincere gratitude. Their leadership has shaped the credibility and impact of our work. At the same time, I am delighted to welcome our new Regional Vice-Chairs from across the globe. Their regional insight and commitment to collaboration will be essential as we continue translating knowledge into action. 🦈 Collaboration is also central to our Q&A with Dr Guy Stevens, whose journey with manta and devil rays led to the creation of the Manta Trust. His reflections remind us that conservation success is rarely the result of a single project. It requires long-term strategy, scientific evidence, and a coalition of partners working toward a shared goal. 🦈 Science in this issue spans scales and systems. We move from freshwater rivers in South America, where the Rosette Freshwater Stingray highlights the challenges of managing species in heavily modified basins, to the open ocean, where Whale Shark movement studies continue to reshape how we understand connectivity across national boundaries. Tracking, tagging, and long-term monitoring are revealing patterns that demand regional cooperation, reminding us that conservation planning must follow the animals, not political borders. Trade and utilization also feature prominently. From mobulid gill plates to meat markets in Italy, these stories reveal how dynamic and localized trade can be. 🦈 At the same time, area-based conservation continues to gain ground. Updates from the ISRA initiative, including new regional delineations and growing integration into spatial planning, demonstrate how science can directly inform global biodiversity commitments. And alongside these broader processes, we continue to uncover new insights into species biology and behaviour. Whether through integrative taxonomy, improved species identification, or the remarkable documentation of Basking Shark breaching events off Ireland, we are reminded that discovery is ongoing. Even well-known species still have stories to tell. 🦈 As always, I am deeply grateful to our contributors for sharing their expertise and to Michael and Peter Scholl for ensuring that Shark News continues to connect this global community. Your dedication in the field, in laboratories, in policy arenas, and within local communities, is what keeps this network strong. ➡ Rima

Transitions within the SSG: Honoring Our Regional Vice-Chairs and Red List Authority Coordinator

Written by Rima W. Jabado

Chair | IUCN Species Survival Commission Shark Specialist Group

For more than a decade, the IUCN SSC Shark Specialist Group (SSG) has operated through a strong regional leadership structure. Our Regional Vice-Chairs (RVCs) coordinate members across geographic regions, support Red List assessments and conservation planning, engage regional stakeholders, and serve as the vital link between local expertise and global priorities.

As a global network of volunteer scientists, practitioners, and policy experts, this structure ensures that the SSG remains diverse, inclusive, and regionally grounded.

As we begin a new quadrennium, we welcome new leaders into these roles and extend our deepest thanks to those who are stepping down.

The past five years have marked an important chapter for the SSG. Together, we completed the Global Shark Trends Project — the most comprehensive reassessment of sharks, rays, and chimaeras to date — and laid the groundwork for the third global assessment of all species, which I had the privilege of launching at the start of this quadrennium. We strengthened our engagement at policy fora, particularly the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) processes, expanded regional conservation planning efforts, and continued scaling the Important Shark and Ray Areas (ISRA) initiative, now a cornerstone of spatial conservation planning for sharks, ray, and chimaeras.

These achievements reflect the collective effort of our membership and the leadership of our Regional Vice-Chairs.

RVCs mobilize regional expertise, mentor emerging scientists, coordinate assessments, and represent the SSG within their communities and networks. They do so alongside demanding professional commitments. Their contribution is voluntary, but its impact is global.

I would also like to extend special recognition to Dr Cassandra (Cassie) Rigby, who steps down from her role as Red List Authority Coordinator (RLAC). Cassie played a pivotal role in supporting and advancing the Global Shark Trends Project and in ensuring scientific rigor and consistency across regional assessments.

Her guidance to assessors and steady leadership through complex Red List processes strengthened both the credibility and impact of our work.

With Cassie's transition, the Red List Authority Coordinator role will now be led by Dr Britanny (Brit) Finucci, ensuring continuity and ongoing support for members engaged in Red List assessments and related processes. We are grateful for Brit's continued commitment in this critical role.

As the SSG moves forward, our focus increasingly turns toward translating knowledge into action — advancing regional priorities, scaling ISRAs, supporting Species Conservation Planning processes, and strengthening implementation through policy engagement and on-the-ground partnerships. This evolution builds directly on the foundations laid by our outgoing leaders.

With this continued growth in scope and impact, we must also ensure that our leadership structure evolves accordingly. Over the coming months, I will be seeking to appoint a Co-Chair to support the growing portfolio of the SSG, with a focus on strengthening strategic communications and creating pathways for early-career scientists to grow into leadership roles. As a global volunteer network, deliberate succession planning is essential to sustain our impact. I am a firm believer that leadership transitions are a healthy part of the SSG's evolution and that they can bring renewed energy while reinforcing our shared commitment to conservation.

To our outgoing Regional Vice-Chairs and to Cassie: thank you for your dedication, integrity, and belief in the mission of the SSG. Our community is stronger because of your service.

With gratitude,
Rima

A welcome note to all the new Regional Vice-Chairs

I am also delighted to welcome our new RVCs as we begin this next chapter of the SSG's work. Each brings deep expertise, regional insight, and a strong commitment to collaborative conservation. I look forward to working closely with them as we build on recent progress and translate our science into meaningful regional action.



Ghofrane Labyedh
Africa Region

Ghofrane Labyedh is an aquatic biologist and ocean conservationist with a master's degree in aquatic biodiversity and ecosystems. Her passion for marine life began on the shores of Monastir, Tunisia, where she volunteered to monitor sea turtles on what became the Kuriat Islands Marine Protected Area. This experience inspired her dedication to ocean conservation.

She has worked in Cameroon over the last six years with the African Marine Conservation Organisation (AMCO), focusing on sharks and rays. She was leading the shark and ray program, fish market surveys, socio-economic studies with fishing communities, volunteer training, and policy advocacy. Her work translates research into reports and policy briefs to guide decision-making and secure conservation funding.

For the next three years she will be serving as the Lead Coordinator to the West/Central Africa Elasmobranch Coalition with the Manta Trust, bridging gaps in research, skills, and policy across the region. In 2024, she became a National Geographic Explorer, launching a live-release program that empowers fishers as conservation partners.

Recently, she became a fellow of the Sustainable Ocean Alliance (SOA) and Nature, Environment, Wildlife Filmmaking (NEWF), working to combine science and storytelling to inspire action. With over a decade of marine conservation experience, her vision is to integrate fisher knowledge with science and build regional collaboration for sustainable ocean conservation along Africa's coasts.



Dr Issah Seidu
Africa Region

Issah Seidu is currently a lecturer at the Kwame Nkrumah University of Science and Technology (KNUST), Ghana. He holds a PhD in Wildlife Management, a MPhil in Wildlife Management, and a BSc in Natural Resources Management. His doctoral research produced the first comprehensive bioecological and bioeconomic assessment of shark and ray fisheries in Ghana. Issah is the Co-founder of AquaLife Conservancy, a registered Ghanaian non-profit organization pioneering research and conservation initiatives for sharks and rays in Ghana and across parts of West Africa. He also holds specialized certifications in Market-Based Conservation (Kinship Fellowship, Western University, USA), Sustainable Environmental Management (University of California), GIS in Conservation Science (University of Cambridge, UK), and Tropical Ecology and Ecosystem Conservation (Tropical Biology Association, UK). He is a Fellow of the Zoological Society of London's EDGE Programme and a Marine Conservation Action Fund Fellow with the New England Aquarium, as well as a Kinship Conservation Fellow. He is currently implementing a groundbreaking project to build grassroots support for the conservation of sharks and rays in Ghana and parts of West Africa. He is an active member of the IUCN Shark Specialist Group and has contributed to the reassessment of 28 endemic and near-endemic West African sharks and rays. He also provided expert input

for the listing of Eastern Atlantic guitarfishes on CITES Appendix II. Presently, he serves as the Regional Coordinator and Co-facilitator for the West and Central Africa Shark and Ray Coalition. He has authored several technical reports and high-quality scientific publications in internationally recognized peer-reviewed journals, contributing significantly to shark and ray conservation science in the region.



Dr Rhett Bennett
Africa Region

Dr Rhett Bennett is the Program Manager for the Western Indian Ocean Shark Conservation Program at the Wildlife Conservation Society (WCS). He obtained his PhD in Ichthyology and Fisheries Science from Rhodes University and the South African Institute for Aquatic Biodiversity, in 2012, which focused on the ecology, population genetics, fisheries, conservation and management of an Endangered endemic fish species in South Africa. For the past eight years, Rhett has led WCS' shark and ray conservation efforts in East Africa through a comprehensive, multi-faceted approach. His work has included advancing ecological and fisheries research to fill knowledge gaps on sharks and rays; raising awareness of national and international management measures; deepening the understanding of sharks' and rays' conservation needs in East Africa; and building capacity for accurate species identification and stronger enforcement of regulations. He has also engaged with fishing communities to promote more

sustainable practices, while supporting governments to strengthen national policies, implement global commitments for shark and ray conservation, and tackle illegal trade in shark and ray products. Rhett joined the SSG as a member in 2021 and has contributed to several shark, ray, and chimaera IUCN Red List of Threatened Species assessments.



Serena Adam
Asia Region

Serena Adam is a marine biologist and Senior Officer with World Wildlife fund (WWF)-Malaysia's Marine Programme. She leads shark and ray conservation across priority seascapes in Malaysia, focusing on spatial management, reducing bycatch in small-scale fisheries, and strengthening policies and legislation to enhance species protection and governance.

She works closely with government agencies, local communities, and research partners on bycatch mitigation, marine park management, trade studies, and species monitoring. She also coordinates state-level consultations, advances management planning, and supports national conservation frameworks.

Serena has been a member of the IUCN SSC Shark Specialist Group (Asia Group) since 2021 and is the co-founder of Reef Stakes® and the Wildlife Co-existence Quest, two initiatives that use gamification and behavioral science to enhance ocean literacy, foster inclusive conservation planning, and support human-wildlife coexistence.



Dr Ana Hacoheh Domené

Central America and the Caribbean Region

“As an RVC, I look forward to learning from colleagues across the region, working together to strengthen our network, and helping highlight the work being done to support shark and ray conservation”.

Ana Hacoheh Domené is a marine biologist and conservation scientist who works on the research and conservation of sharks and rays in the Eastern Tropical Pacific and the Caribbean. She is a professor and researcher at Universidad del Valle de Guatemala, where she leads applied research projects and is actively involved in the training of undergraduate and graduate students in marine ecology, fisheries, and conservation. Her work is strongly oriented toward producing scientific information that can be used to inform management, policy, and conservation decisions in coastal and marine environments.

She earned her Ph.D. in Marine Sciences from the Centro Interdisciplinario de Ciencias Marinas (CICIMAR-IPN, Mexico). Her research interests include the ecology, distribution, and vulnerability of sharks and rays, as well as the impacts of artisanal and industrial fisheries and pollution on marine species. She uses interdisciplinary approaches, such as stable isotope analysis and genetic tools, together with participatory research, to support fisheries management, seafood traceability, and the conservation of threatened species.

Throughout her career, Ana has led and collaborated on a wide range of research initiatives in Guatemala and across the region, with particular emphasis on elasmobranch fisheries and applied conservation along both the Caribbean and Pacific coasts of the country. Her work has contributed to documenting fisheries dynamics, species distributions, and emerging conservation challenges in Guatemala. As a member of the IUCN SSC Shark Specialist Group, she brings experience grounded in local and regional research contexts and contributes evidence-based perspectives to collaborative efforts aimed at improving conservation planning and management outcomes for sharks and rays in Central America.



Dr Ioannis Giovos

Mediterranean and Black Seas Region

“I am deeply honoured to serve as the Regional Vice Chair for the Mediterranean. In this role, I look forward to working closely with colleagues across the region to strengthen collaboration, bridge critical knowledge gaps, and advance effective management and conservation of sharks and rays. Together, we can support the recovery of their populations and the restoration of essential habitats across the Mediterranean.”

Born in Thessaloniki, Ioannis graduated from the Biology Department of Aristotle University of Thessaloniki and holds a joint PhD from the Universities of Patras and Padova, where his research focused on shark and ray conservation policies in the Mediterranean. With over 15 years

of experience in Mediterranean conservation, including roles at major organizations such as the Tethys Research Institute and the European Commission's Joint Research Centre, he is currently the Conservation Officer at the environmental organization iSea. He also holds several key leadership positions, including Regional Vice co-Chair of the IUCN Shark Specialist Group for the Mediterranean, President of the European Elasmobranch Association, and other advisory roles related to shark and ray conservation. Ioannis has authored more than 50 articles in scientific journals and has delivered over 60 presentations at national and international conferences.



Eva Meyers

Northern Europe Region

“I am honoured to take on the role of Regional Vice [co-] Chair and to continue the legacy of the previous RVCs together with Sophy [McCully Phillips]. Now that the Important Shark and Ray Areas (ISRAs) have been delineated for this region [European Atlantic], I am especially looking forward to working closely with SSG members, wider collaborators, and decision-makers to strengthen area-based conservation for sharks across Northern Europe.”

Eva is a conservation biologist from Germany but that was raised in South America. For the past 15 years, she has been involved in various policy, research, and conservation projects across the globe. She has extensive experience as a project manager, field

researcher, and founded knowledge in international nature and biodiversity conservation, as well as environmental policy. Eva has worked as a consultant for the United Nations (UN) Convention on the Conservation of Migratory Species of Wild Animals (CMS), and the CMS (Sharks MoU) Sharks Memorandum of Understanding. Currently, she is the Coordinator of the CMS Single Species Action Plan for the Angelshark in the Mediterranean (SSAP Angelshark Med).

She has also served six years as programme management officer for the UN Environment Programme coordinating an intergovernmental platform addressing the conservation and sustainable use of migratory waterbirds.

She co-founded the Angel Shark Project and Angel Shark Conservation Network, a collaboration between various institutions including the Leibniz Institute for the Analysis of Biodiversity Change, where she is based now, aiming to safeguard the future of Critically Endangered angel sharks (Squatinaidae). In the Macaronesia region, Eva is working as Head of Science of the Marine Protected Areas (MPAs) Canary Islands Project, aiming to expand MPAs, including for sharks and rays. She is also a member of the IUCN SSC SSG Important Shark and Ray Areas (ISRAs) Independent Review Panel. Eva is also a member of the German Elasmobranch Association (DEG).



Meaghen [Meag] McCord

North America Region

“As we begin the new quadrennium, I’m looking forward to supporting collaboration across the North America region, strengthening connections between the IUCN Red List of Threatened Species, Important Shark and Ray Areas (ISRAs), and other SSG priorities, and helping translate strong science into durable, place-based conservation action. I’m also keen to bring a Canadian lens to regional discussions and to work with colleagues to support growing capacity and interest in shark conservation in Canada.”

Meaghen [Meag] McCord is a shark scientist and conservation leader based in British Columbia, Canada. She has been an active member of the IUCN SSC Shark Specialist Group Africa Region since 2003 and currently serves as Regional Vice co-Chair for North America.

Meag began her career with the Canadian Shark Research Lab in Nova Scotia before moving to South Africa, where she founded and directed the South African Shark Conservancy (SASC). Over 15 years, she worked to advance shark research, policy engagement and conservation outcomes for understudied sharks and rays across southern Africa. After returning to Canada in 2020, Meag worked with Parks Canada as a marine scientist and advisor, contributing to national efforts to advance (MPA) planning and Canada’s 30x30 conservation commitments.

Meag has recently worked with a transboundary network of shark scientists and MPA

practitioners across the Pacific coast of Canada, the United States, and Mexico, convened by the Commission for Environmental Cooperation, and is a founding member of ReShark, supporting global efforts to recover threatened shark and ray species.

She currently serves as Executive Director of the Central Coast Indigenous Resource Alliance (CCIRA), supporting Indigenous-led marine stewardship, fisheries governance, and conservation across the territories of the Heiltsuk, Kitasoo Xai'xais, Nuxalk, and Wuikinuxv Nations in the Great Bear Sea region of British Columbia's central coast.

In her role with the SSG, Meag is excited to bring a Canadian lens to discussions, strengthen regional collaboration and support members in their efforts to translate science into durable, place-based conservation outcomes.



Dr María Lourdes [Marilú] Estalles

South America Region

“South America hosts an extraordinary diversity of ecosystems and species, as well as valuable human capacities and cultural diversity. Representing regional perspectives and priorities on the global agenda will require continuous effort and ongoing dialogue with experts across the region, while also addressing region-specific needs as they arise. Strengthening collaboration among researchers from different countries will be essential to ensure the conservation of species throughout their range and to further consolidate ties among colleagues within the

group. Another key challenge will lie in translating the knowledge generated by the specialists into effective policies that can be implemented at national and regional levels. For this reason, communication with decision-making sectors, as well as with the public, is of critical importance.

Finally, and no less importantly, I see great value in increasing awareness of the work of the IUCN SSC SSG among the public and new generations of conservationists, while promoting the active participation of early-career specialists who will carry this work forward in the years to come.”

Ma. Lourdes [Marilú] Estalles began her career studying rays in Argentina's bottom trawl fisheries. Her research has focused on the reproductive biology, trophic ecology, and distribution of rays and sharks, as well as the impacts on their populations from bycatch in the industrial fisheries of Buenos Aires and Patagonia. Her studies have contributed to outlining policies and guidelines for species-specific catch discrimination and the management of these species within the bottom trawl fishery of the San Matías Gulf.

Marilú holds a Ph.D. in Biological Sciences from the University of Buenos Aires and is an Associate Professor at the Universidad Argentina de la Empresa (UADE) University. She was a member of the PAN-Tiburones (National Plan of Action for Sharks (NPOA)-Sharks of Argentina) and joined as a member of the IUCN SSC Shark Specialist Group for the South America region in 2020. Currently, she is a researcher at the National Directorate of Marine Protected Areas (National Park Administration of Argentina), where she investigates the role of Marine Protected Areas (MPAs) in the conservation of sharks and rays. Her primary research interests include ecology, the impacts of industrial fisheries, mitigation, and the management and conservation of sharks, rays, and chimaeras.



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Stepping back Red List Authority Coordinator



Dr Cassandra Rigby

Turning the tide for manta and devil rays



An interview with
Dr Guy Stevens,
Chief Executive and
Co-Founder of the
Manta Trust | Written
by Chelsea Stein



Manta and devil rays — collectively known as mobulids — are harmless filter feeders with markings and patterns as unique as human fingerprints. Mantas, known as giants of the sea, can reach a wingspan of up to seven meters and weigh up to two tons. While devil rays are smaller, like the mantas, they have an ability to propel themselves up and above the water’s surface. These wondrous creatures first caught the eye of Dr. Guy Stevens more than 20 years ago and he’s been working to protect them ever since.

“My first underwater encounter with a manta ray was in the Maldives in 2003, they left an immediate impression,” he said. “Their size, strange shape, and most of all, their inquisitive nature sparked my interest. There are few animals this large which you can get so close to in the wild.”

Guy is Chief Executive of the Manta Trust, a global charity which he co-founded in 2011 to protect the world’s 10 species of manta and devil rays—all of which are threatened with extinction.

“Manta and devil rays are not extinct yet and we know the solutions to the threats they face,” he said. “I realized that to address the threats facing these animals globally, a strategic and coordinated approach was necessary.”

Based in the United Kingdom, the Manta Trust cultivates an affiliate network to coordinate manta and devil ray research and conservation efforts happening around the world. Their approach involves conducting long-term research to inform species management and decision-making; expanding education and outreach efforts to people about the importance of protecting manta and devil rays; and collaborating across business, government, and community groups to drive conservation efforts.

Since its inception, the Manta Trust has achieved significant milestones which are turning the tide for manta and devil rays, like publishing the world’s first book on manta rays in 2017. They played a key role in gaining species protection in the Maldives — one of the best places to find mantas — helping Hanifaru Bay to become a Marine Protected Area in 2009 and, subsequently, supporting the implementation of a management plan to sustainably control tourism in the area which launched in 2012. They also built a genetics team to develop the first global mobulid genetic identification kit, to name a few highlights.

Topping it off, the Manta Trust has contributed data and expertise to inform regulations and designate protected areas for threatened species across the Maldives, Indonesia, Peru, Thailand, Mexico, and more. Their work over the last 15 years, in collaboration with other conservation groups, has resulted in the successful listing of all mobulid species on Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS), as well as on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and, most recently, the up-listing to Appendix I at CITES 20th Conference of Parties (CoP20).

“As with all the biggest achievements,” Guy noted, “the Manta Trust

is just a part of the reason for this conservation win, but it is one we have worked extremely hard for.”

In this Q&A, Guy shares his vision for starting the Manta Trust, what’s ahead for the organization in 2026, and more.

What inspired you to study and work with mobulids?

Guy: When I realized every animal could easily be identified using their spot patterns, [I found that] this ability to follow the lives of individuals was fascinating to me [and still is]. There are many manta rays I have known for over 20 years. I have followed their lives through growth, maturation, injuries, and reproduction. When you put all these life history stories together you can build a picture of the population, which is key to understanding and protecting them.

What are some of the highlights of your early career, before founding the Manta Trust in 2011?

Guy: My first research project was on coral reef symbiotic relationships between cleaner fishes and their clients in Grenada, Caribbean. I ended up in the Maldives because of a job—I was employed by Four Seasons Resorts to work onboard a luxury catamaran as the resident marine biologist in 2003. I was a snorkel and diving guide.

During week one of starting my new job I saw my first Reef Manta Ray (*Mobula alfredi*) and fell in love with these wonderful animals. I started to try and learn more about the species and realized virtually nothing was published. Indeed, even the Reef Manta Ray species was not separated from the Oceanic Manta Ray (*Mobula birostris*) at the time.

This led me to launch the Maldives Manta Conservation Programme (MMCP) [formerly the Maldivian Manta Ray Project] in 2005. I wanted to fill some of the knowledge gaps and realized there were also many threats facing these animals and that there was a need to aid their protection.

Much like how the Manta Trust operates today on a global scale, I first founded the MMCP to be a network of researchers, educators, dive instructors, biologists, communities, and tourism operators on a national scale. The goal was to conduct research to learn more about the Maldivian manta life cycle, population dynamics, and habitat usage. The network shares insights and education, identifies key patterns over time, and informs management and protection measures. It has become one of the largest and longest-standing manta ray conservation and research groups in the world. Today, the Manta Trust offers a research portal which contains over 100 peer-reviewed publications by the charity and our affiliates, many of which result from the research undertaken in the Maldives by the MMCP.

After 11 years of research, I completed my PhD on the world’s largest population of Reef Manta Rays in the Maldives in 2016. Specifically, I aimed to address the gaps in the life history of these



Photo by Simon Hilbourne

Guy Stevens and Manta (Maldives, 2019)



Photos by Jasmine Corbett | The Manta Trust



species, looking at how long they live, what age they reach maturity, reproductive fecundity, etc.

What did it take to upscale your work from a national to global scale when founding the Manta Trust? What goes into making such a global collaboration work?

Guy: I am a collaborative person, and I knew that if these species were to be protected, it would require bringing together a like-minded group of researchers, educators, communicators, policymakers, etc. The [Manta Trust] charity is centered around supporting our affiliates. If we fail in this mission, the charity fails.

I think it's mostly about developing personal relationships and getting people to trust my team and I. We've proven that we can be successful at achieving conservation gains and doing this in a way which supports our affiliates.

What are your personal reflections on some of the Manta Trust's recent accomplishments?

Guy: Well, the one that is freshest in my mind is the Appendix I up-listing of all mobulids [at the CITES CoP20. The work started nearly three years ago.

We had a plan; we knew that to be successful we would need funding, staff expertise, and that we'd need to produce some important scientific publications on trade, policy, fisheries impacts, and population declines, all of which can be found as open access publications on the Manta Trust research portal.

We also knew that we would need the support of a wider shark conservation coalition and of course CITES nation parties to champion any proposal put forward.

Is there a project or outcome from the Manta Trust that you're most proud of? And why?

Guy: What I am most proud of are not the projects or outcomes, but the wonderfully dedicated team of people I work with, who, together, make this charity the success it is. They are what give me the hope, motivation, and desire to keep working to save mobulid rays and their ocean habitat because it is people who change minds and outcomes, not projects and policies on paper.

At a time when so many species are threatened with extinction, how do you stay inspired and motivated? What keeps you going?

Guy: [For me,] if you break down the challenges into smaller pieces, the solutions are attainable. Focus on what can be achieved, prioritize, and make it happen.

What are you most looking forward to for the Manta Trust in 2026?

Guy: Our focus will be on gaining national protections for those countries which are still fishing mobulids and starting to find ways to stop illegal fisheries and trade.

Want to learn more about the Manta Trust? Donate to the cause, adopt a manta ray, find a volunteer project, and more at mantatrust.org.





Rosette Freshwater Stingray

[Potamotrygon schuemacheri]



Shark
Spotlight

Written by
Alexandra Z. A. Morata
IUCN SSC Shark Specialist Group |
Programme Officer

Taxonomy

The order Myliobatiformes includes 234 valid species from 38 genera and 12 families: Aetobatidae [pelagic eagle rays], Dasyatidae [stingrays], Gymnuridae [butterfly rays], Hexatrygonidae [sixgill stingrays], Mobulidae [devil rays], Myliobatidae [eagle rays], Plesiobatidae [giant stingarees], Potamotrygonidae [neotropical rays], Rhinopteridae [cownose rays], Urolophidae [stingarees], Urotrygonidae [round rays], and Zanobatidae [panrays].

Potamotrygon schuemacheri Castex, 1964, is commonly known as the Rosette Freshwater Stingray, due to its rosette patterns. The species is also known as the Parana River Stingray, not to be mistaken for the Paraná Freshwater Stingray (*P. falkneri*). It belongs to the family Potamotrygonidae and is one of approximately 32 species in the *Potamotrygon* genus. The species name “*schuemacheri*” is derived from ‘Shuhmacher’, the first revisor principle of Rosa (1985) in her revision of *Potamotrygon* species.

Morphology

The Rosette Freshwater Stingray is greenish or greyish brown in color with a dark reticulated pattern on its dorsal surface, similar to the Porcupine Freshwater Stingray (*P. histris*), Paraná Freshwater Stingray, and young Giant Freshwater Stingray (*P. brachyura*). This resemblance often leads to identification challenges amongst these species. Additionally, the Rosette Freshwater Stingray is now considered a junior synonym of the Porcupine Freshwater Stingray, although further taxonomic review is needed.

The Rosette Freshwater Stingray is small in size, reaching 25 cm disc width (DW) with a body that is rather circular, but slightly longer than wider. However, the literature suggests that this species could reach 35 cm DW (or 45 cm total length).

Distribution and Range

The Rosette Freshwater Stingray is known to reside in the freshwater bodies of South America. Based on the few samples collected, it occurs in shallow waters of densely populated areas of the Paraná-Paraguay River basin.

Conservation Measures and IUCN Red List status

In 2023, the Rosette Freshwater Stingray was assessed as Data Deficient (DD) on the IUCN Red List of Threatened Species. Its DD status is due to the limited information on its ecology as well as the impact of fishing on populations.

Given its rarity, its population size is unclear. However, it is possible that the Rosette Freshwater Stingray is facing similar threats to other potamotrygonids, including high exposure to incidental fishing (especially considering its distribution), negative fishing (i.e., tail mutilation, killing, and discarding), and the demand from international ornamental aquarium trade. The species is also likely impacted by anthropogenic habitat destruction (i.e., building dams), with observations of the species recorded in the upper Parana River, beyond their known habitat.

There are limited management measures or species-specific protections for the Rosette Freshwater Stingray. In 2022, all potamotrygonids were listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II or III. However, only the Brazilian populations of the Rosette Freshwater Stingray is included in Appendix III under the genus level .

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Photo by Andy Murch | sharksandrays.com | bigfishexpeditions.com | @bigfishexpeditions

A large, flat, brown stingray with a dark reticulated pattern on its dorsal surface, resting on a gravelly substrate. The stingray is positioned horizontally, with its head towards the left and its tail extending towards the right. The background is a mix of light and dark gravel and small stones.

20

NEW SPECIES ALERT



Written by

David Ebert

Pacific Shark Research Center
San Jose State University | Program Director

Alexandra Z. A. Morata

IUCN SSC Shark Specialist Group
Programme Officer

Nayara M. Bucair

Instituto Oceanográfico
Universidade de São Paulo

Photo by Nayara Bucair | All Angle Image |
Projeto Mantas do Brasil database

Juvenile *Mobula yarae* observed in the
Fernando de Noronha Archipelago, Brazil,
during scuba diving activities

Order	Family	Genus	Authority
Carcharhiniformes	Pentanchidae	<i>Apristurus iterum</i>	White, O'Neill & Jayasinghe, 2025
Carcharhiniformes	Triakidae	<i>Iago gopalakrishnani</i>	Bineesh, Beura & Akhilesh, 2025
Squaliformes	Etmopteridae	<i>Etmopterus westraliensis</i>	Ng, White, Liu & Joung, 2025
Myliobatiformes	Dasyatidae	<i>Hypanus rubioi</i>	Mejía-Falla, Navia, Cardeñosa & Tavera, 2025
Myliobatiformes	Mobulidae	<i>Mobula yarae</i>	Bucair & Marshall, 2025
Rajiformes	Arhynchobatidae	<i>Bathyraja nansei</i>	Misawa, Moteki & Endo, 2025
Myliobatiformes	Dasyatidae	<i>Neotrygon romeoi</i>	Glaus, White, O'Neill, Thurnheer, & Appleyard, 2025

Apristurus iterum

White, O'Neill & Jayasinghe, 2025

Apristurus iterum

A new addition to the Pentanchidae family and Carcharhiniformes order, *Apristurus iterum*, was recently described in northern Australia. This species was named *iterum* meaning 'again', 'a second time' or 'once more' in latin, due to this being the second *Apristurus* species discovered based initially from its distinct egg case morphology. The egg cases *Apristurus iterum* closely resembles Ridged-egg Catshark [*A. ovicorrugatus*] and Milk-eye Catshark [*A. nakayai*] from north-western Australia and New Caledonia to Papua New Guinea, respectively. However, based on 10 egg cases, this new catshark can be distinguished from its congeners by their weakly T-shaped, longitudinal ridges on the dorsal and ventral surfaces.

Based on the single gravid female holotype *A. iterum* also resembles the Australian populations of South China Catshark [*A. sinensis*], Flatnose Catshark [*A. platyrhynchus*], and Ridged-egg Catshark. *A. iterum* differs from the South China Catshark and Flatnose Catshark by its relatively wider snout. Compared to the Ridged-egg Catshark, the new species has its paired fins closer together, the pelvic fin is closer to the anal fin, and it has a smaller first dorsal fin.

Iago gopalakrishnani

Bineesh, Beura & Akhilesh, 2025

Iago gopalakrishnani

Another new species for the Carcharhiniformes order was discovered in the eastern Arabian Sea, India. Belonging to the Triakidae family, *Iago gopalakrishnani* is fourth species described in this genus (including the uncertain *Mustelus mangalorensis* vs *Iago mangalorensis*). I. *gopalakrishnani* was named in honour of Dr. A. Gopalakrishnan, eminent marine fish geneticist and former Director of ICAR-Central Marine Fisheries Research Institute (2013-2024).

This new houndshark is distinguishable from its congeners primarily by its dark chocolate brown to blackish colouration. In the Bay of Bengal and Andaman Sea, there is likely a similar species, however, this needs confirmation.

Although recently described, *I. gopalakrishnani* was discovered as it is frequently caught incidentally by fisheries in southwest India at depths between 300–400 m.

Etmopterus westraliensis

Ng, White, Liu & Joung, 2025

Etmopterus westraliensis

A new species of lanternshark (Squaliformes order, Etmopteridae family) has been described from Western Australia and was consequently named *Etmopterus westraliensis*.

E. westraliensis most closely resembles the Short-tail Lanternshark [*E. brachyurus*] and Papuan Lanternshark [*E. samadiae*]. This new species morphologically differs from the former with its longer caudal-fin base marking; and from the latter with its longer mouth, differently shaped underside of the snout’s naked area, thinner posterior branch of flank marking, caudal-fin base marking tip tapering, and more monospondylous centra.

Due to the similar appearances and of *E. westraliensis* with the Short-tail Lanternshark, the western Australian populations of the latter are likely to be *E. westraliensis* instead.

Hypanus rubioi

Mejía-Falla, Navia, Cardeñosa & Tavera, 2025

Hypanus rubioi

Hypanus rubioi, belonging to the Dasyatidae family (Myliobatiformes order) was discovered in the shallow waters (0.5–15 m) of the Eastern Tropical Pacific (ETP) region of Colombia. However, it possibly extends from central Mexico to northern Peru. The name ‘rubioi’ derives from the ichthyologist Efrain Rubio, one of the first researchers interested in the fish fauna of the Colombian Pacific.

H. rubioi is most closely related to the Longnose Stingray [*H. guttatus*]. This new stingray is unique in its 1:1.1 (width-to-length) spade-shaped disc, long snout and tail, large disc width (DW) of 125 cm, and three distinctive rows of enlarged denticles.

In Colombia, stingrays are often caught incidentally by artisanal fisheries, with all of the known samples of *H. rubioi* collected at landing sites. Considering this and the similarities with the Longnose Stingray, it is likely that *H. rubioi* is being heavily impacted by fishing.

Mobula yarae

Mobula yarae

Bucair & Marshall, 2025

Mobula yarae

Unrecognised species face an elevated risk of extinction, largely due to the absence of environmental protection policies. *Mobula* rays (manta and devil rays) inhabit both coastal and oceanic regions and are exposed to several threats, including habitat degradation, coastal development, pollution, and interactions with fisheries and other human activities. The recent description of *Mobula yarae* — the Atlantic Manta Ray — expands our understanding of marine biodiversity and provides a foundation for more effective conservation measures.

For decades, the existence of a distinct manta ray species was hypothesised but remained unconfirmed. A major challenge lay in the striking similarity among existing species, which limited the effectiveness of traditional morphology-based taxonomy. To achieve a conclusive delineation, scientists adopted an integrative taxonomic approach, combining detailed morphological analyses (such as examinations of dentition, dermal denticles, and the caudal bulb) with advanced genetic techniques, including complete mitochondrial genome sequencing and partial nuclear genome sequencing, alongside comprehensive assessments of colouration patterns.

The Atlantic Manta Ray can reach 5–6 m DW. Its occurrence has now been confirmed throughout the Western Atlantic, ranging from the northeastern United States of America to southeastern Brazil, where it inhabits estuarine, coastal, and oceanic regions. Despite the general resemblance among the three manta species (Oceanic Manta Ray *M. birostris*, Atlantic Manta Ray, and Reef Manta Ray *M. alfredi*) and the wide colour variation, the Atlantic Manta Ray can be distinguished by its stellate-shaped dermal denticle form, teeth, caudal bulb, and characteristic colouration patterns, including the dorsal V-shaped supra-branchial patches and distinct ventral markings. Nevertheless, identifying manta ray species in the field or from photographs requires caution, as many characteristics may overlap.

This discovery resulted from extensive collaboration among Brazilian, Mexican, and American scientists, supported by a global network of researchers, NGOs, museums, and local photographers. The description of the Atlantic Manta Ray underscores the importance of collaborative science and the integration of diverse research methods in revealing the complexity and richness of marine life.

Unfortunately, even before its formal recognition, Atlantic Manta Ray was already subject to multiple threats, including entanglement, ghost fishing, vessel strikes, and both incidental and targeted fisheries. By highlighting this discovery, it could strengthen conservation initiatives and inspire action toward the protection of mobulids and their ecosystems, and encourage local conservation efforts, scientists, and future generations of researchers worldwide.

Bathyraja nansei

Bathyraja nansei

Misawa, Moteki & Endo, 2025

Bathyraja nansei

In southern Japan's Okinawa Trough, a new deepwater softnose skate (Rajiformes order and Arhynchobatidae family) has been discovered. This skate is located around Nansei Islands at depths of 790–1,000 m, hence named *Bathyraja nansei*. This species is considered the 16th valid *Bathyraja* species present in Japanese waters.

This new skate closely resembles the Raspback Skate [*B. isotrachys*], Cinnamon Skate [*B. fedorovi*], and Creamback Skate [*B. tzinovskii*]. *B. nansei* differs from the three congeners by a multitude of slightly different body proportions, rounded (instead of straight) disc posterior margin, and uniform dark brown/ ground coloration.

Neotrygon romeoi

Glaus, White, O'Neill, Thurnheer,

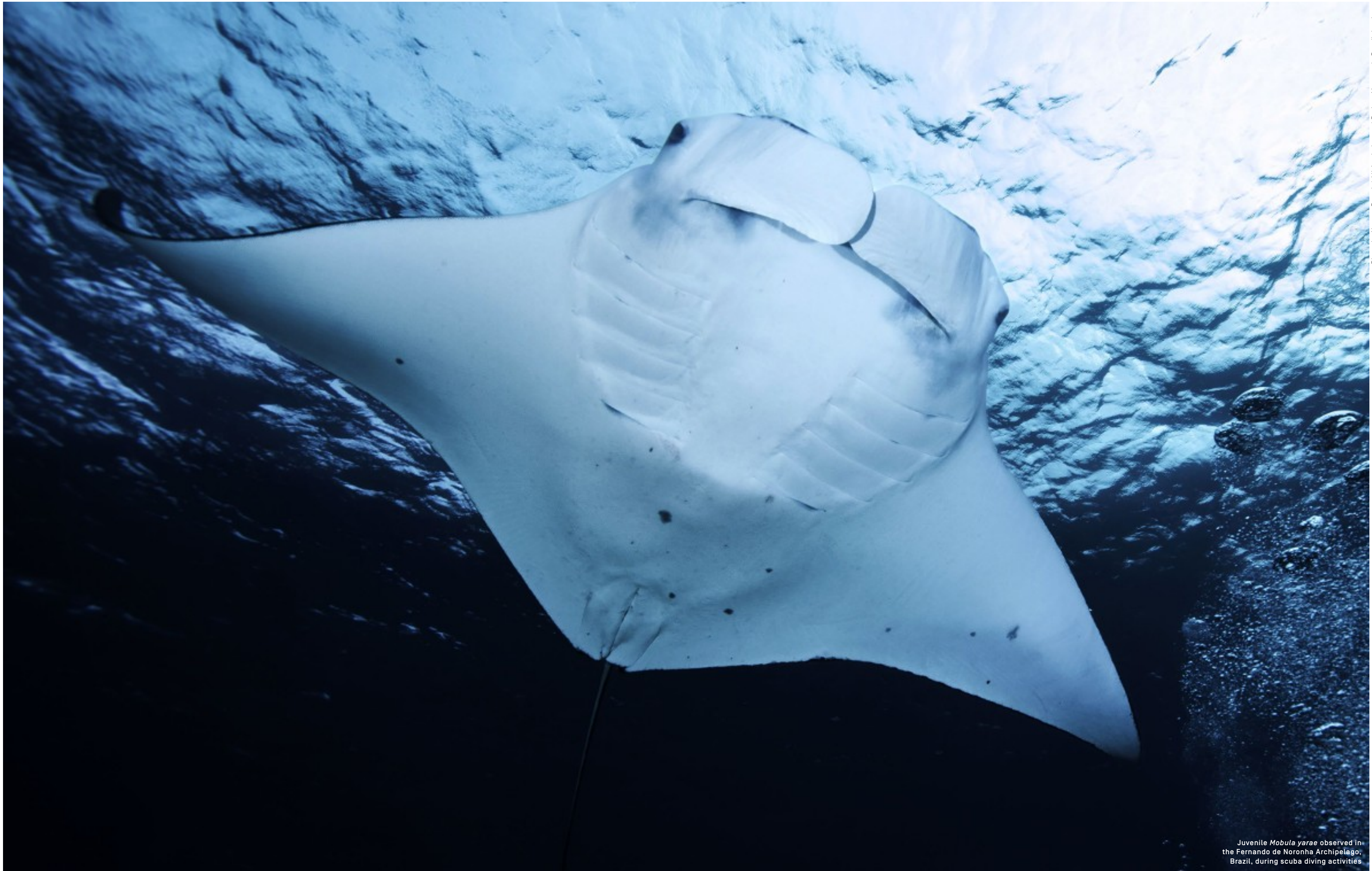
& Appleyard, 2025

Neotrygon romeoi

A new species of Blue-spotted Maskray, *Neotrygon romeoi*, was described from nine specimens collected in Fijian waters. The new species appears to be common throughout the Fijian Archipelago in nearshore habitats, and on various substrates including sandy bottoms, seagrass beds, muddy-sandy areas with and without seagrass and coral reefs. It ranges from low intertidal areas to at least 23 m deep.

The new species is the 18th described species in the genus, however, several of these species were poorly described with limited descriptive information. A detailed revision of the genus is wanting with more complete morphometric and meristic information for comparisons between species.

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Juvenile *Mobula yarae* observed in the Fernando de Noronha Archipelago, Brazil, during scuba diving activities

Breaching Basking Sharks!

Written by
Simon Berrow
Fátima Pérez Neira
Marine and Freshwater Research Centre,
Atlantic Technological University, Galway, Ireland
and the Irish Basking Shark Group

Photos by Andres Fabian and Blanca Basting

Imagine the sight – an 8 m, two tonne shark leaping out of the sea, its round pointed head breaking out of the water, twisting in the air as its pectoral fins bend, large broad dorsal fin flops to one side and then thud! As the shark hits the sea surface it creates a large splash and a deep resonating boom, which we hear above water from hundreds of metres. The shark could enter back into the water more gracefully, they are quite streamlined, but no, they seem to maximise the splash as they crash back into the sea with the associated thud!

It takes a lot of energy for a 2-tonne Basking Shark (*Cetorhinus maximus*) to breach, but this is what they do, and more frequently than perhaps we initially thought. A study by Rudd et al. (2021) from the University of Exeter in the United Kingdom, which attached Wildlife Computers Daily Diary tags to three Basking Sharks recorded 67 breaches over 31 cumulative days. Approximately half of the breaches were single breaches and occurred once a day, but they also recorded 13 double breaches, three triple breaches, and one shark that breached four times in 47 seconds. How do Basking Sharks manage to breach and why?

How does a Basking Shark breach?

A breach by a Basking Shark is preceded by a sharp descent followed quickly by a steep ascent towards the surface, whereby the shark exhibit as much as a six-fold increase in tail beat frequency and can obtain vertical speeds of up to 4.9 m/s (Johnston et al., 2018). In just over nine seconds, and 10 tail beats, an 8 m male shark tagged with a Customised Animal tracking Solutions (CATSCAM), accelerated from a depth of 28 m to the surface. The sharks centre of mass cleared the water for one second and peaked at a height of 1.2 m above the surface. Johnston et al. (2019) compared this breach with that recorded for White Sharks (*Carcharodon carcharias*). White Sharks breach at similar angles (around 75° from horizontal) and at similar speeds (4.8 m/s). White Sharks are also known to breach up to three times in succession.

A Basking Shark being compared to a White Shark? The Basking Shark is in a sister taxon (Cetorhinidae) to the Lamnidae, which includes the White Shark, mako sharks (*Isurus* spp.), and Porbeagles (*Lamna nasus*), all fast predatory species. But Basking Sharks are slow, plankton-feeding, species typically cruising at 1.1 m/s. How can these slow-moving, filter-feeding sharks generate enough power to breach? In a recent paper by Dalton et al. (2023), they showed that the Basking Shark physiology, including red muscle located medially at the trunk, combined with core muscle temperatures consistently 1.0–1.5° above ambient, resulted in them being considered as regional endotherms and sharing these traits with other regional endotherms found in the family Lamnidae. Thus, both Basking Sharks and White Sharks share very similar physiology and biomechanics, which enable both species to breach clear of the water.

The energetic cost of a breach by a Basking Shark was estimated to be between 5–6% (Johnston et al., 2019) or 0.05–0.09% (Rudd et al., 2021) of its daily metabolic energy. As these breaches represent a significant expenditure of energy, they are assumed to offer a substantial fitness advantage in return. So why do Basking Sharks breach?

Why do Basking Sharks breach?

In a recent review of shark and ray breaching, Klimley et al. (2024) proposed a number of theories as to why Basking Sharks and other species, including black-tip sharks (*Carcharhinus* spp.), Oceanic Whitetip Sharks (*C. longimanus*), threshers (*Alopias* spp.), Spinner Sharks (*C. brevipinna*), Copper Shark (*C. brachyurus*), mantas and devil rays (*Mobula* spp.), eagle rays and stingrays (Myliobatiformes), breach. Theories range from cleaning of gill-rakers, to the expulsion or dislodging of faeces, internal or external parasites, to courtship, feeding and attracting, or repelling, conspecifics. In Basking Sharks, breaching habitually occurs when sharks are aggregating. Basking Sharks are recorded breaching during spring feeding aggregations, but also within a torus, a putative courtship behaviour, when feeding is not occurring.

Gore et al. (2019) suggested that breaching by one shark may trigger breaching by another. Could breaching be an attempt by males to assert dominance over other males or to attract females for mating?

Basking Sharks breaching off County Clare, Ireland

Since autumn 2020, we have had the privilege of witnessing this amazing shark behaviour in the coastal waters of Loop Head, County Clare, on the western seaboard of Ireland. Over three days in September 2020 we recorded 93 breaches by Basking Sharks during a total observation period of 8 hours and 45 minutes. Such behaviour, where Basking Sharks have breached consistently in relatively small areas over a short period of time, was also reported by Johnston et al. (2019) off Malin Head, County Donegal in the north of Ireland where around 600 breach events were recorded during around 90 hours of observation. Such breaching activity just a few kilometres off the rocky headland of Loop Head provided a short opportunity to try and learn a little more about this behaviour (Berrow et al., 2025). This breaching behaviour culminated towards the end of a remarkable period of Basking Shark activity when we had recorded multiple 'torus' off west Clare. A torus is a circular movement of Basking Sharks at the surface and descending through the water column. It is a temporary aggregation, highly choreographed and dynamic and thought to be associated with courtship (Sims et al., 2022)

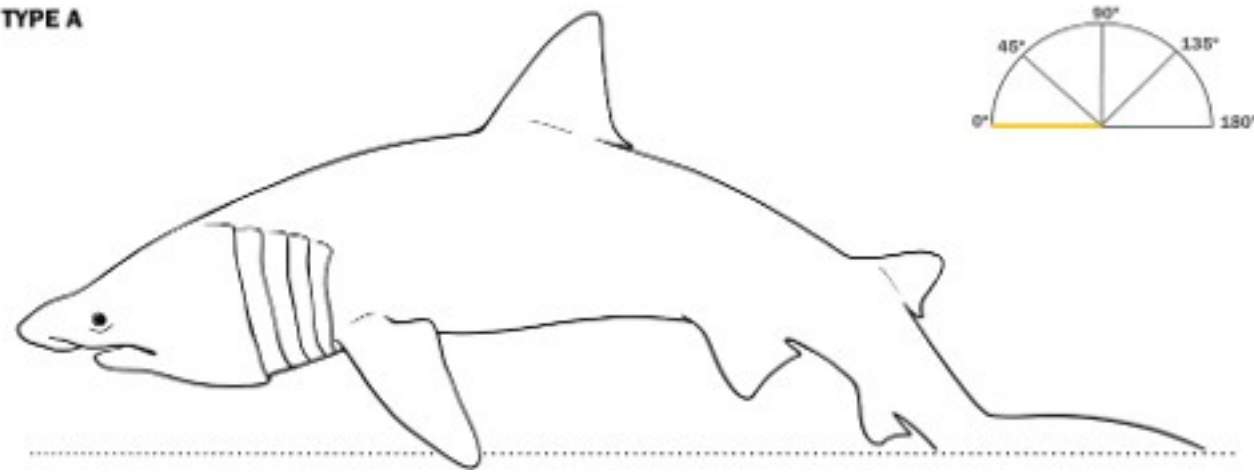
We had the impression that breaches were not randomly distributed throughout the watch period but clustered into bouts. It was if, as suggested by Gore et al. (2019), that a breaching shark triggered breaching by other sharks. The mean number of breaches per hour ranged from six to 15 with a mean of around nine breaches. The inter-breach-interval (IBI) is the time between a single breach and the subsequent one within the observation area and ranged from less than a minute to a maximum of 34 minutes with a mean of 5.4 minutes. Most breaches (65.6%) were recorded within five minutes of the previous breach, while 39.8% were made within one-minute. This suggested that sharks were more likely to breach within a shorter timeframe to one another, rather than over an extended period (>5 minutes), thus sharks appeared to respond to a previous breach within a relatively small window.

Fast forward four years and imagine our surprise, and delight, when reports of multiple sharks breaching off Loop Head were again received; another opportunity to try and build on our observations during 2020. On five days between 19 September and 1 October 2024, we recorded a total of 375 Basking Shark breaches over 16 hours and 46 minutes of observation. This was at a rate of between 14

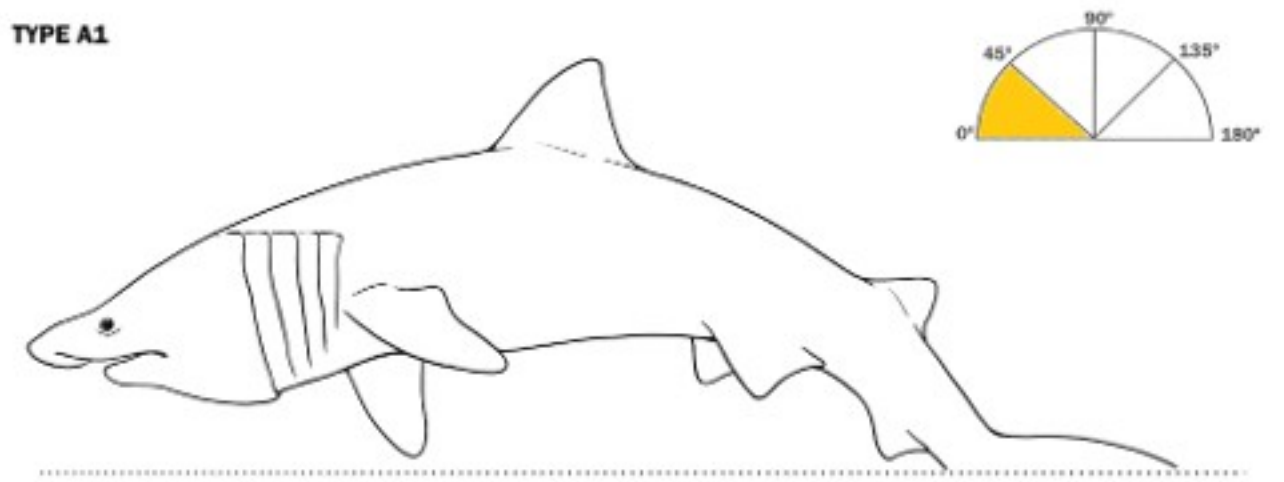


Basking Shark (*Cetorhinus maximus*) breach

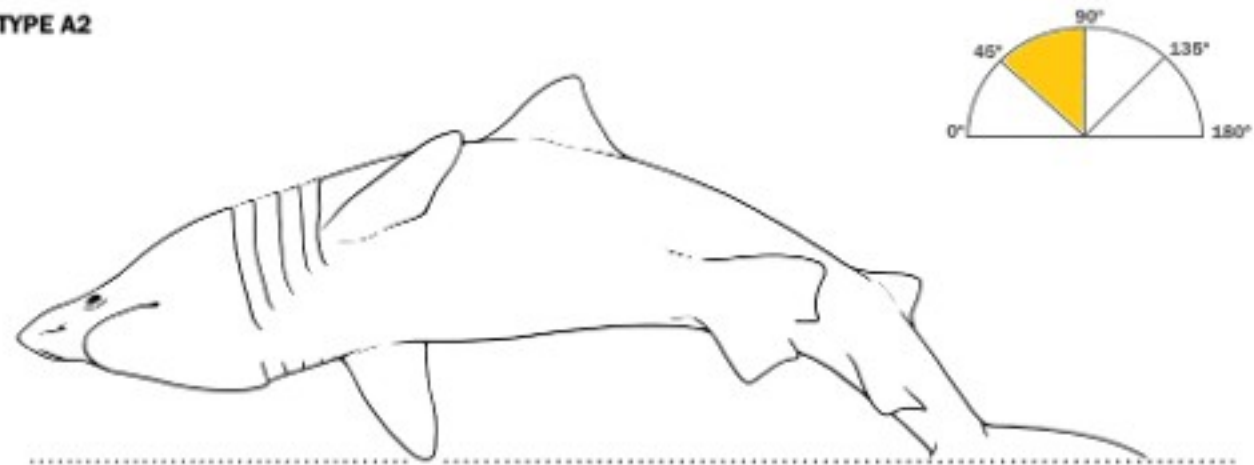
TYPE A



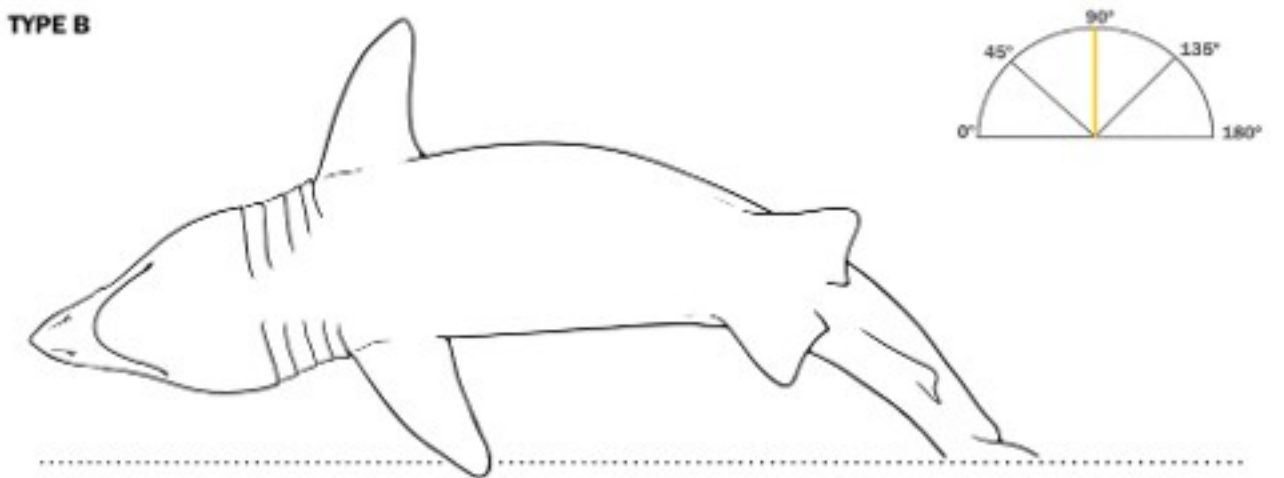
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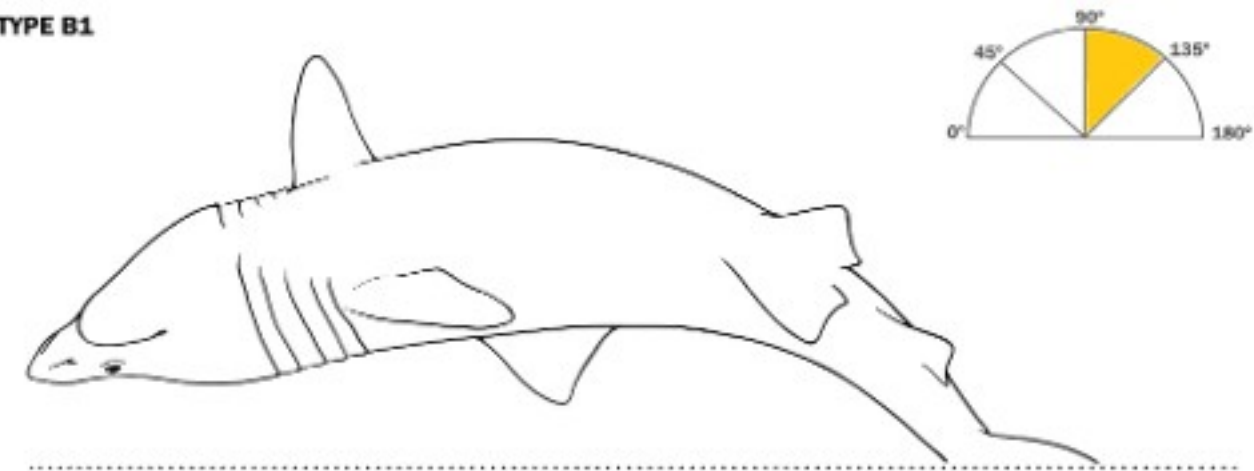
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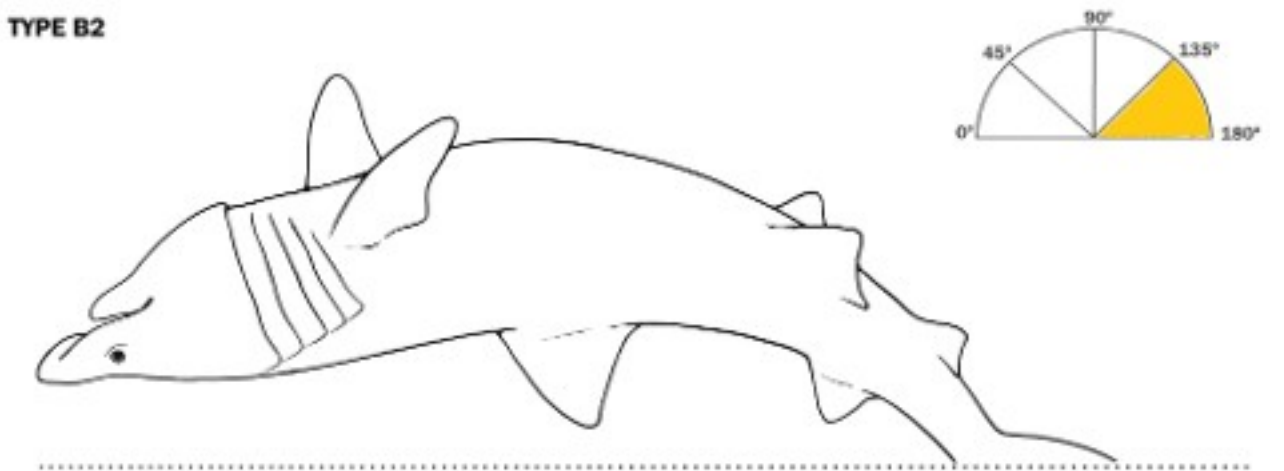
TYPE B



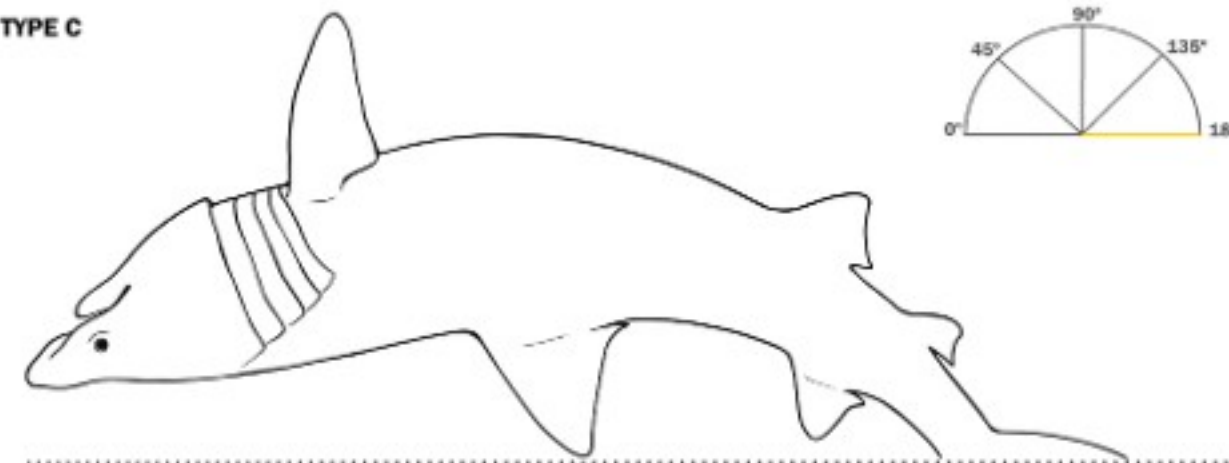
TYPE B1



TYPE B2



TYPE C





Basking Shark [*Cetorhinus maximus*] torus [July, 2024]

Photo by Simon Berrow

and 33 per hour each day, with a mean of 27.8 during the first three days before declining to 14—15 per hour on the last two days of observations.

The highest number of breaches took place within a relative short time. Most [90.5%] breaches took place within 5 minutes of the last breach, while few [7.2%] were between 5 to 10 minutes and only 2.2% between 10 to 20 minutes. Similar to 2020, breaches were clustered. The shortest interval recorded was 0 seconds (i.e., breaches were simultaneous) and the longest period between breaches was 18.1 minutes, with a mean of 2.1. Over the observation days breaching frequency was not constant, but also not random, showing a regular pattern with clear time gaps of high and low activity. Breaches were also concentrated into nominal areas with the probability of a breach within, or adjacent to the last breach being 85.4% and it remained stable across days, despite the variation in the number of breaches recorded.

Images of Basking Sharks breaching

Imagine the attention this event caused, not just locally but throughout Ireland. People were flocking to Loop Head to sit and witness one of nature’s most remarkable activities. Amateurs and professionals, DSLR cameras with massive, long lenses were trained on sharks next to android and apple iPhones, unmanned aerial vehicles flying in all directions – all trying to capture the moment for posterity or their social media. Between us and others on the headland we managed to obtain images of 61 individual shark breaches with most (>75%) showing the body of the animal clear of the water before landing.

We broke the breaching event into breach types with the most frequent breach type (Type B), where the shark lands back in the water on the lateral side of the body, witnessed in 30 breaches [46.2%]. Type A, with the shark landing on the ventral side, was recorded in five images, while Type A1 observed in 11 images and Type A2 in 12. External lampreys were observed in 24 pictures [36.9%] of which 87.5% were located in the pelvic area between the pelvic fins. For all the images where the mouth was visible [72.3%], it was never observed wide or clearly open, and the gills were not extended. For images where the genitals were clearly visible, 23 were males and 14 females, giving a sex ratio of approximately 1.6 males to each female.

The work we were able to carry out in 2024, which was once again opportunistic and ended when the weather turned and sea conditions became unfavourable for observations, was consistent with those observations from 2020. The distribution of breaches was not random but clustered to within short periods between breaches. The numbers of Basking Sharks congregated off Loop Head during this breaching activity were hard to assess but numbered in their hundreds. This activity again coincided with a period of torus activity along the west Clare coast, first recorded in July and still present in October during the breaching activity, but now all concentrated off Loop Head.

This breaching behaviour continued into 2025. We recorded 604 breaches during 14.4 hours of observations from Loop Head (a rate of 42 breaches per hour) from 11 to 15 August 2025, much earlier than in previous years. It’s likely the increased breaching rate reflects the greater number of sharks occurring at the site. Interestingly there was little torus behaviour recorded off west Clare during the autumn, but the breaching activity occurred at a rate not previously documented. We remain to analyse these new data from 2025.

Breaching activity by Basking Sharks off County Clare

Clearly, we have witnessed an incredible wildlife spectacle off west Clare in recent years. This intense breaching activity seems to be associated with the build-up of torus activity, with conservative counts of hundreds of Basking Sharks in our coastal waters.

We suggest these breaches were performed in bouts with sharks breaching in response to other sharks within the same area breaching. Both males and females breached, in similar numbers and these behaviours were associated with large gatherings of Basking Sharks in torus or other behaviours associated with courtship. The rate of breaching may reflect the number of sharks gathering in the area, but the true function remains a mystery.

Ireland has long been associated with Basking Shark hunting with the Achill Island fishery, which peaked in 1950–1954 [see McNally, 1976], being one of the best documented fisheries in the world. Basking Shark sightings have increased in Irish waters in recent years, at a time when shark sightings in formal hotspots such as the Isle of Man and Cornwall in the UK have declined. Why this should

be is not clear, but a campaign by the Irish Basking Shark Group (<http://baskingshark.ie>) since 2008 to afford Basking Sharks legal protection in Irish waters was successful in 2022 when they were added to the Irish Wildlife Act – the first new species on the Act since it was enacted in 1976.

The images of Basking Sharks in Ireland, feeding aggregations during the summer, torus formations, and this incredible breaching activity in autumn has created an enormous public interest in Basking Sharks in Ireland. National and social media is full of iconic images; social influencers are filling their platforms and hundreds of people are experiencing these incredible animals in their ocean realm. While we are still trying to understand the function of breaching in Basking Sharks, a poem published in 1852 was fully aware of this behaviour and even hints at a function!

*Ho! the Sun's shark is up since the break of day,
From the dreamy profound of the depths of the sea,
And he lies on the floor of the glittering deep,
Like a brute in the sunny Zaharas asleep.*

*And the sunbeams are flooding him over with light,
Till his black fins are golden, and briny, and bright.
And anon he rolls over in luxuried rest,
And the red beams flash back from his white-mottled crest,
And the soft waves recede as he stretches again,
O'er the pavement of light on the warm sun-warmed main.*

*But now the blue sky sends a fierce radiance seaward,
And the light winds of morn droops wingless to leeward
And the heat broils the brain of the sluggard to motion,
And he bounds in the air from his couch in the ocean,
And rainbows of spray flash resplendent around him-
The rent diamond bonds that had spell'd him and bound him.*

*Then falling like thunder, the vexed wave receives him,
And like a wild rein'd steed, upholds him and heaves him,
Till again in the air, from the main of its seething,
He plunges once more amid the sprays tinted wreathing.
Anon 1852 [from McNally, 1976]*

Sitting on Loop Head witnessing this spectacle gave us the impression that the breach ended in a loud low thud, maybe an acoustic signal to attract sharks to the area to partake in the next stage or this courtship ritual ! Mating !! We haven’t witnessed this yet and maybe this torus and breaching behaviour will not occur again in our inshore waters but occur elsewhere – further north or offshore – but while it does we will continue to try and record, admire and share these incredible experiences.

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Biographies

Dr Simon Berrow is a lecturer at the Atlantic Technological University (ATU) in Galway and founder member of the Irish Basking Shark Group. He has been attempting to tag basking sharks since 1993, achieving his first success in 2008, since when he has tagged over 400 Basking Sharks! He has shark fever.

Fátima Pérez Neira completed her MSc in Applied Marine Conservation at ATU in June 2024 and is currently diving in the Azores as project lead on Elasmobase (@elasmobaseazores)

Photo by Simon Berrow

Loop Head in County Clare
in the west of Ireland





CITES CoP20 and why it matters for shark and ray conservation moving forward

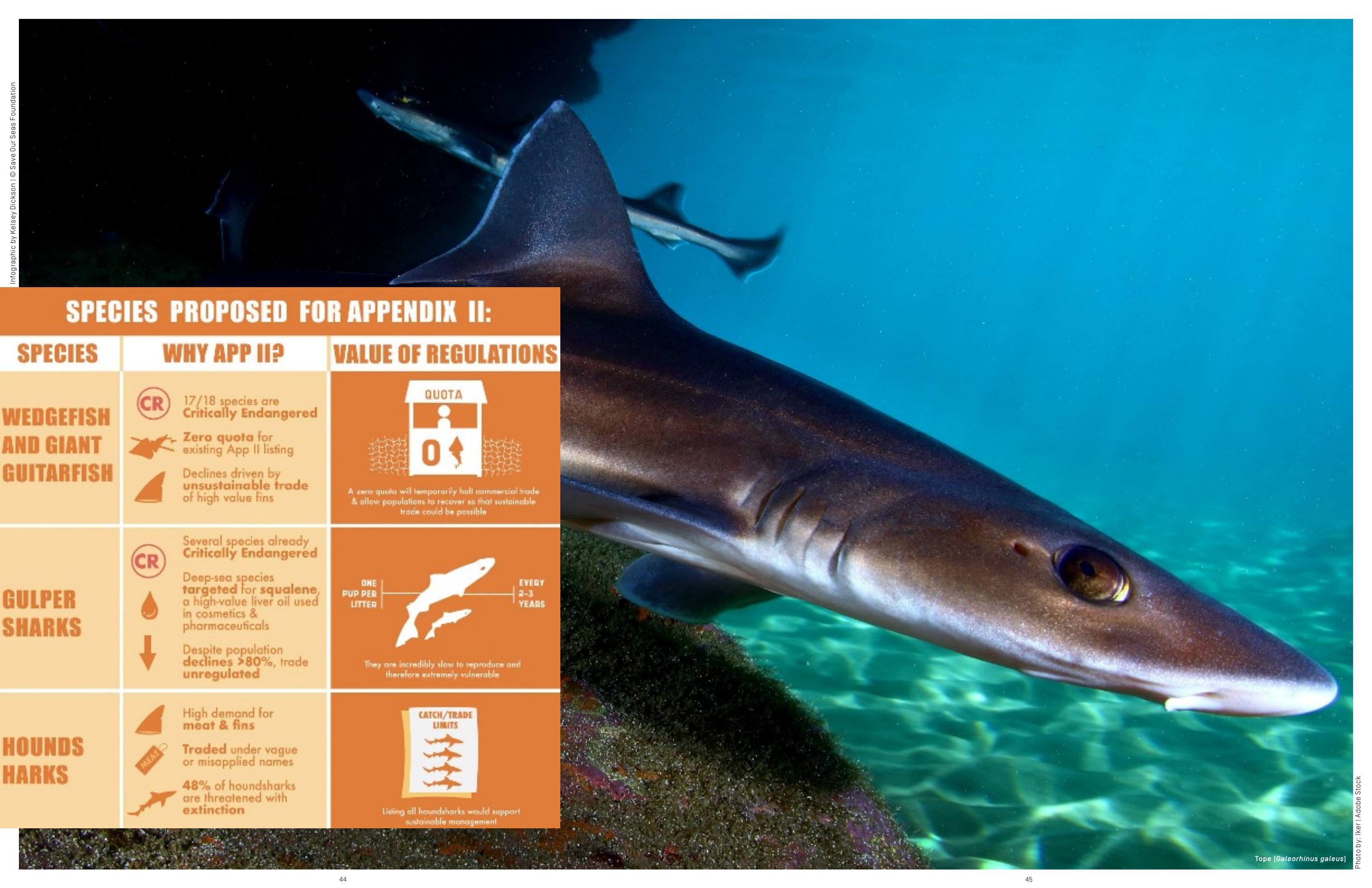
Luke Warwick
Wildlife Conservation Society (WCS) |
Director – Shark and Ray Conservation



Munk's Pygmy Devil Ray
(*Mobula munkiana*)

SPECIES PROPOSED FOR APPENDIX I:

SPECIES	WHY APP I?	VALUE BEYOND TRADE:
OCEANIC WHITETIP SHARKS	CR Critically Endangered: the world's most threatened open ocean species 70 times more fins than reported in Hong Kong markets > 95% of trade is illegal	Big sharks have big impacts on ocean ecosystems. With healthy shark & ray populations, our oceans deliver what we need to survive.
MANTA & DEVIL RAYS	> 264,000 caught annually Meat & gill plate trade has increased & adapted Steep population declines	Manta tourism is worth > US\$73 million/year directly
WHALE SHARKS	EN Endangered: needs stronger protection Fins still illegally traded into shark fin trade hubs like Hong Kong Climate change reducing feeding & breeding habitat	Tourism key for Global South countries: worth US\$140 million in 2019



SPECIES PROPOSED FOR APPENDIX II:

SPECIES	WHY APP II?	VALUE OF REGULATIONS
WEDGEFISH AND GIANT GUITARFISH	CR 17/18 species are Critically Endangered  Zero quota for existing App II listing  Declines driven by unsustainable trade of high value fins	QUOTA 0 A zero quota will temporarily halt commercial trade & allow populations to recover so that sustainable trade could be possible
GULPER SHARKS	CR Several species already Critically Endangered  Deep-sea species targeted for squalene, a high-value liver oil used in cosmetics & pharmaceuticals  Despite population declines >80%, trade unregulated	ONE PUP PER LITTER  EVERY 2-3 YEARS They are incredibly slow to reproduce and therefore extremely vulnerable
HOUNDS HARKS	 High demand for meat & fins  Traded under vague or misapplied names  48% of houndsharks are threatened with extinction	CATCH/TRADE LIMITS  Listing all houndsharks would support sustainable management

Tope (*Galeorhinus galeus*)

CITES CoP20 was held from the 24th November to the 5th of December, 2025, in Samarkand, Uzbekistan. Despite this landlocked location, the meeting made significant decisions on shark and ray conservation – including many that indicate an encouraging change in government’s thinking when it comes to how we should approach the conservation of the world’s sharks and rays.

What is CITES?

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species. CITES was drafted as a result of a resolution adopted in 1963 at a meeting of members of the International Union for Conservation of Nature – IUCN (known as The World Conservation Union back then). The text of the Convention was finally agreed at a meeting of representatives of 80 countries in Washington, D.C., United States of America, on 3 March 1973, and on 1 July 1975 CITES entered in force.

Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation. Today, CITES accords varying degrees of protection to more than 37,000 species of animals and plants, whether they are traded as live specimens, fur coats, fins, or dried herbs. Its two main appendices either offer a full commercial trade ban (Appendix I) or trade regulation steps that limit trade to levels judged to be legal and sustainable (Appendix II).

CITES is an international agreement to which States adhere voluntarily. States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties. For many years CITES has been among the conservation agreements with the largest membership, now having 184 Parties.

The Convention recently celebrated its 50th birthday and held its 20th Conference of the Parties (CoP) – its key decision making meeting – but is it doing enough to protect the worlds sharks and rays from extinction?

What has CITES done to date for sharks and rays?

Over the last 20 years, CITES has progressed from almost no regulation of the global trade in shark and ray products, to a point where in the run up to CoP20 around 90% of the shark fin trade has been brought under CITES listing – with 150 species of shark and ray listed. Almost all of those listings have been on Appendix II, with only sawfish (family Pristidae) listed on Appendix I – sadly after their populations were all but gone in much of their historic range and they no longer appeared in shark fin trade records.

What was on the table for CoP20?

The seven shark and ray proposals submitted by Parties for consideration at CITES CoP 20 covered over 70 species. This included Appendix I listing proposals (full commercial trade bans) for all manta and devil rays (Mobulidae), the Whale Shark (*Rhincodon typus*), and Oceanic Whitetip Shark (*Carcharhinus longimanus*); ‘zero quota’ measures that in practice would also apply a full commercial trade ban for wedgefish (Rhinidae) and giant guitarfish (Glaucostegidae); and Appendix II listings to limit trade in gulper sharks (Centrophoridae), smoothhound (*Mustelus* spp.), and Tope (*Galeorhinus galeus*) to sustainable levels.

The CITES CoP20 considered a series of firsts. This was the first time proposals have been considered by CITES Parties to list regularly traded species on Appendix I or issue zero quotas – both steps that ban commercial trade. CITES has also focused mainly on species traded for

their fins over the last two decades, but at the CoP20, the Appendix II proposals focused on species principally traded for their oil and meat.

This combination of proposals showed a growing appreciation of the need for the strongest protection for some sharks and rays, and that CITES should consider the wide range of trade threats these species face.

And what happened?

Marine species listings have been highly controversial at CITES since the Conventions’ inception 50 years ago. Many of the shark and ray listings that have been adopted in the past two decades were only just agreed by CITES Parties – most passed by one or two votes (2/3 of the CITES Parties need to vote yes for a species to be listed, setting a high bar).

However, at CoP20 all seven proposals covering more than 70 species were adopted, several by consensus (with no vote even needed), and those that were forced to a vote passed by margins of more than 20 votes. This is a significant change, especially given the elevated level of protection these proposals create – showing that after several decades of dedicated work by Parties, scientists and advocates, sharks and rays are starting to become far less of a controversial issue within CITES.

This is hugely encouraging. Given the biology of sharks and rays and the declines so many species are suffering, building this recognition and political buy-in that sharks and rays cannot be exploited without safeguards, and that the most threatened species shouldn’t be exploited at all is significant. This shift to shark and ray listings on CITES being less politically controversial to so many of the world’s governments bodes well for the change we need to see for these species in the coming decades.

These listings increase the percentage of the shark and ray fin trade covered by CITES from 90% to 96% in terms of species found in trade, with over 50% of the species found in the shark meat trade also now covered by CITES listings. Increasingly, if anyone commercially trades any valuable shark or ray product globally, they need to be accompanied by CITES permits underpinned by sustainability assessments.

What happens next?

Recent papers show two somewhat conflicting stories – Cardenosa et al. (2025) clearly shows widescale non-compliance with existing CITES listings, albeit it was before the recent activation of formal CITES compliance action for the first time. But in work conducted during the same time period, Bond et al. (2025) clearly show the same CITES listings driving better national and local shark and ray management measures in multiple countries. Both of these studies are accurate and together show that while there are positive signs in some locations, in others, far more is needed to turn CITES shark and ray listings into national and local level protections or fisheries management measures, and that is where work must now focus.

A wide range of tools are available to the Governments who supported these listings to take that crucial next step– from identification guides, genetic ID kits, to fishery sustainability tools and most are freely available online: citessharks.org

In conclusion

CITES CoP 20 was clearly a huge success for sharks and rays, and those that work to prevent their extinction – but it is also just one step towards the change that is needed to save these species.

Continued CITES focused shark and ray work – via additional listings where needed, paired to strong enforcement and effective national and local level action can help secure the rapid shark

and ray mortality reductions we need to see globally. But this work will only deliver those goals via a renewed focus on how best to effectively and equitably implement and enforce these international measures at the point of catch and trade.

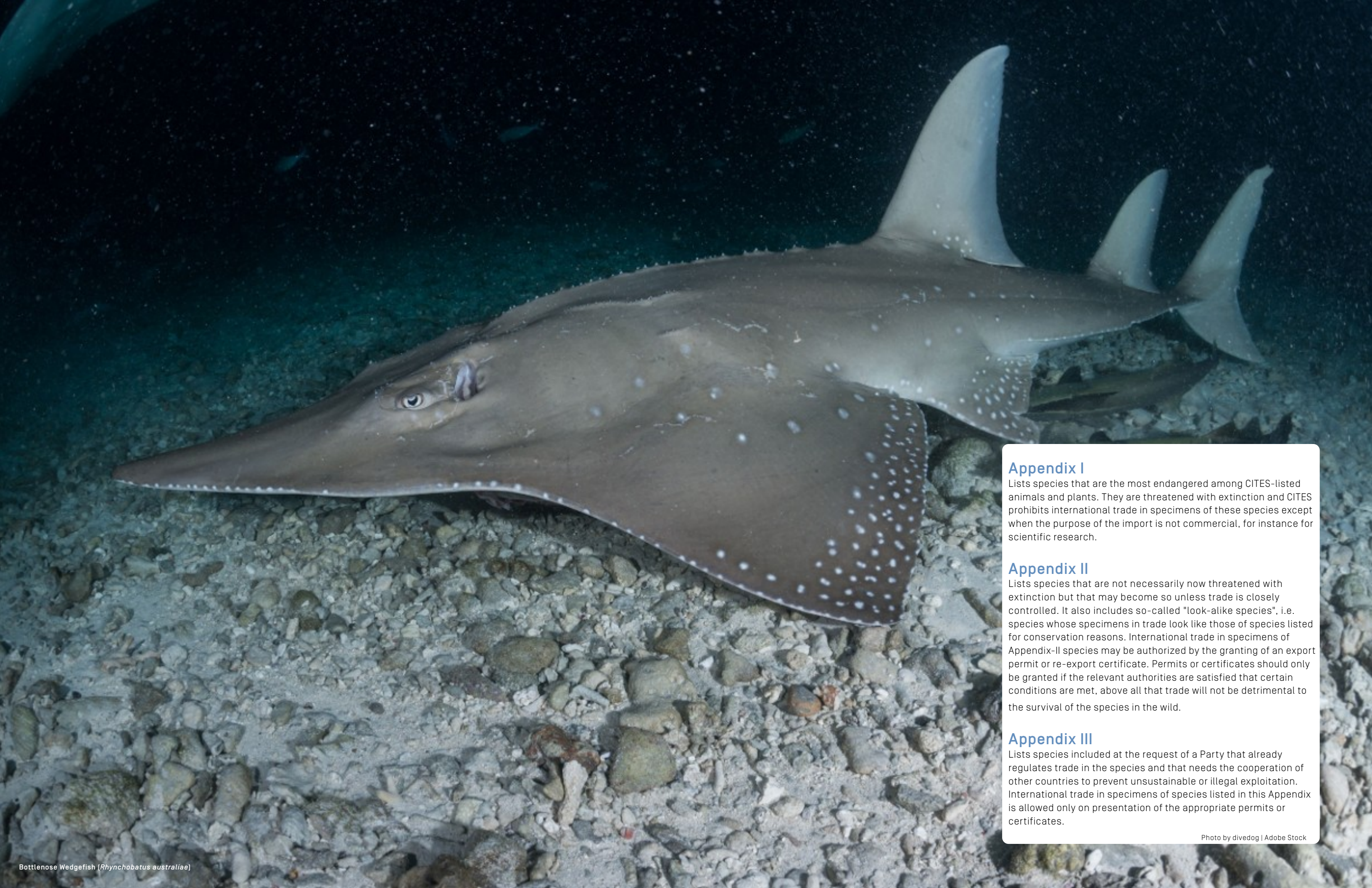
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Photo by: Gregory Piper | Ocean Image Bank | theoceanaagency.org



Bottlenose Wedgefish (*Rhynchobatus australiae*)

Appendix I

Lists species that are the most endangered among CITES-listed animals and plants. They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial, for instance for scientific research.

Appendix II

Lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e. species whose specimens in trade look like those of species listed for conservation reasons. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate. Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild.

Appendix III

Lists species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation. International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates.

Photo by divedog | Adobe Stock

CITES Conference of Parties 20

PROPOSAL 28 Uplist Oceanic Whitetip Sharks (*Carcharhinus longimanus*) from **Appendix II** to **Appendix I**

ADOPTED

>83% of Parties in favor



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 29 List **Tope** (*Galeorhinus galeus*) and **Smoothhounds** (*Mustelus* spp.) in **Appendix II**

ADOPTED

Parties accepted by consensus
Delay of implementation by 18 months



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 32 Add "A zero annual export quota for wild-taken specimens traded for commercial purposes" annotation for **Giant Guitarfish** (*Glaucostegus* spp.)

>82% of Parties in favor

ADOPTED



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 33 Add "A zero annual export quota for wild-taken specimens traded for commercial purposes" annotation for **Wedgefishes** (*Rhinidae* spp.)

ADOPTED

85.5% of Parties in favor



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 30 Uplist **Mantas and Devil Rays** (*Mobulidae* spp.) from **Appendix II** to **Appendix I**

ADOPTED

Parties accepted by consensus



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 31 Uplist **Whale Sharks** (*Rhincodon typus*) from **Appendix II** to **Appendix I**

ADOPTED

Parties accepted by consensus



IUCN SSC Shark Specialist Group

CITES Conference of Parties 20

PROPOSAL 34 List **Gulper Sharks** (*Centrophoridae* spp.) in **Appendix II**

ADOPTED

>85% of Parties in favor
Delay of implementation by 18 months



IUCN SSC Shark Specialist Group



Angelsharks:

Eva Meyers

Angel Shark Project
IUCN SSC Shark Specialist Group |
Regional Vice co-Chair | Northern Europe

Andrea Pauly

The Convention on the Conservation
of Migratory Species (CMS) Sharks
Memorandum of Understanding (MOU)

John Carlson

IUCN SSC Shark Specialist Group |
Regional Vice co-Chair | North America

A Convention of Migratory Species (CMS) Success Story

The Convention on the Conservation of Migratory Species of Wild Animals (CMS) is a legally-binding global intergovernmental treaty under the United Nations Environment Programme (UNEP) that aims to conserve migratory species and their habitats worldwide across their entire ranges. The Convention was signed in 1979 in Bonn, Germany and entered into force in 1983. The Convention provides a platform for ‘Range States’ (countries through which migratory animals pass) to coordinate conservation measures internationally. This is vital because threats in any one part of a species’ migratory range can affect a large portion of its population. The Convention currently has over 130 members and covers both terrestrial and aquatic migratory species. Within the CMS Convention there are several ‘daughter agreements’ that focus on specific species or regions. These agreements can take various forms, from legally binding treaties to less formal Memoranda of Understanding (MOUs) and are designed to be flexible and adapted to local needs.

The Memorandum of Understanding on the Conservation of Migratory Sharks (Sharks MOU) is one such daughter agreement under the CMS. It represents the only global instrument specifically dedicated to the conservation of migratory species of sharks, rays, and chimaeras (herein referred to collectively as sharks). Since its establishment in 2010, the Sharks MOU has been signed by 48 States, the European Union (EU), and 15 cooperating partners. The main objective of the Sharks MOU is to “achieve and maintain a favourable conservation status for migratory sharks included in its Annex 1 based on the best available scientific information...”

Sharks listed on Appendices I and II of the larger CMS, are not automatically included in Annex 1 of the Sharks MOU. However, they are automatically considered by the Sharks MOU Signatories for inclusion in the MOU. Consistent with the criteria for the inclusion of species in CMS, Sharks listed on the MOU shall have an ‘unfavourable’ conservation status and which require international agreements for their conservation and management, as well as those which have a conservation status which would significantly benefit from the international cooperation. In line with species listed on the MOU are Conservation Action Plans which aim to improve research, fisheries management, habitat protection, public awareness, and cooperation at national and international scales. Prior to inclusion on the Annex, all proposals are subject to review by the Advisory Committee to the CMS Sharks MOU. This committee includes representatives from various regions to guide the Secretariat and Signatories on implementation, scientific assessments, and the conservation status of listed shark species.

The Angelshark (*Squatina squatina*) has been depleted throughout much of its historical range over the past century and is listed as Critically Endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Morey et al., 2019). Due to its poor conservation status, the Mediterranean population of Angelshark was proposed and listed on Appendices I and II of CMS along with a Concerted Action Plan in 2017. Following the listing in the CMS Appendices, the Government of the Principality of Monaco proposed the Angelshark for listing in Annex I to the Sharks MOU at the 3rd Meeting of Signatories (MOS3) in Monaco, 2018. While there were some initial differences in the interpretation on the ‘migratory status’ and its alignment with the criteria for ‘migratory’ that was determined by the Advisory Committee, at MOS3 after further consultation with the Advisory Committee consensus was reached and all Signatories agreed to its listing on Annex 1. This decision was supported by evidence of transboundary movement, the species’ critical status, and the necessity of international cooperation. The agreement by the Signatories illustrated the commitment of the Parties to the conservation of Angelshark.

Bordered by more than 20 countries and territories, each with its own rich cultural and political landscape, the Mediterranean is a complex region. This diversity is part of what makes the region so fascinating, but it also presents major challenges for managing shared marine resources. Thanks to their CMS listing, Angelsharks are now within the mandate of countries to collaborate on shared conservation action. A dedicated Single Species Action Plan (SSAP) for the Angelshark in the Mediterranean was developed by the CMS Sharks MOU Advisory Committee with support from the Angel Shark Conservation Network. The goal of this plan is to strengthen coordination, harmonisation, data collection, conservation, and management efforts for the Angelshark across its Mediterranean range.

The groundwork for this SSAP can be traced back to a decade of coordinated research in the region and a collaborative Regional Action Plan for three Mediterranean angel shark species (Squatinidae family) (i.e., Sawback Angelshark – *S. aculeata*, Smoothback Angelshark – *S. oculata*, and Angelshark) was produced in 2019 by the Angel Shark Conservation Network (Gordon et al., 2019). That plan organised recommended actions under three overarching goals:

1. Establish, implement, and enforce national legislation for angel sharks;
2. Minimise fisheries-related mortality throughout the Mediterranean; and
3. Identify and protect critical angel shark habitats.

While the presence of angel sharks was long uncertain across much of the Mediterranean, long-term research efforts, for example conducted by the Angel Shark Project, has shed new light on these elusive species. Efforts such as Local Ecological Knowledge studies in Greece, market surveys in Libya, acoustic tagging in Corsica, and knowledge transfer from long-term research in the Canary Islands (Spain), alongside work led by numerous organisations in countries including Türkiye, Tunisia, and Cyprus, have helped identify critical habitats, key threats, and significant ecological insights. This coordinated, data-driven approach has not only filled major knowledge gaps but also established a strong foundation for informed, targeted conservation actions across the region. Building on this foundation, CMS Parties are now encouraged to undertake more targeted work focused specifically on the Angelshark to advance the Concerted Action for the species in the Mediterranean Sea. Priority areas include:

- Species protection;
- Identification of Critical Angel Shark Areas (CASAs) and the potential development of spatial management measures;
- Scientific research and data collection; and
- Securing additional financial and logistical resources.

The development of the SSAP did more than produce a conservation blueprint, it actively united Mediterranean Range States. Countries and appointed experts from across the region collaborated to shape and endorse the plan before it was presented at CMS 14th Conference of Parties (CoP14) in Samarkand, Uzbekistan, where it received official adoption by the Parties. Alongside this milestone, Parties also agreed to establish an International Working Group, creating a dedicated forum for coordinating and guiding the SSAP implementation. Operating under an agreed governance structure and a formal work plan, the Working Group held its first online meeting in April 2025, an early

and encouraging sign of the plan moving swiftly into action. During this meeting, Range States and expert advisers reviewed the latest understanding of Angelshark status in the Mediterranean, their distribution and critical habitats. Participants also examined how these key areas overlap with Marine Protected Areas (MPAs) and Important Shark and Ray Areas (ISRAs), and explored ways to strengthen area-based management for the species. According to the Spatial Advice Document (Meyers et al., 2025) discussed during the meeting, only 2% of identified ISRAs for angel sharks currently fall within an MPA that has a fully or partially implemented management plan. The analysis highlights clear opportunities to enhance spatial protection and provides targeted guidance for improving MPA coverage and effectiveness for Angelsharks across the region. A key recommendation emerging from the Working Group discussions urges Range States to work toward having at least 10% of ISRAs covered by MPAs with fully implemented management plans. At the time of writing, these recommendations are still under review by the Range States as they assess their feasibility and next steps.

Finally, the Working Group is collaborating closely with the Angel Shark Conservation Network and its partners to develop practical tools and guidelines for implementing the SSAP. These resources

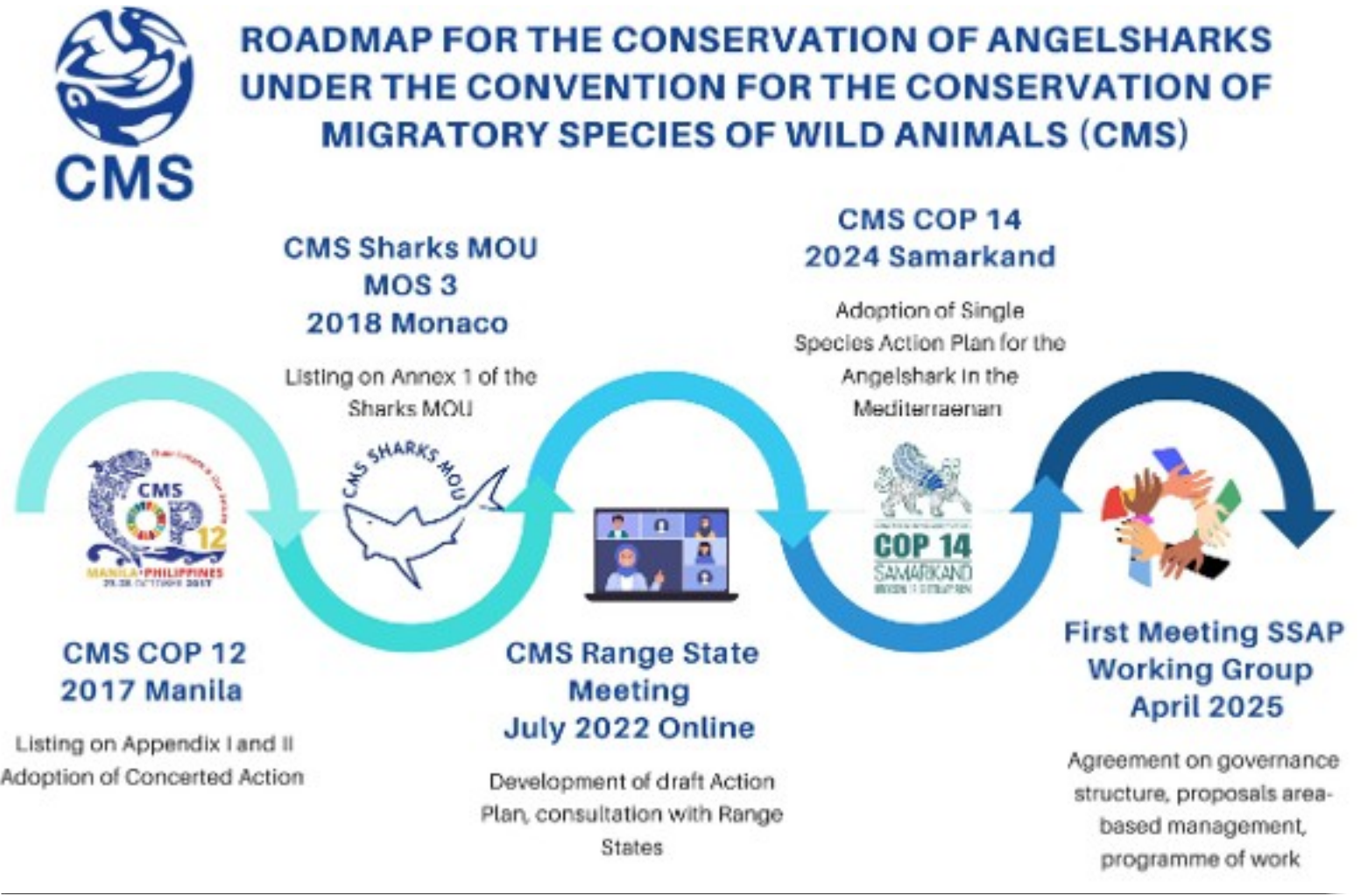
include identification guides, safe-handling protocols to reduce fisheries mortality, reporting platforms, and data management and communication tools.

Taken as a whole, this process represents a powerful example of how science, community, and policy can come together in a diverse region. Angelsharks are serving as an umbrella species for international cooperation, driving coordinated action that benefits not only themselves but also other co-occurring species and their habitats. This collaborative model offers a success model for conservation efforts that could be replicated elsewhere.

Find out more here: www.cms.int/species/squatina-squatina



Andrea Pauly provides an outline of the Terms of Reference to the Signatories in Monaco, 2018 at the 3rd Meeting of the Sharks MOU (MOS3)





Hilary Lewis

Research School of Earth Science, College of Science,
Australian National University, Canberra, Australian Capital Territory 2601,
Australia; Centre for Sustainable Tropical 2 Fisheries and Aquaculture,
James Cook University, Townsville, Queensland 4811, Australia

Brandon Mahan

Melbourne Analytical Geochemistry, School of Geography, Earth and
Atmospheric Sciences, The University of Melbourne, Victoria 3010, Australia

Michael Grant

Centre for Sustainable Tropical 2 Fisheries and Aquaculture, James Cook
University, Townsville, Queensland 4811, Australia; Faculty of Marine Science
and Fisheries, Hasanuddin University, Jl. Perintis Kemerdekaan Km.
10 Tamalanrea, Makassar 90245, Indonesia

*Proof of concept: Age
validation through isotopic
signatures in vertebrae*

Neonate Speartooth Shark
[*Glyphis glyphis*] held by researcher
during field surveys in remote
Northern Territory, Australia

Importance of age estimation

Reliable age and growth estimates help determine the propensity of species to tolerate additional mortality (such as incidental capture), sustainable harvest strategies, populations recovery times, and generation lengths for species assessment. However, obtaining accurate estimates of age is a maligned field and only a handful of the more than 1,270 species of sharks, rays, and chimaeras (hereafter ‘sharks’) have been reliably aged. With more than 37% of shark species now considered threatened with extinction on the IUCN Red List of Threatened Species, there is a need for robust age estimation to accurately assess species extinction risk, and to develop fisheries management initiatives and conservation plans that can stabilize declines and rebuild populations (Jabado et al., 2024).

A growing conjecture

Traditional methods of ageing sharks involve examination of alternating light (transparent) and dark (opaque) optically visible bands in calcified hard structures known together as ‘band pairs’. This is often considered an analogous approach to that used in teleost fish age estimation through otoliths. In ideal circumstances, these visible band pairs need to be proven to be deposited in a consistent temporal periodicity, referred to as ‘validation’. This most commonly involves mark-recapture methods, where individuals are injected with a chemical marker (such as Oxytetracycline), and visible band pairs are examined after recapture following a known time at liberty. When individuals over a range of life phases (i.e., juvenile, sub adult, adult) consistently show corresponding visible band pair formation, the periodicity of their formation is validated. While this method is sound, in practice it is difficult to robustly employ. Time and cost inputs are high, and for species with wide habitat ranges, severe population depletions, or are protected, mark-recapture methods become problematic. As such, the periodicity of visible band pair formation is often presumed to be annual due to the limited number of validation examples.

Existing age validation studies directly linking visible band pair formation to seasonal growth are limited and constrained by taxonomic biases and sample sizes that are life-stage biased (often towards immature size classes). As such, age estimation that vests in assumptions of an annual periodicity of visible band pair formation are variably precarious. Another factor is the optical visibility of band pairs. Whether hard structures within a species contain visible band pairs depends on species morphology, hard structure preparation, and ambient environmental conditions. When present, human-ager experience and interpretation bias are additional factors of consideration. Sharks from tropical or deepwater regions, with a lack of pronounced seasonality, often show faint, irregular, or a complete absence of bands (Burke et al., 2020). As such, the technique of counting visible band pairs in sharks is not uniformly applicable. Older sharks present further issues with band interpretation, as they slow in growth following maturation, consequently bands become compressed and may ultimately become impossible to distinguish.

Further study into formation of bands has indicated that there is perhaps a structural morphometric function to bands, suggesting they are more indicative of somatic growth, challenging assumptions of temperature influence in their formation (Natanson et al., 2018). The evidence base towards these issues has increasingly been recognized over the past two decades, highlighting the ‘forgotten’ need to validate band pairs used for age estimation, and the need for alternative methods to validate ages in sharks.

Geochemical characterisation

Researchers have begun exploring whether the chemistry within biologically inert, concentrically formed vertebrae could indicate age, using long-standing techniques developed and applied in geosciences. The cartilage of sharks and rays are made of apatite minerals (specifically hydroxyapatite, a mineral formed of calcium, phosphate, carbonate, and organic matter (primarily amides)). During growth, the biologically inert apatite mineral incorporates trace elements from the ambient environment, ultimately recording the environmental conditions in which the shark lived.

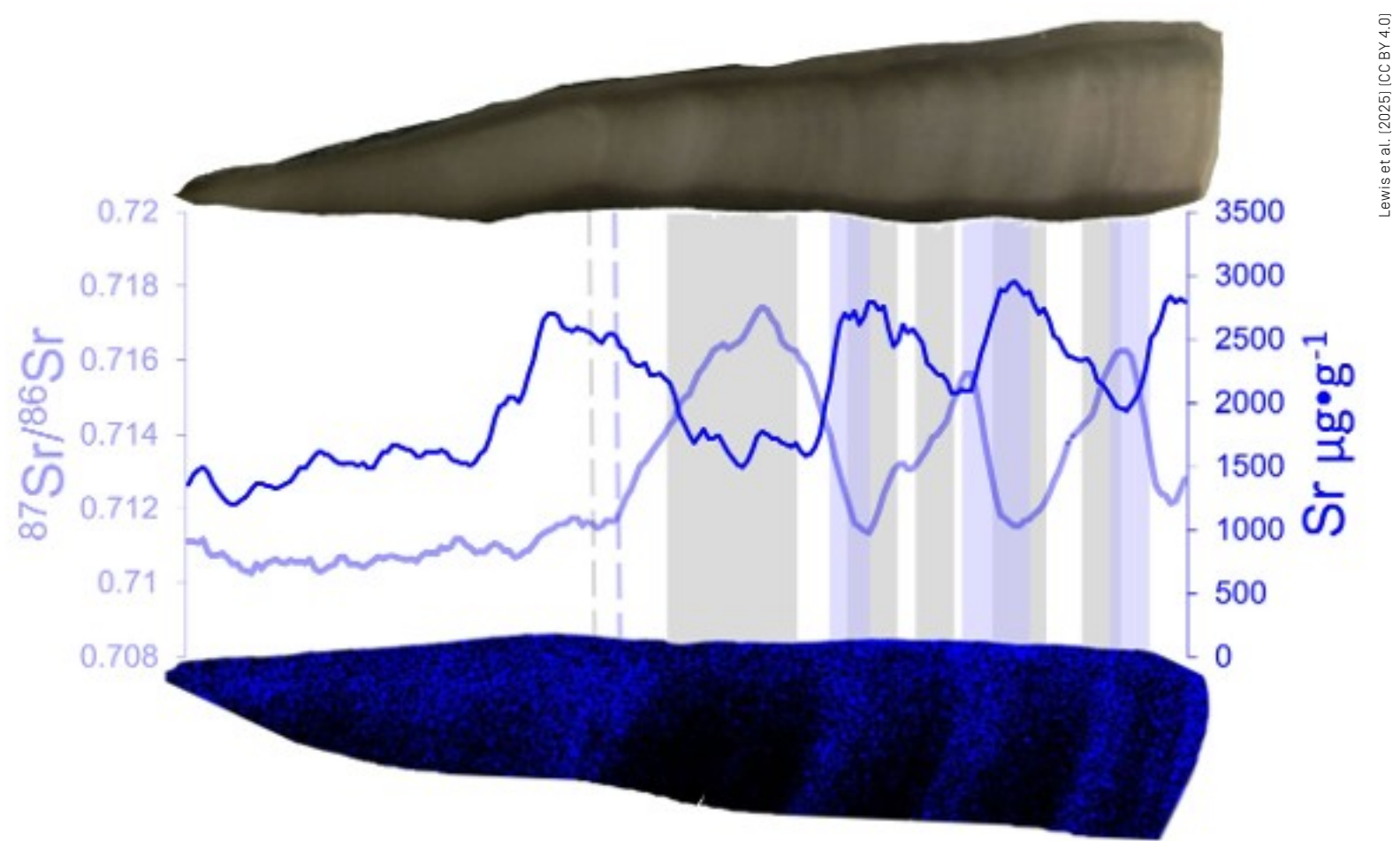
Among the elements incorporated into the apatite matrix, Strontium (Sr) is a particularly promising element for application to age. Its incorporation into the apatite matrix is passive, meaning that its substitution for calcium is dependent on the abundance of Sr in the ambient environment, and its uptake is not metabolically mediated. Therefore, the radiogenic strontium isotopic signature—the ratio between the heavier ⁸⁷Sr isotope and the lighter ⁸⁶Sr isotope (⁸⁷Sr/⁸⁶Sr) — reflects the body of water the shark inhabits during the time of apatite formation. In riverine environments, the ⁸⁷Sr/⁸⁶Sr of the water body is based on the geology of the catchment. In periods of rainfall, the ⁸⁷Sr/⁸⁶Sr of the catchment geology is reflected in terrigenous runoff into rivers, meanwhile the ocean has a homogenous single ⁸⁷Sr/⁸⁶Sr. This means that the radiogenic strontium isotope ratio typically varies between fresh and marine waters, and changes in ⁸⁷Sr/⁸⁶Sr within rivers can additionally be detected based on varied temporal precipitation. Importantly, because the ⁸⁷Sr/⁸⁶Sr is a radiogenic isotope ratio, it does not change during physical and chemical processes the way that stable isotope ratios do.

We hypothesized that if these environmental radiogenic strontium isotope changes occur predictably every year. For example in a region and river basin with a well-known annual precipitation pattern, then this isotopic ratio can provide a chemical ‘timestamp’ within vertebrae, allowing quantification of an individual’s lifetime wet and dry season chronology. This principle has been applied to teleost otoliths, but until recently, had not been applied to shark hard structures.

To explore this hypothesis, we examined vertebrae from the Speartooth Shark (*Glyphis glyphis*) population in the Adelaide River. The Adelaide River in Northern Territory, Australia, provided an ideal location due to two primary factors. Firstly, the region experiences distinct seasonality of wet and dry seasons, with approximately 1,700 mm rainfall annually within a discrete confined wet season, and virtually no rainfall within its dry season. Secondly, the region has a particularly radiogenic strontium isotope signature of its local geology, meaning the ⁸⁷Sr/⁸⁶Sr ratio is far removed from the global marine average.

To examine Sr, we used a double proxy approach. X-ray fluorescence maps were used to measure concentration of Sr along the growth axis and laser ablation inductively coupled plasma mass spectrometry was used to measure changes in Sr isotopic ratio along the growth axis. We found that strontium concentration banding patterns differed to the traditionally counted visible bands in position, and often in number of bands present. Furthermore, these strontium bands contained differences in the Sr isotopic ratio. Bands with a higher concentration of Sr had an ⁸⁷Sr/⁸⁶Sr ratio closer to marine, while bands with a lower Sr concentration had a higher ⁸⁷Sr/⁸⁶Sr ratio, indicative of increased precipitation influence.

Considering the external measure of temporal rainfall, and its well-founded relationship to the radiogenic Sr isotopic ratio, we determined that each pair of strontium bands corresponded to an annual growth increment. This finding provides a ‘proof of concept’ that chemical markers can provide a time-anchored record of growth, independent of visual band pairs conventionally used.



What this means for ageing sharks

For species living in environments with temporally defined, and predicable chemical changes, this approach of quantifying such changes carries the prospect of revolutionising how ages are validated in sharks. Further, this method has potential to confirm annual events in species that lack discernible visible band pairs, contingent on vertebrae growing concentrically and continuously, which is our present understanding, at least to sexual maturity. Future work investigating other elemental and isotopic systems that are temporally defined will further refine this approach beyond non-marine sharks and rays.

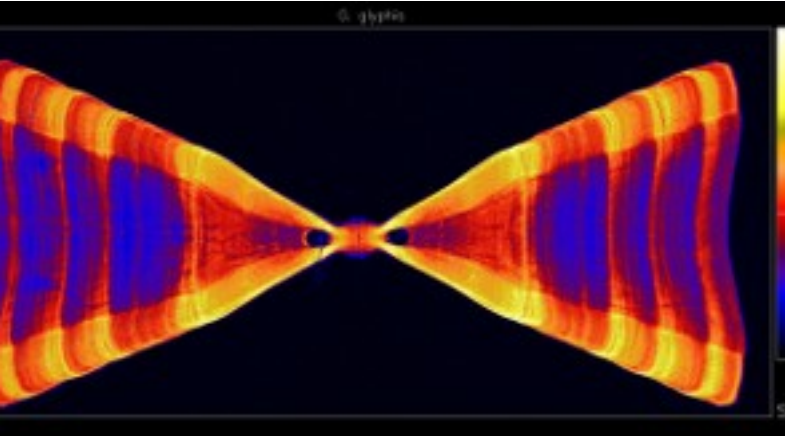
Full article

Lewis, H., Grant, M., Alard, O., Kyne, P., Huang, H.-Q., Gréau, Y., Harry, A., Johnson, G., Kirke, A. & Mahan, B. 2025. Challenging traditional methods of age estimation: elemental and isotopic characterisation of speartooth shark *Glyphis glyphis* vertebrae. *Marine Ecology Progress Series*, 771, 105–121. doi.org/10.3354/meps14986

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Speartooth Shark (*Glyphis glyphis*) strontium isotope data, optical microscope image (top) and X-Ray Fluorescence map (strontium intensity) (bottom) with bands identified



X-Ray Fluorescence Strontium intensity map showing high strontium banding (yellow) undertaken on the XFM beamline at the Australian Synchrotron, part of ANSTO

Photo by Hilary Lewis

The Important Shark and Ray Areas of the European Atlantic

Written by
Ryan Charles

IUCN SSC Shark Specialist Group |
Important Shark and Ray Areas |
Research Assistant

The Important Shark and Ray Areas (ISRA) project, an IUCN SSC Shark Specialist Group initiative, has been successful in the first eight global regions that have been investigated, with over 700 ISRAs identified across the Central and South American Pacific, the Mediterranean and Black Seas, the Western Indian Ocean, Polar Waters, Asia, New Zealand and Pacific Islands, South American Atlantic, and South American Inland Waters. In May 2025, we put sharks, rays, and chimaeras on the map for the European Atlantic. How did we do?

The European Atlantic region was the ninth of thirteen regions to be investigated. The ISRA team hosted a regional expert workshop in Den Haag, The Netherlands, from 17–21 May. The best available science [such as local ecological knowledge and peer-reviewed scientific articles] was collated at the workshop, which facilitated conversations between the contributors. This was crucial in developing representative proposals of areas that may meet the ISRA Criteria – including the definition of accurate spatial boundaries.

In total, 25 experts contributed to the process in-person. The result of this international effort was the delineation of 124 ISRAs – the first of the region. Five areas remained as candidate ISRAs, which will benefit from ongoing research that may help define their importance over the year or so [until we wrap up the project!]. Also, 30 Areas of Interest (Aols) were mapped to highlight areas for potential future investigation. ISRAs in this region range in size from small areas of 0.09 km² [Wembury Bay in the United Kingdom of Great Britain and Northern Ireland] to large movement areas which cross numerous jurisdictions [e.g., the Northeast Atlantic Corridor ISRA, with an area of 1,482,885 km²]. ISRAs were delineated for a range of depth ranges, including shallow bays [0–4 m], offshore locations [0–3,300 m], and completely sub-surface habitat [200–1,500 m].

All of these areas have been uploaded to the ISRA e-Atlas, where they can be viewed and interacted with alongside all ISRA delineations in each investigated region. This e-Atlas can be filtered to display ones specific to your requirements or interest. For example, you can choose to only see areas within certain countries, for specific species, delineated under particular criteria, and more. Each ISRA has a unique factsheet, which details the

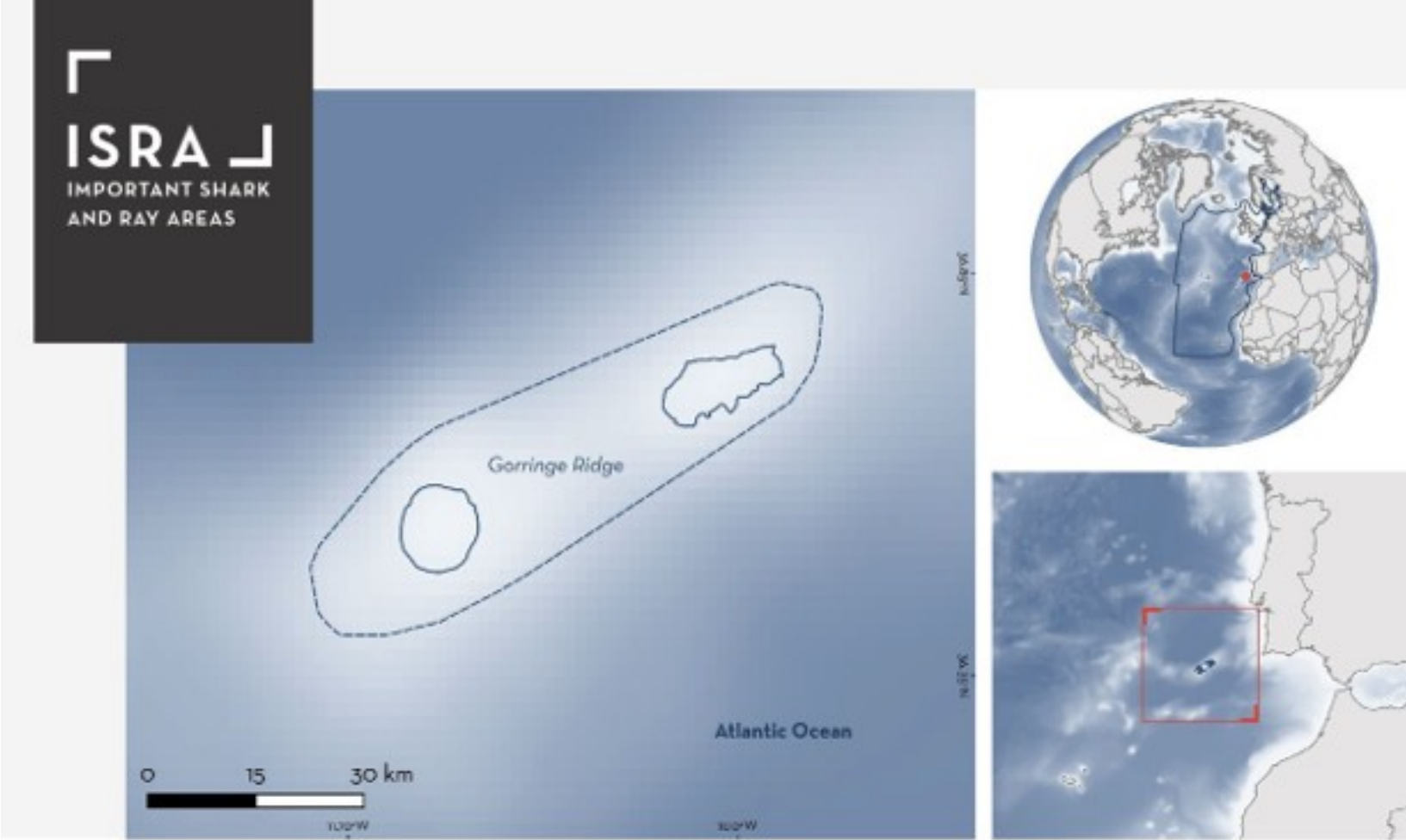
species, ISRA Criteria met, and geographic information. The recently published 'European Atlantic: A Regional Compendium of Important Shark and Ray Areas' contains all the respective regional factsheets, collating all the regional information at the jurisdictional level. This is free to download from the ISRA website [sharkrayareas.org] to ensure the information is available to everyone, including scientists, policy makers, and the general public.

Every ISRA criterion was applied to delineate critical shark, ray, and chimaera habitat in the European Atlantic. This means that some delineated areas were mapped for species threatened with extinction [e.g., Angelshark *Squatina squatina*] as well as some range-restricted species [e.g., Cape Verde Skate *Raja herwigii*]. Regular and predictable observations were used to demonstrate the importance of areas for reproductive purposes, resting, feeding, movement, and undefined aggregations. Other areas had special attributes, such as having a high species diversity [such as the Sardina ISRA for 16 Qualifying Species] or had distinct features. For example, the Marbled Torpedo Ray (*Torpedo marmorata*) exhibits a globally distinct behaviour in Gorringe Ridge ISRA in Portugal, where hundreds of (mostly pregnant) individuals aggregate and stack on top of each other.

At the time of writing, the ISRA team have worked with international experts to map 816 ISRAs, 29 candidate ISRAs, and 134 Aols in nine regions of the world. The team is currently coordinating with previous contributors to discuss the level of information that has become available for previously delineated candidate ISRAs. Further, it is currently finalising the proposals made for areas within the Australia and the South-East Indian Ocean region. Earlier in March, the ISRA team held a workshop for the North American and Caribbean Atlantic and North American Pacific regions – the eleventh and twelfth regions to be investigated. Nearly all of the known important areas have been put on the map!

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Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

GORRINGE RIDGE ISRA

European Atlantic Region

SUMMARY

Gorringe Ridge is located in Portuguese waters, ~250 km off the coast. The area comprises two seamounts (Gettysburg and Ormonde) and is characterised by kelp forests, coral and sponge assemblages, sandy and rocky substrates, and nutrient-enriched upwelling zones. The area overlaps with the Madeira-Tore Ecologically or Biologically Significant Marine Area and with the Banco Gorringe Special Area of Conservation. Within this area there are: **threatened species, reproductive areas, and distinctive areas** (Marbled Torpedo Ray *Torpedo marmorata*).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C1 – Reproductive Areas; Sub-criterion D1 – Distinctiveness

–
PORTUGAL
–
0–400 metres
–
200.7 km²
–

— —
EUROPEAN ATLANTIC

A REGIONAL COMPENDIUM OF
IMPORTANT SHARK AND RAY AREAS

— —
IUCN SSC SHARK SPECIALIST GROUP

— —
SEPTEMBER 2025
— —



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

CARDIGAN-CAERNARFON BAY ISRA

European Atlantic Region

SUMMARY

Cardigan-Caernarfon Bay is located on the western coast of Wales, United Kingdom of Great Britain and Northern Ireland. The area is characterised by kelp forests along the rocky shores, saltmarshes, sandbanks, and reefs. It includes relatively shallow and sheltered bays influenced by moderate tidal currents and high turbidity. Within the area there are: **threatened species** (e.g., Angelshark *Squatina squatina*); and **reproductive areas** (e.g., Tope *Galeorhinus galeus*).

CRITERIA

Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas



UNITED
KINGDOM OF
GREAT
BRITAIN AND
NORTHERN
IRELAND

0-65 metres

2,652.8 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

GALICIA BANK ISRA

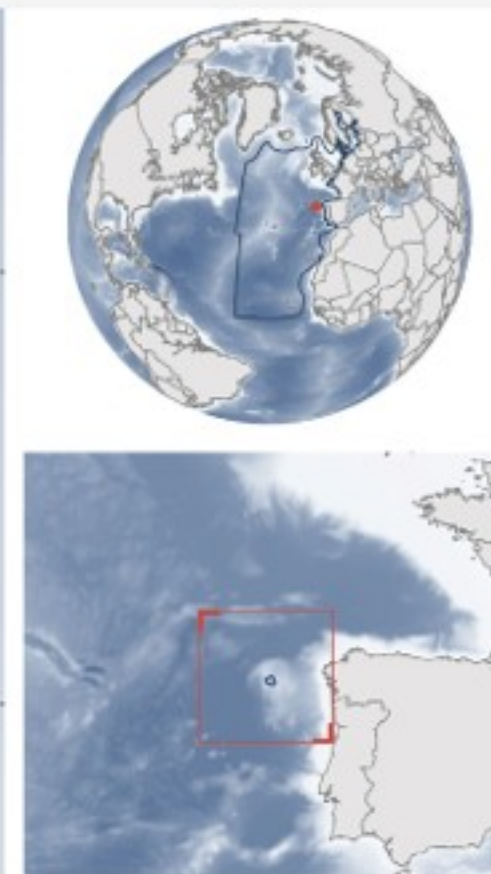
European Atlantic Region

SUMMARY

Galicia Bank is located off the west coast of Galicia, Spain. It encompasses an isolated seamount rising to 625 m depth. The area is characterised by rocky substrates of basaltic lava origin. It is influenced by several distinct water masses which contribute to high primary productivity. This area overlaps with the West Iberian Canyons and Banks Ecologically or Biologically Significant Marine Area and the Banco de Galicia Key Biodiversity Area. Within this area there are: **threatened species** and **feeding areas** (Velvet Belly Lanternshark *Etmopterus spinax*).

CRITERIA

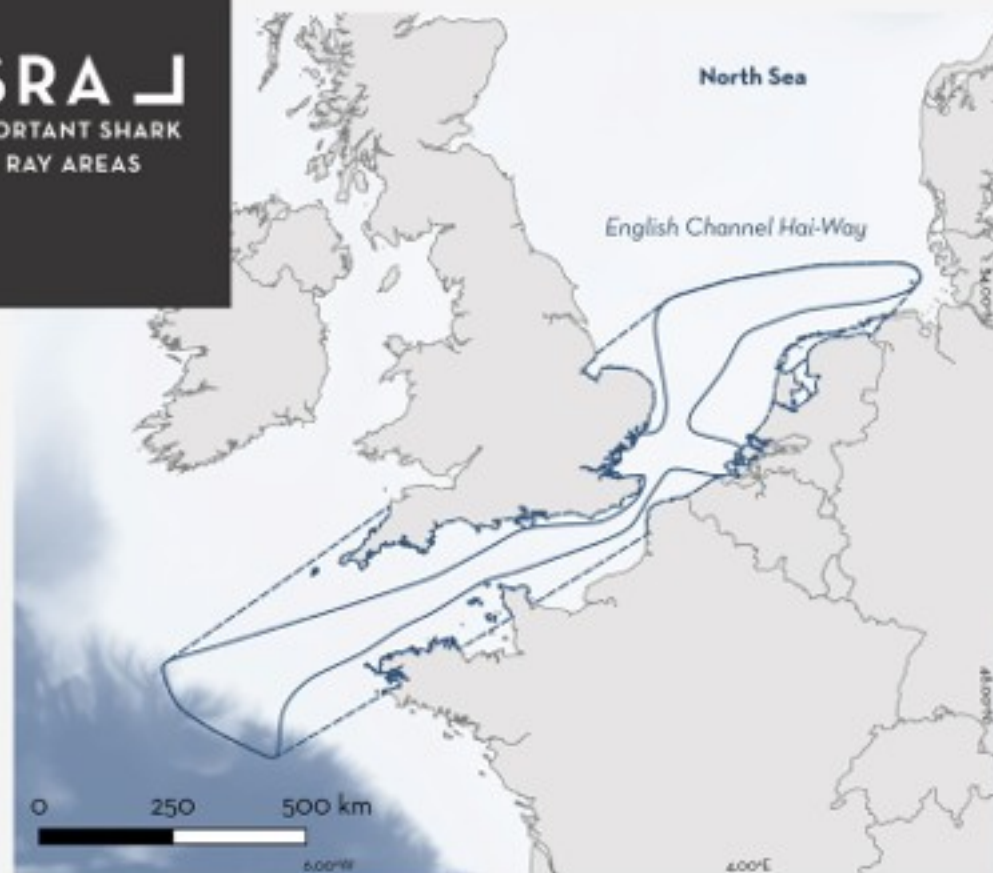
Criterion A - Vulnerability; Sub-criterion C2 - Feeding Areas



SPAIN

625-900 metres

714.9 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

ENGLISH CHANNEL HAI-WAY ISRA

European Atlantic Region

SUMMARY

English Channel Hai-Way is a transboundary area connecting the southern North Sea, English Channel, and Celtic Sea through the waters of Germany, the Netherlands, Belgium, France, the United Kingdom of Great Britain and Northern Ireland, and Ireland. The habitat is characterised by shallow shelf waters, pelagic waters, sandy and rocky substrates, sandbanks, and tidal flats. Within this area there are: **threatened species** (Tope *Galeorhinus galeus*); and areas important for **movement** (e.g., Starry Smoothhound *Mustelus asterias*).

CRITERIA

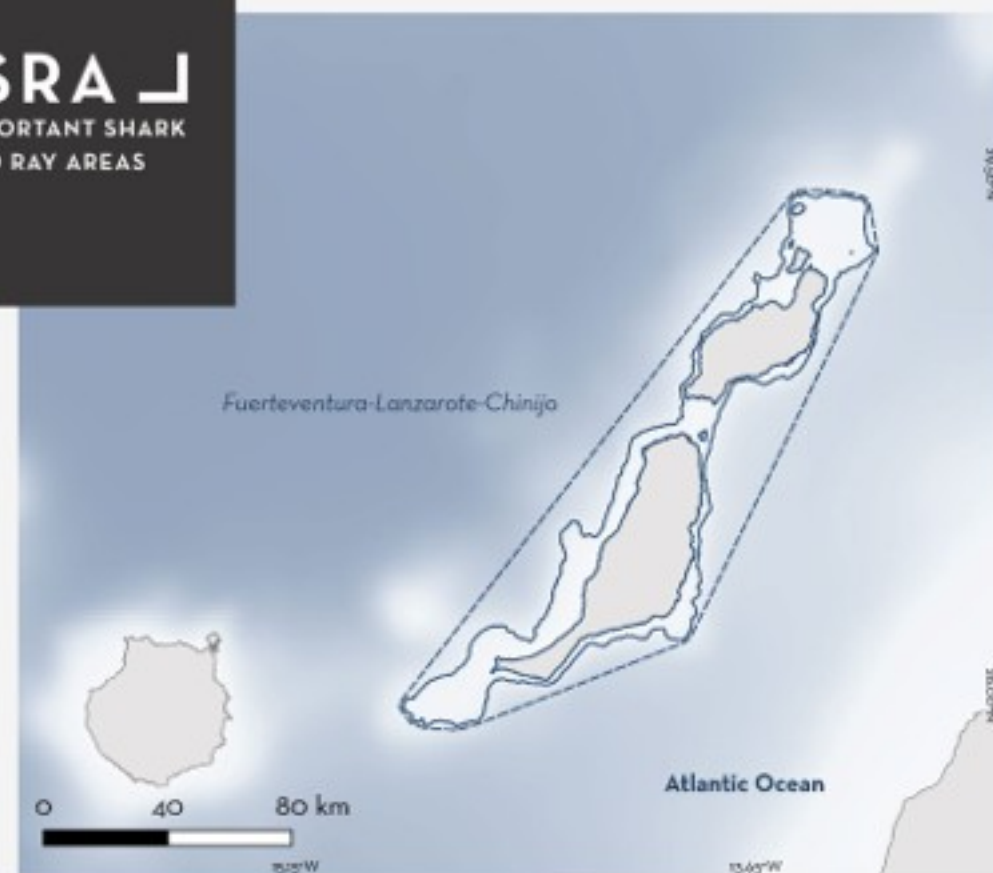
Criterion A - Vulnerability; Sub-criterion C4 - Movement



BELGIUM,
FRANCE,
GERMANY,
IRELAND,
NETHERLANDS,
UNITED
KINGDOM OF
GREAT BRITAIN
AND
NORTHERN
IRELAND

0-826 metres

126,791 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

FUERTEVENTURA-LANZAROTE-CHINIJO ISRA

European Atlantic Region

SUMMARY

Fuerteventura-Lanzarote-Chinijo is located in the northeast Canary Islands. It includes the Chinijo Archipelago (composed of one island and four islets), Lanzarote Island, Lobos Islet, and Fuerteventura Island. The area is characterised by sandbanks, rocky reefs, patches of seagrass, sponge patches, and submarine canyons. The area overlaps with one Ecologically or Biologically Significant Marine Area, two Key Biodiversity Areas, and two marine protected areas. Within this area there are: **threatened species** (e.g., Common Eagle Ray *Myliobatis aquila*); **reproductive areas** (Angelshark *Squatina squatina*); **undefined aggregations** (e.g., Common Smoothhound *Mustelus mustelus*); and the area sustains a **high diversity of sharks** (16 species).

CRITERIA

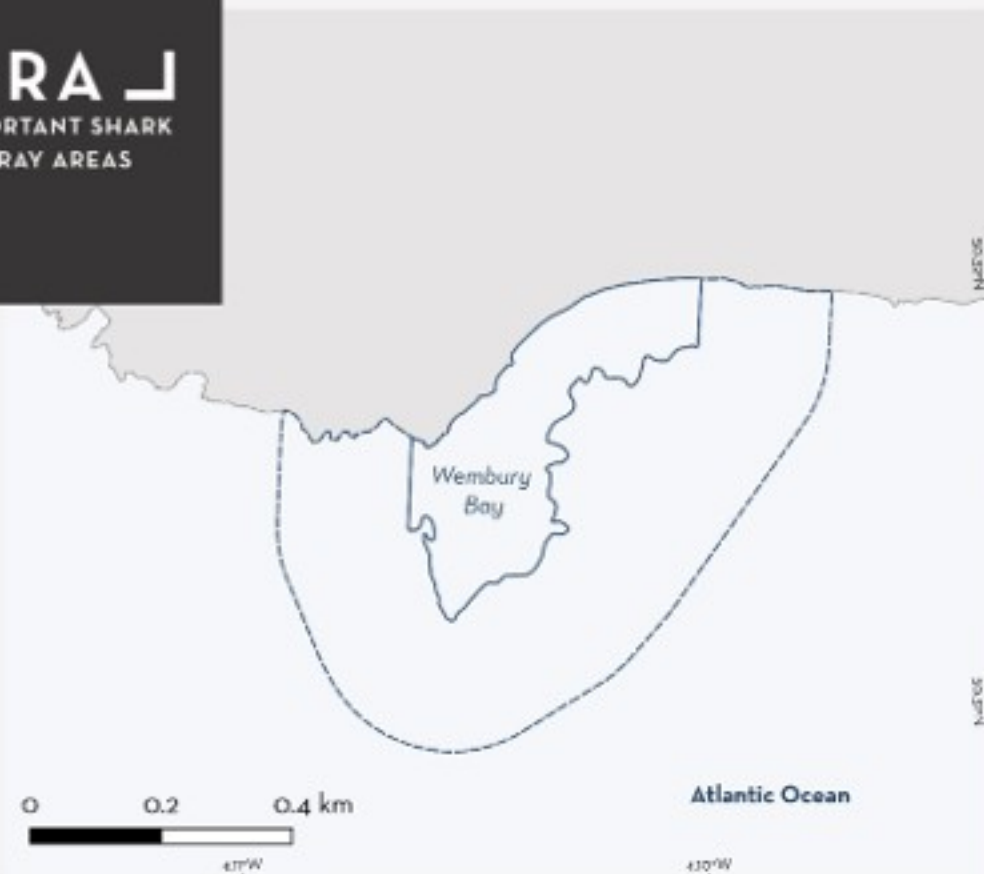
**Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas;
Sub-criterion C5 - Undefined Aggregations; Sub-criterion D2 - Diversity**



SPAIN

0-200 metres

2,695.5 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

WEMBURY BAY ISRA

European Atlantic Region

SUMMARY

Wembury Bay is located in Devon on the southwestern coast of England, United Kingdom of Great Britain and Northern Ireland. The area is a shallow, sheltered, intertidal gully characterised by rocky, sandy, and shingle substrates. This area is influenced by freshwater input from the River Yealm. Within the area there are: **threatened species** and **reproductive areas** (Nursehound *Scyliorhinus stellaris*).

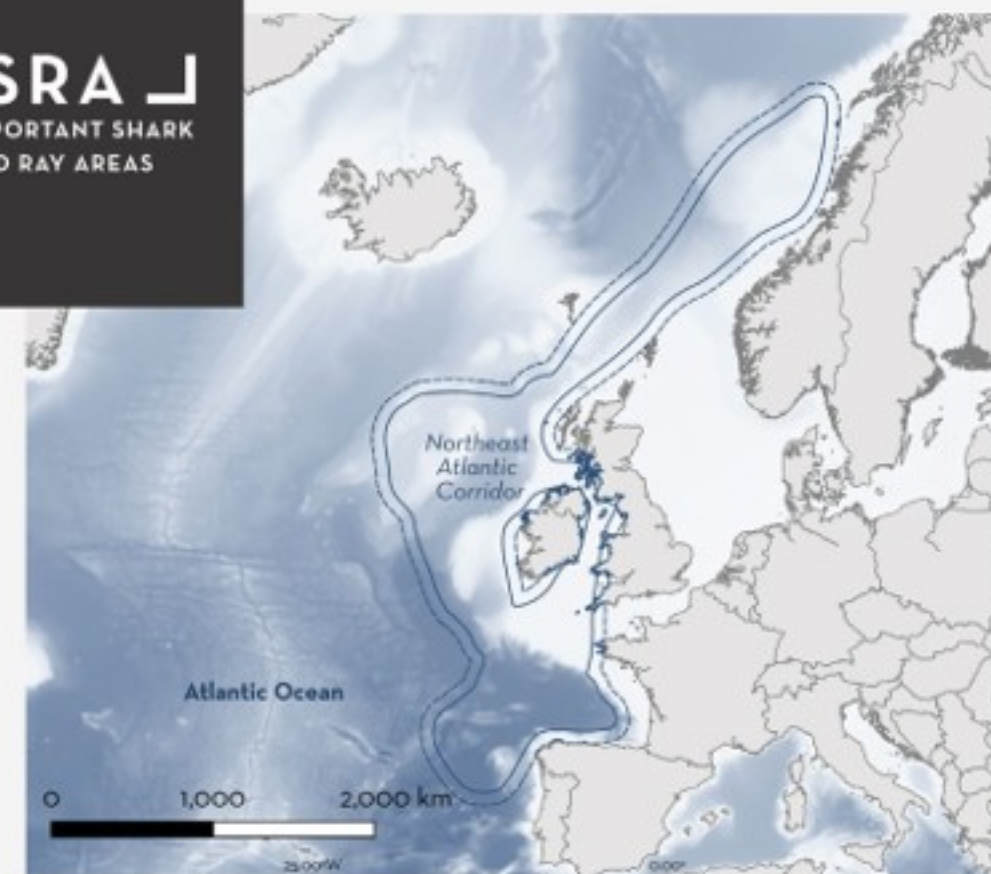
CRITERIA

Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas

UNITED
KINGDOM OF
GREAT
BRITAIN AND
NORTHERN
IRELAND

0-5 metres

0.09 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

NORTHEAST ATLANTIC CORRIDOR ISRA

European Atlantic Region

SUMMARY

Northeast Atlantic Corridor spans from Norway in the north, via Faroe Islands, the United Kingdom of Great Britain and Northern Ireland, Ireland, Isle of Man, France, and Spain to northern Portugal. The area is characterised by pelagic waters mostly over the continental shelf break and also in offshore and shelf areas. It is mainly influenced by the Slope Current flowing northward along the continental slope. Within this area there are: **threatened species** (e.g., Porbeagle *Lamna nasus*); and areas important for **movement** (e.g., Basking Shark *Cetorhinus maximus*).

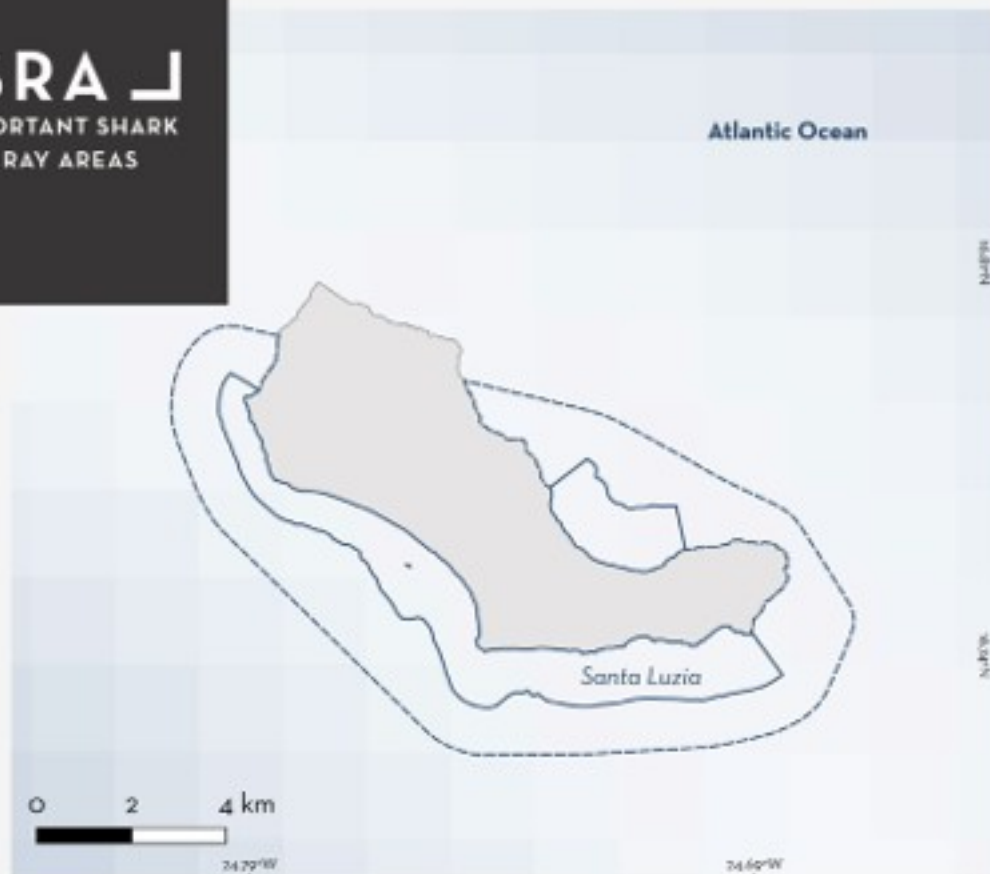
CRITERIA

Criterion A - Vulnerability; Sub-criterion C4 - Movement

FAROE ISLANDS,
FRANCE,
IRELAND,
ISLE OF MAN,
NORWAY,
PORTUGAL,
SPAIN,
UNITED
KINGDOM OF
GREAT BRITAIN
AND NORTHERN
IRELAND,
ABNJ

0-1,809 metres

1,482,885 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

SANTA LUZIA ISRA

European Atlantic Region

SUMMARY

Santa Luzia is located between the islands of São Nicolau and São Vicente in Cabo Verde. It is situated on the second largest insular shelf of Cabo Verde. The area encompasses sandy beaches and rhodolith beds that are partially covered in the subtidal zone. Within this area there are: **threatened species** (e.g., Blackchin Guitarfish *Glaucostegus cemiculus*); **reproductive areas** (e.g., Blacktip Shark *Carcharhinus limbatus*); and **undefined aggregations** (Atlantic Weasel Shark *Paragaleus pectoralis*).

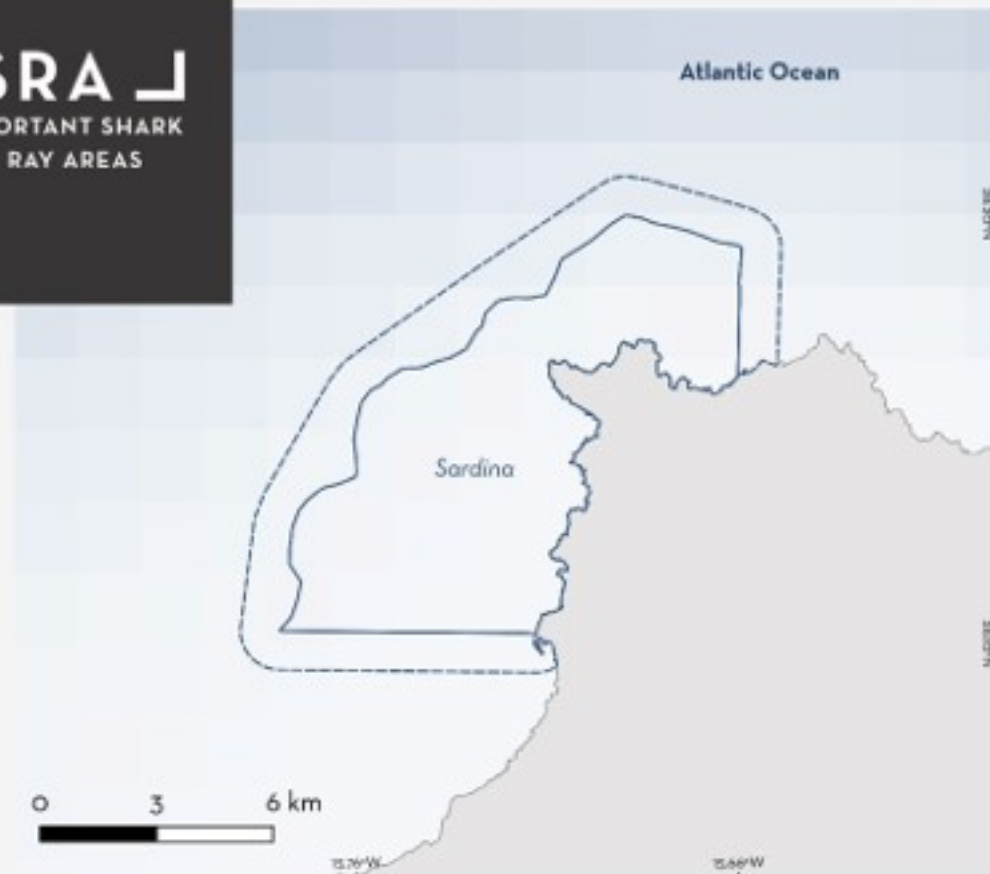
CRITERIA

Criterion A - Vulnerability; Sub-criterion C1 - Reproductive Areas;
Sub-criterion C5 - Undefined Aggregations

CABO VERDE

0-100 metres

18.83 km²



Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

SARDINA ISRA

European Atlantic Region

SUMMARY

Sardina is located on the northern coast of Gran Canaria, one of the eight main islands of the Canary Islands archipelago, Spain. This sheltered bay is characterised by benthic habitats composed of sand, rocky substrates, and patches of seagrass. The area overlaps with an Ecologically or Biologically Significant Marine Area. Within this area there are: **threatened species** (e.g., Duckbill Eagle Ray *Aetomylaeus bovinus*); **undefined aggregations** (e.g., Bentfin Devil Ray *Mobula thurstoni*); and the area sustains a **high diversity of sharks** (16 species).

CRITERIA

Criterion A - Vulnerability; Sub-criterion C5 - Undefined Aggregations;
Sub-criterion D2 - Diversity

SPAIN

0-100 metres

63.15 km²

African Atlantic

Call for proposals for preliminary Areas of Interest

We are seeking proposals for preliminary Areas of Interest in the African Atlantic region which we will be used to delineate candidate Important Shark and Ray Areas.

The deadline to submit proposals is June 15th, 2026.
The workshop will be held in July 2026.

Please submit proposals to
submissions@sharkrayareas.org



Only One Percent of Important Shark and Ray Areas in the Western Indian Ocean Are Fully Protected

The Important Shark and Ray Areas (ISRA) team is excited to share their latest paper: ‘Only One Percent of Important Shark and Ray Areas in the Western Indian Ocean Are Fully Protected From Fishing Pressure’. This research looked at what data sources were used to support the delineation of Important Shark and Ray Areas (ISRAs) in the Western Indian Ocean and how these ISRAs overlap with marine protected areas.

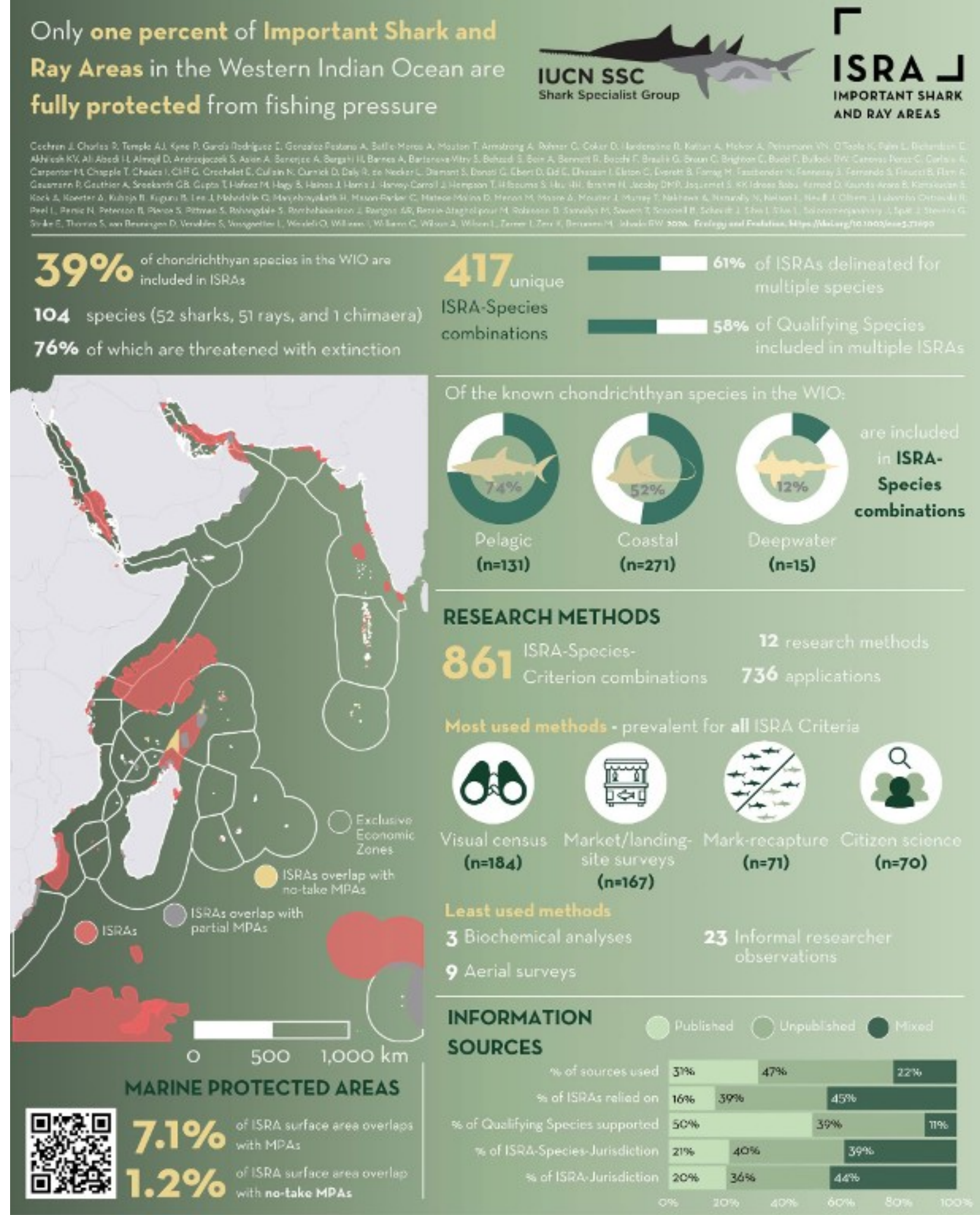
Abstract

The Western Indian Ocean (WIO) is known for its high diversity of chondrichthyans (sharks, rays, and chimaeras). However, intense fishing pressure has led to severe population declines and local extinctions of several species. The Important Shark and Ray Area (ISRA) process is a collaborative, evidence-based approach used to identify critical habitat for chondrichthyans. We analysed ISRAs across the WIO to quantify the diversity of research methods used to identify them, evaluate spatial overlap with designated marine protected areas (MPAs), model the influence of several species- and jurisdiction-specific variables on ISRA delineation, and explore the importance of incorporating unpublished data into the delineation process. In total, 125 ISRAs (covering > 2.8 million km²; ~10% of total regional surface area) were identified within the WIO from surface waters to ~2000 m depth. These ISRAs contain over one-third (n = 104, 39%) of the 270 chondrichthyan species reported from the region, with 76% being threatened with extinction according to the IUCN Red List

of Threatened Species. The underlying evidence supporting ISRA identification was primarily drawn from relatively inexpensive research methods, such as visual census (25%) or fish-market/landing site surveys (22.6%), as well as citizen science (9.5%). Incorporating unpublished records substantially increased the frequency of ISRA delineation, leading to expanded taxonomic and geographic coverage. Still, the full dataset was influenced by the same biases as the published record, tending to favour large-bodied, wide-ranging, and shallow-dwelling species. Only 7.1% of ISRAs are within designated MPAs, with just 1.2% in fully protected no-take areas. The highest no-take overlap occurs in the Seychelles and Chagos Archipelago. These findings highlight the shortfalls in spatial protection of chondrichthyan habitats, but also present a strategic opportunity for policy-makers and resource managers to improve current MPA coverage and meet their commitments under international agreements, such as the Global Biodiversity Framework

Explore the key findings and their implications for the conservation of sharks, rays, and chimaeras across the region. The full publication can be found online here.

How to cite the document:
Cochran, J.E.M., Charles, R., Temple, A. J., Kyne, P.M., García-Rodríguez, E., González-Petana, A., Batlle-Morera, A., ... Jabado, R.W. (2026). Only One Percent of Important Shark and Ray Areas in the Western Indian Ocean Are Fully Protected From Fishing Pressure. *Ecology and Evolution*, 16:e72690. doi.org/10.1002/ece3.72690



Mobulids of Muncar: Balancing Science and Conservation for Lasting Change in East Java's Largest Shark and Ray Fisheries

Written by

Kyra B Wicaksono

Yayasan Konservasi dan Penelitian
Pari Mobula (Mobula Project Indonesia);
Jakarta, Indonesia;
kyra.bestari@gmail.com
www.instagram.com/kyrabestari/

Muhammad G Salim

Yayasan Konservasi dan Penelitian
Pari Mobula (Mobula Project Indonesia);
Banyuwangi, Indonesia;
mgsalim95@gmail.com
www.instagram.com/egin95/



Region
Update:
Asia



Muncar, on the southeastern coast of East Java within the Banyuwangi Regency, is recognized as one of Indonesia's key hubs for shark and ray fisheries [Osmalesi et al., 2024]. The subdistrict hosts the largest fish landing site on Java Island and serves as the primary fish producer in East Java. Fishers operating from Muncar target a wide range of species from the surrounding Bali Strait and, in some cases, travel as far as Borneo. This strategic position has made Muncar one of Indonesia's most active fishing centers, where shark and ray landings occur year-round.

Since 2015, we at Mobula Project Indonesia (MPI) have been dedicated to improving understanding and promoting the conservation of these species. Initially established as a research initiative focusing on mobulids, an threatened family of rays, the project began as an affiliate of The Manta Trust [see www.mantatrust.org/indonesia-devil-rays]. Our work began with systematic daily surveys at Muncar's fishing port and markets, documenting landings and recording species composition and abundance. Between 2019 and 2025, these monitoring efforts identified close to 100 species of sharks and rays regularly landed in Muncar.

A recently published study from our team revealed a declining trend in the catch rate of Spinetail Devil Rays (*Mobula mobular*), supported by fisher reports of decreasing mobulid sightings and the predominance of immature individuals across Muncar's fisheries. These findings strongly indicate that mobulid rays are overfished in East Java. In addition, illegal landings of Oceanic Manta Ray (*M. birostris*) and Reef Manta Ray (*M. alfredi*), along with evidence of mobulid gill plate trade for international export, underscore the urgent need for more vigorous enforcement of national protections and international conservation measures [Laglbauer et al., 2025].

The discovery of such exceptional diversity, coupled with clear signs of population decline, led us to expand our focus beyond mobulids to include sharks, reflecting a broader commitment to shark and ray conservation. This evolution was mirrored in our organization's structure, which developed into a non-governmental organization (NGO) dedicated to advancing research and protecting these vulnerable species.

Building on our comprehensive landing data, our expanded research strategy employs satellite tagging and biological studies to conduct broader ecological assessments and gather behavioral information to support effective management. We have deployed pop-up archival satellite tags (PSATs) to track individuals after release, providing valuable data on survival, movement, and habitat use. To carry out this work, our team often joins gillnet fishers on their overnight trips, deploying tags and collecting data directly at sea while gaining first-hand insight into fishing techniques and the realities local fishers face. These findings are essential for evaluating the success of conservation interventions and informing policy decisions, particularly those related to bycatch reduction and protected area designation.

To better understand the resilience of these populations of sharks and rays, we complement our tracking efforts with biological assessments of key life-history parameters. In particular, our research estimates the age of mobulids, a factor essential for understanding their growth and reproductive capacity. We use growth bands visible in the caudal vertebrae, located below the dorsal fin origin, following Cuevas-Zimbrón et al. [2013]. By analyzing these bands, we can model population dynamics and better assess the resilience of mobulid populations to fishing pressure. This information is critical for developing evidence-based management and conservation strategies.



Fishing Boat Aerials Muncar, Indonesia 2024

The MPI understands that protecting mobulids in Muncar is impossible without addressing the economic realities of local fishing communities. Our research is only one part of the wider conservation story, as mobulid protection is inseparable from supporting community well-being. To promote positive change, we established the Sustainable Seafood Network (SSN) to assist fishers who practice responsible fishing. This initiative aims to improve market access and create economic incentives to reduce catches of vulnerable mobulid species. Through the SSN, we have engaged with over 50 fishers, providing training focused on reducing mobulid bycatch and improving post-capture survival through safe release practices. These capacity-building efforts extend beyond species protection to include soft skills training in fish handling, financial management, and occupational safety. Such holistic support enables fishers to adopt sustainable practices while strengthening both their economic and personal resilience.

The MPI has learned that lasting conservation impact arises when scientific evidence is interpreted through the lens of those who live and work with the sea. While our monitoring provides essential data, collaboration with fishers brings those data to life, creating a shared commitment to conserving sharks and rays. This approach

has revealed the social, economic, and ecological connections that shape how these species are managed and protected.

Our decade in Muncar has not been without challenges and moments of resistance. One of the bumpiest roads we experienced was building trust with the local fishing community in the early stages of our work. Most fishers were unaware of the importance of science and research, leading to uncertainties about our goals. This atmosphere initially made data collection and meaningful conversations nearly impossible. Moreover, the policy regarding sharks and rays in Indonesia was almost invisible to them, creating fear that our presence might result in enforcement action or expose illegal activities.

Persistence and patience were key to addressing this issue. It took nearly two years of meeting key figures, attending religious and family events, and casually conversing with fishers to convey MPI's purpose and gain their trust. Eventually, they realized that our work had positive intentions and was, in fact, beneficial to them. Today, fishers regularly help us document landings and share updates from the field, and we ensure their voices are heard by marine conservation authorities. They have even formed their own fisher group and asked us to advise them on how to launch it. What

began with distrust and uncertainty has grown into a partnership built on patience, understanding, and shared purpose.

As the project progresses, we aim to expand our monitoring efforts to other regions and strengthen the SSN, further embedding conservation values within local fisheries management. Our vision is to establish a framework that balances marine biodiversity protection with socio-economic development, ensuring the future of sharks, rays, and the communities that depend on them. The MPI's work in Muncar shows how combining science with community collaboration can make a real difference for sharks, rays, and those who rely on them. It reflects how steady, local efforts can contribute meaningfully to broader marine conservation goals.

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Important habitats for Karimunjawa's shark-like rays: a collaborative search by fishers and scientists



Region
Update:
Asia

Nyimas Alvynna Keneisha Zahra

Elasmobranch Project Indonesia (EPI – Yayasan Hiu Pari Lestari)

Faqih Akbar Alghozali

Elasmobranch Project Indonesia (EPI –
Yayasan Hiu Pari Lestari) | James Cook University

Huda Lasmi

Elasmobranch Project Indonesia (EPI – Yayasan Hiu Pari Lestari)

Maula Nadia

Elasmobranch Project Indonesia (EPI – Yayasan Hiu Pari Lestari)

Fahmi

Badan Riset Nasional Indonesia | IUCN SSC Shark Specialist Group |
Regional co-Vice Chair | Asia region

Hollie Booth

The Interdisciplinary Centre for Conservation Science,
Department of Zoology, University of Oxford | Kebersamaan Untuk Lautan |
IUCN SSC Shark Specialist Group | Northern Europe Regional Member

Vinay Udyawer

Sharks Pacific

Simon Foale

James Cook University

Andrew Chin

James Cook University | Fish and Fisheries Lab |
IUCN SSC Shark Specialist Group | Asia Regional Member

Rhino rays — a collective term referring to wedgefishes (Rhinidae family) and giant guitarfishes (Glaucostegidae family) — represent one of the most distinctive and evolutionarily unique groups amongst sharks and rays. Unlike most rays, which typically exhibit rounded or diamond-shaped bodies, rhino rays possess a striking combination of features that makes them resemble sharks in many aspects. Their elongated bodies, upright dorsal fins, and pronounced snouts create a silhouette that stands apart from the majority of ray species and reflects a long evolutionary history shaped by life in shallow coastal environments. Similar to a few other sharks and rays, this group is genetically unique, having diverged through millions of years of independent evolution that differentiates them from other sharks and rays.

Their distinctiveness is further underscored by their conservation status, where rhino rays are considered among the most threatened shark and ray groups globally, standing alongside sawfishes (Pristidae family) and angel sharks (Squatinae family) in terms of extinction risk. Nearly all recognized species within this group are currently listed as Critically Endangered on the IUCN Red List of Threatened Species, placing them at exceptionally high risk of extinction (Kyne et al., 2020). Their high extinction risk is tied not only to their biological characteristics of slow growth, late maturity, and low fecundity, but also the increasing pressures they face throughout their range, especially high vulnerability to fishing mortality (Kyne et al., 2020). This fishing mortality is driven in part by rhino rays’ high incidental catch levels in some fisheries, and in part by their international and domestic market value. As a result, in regions where rhino rays were once abundant, their numbers have declined substantially in recent years, raising concern about what remains of their populations and the habitats that still support them.

Our team at the Elasmobranch Project Indonesia (EPI – Yayasan Hiu Pari Lestari) has been working on rhino rays in Karimunjawa National Park (KJNP), one of Indonesia’s seven marine national parks, since 2022. The KJNP is a multi-use marine protected area located off the northern coast of Central Java in the Java Sea. Our team has recorded the presence of multiple rhino ray species in KJNP (Alghozali et al., 2023; EPI unpub. Data, 2023), including the Giant Guitarfish (*Glaucostegus typus*) and the Bottlenose Wedgefish (*Rhynchobatus australiae*). Yet despite confirming their presence in the park, rhino ray’s use and movement patterns within these waters, and their overall population status, remain uncertain. Such data are critical for informing targeted management, to mitigate the risk of rhino rays being captured by the fisheries that operate within KJNP. Moreover, implementing such management measures requires close engagement with the fishing communities themselves.

Within this context, we pioneered a ‘Fisher Scientist’ program and a critical habitat study on rhino rays in KJNP, with data collected in collaboration with local fishers. We focused on identifying pupping and nursery grounds, as our previous socio-ecological research indicated that fishers were more supportive of mitigating catches of small rhino rays due to their low market value (Alghozali et al., 2025). As interactions with rhino rays were higher amongst gillnet fishers, they were prioritized in our Fisher Scientist program.

The Fisher Scientist program aims to engage fishers as active participants to population studies, specifically through a capture–mark–recapture (CMR) approach on small rhino rays. Information on the capture location, distance, and time between recaptures will provide the first estimates of population density, movement patterns, and habitat associations of rhino rays within the KJNP. The program started with four local fishers known in their community for their long history of catching rhino rays. Two fishers use deep bottom-set gillnets, while the other two operate shallow bottom-set gillnets, providing complementary coverage of different habitat zones and depths where rhino rays are likely to be found. Under this approach, participating fishers could continue with their usual fishing operations – targeting various species such as trevallies and blue swimming crabs – while agreeing to release any small rhino rays that become entangled in their nets, as part of a CMR approach. Each rhino ray that was incidentally caught — particularly smaller individuals — was measured, tagged with a conventional tag, then released back into the water, helping us to understand their movement and use of the area. To recognize their time and expertise in the Fisher Scientist program, each fisher was compensated on a per-trip basis. This collaborative model not only generates reliable population data but also fosters trust and ownership among local communities, as fishers become integral to documenting the species they encounter. Furthermore, this program paves the way for effective community-based management, with fishers more likely to accept and comply with bottom-up approaches, compared to top-down regulations.

During the program, in addition to collecting management-relevant data, we also observed changes in fishers’ attitudes and behaviors. As more small rhino rays were tagged and released, one of the fishers said that he had started encouraging his friends to voluntarily release them as well. Another fisher stated that while it initially felt weird to release a fish he had caught, he now feels excited to watch the tagged wedgefish get released. Our team also felt incredibly proud while out at sea with the fishers, seeing them transform from being scared of putting a tag on the rhino ray to proudly releasing these Critically Endangered species from their fishing boat.

Although the Fisher Scientist program is still in its trial phase, evidence of long-term behavioral changes has been observed among the fishers we engaged. One fisher regularly updates the EPI team each time he releases a Giant Guitarfish and shares videos of himself releasing them on his WhatsApp story to his friends and family. Occasionally, a fisher would also change his gillnet operation, soaking his net to only a few hours compared to the usual whole night soaking, to ensure a higher survival rate of any caught wedgefishes.

To complement the Fisher Scientist program, the EPI has started an independent rhino ray critical habitat identification process, expanding coverage to sites within KJNP that may serve as pupping or nursery grounds. Targeted sites were selected based on discussions with authorities (the Ministry of Marine Affairs and Fisheries and the KJNP Office), experts, and local fishers. Pilot surveys were conducted in June 2025, and six sites around Karimunjawa and Kemujan Island will be surveyed over the next

Photo by Elasmobranch Project Indonesia



year. The same approach will be used as in the Fisher Scientist program, utilizing gillnets, measuring and tagging new rhino rays, and recording oceanographic parameter information.

Findings from both the Fisher Scientist program and our independent research have begun to reveal distinct habitat-use patterns within the KJNP, as observed at previous survey sites. Site fidelity was observed by both the small-sized Giant Guitarfish and Bottlenose Wedgefish between June and November 2025. This was reflected in consistent sightings and was further reinforced by repeated encounters with previously tagged individuals, which were recaptured within short distances of their initial release points, indicating movement restricted to small areas. Apparent differences in habitat use are evident, with all encounters with small giant guitarfish occurring in shallow waters below 2 m, whereas captures of the Bottlenose Wedgefish mainly occur in waters between 20 and 40 m. These repeat recaptures suggest that juveniles are staying within specific zones for extended periods, rather than moving freely across the park, indicating early signs of residency behavior. While these observations are preliminary, they provide promising early evidence that specific areas within the park support the early stages of rhino ray life cycles.

Surveys for rhino ray critical habitat in KJNP will continue beyond 2025. We are hopeful of uncovering more about the early life of these Critically Endangered species while engaging fishers to protect them. These efforts will provide essential knowledge to strengthen the species management and conservation within the national park.

We gratefully acknowledge the generous support of our donors — the Darwin Initiative, Shark Conservation Fund, Ocean Park Conservation Foundation Hong Kong, and the Marine Conservation Action Fund of the New England Aquarium — whose contributions have made this research and ongoing monitoring in KJNP possible. We also extend heartfelt thanks to all collaborators who have contributed their time, energy, and expertise throughout this project. A special recognition goes to the local fishing communities, whose knowledge of the sea and willingness to work alongside us have been invaluable. Their involvement has not only strengthened our research but also helped build a shared hope for the future of rhino rays in Indonesia. Together, we are charting new understanding and helping protect the next generation of these remarkable species. A short documentary film “Nelayan Peneliti” is published on YouTube on the story of the Fisher Scientist program.

Release process of a juvenile Bottlenose Wedgefish (*Rhynchobatus australiae*) by a fisher scientist



Tagging process of a baby Giant Guitarfish (*Glaucostegus typus*)



Tagging process of a Bottlenose Wedgefish (*Rhynchobatus australiae*)

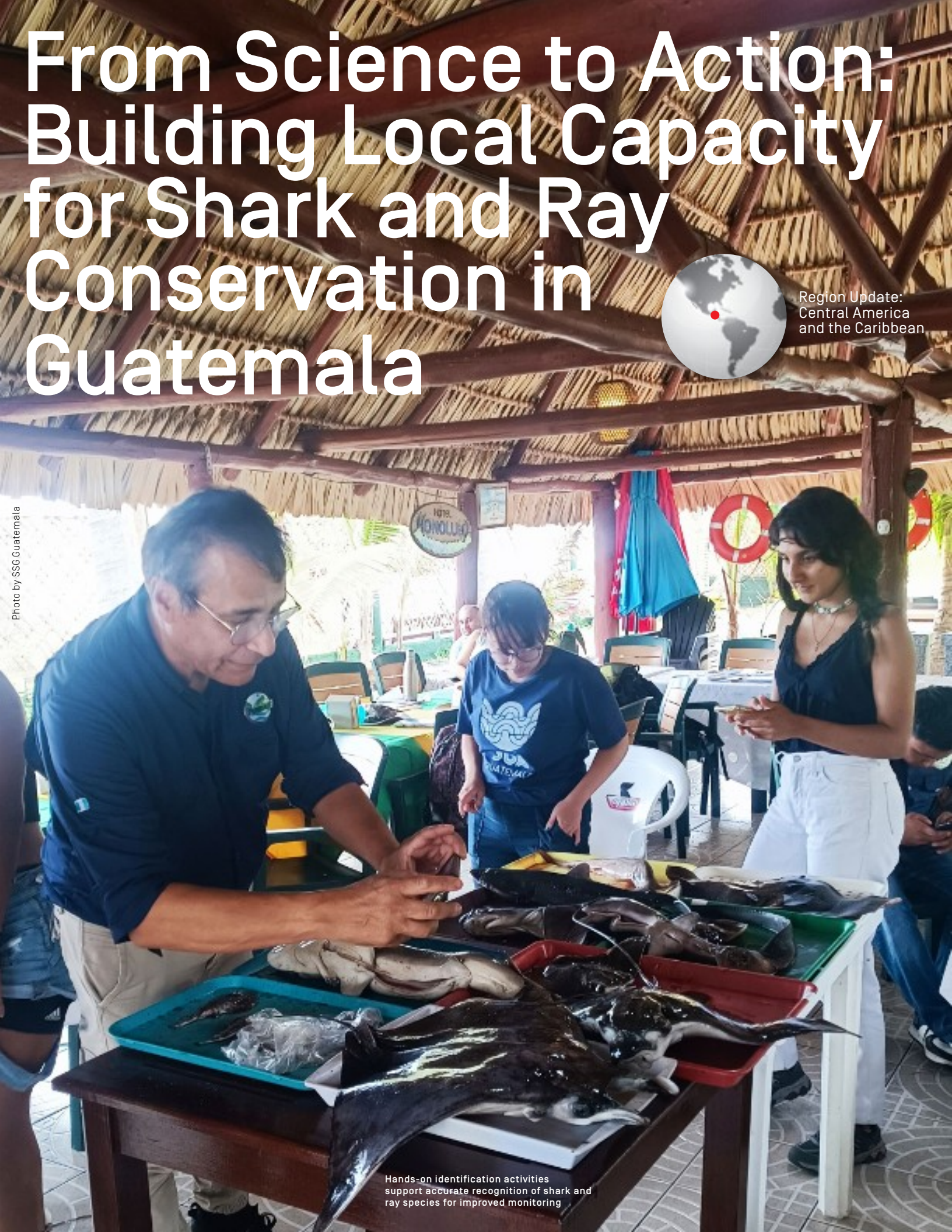


Photo by SSG Guatemala

From Science to Action: Building Local Capacity for Shark and Ray Conservation in Guatemala



Region Update:
Central America
and the Caribbean

Hands-on identification activities support accurate recognition of shark and ray species for improved monitoring

Written by

Ana Hacohen-Domené

Centro de Estudios Ambientales y Biodiversidad,
Universidad del Valle de Guatemala, Guatemala.
Departamento de Biología, Universidad del Valle
de Guatemala, Guatemala
IUCN SSC Shark Specialist Group | Regional co-Vice
Chair Central America and Caribbean Region

Francisco Polanco-Vásquez

Centro Interdisciplinario de Ciencias Marinas-IPN, México
Centro de Estudios del Mar y Acuicultura CEMA-USAC, Guatemala
Wildlife Conservation Society WCS-Guatemala, Guatemala
Guatemala

Cristopher Ávalos-Castillo

Dirección de Normatividad de la Pesca y Acuicultura,
Guatemala | IUCN SSC Shark Specialist Group |
Central America and Caribbean Region member

Strengthening local action through science and collaboration. Between 2024 and 2025, members of the IUCN Species Survival Commission (SSC) Shark Specialist Group (SSG) led a series of five training workshops in Guatemala to enhance national capacities for the conservation and sustainable management of sharks and rays. More than 250 people from different fields, such as inspectors from the Directorate of Fisheries and Aquaculture Regulations (DIPESCA), rangers from the National Council for Protected Areas (CONAP), academics, non-governmental organizations (NGOs), students, community members, and fishers, took part in these workshops. The goal was to turn scientific knowledge into action.

The initiative was established in response to a shared need: to strengthen local and institutional capacities to better monitor and manage shark and ray populations in the Guatemalan Pacific. By combining scientific concepts, interactive learning, and inter-institutional collaboration, these workshops have played a major role in providing scientific knowledge about sharks and rays to a wide range of sectors in Guatemala.

From classroom to coast: applied learning for conservation

Each workshop integrated theory and practice, covering topics crucial to shark and ray conservation. Sessions started with fisheries biology—introducing participants to the ecological roles of sharks and rays, their habitat utilization, feeding methods, and reproductive characteristics that make several species particularly vulnerable to overfishing.

Participants also gained experience identifying key species from the Guatemalan Pacific using real specimens, collected and preserved by local fishers, that were preserved in alcohol specifically for educational and outreach purposes.

Another important component of the workshop was the presentation of the several shark and ray products, as well as by-products, that are utilized within the Guatemalan market. These interactive sessions helped reduce the gap between academic knowledge and field realities. Inspectors and rangers, for example, practiced distinguishing among morphologically similar species and recording standardized biological data, skills that are directly applicable to their daily monitoring activities.

Field components were also conducted at major landing sites, where participants collected morphometric data, interviewed

fishers, and documented fishing gear and practices. These exercises not only provided valuable baseline information but also strengthened relationships between fishers and conservation and management institutions, fostering trust and collaboration at the community level.

Identifying critical habitats: Important Shark and Ray Areas (ISRAs)

A key component of the training was introducing participants to the concept and methodology of Important Shark and Ray Areas (ISRAs). The sessions showcased the locations, borders, and biological criteria of the identified ISRAs in Guatemala's Pacific.

Participants were shown how these regions were chosen based on the existence of vulnerable shark and ray species, ecological significance, and habitat utilization. This improved knowledge of the important habitats found in Guatemalan waterways and their importance for conservation planning.

By sharing this information, local and national stakeholders were more conscious of the significance of preserving healthy marine ecosystems that sustain coastal livelihoods and biodiversity.

Understanding trade and socioeconomic dimensions

A vital component of these workshops was addressing the socioeconomic aspects of shark and ray fisheries. Participants analyzed products and by products derived from these species [such as salted dried meat, shark oil, cartilage powder, and jaws], discussing their local and international demand.

These conversations provided a clearer picture of the market complexity and highlighted the importance of monitoring trade to improve transparency and inform sustainable management. Understanding these socioeconomic linkages is key to ensuring that conservation actions are both socially equitable and economically viable. By involving resource users, particularly community members and fishers, the workshops facilitated a clearer understanding of the challenges and priorities related to the use of marine resources. Their participation allowed for the exchange of practical knowledge and helped contextualize the information presented within the realities of local fisheries management.

Building institutional bridges

Perhaps the most significant achievement of this initiative is that it helped build lasting connections among institutions that usually work separately. The collaboration between DIPESCA, CONAP, universities, NGOs, and civil societies is a major step toward coordinated marine conservation in Guatemala. The initiative also trained members of the Mesa Técnica de Condriotics, who, even if they do not work directly with sharks and rays, play key roles in their management and conservation. This includes staff from the Naval Command, AGEXPORT, the Ministry of Health, and the Department of Animal Health, among others.

The Universidad del Valle de Guatemala, the Center for Marine Studies and Aquaculture at the University of San Carlos de Guatemala, and Semillas del Océano contributed scientific expertise and training capacity. The Wildlife Conservation Society Guatemala provided logistical support and field coordination, while the Shark Conservation Fund offered the financial backing that made the initiative possible.

From science to action: building a foundation for the future

Through these workshops, Guatemala has taken an important step in strengthening its national response to the conservation challenges facing sharks and rays. The initiative shows how scientific knowledge can be turned into practical tools for decision-making, and how collaboration across sectors can increase conservation impact.

As the country continues to refine its marine management strategies, the skills and capacities developed through this program will help ensure that conservation measures are grounded in both science and local experience. The long-term goal is clear: to build a network of trained professionals and engaged communities capable of monitoring, managing, and protecting shark and ray populations across the Guatemalan Pacific.

Finally, the organizing team highlighted that the success of this effort came from its cooperative spirit, showing that when institutions share goals and work together, science can directly guide conservation and management decisions on which they depend.



Participants engage in hands-on laboratory training to build skills in shark and ray identification

Photos by SSG Guatemala



Students participate in training to strengthen future marine conservation work



Participants learn to identify shark byproducts to improve monitoring and traceability in coastal markets

SHARKS, PARADISE, AND AN UNEXPECTED THREAT: THREE YEARS STUDYING POLLUTION IN ELEUTHERA



Region Update:
Central America
and the Caribbean

Written by
Dr Natascha Wosnick

Former Research Faculty, Cape Eleuthera Institute, The Bahamas
Collaborating Professor, Universidade Federal do Paraná, Brazil
IUCN SSC Shark Specialist Group | South American Region member



Sharks sampled around South Eleuthera
to study chemical pollution impacts on
health, following animal welfare standards
and with the Department of Environmental
Planning and Protection (DEPP approval)

When I accepted a job in The Bahamas three years ago, I was thrilled by the chance to study sharks in a place that has inspired so many of us. Beyond being a tropical paradise, The Bahamas has served as a refuge for sharks since longline fishing was banned in 1993 and the national shark sanctuary was established in 2011. I had read countless papers by scientists I admired, many of whom have worked here. To live where sharks and rays glide through turquoise waters, where you can meet them while diving or even walking along the shoreline, felt like a dream. I could not wait to contribute to the conservation of animals I respect so deeply, even though I knew I had big shoes to fill.

Coming from Brazil, where my research focused on how commercial fishing affects threatened species, the idea of working somewhere without fishing as the primary threat was both exciting and intimidating. What questions could I ask in a place where the dominant global stressor wasn't the main local issue? How could my experience help uncover something meaningful?

When I arrived in Eleuthera, the island that would become home for the next three years, I felt a moment of panic. How would someone used to a large, developed, Brazilian capital adapt to such a remote, quiet, resource-limited place? I had worked in isolated regions before, including the Amazon coast, studying species like the Daggnose Shark (*Isogomphodon oxyrhynchus*) and the Colares Stingray (*Fontitrygon colarensis*). But Eleuthera was different: breathtaking, challenging, and unforgettable in ways I couldn't yet understand.

My first weeks were spent exploring sites where newborn Lemon Sharks (*Negaprion brevirostris*) cruised the shallows and adult Atlantic Nurse Sharks (*Ginglymostoma cirratum*) lived peacefully among boats in a marina, joined seasonally by Bull Sharks (*Carcharhinus leucas*) migrating from Florida and Cuba. The water was so clear that even 8 m down, you could see the seafloor as if it were only 1 m deep. Eleuthera was hot, humid, vibrant, and filled with people who welcomed me immediately

First Signs of an Invisible Threat

As the excitement settled, I began noticing things that worried me. Coming from a city known for recycling and efficient waste management, encountering a community where waste was dumped in the open and burned was one of the biggest cultural shocks I have ever experienced, and it became my greatest motivation. How was this affecting the sharks sharing these coastal ecosystems? How were pollutants moving through this tightly connected environment?

The Bahamas attracts millions of tourists each year and is celebrated as a pristine destination for diving and shark encounters. Yet even here, we lack scientific data on how increasing tourism and rapid real-estate development are shaping the environment.

This became the foundation of my research at the Cape Eleuthera Institute: to understand how urban expansion on Eleuthera might influence the health and habitats of key species, especially Lemon Sharks and Atlantic Nurse Sharks. During my literature review, two studies stood out: Shipley et al. (2021) reported high concentrations of toxic metals in coastal sharks from Nassau and Great Exuma, especially in Caribbean Reef Sharks (*Carcharhinus perezi*); and Gelsleichter et al. (2020) documented similarly alarming mercury levels in Oceanic Whitetip Sharks (*C. longimanus*) around Cat Island, the highest ever recorded for the species. Together, these studies made one thing clear: even seemingly pristine places are not immune to pollution.

Juvenile Lemon Sharks and Early-Life Stress

Guided by these insights, the first phase of my research focused on juvenile Lemon Sharks (Wosnick et al., 2025), at a life stage highly sensitive to environmental disturbance. Through repeated sampling and physiological assessments, we documented how subtle human activities can influence their stress physiology. What began as a simple question about habitat use revealed a far more complex story.

Juveniles near disturbed shorelines showed elevated stress markers and altered energetic profiles, suggesting that cumulative, everyday disturbances shape how these young sharks grow, feed, and survive. These results highlighted not only the vulnerability of early life stages but also the fact that 'light' coastal development can still have meaningful biological consequences.

Contaminants of Emerging Concern

As the research progressed, the focus naturally shifted toward what happens once sharks move beyond nurseries and encounter broader human impacts. That shift led to a question that had never been explored in The Bahamas: Could sharks be exposed to pharmaceuticals and illicit drugs?

The answer, as it turned out, was yes. By analyzing serum from Eleutheran sharks, we detected compounds such as diclofenac, acetaminophen, caffeine, and cocaine in Caribbean Reef Sharks, Atlantic Nurse Sharks, and Lemon Sharks. These were not incidental traces; they appeared at biologically relevant concentrations, confirming real environmental exposure. Physiologically, sharks with detectable contaminants often showed altered triglycerides, glucose, urea, and lactate: biomarkers linked to metabolic balance and stress resilience. These subtle but consistent shifts suggest that exposure to pharmaceuticals and illicit drugs may already be influencing systemic health. In a place renowned for clear waters and thriving shark populations, uncovering this link was both scientifically exciting and deeply concerning.

Pollution Effects on Caribbean Reef Sharks and Atlantic Nurse Sharks

For Caribbean Reef Sharks, preliminary results suggest that pollution may be amplifying risks associated with fisheries interactions. Globally, pollution is currently recognized as a threat for only 6.4% of all shark and ray species (Dulvy et al., 2021), however, its impacts are likely underestimated. When paired with research from Lyons and Wynne-Edwards (2019) — showing pollutants heighten physiological stress responses — a concerning picture emerges: sharks carrying higher contaminant loads may be far more vulnerable to capture stress than previously understood. In our dataset, individuals with elevated contaminants show reduced resilience during capture, which may help explain why some populations suffer disproportionately high mortality.

For Atlantic Nurse Sharks, early results hint at another story. We are seeing potential signs of diminished circulating selenium, a micronutrient that buffers metal toxicity. Although still early, one hypothesis links this pattern to provisioning at the study site, suggesting that tourism activities, particularly shark feeding, may be subtly reshaping nutritional and physiological pathways.

Photo by Natascha Wosnick | Cape Eleuthera Island School



A Growing Dataset

As my time in The Bahamas ends, the research itself feels more alive than ever. Over the coming months, we will continue analyzing samples collected between 2023 and 2025 from more than 200 sharks and rays, including Tiger Sharks (*Galeocerdo cuvier*), Lemon Sharks, Atlantic Nurse Sharks, Blacktip Sharks (*Carcharhinus limbatus*), Blacknose (*C. acronotus*), and Caribbean Reef Sharks, as well as Southern Stingrays (*Hypanus americanus*) and Atlantic Chupare (*Styracura schmardae*). These samples span juveniles, adults, reproductively active individuals, and pregnant females. They carry a complex chemical history, allowing investigation of organic contaminants (pharmaceuticals and illicit drugs) and inorganic pollutants such as mercury, lead, and emerging technology-critical elements tied to improper e-waste disposal (Wosnick et al., 2024). This work is especially timely as these elements become central to deepwater mining initiatives for which The Bahamas is a signatory.

Looking Ahead: Safeguarding a Pristine Future

Despite the challenges, there is hope. Pollution is a solvable problem, through planning, investment, and community engagement. Establishing a long-term national monitoring program for sharks and rays in mangroves and coastal waters would facilitate early detection and response. Improving waste management, transitioning to controlled landfills, implementing proper sewage treatment, and supporting recycling efforts would reduce the flow of contaminants into critical habitats.

Education is equally important. Empowering local communities and informing the millions of tourists who visit each year can foster more sustainable behaviors. Responsibility must also extend to the companies shaping the islands' future. Developers, hotels, and foreign investors should implement robust environmental mitigation plans, contribute financially to habitat restoration, and support pollution-reduction programs.

The Bahamas has a rare opportunity: to protect its sharks and the ecosystems that depend on them before pollution becomes an irreversible problem. With thoughtful planning, shared responsibility, and continued scientific inquiry, this archipelago can remain a global leader in shark conservation. And even as I say goodbye, I know the story is far from over. The work continues, the data grow, and with the combined efforts of scientists, communities, policymakers, and visitors, there is every reason to believe The Bahamas will remain a sanctuary not only in name, but in practice.

Paper published

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Juvenile Atlantic Nurse Shark
(*Ginglymostoma cirratum*) being
released after a quick work up
to collect blood samples



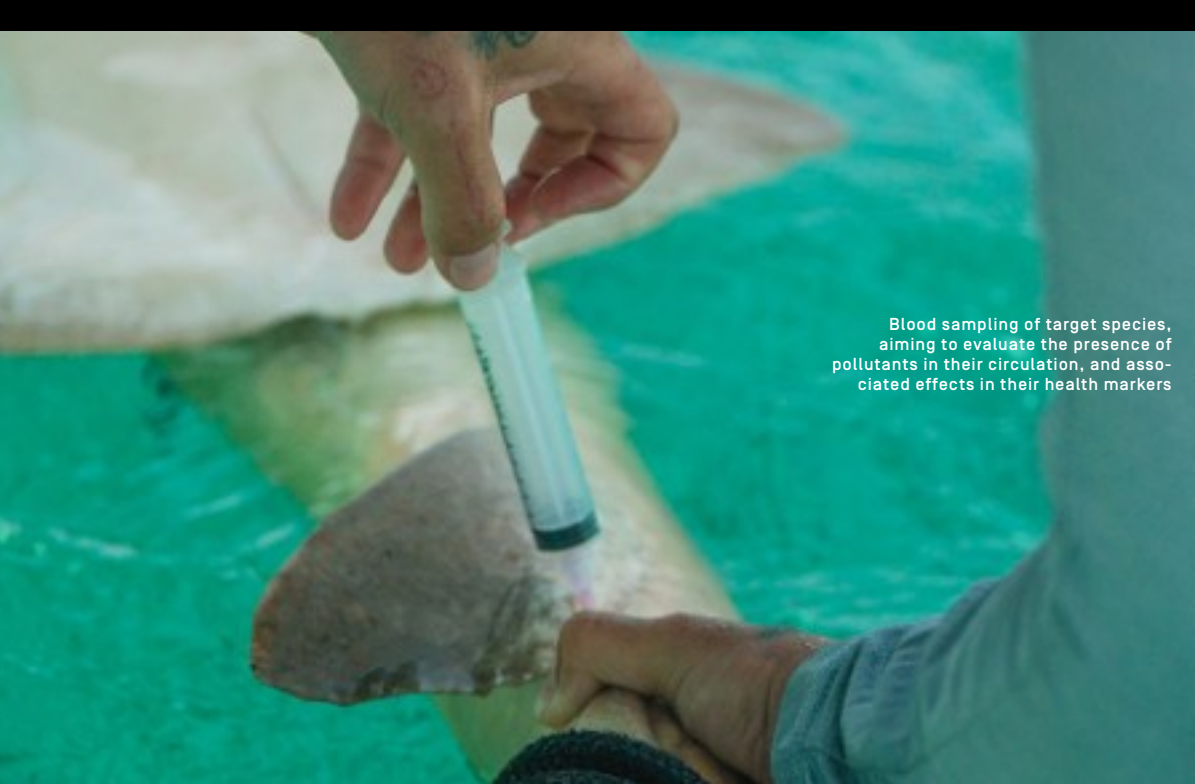
Sharks sampled around South Eleuthera
to study chemical pollution impacts on
health, following animal welfare standards
and with the Department of Environmental
Planning and Protection (DEPP) approval



Blood sampling of target species, aiming to evaluate the presence of pollutants in their circulation, and associated effects in their health markers



Juvenile Lemon Shark (*Negaprion brevirostris*) swimming in Page Creek, one of the mangrove nurseries used by the species in south Eleuthera



Blood sampling of target species, aiming to evaluate the presence of pollutants in their circulation, and associated effects in their health markers

Oceânicas: Empowering Women and Girls in Shark Research on Brazil’s Oceanic Islands

Written by
Bianca S. Rangel

Instituto Vida no Oceano / Project Sharks and Rays of Noronha,
Institute of Biosciences, University of São Paulo
Address: São Paulo, Brazil, 05508090
Email address: bianca@tubaroesnoronha.org.br
Social network links:
instagram.com/tubaroes.raias.noronha
instagram.com/biarangel.sharks
instagram.com/onda_iloc/

Globally, women represent roughly one-third of the research work-force and less than 15% of leadership positions in scientific institutions. In marine and field-based disciplines, particularly in shark, ray, and chimaera research, this gap is even more evident. To address this imbalance, Oceânicas: Women and Girls in Island Science was created to provide opportunities for women to develop technical skills, confidence, and hands-on experience in marine research and conservation. The program aims to strengthen women’s participation and leadership in ocean science, particularly in isolated and oceanic island contexts.

The first edition of Oceânicas was held in April 2025 at the Fernando de Noronha Archipelago, where ten women aged 18 to 35 participated in field activities focused on understanding and conserving shark, ray, and sea turtle populations. Equipped with field nets, data sheets, and a shared sense of determination and curiosity, the participants exemplified the program’s commitment to advancing women’s roles in marine conservation.

The program was conceived by marine scientists Bianca Rangel, Ana Clara Suhett, and Larissa Amaral, members of the Nature Observers for the Development of Oceanic Islands (ONDA-ILOC) Network. The inaugural edition was implemented by the Project Sharks and Rays of Noronha, in collaboration with the Institute of Biosciences, University of São Paulo, the Chico Mendes Institute for Biodiversity Conservation (ICMBio), and the TAMAR (Tartarugas Marinhas) Project – a sea turtle conservation program. Over three weeks, participants, affectionately known as Oceânicas, engaged in theoretical sessions, practical field training, drone-based monitoring, and outreach activities throughout the archipelago.

The Shark Module introduced participants to the practical aspects of shark and ray research in Fernando de Noronha. The module focused primarily on monitoring Lemon Shark (*Negaprion brevirostris*) nursery areas. Through a combination of scientific capture, shoreline surveys, and drone-based aerial monitoring, participants learned the methodologies used by the research team to evaluate population structure, habitat use, and interactions with human activities. Discussions also addressed how increasing tourism and coastal development are influencing shark and ray nursery ecosystems in Noronha, which constitutes the focal theme of Bianca Rangel’s postdoctoral research project.

The program commenced with two science dialogue sessions

at the ICMBio auditorium, where participants were encouraged to develop their own research questions. Each participant formulated a hypothesis and outlined methods for testing it, engaging directly in scientific reasoning and experimental design. The resulting proposals reflected both ecological and socio-environmental perspectives. Some focused on interactions between sharks and rays with small-scale fisheries, assessing the frequency of encounters and the potential use of deterrent technologies. Others explored marine debris and its impacts on sharks, proposing methods such as gastric lavage or drone-based detection to investigate ingestion and entanglement risks. Through this exercise, participants transitioned from observers to active contributors to the scientific process.

Fieldwork activities began early each morning with equipment checks, tidal and safety assessments, and task briefings. The team conducted scientific captures using hand nets in shallow coastal habitats, enabling the safe capture, measurement, and release of juvenile Lemon Sharks. Over the course of the expedition, several individuals were captured, sampled, and released. Despite challenging sea conditions and seasonal variability, the experience provided participants with essential training in ethical animal handling, biological sampling techniques, and systematic field documentation.

All participants contributed to field observations and data recording, while two, Arianny Ribeiro (18 years old) and Luna Moreno (20 years old), were authorized to perform in-water captures after completing prior technical training and obtaining the necessary permits.

A central component of the module involved the use of drones for aerial monitoring of sharks and rays. Over ten days, participants assisted in flights around Fernando de Noronha’s main island, collecting high-resolution video data on shark and ray activity in shallow lagoons and coastal zones. These operations contributed to ongoing research on the spatial and behavioral patterns of juvenile Lemon Sharks, feeding behavior during sardine aggregations, and habitat use and trophic ecology of Tiger Sharks (*Galeocerdo cuvier*) in Sueste Bay.

Under the guidance of Fabio Borges, filmmaker and president of the Instituto Vida no Oceano, participants received training in flight planning, aerial imaging, and data analysis. They learned to identify behavioral patterns, such as foraging, social interactions, and avoidance responses, from aerial footage, gaining valuable insights into how drone technology can support non-invasive behavioral studies of sharks and rays. Beyond the development of technical skills, Oceânicas emphasized collaboration, mentorship, and collective learning. Each participant maintained a field journal documenting both scientific observations and personal reflections on teamwork, leadership, and resilience in field research.

The program concluded with an Earth Day outreach event at the Arquipélago School, where participants conducted interactive educational activities for local students aged 11 to 15. These sessions introduced students to shark and ray biology and conservation through creative games and guided discussions. The participants delivered short presentations on Noronha’s shark and ray species, led a simulated ‘research expedition,’ and highlighted the ecological importance of sharks and rays in maintaining healthy marine ecosystems. The event strengthened community engagement and

positioned women scientists as visible role models for the next generation of ocean stewards.

Participants also contributed to the maintenance and redeployment of an acoustic telemetry receiver in Sueste Bay, gaining hands-on experience with a key technology used in movement ecology studies of sharks and rays. Throughout the Shark Module, participants developed a range of competencies, including field expedition logistics and planning, permit and regulatory compliance for marine research, formulation and testing of ecological hypotheses, ethical capture and sampling of juvenile sharks, drone operation and aerial data interpretation, and science communication and environmental education. These skills are essential for professionals entering the field of marine conservation and are particularly important for women aspiring to leadership roles in the natural sciences.

The outcomes of Oceânicas extend far beyond individual skill development. By integrating research, education, and gender equity, the initiative reinforces the connection between science and society, demonstrating that empowering women in oceanic island contexts can enhance both conservation outcomes and social inclusion. Each observation recorded, each hypothesis tested, and each student inspired contributes to a growing network of women dedicated to marine conservation in Brazil. The Oceânicas experience exemplifies how inclusive capacity-building initiatives can foster more diverse, resilient, and effective conservation communities.

The full report in Portuguese is available here: drive.google.com/file/d/172wp0j7dKlAlh41PnmIFG5R0YJiAgyKh/

Acknowledgments
Participants and collaborators of the first edition of Oceânicas: Ana Clara Suhett and Larissa Amaral, for their valuable contributions. São Paulo Research Foundation (FAPESP) [grants #2023/10020-0 and #2024/13478-0], the National Council for Scientific and Technological Development (CNPq) [grant #409705/2022-5], and the Chico Mendes Institute for Biodiversity Conservation (ICMBio).



Participants leading educational activities with students from the Arquipélago School during the Earth Day event, introducing them to shark biology and conservation through creative games and discussions

Photo by Bianca Rangel

Field research for monitoring juvenile Lemon Sharks (*Negaprion brevirostris*). From right to left Arianny Ribeiro, Luna Moreno, and Bianca Rangel



Photos by Bianca Rangel and Luna Moreno.





Lemon Sharks
(*Negaprion brevirostris*)



Projeto Tubarões e Raias de Noronha



Dra. Bianca Rangel
Coordenadora TRN
Pós-doutoranda IBUSP
Vice-presidente IVQ

Oceânicas participants take part in a "Science Dialogue", learning to design their own research questions and hypotheses.



Researching walking (epaulette) sharks in Papua New Guinea

Drone view of Wari Island, one of the locations where walking shark surveys were conducted in Milne Bay, November 2023



Region
Update:
Oceania

Written by

Jessica-Anne Blakeway

The University of the Sunshine Coast

Christine L. Dudgeon

The University of the Sunshine Coast, Biopixel Foundation
IUCN SSC Shark Specialist Group | Regional co-Vice Chair |
Oceania region

Mark V Erdmann

Re:wild

IUCN SSC Shark Specialist Group |
Oceania Regional Member

Kathy A Townsend

The University of the Sunshine Coast

Max Teliwa

Milne Bay Provincial Fisheries

Julie Anne Waranaka

The University of Papua New Guinea

Hayley Versace

The Conflict Islands Conservation Initiative

Walking [epaulette] sharks

The genus *Hemiscyllium* – commonly referred to as epaulette or walking sharks — consists of nine validated species. These sharks are small, typically nocturnally active, and benthic-dwelling, and are favourites in the marine tourism industry for their ability to ‘walk’ using their pectoral fins over reef flats. The group inhabit the coastal waters of northern Australia, New Guinea, and its satellite islands, and are commonly encountered on shallow coral reefs, seagrass beds, and mangrove systems.

The nine species of walking shark have relatively small non-overlapping ranges, with individual home ranges typically spanning at most a few square kilometres. A review by Allen et al. [2016] updated the distributions and descriptions of species within the genus, identifying non-overlapping ranges that are much smaller than previously considered, resulting in four species being described in the last 16 years. Interestingly, the morphology of this genus is relatively conserved across species; as such the main methods for identifying species in the field relies on species-specific colour patterns and their locality.

Vulnerable to Extinction

Given walking sharks live in small, isolated groups, populations have the potential to be genetically distinct, but this also means they are at higher risk from localised disturbances and even extirpation. Localised threats include habitat loss from coastal developments, marine pollution, and harvest by subsistence fisheries and the marine ornamental trade. Climate change exacerbates these issues, with rising ocean temperatures negatively impacting coral and seagrass habitats where walking sharks live and hunt. As such, five of the nine species are currently classified as Vulnerable to Extinction by the IUCN Red List of Threatened Species under Criterion B.

Why Papua New Guinea?

Currently, most knowledge of the genus is derived from research on the Epaulette Shark (*H. ocellatum*) in northern Queensland, with some recent studies also focusing on species endemic to the West Papua province of Indonesia.

However, there have been no prior focused studies on the three species endemic to Papua New Guinea: Michael’s Epaulette Shark (*H. michaeli*) in the east, the Papuan Epaulette Shark (*H. hallstromi*) in the south, and the Hooded Carpet Shark (*H. strahani*) in the north.

Substantial knowledge gaps exist for their biology (e.g., reproduction and genetics), ecology (e.g., habitat use, diet, and trophic role), and conservation status, with even the full extent of their distributions not yet defined.

The Research

To fill these substantial knowledge gaps, our team began researching the walking shark species endemic to Papua New Guinea in 2023. This project utilises in situ exploratory and targeted surveys, in addition to photo submissions to collect distributional information. In addition, we collect blood samples, fin clips, cloacal swabs, and morphometric measurements to improve understanding of the genetics, trophic ecology, and reproduction of these site-associated species.

Exploratory surveys

In 2023, our team embarked on the first of a series of in situ surveys working with local collaborators from the Milne Bay Provincial Fisheries, the Conflict Islands Conservation Initiative (an Australian non-governmental organisation operating exclusively in Milne Bay — Kedekedewa, Sigoita, and Gegeto), and a research assistant from the University of Papua New Guinea. Our survey was focused specifically

Exciting discovery of the Papuan Epaulette Shark (*Hemiscyllium hallstromi*) approximately 300 km east of its described range

on Michael’s Epaulette Shark. Although we were also hoping to encounter the Papuan Epaulette Shark at the easternmost extent of its range along the southern coast of mainland Papua New Guinea, with an aim of determining if there is any overlap of the two species’ ranges, or if some form of habitat disjunction serves as a barrier to overlap. Our survey was designed to collect biological and ecological data from within the known range of Michael’s Epaulette Shark, while exploring locations that *Hemiscyllium* species had not yet been recorded from.

To make the most of the time available, at every location visited, our team conducted human ethics approved, guided interviews with local communities. Photos of the sharks were shown to determine if people were familiar with walking sharks, and if so, which species, their local name(s), where and when they are typically encountered, and if they are a targeted for consumption.

Since 2023, we have now conducted three exploratory surveys in the Milne Bay and Oro (Simbara) provinces, with an additional short survey in collaboration with Loloata Island Resort in the Central (Kwasa) Province.

A particular highlight of these surveys has been working with local Papuan communities and learning the local names of walking sharks that often vary between island groups, which is not surprising, given that Papua New Guinea has over 850 living languages!

Excitingly, these surveys have resulted in species distribution extensions by over 300 km east for both Michael’s Epaulette Shark and Papuan Epaulette Shark, as well as evidence of mosaic (non-sympatric) overlap of the two species distributions off the far southeastern tip of Papua New Guinea! We are currently using genetic tools to further explore the population genetics of these range extensions and mosaic overlaps.

Conflict Islands targeted surveys

In addition to the exploratory surveys, we have been collaborating with a Milne Bay-based conservation group, the Conflict Islands Conservation Initiative (CICI), to conduct a targeted survey of a known population of Michael’s Epaulette Shark over a 12-month period.

Aims of this targeted survey were to work with the locally employed rangers to collect morphometrics, blood samples, and fin clips. Specifically, blood samples will be used to analyse reproductive hormones from plasma to identify peaks in hormones that may indicate seasonality in breeding. Fin clips will be used for genetic analysis to: 1) assess effective population size at the Conflict Islands; and 2) compare genetic structuring of this population compared to the full species range.

In June 2024, Jessica-Anne Blakeway travelled to the Conflict Islands, an atoll of 21 islands in Milne Bay to train CICI rangers in survey methods, data collection, and sample storage. This trip successfully established the foundation for ongoing surveys conducted by the CICI rangers over the following 12 months.

Between June 2024 and May 2025 (inclusive), the CICI rangers conducted approximately 60 surveys, spanning 12 of the 21 islands, and collected data on 271 walking sharks.

We are very thankful to the 18 indigenous rangers of the CICI team who did the hard work of night-time surveys, sample collections, photo identification and data entry for the sharks, and really took ownership of the surveys for this project.

Citizen Science

Finally, to complement in situ survey methods, we have created an online submission page to encourage citizen science photo submissions with associated data (time, depth, date, location). This has been shared through social media platforms to local dive groups and centres, and also at the University of Papua New Guinea

To date we have received submissions from various locations we have not otherwise been able to access due to funding and time constraints; these submissions are now guiding our planning for future surveys.

Submissions have provided insights into habitat use, with regular observations (between 10–20 m depth) submitted of the Papuan Walking Shark by the Port Moresby Sub-Aqua Club. Excitingly we have also had videos of potential mating!

Into the future

The next steps for this research include finalising the laboratory and data processing aspects, from analysing genetic outputs to testing plasma for reproductive hormones.

While we have been targeting our research in the Milne Bay province, with some effort in the Central and Oro provinces, we are excited about the possibility of extending our research into other provinces and into the Torres Strait.

How can you help?

If you have any photos location information, date, time, depth of walking sharks from Papua New Guinea or the Torres Strait in particular – please make a submission to our online form: www.jotform.com/240460754845864 or email jess.blakeway@research.usc.edu.au

Fun facts

Evolving approximately 9 million years ago, walking sharks are the youngest radiation of sharks, compared to the evolutionary lineage of sharks that spans over 450 million years.

Walking sharks can tolerate low oxygen levels, allowing them to haul themselves out over the reef during low tide to hunt in isolated tide pools.

Local names for walking sharks: Lazy shark, dog shark

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Ranger Patrick from the Conflict Islands Conservation Initiative holding the largest Michael's Epaulette Shark (*Hemiscyllium michaeli*) recorded during surveys conducted at the Conflict Islands

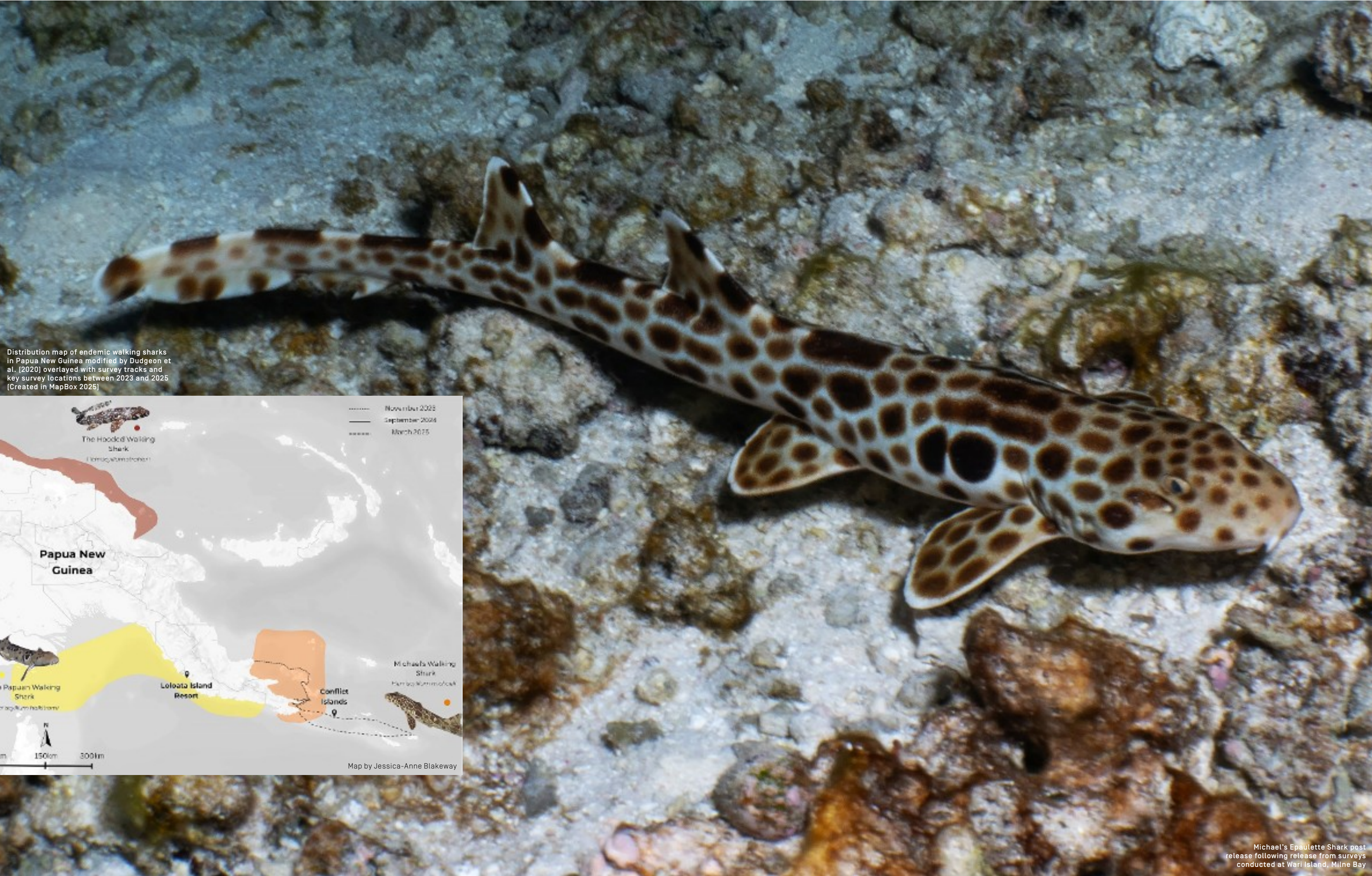


Photo by Mark Erdmann

Distribution map of endemic walking sharks in Papua New Guinea modified by Dudgeon et al. (2020) overlaid with survey tracks and key survey locations between 2023 and 2025 [Created in MapBox 2025]



Michael's Epauvette Shark post release following release from surveys conducted at Wari Island, Milne Bay



Julie-Anne Waranaka and Jess Blakeway collecting morphometrics from a Michael's Epulette Shark (*Hemiscyllium michaeli*) onboard the MV Chertan in Milne Bay, 2024



Group photo onboard the Undersea Explorer at the end of a successful first walking shark survey in Milne Bay, November 2023



Ranger Henry from the Conflict Islands Conservation Initiative collects photo ID images during a night survey

Doomed to isolation or just exploiting spatial benefits? Findings about the strange distribution of the Galapagos Shark (*Carcharhinus galapagensis*)

Written by
Dr Peter Gausmann

Ruhr University Bochum, Bochum,
North Rine-Westphalia, Germany

[Snodgrass & Heller, 1905]



Introduction

The Galapagos Shark (*Carcharhinus galapagensis*) [Snodgrass & Heller, 1905] shows a cosmopolitan range that includes all three major ocean basins. Its distribution includes some of the most remote island ecosystems of the world such as Easter Island, Salas y Gómez, the Hawaiian Archipelago, Pitcairn Islands, Ascension Island, and St. Helena Island. This species is not well-studied, partly due to its core distribution around remote and isolated oceanic islands, archipelagos, atolls, and seamounts, mostly at great distances from continental coasts. This remoteness acts as a barrier to in-depth investigations due to the abandonment of these sites from scientific institutions. Its unusual distribution with an apparent preference for oceanic islands and atolls is poorly understood, adding this species to one of the many unresolved mysteries in the shark world. The Galapagos Shark has probably one of the most striking distribution patterns of all extant shark species. Since the 1960s, researchers have remarked on the curious preference of this species to occur only off the coasts of oceanic islands. Later, its strange distribution was characterized by other researchers as ‘patchy’, ‘scattered’, or ‘disjunct’. Although the distribution of the Galapagos Shark includes all three major oceans, it has been reported only from a few atolls, archipelagos, islands, and seamounts yet. However, where it occurs, it can be the most abundant of local sharks. Due to its preference for such remote sites , in several locations it was discovered relatively late by scientists [e.g., St. Peter and St. Paul Archipelago: 1981; Azores Archipelago: 1988; Norfolk Island: 1993; Salas y Gómez Island: 2003; Mikomoto Island: 2015], stressing the need for ongoing research targeting this species.

Worldwide records and population structure

This unusual distribution pattern of the Galapagos Shark raised my interest because I am a geographer who is interested in the spatial distribution of sharks. Driven by curiosity, I tried to find a reasonable explanation for its strong attachment to remote, insular habitats. I conducted an extensive literature review with a holistic approach, accompanied with an investigation of public databases — as well as specimens housed in ichthyological collections — as well as additional sources for distributional data. I was able to identify 53 atolls and oceanic islands worldwide that harbor this species (and an additional 16 records from continental coasts), which is not much from a global point of view. Because the Galapagos Shark is a cosmopolitan species, my extensive literature review included a considerable number of non-English references. It has taken me six years to collate and analyze this widespread information to finish this study, which now possibly represents the most comprehensive species monograph that has ever been produced for a particular shark species. My investigation also included an analysis of the distribution of age classes at the sites where the Galapagos Shark has been verifiably recorded.

Thus, with only 53 verified occurrences at oceanic islands and atolls around the globe, the Galapagos Shark is a relatively rare, primarily insular species. However, the isolation of occurrences and the distance between their respective populations raises questions about the maintenance of gene flow and the spatial connectivity of subpopulations. Moreover, the limited number of occurrences makes this species susceptible to overfishing at its insular home ranges.

I found out that small juvenile Galapagos Sharks were exclusively recorded from oceanic islands, atolls, and seamounts, a great distance from continental coasts suggesting that birth of this

species takes place in remote places and not in continental waters. As such, these remote and isolated offshore habitats likely represent nurseries and parturition sites.

Key findings and takeaways

1. With only 53 verified records around oceanic islands, atolls, and seamounts worldwide, the Galapagos Shark is a relatively rare species from a global perspective considering the entire number of islands in the tropics, subtropics, and warm-temperate regions of the world.
2. These oceanic island habitats provide likely nursery areas for this species, with small juvenile [i.e., neonates and young-of-the-year, YOY] Galapagos Sharks reported exclusively from oceanic islands, atolls, and seamounts, but never from continental coasts. This attachment of juveniles to remote island habitats can be understood as a reproductive strategy for this species to reduce mortality of the offspring. It is possible that this is because many larger sharks and ray predators such as Bull Shark [*Carcharhinus leucas*], Tiger Shark [*Galeocerdo*

cuvier], and Great Hammerhead [*Sphyrna mokarran*] sharks are mainly distributed along the continental coasts and can be scarce, or lacking, in oceanic island habitats. As such, competition and predation can be considered range-building factors. Occasionally, subadult and adult Galapagos Shark venture to continental coasts where they are strays/roamers but do not build appear to have a resident population. Presumably, they do so when they have attained a size that allows for escaping large coastal sharks that feed on other sharks and rays.

3. Due to the relatively young evolutionary age of the Galapagos Shark (<1 million years ago) accompanied by a relatively young geological age of most of the oceanic islands and seamounts, these remote spots in the middle of the oceans may provide a wide array of free ecological niches that were occupied by marine fishes (including sharks) recently. As such, at some of these oceanic islands, the Galapagos Shark is one of the only known inshore sharks that occurs in rocky or coral reef and lagoon habitats [e.g., St. Peter and St. Paul Archipelago]. Therefore, the occupation of free ecological niches available

at remote oceanic islands may also explain the disjunct distribution pattern of the Galapagos Shark.

4. Because Galapagos Sharks are overwhelmingly residential with limited home ranges and show a strong affinity to specific sites [e.g., reefs and seamounts], they benefit greatly from spatial conservation approaches such as Marine Protected Areas (MPAs) and shark sanctuaries, especially those with accompanying no-take zones and fisheries regulations. However, it should be noted that illegal fishing of sharks still occur in some protected areas, thus affecting the Galapagos Shark, such as in the Galápagos Marine Reserve in Ecuador. Moreover, based on it limited distribution, it should be noted that the loss of a single local population at a specific island is likely to weaken the entire population of the respective ocean (sub)basin. This is because of the loss of a center of dispersal for Galapagos Sharks, and because islands and seamounts are also used as stepping stones for large-scale migrations that have been observed. There is evidence of a near extirpation of the local Galapagos Shark population around Brazil’s St. Peter



Galapagos Shark
[*Carcharhinus galapagensis*]

Photo by Nicolas | Adobe Stock

and St. Paul Archipelago in the equatorial Atlantic resulting from unsustainable fishing of sharks. Within Brazilian populations, there is significant concern for their survivability because this archipelago houses the only Brazilian population of this species. For other locations, data suggest that Galapagos Sharks have been seriously overfished and possibly no longer present, such as Walters Shoals, a group of submerged seamounts south off the coast of Madagascar, and one of only four localities in the Indian Ocean where this shark has been reported. However, its assessment on the IUCN Red List of Threatened Species as Least Concern seems to be justified since many populations of the Galapagos Shark are located in protected areas (e.g., Ascension Island Marine Protected Area, Kermadec Island Marine Reserve, and Lord Howe Island Marine Park) nowadays. Nevertheless, several other oceanic islands and archipelagos with Galapagos Shark occurrences are largely unprotected, or fishing is intense despite administrative protection (‘paper parks’). This applies, for example, to Brazil’s St. Peter and St. Paul Archipelago that, although it has been declared a protected area (Marine Natural Monument), fisheries still operate in those waters. Due to its remoteness, it is virtually unmonitored, and fishing activities continue.

5. The Galapagos Shark can be difficult to identify, due to its similar appearance to several other requiem sharks [*Carcharhinus* spp.] such as the Grey Reef Shark [*C. amblyrhynchos*] and the Caribbean Reef Shark [*C. perezi*] as well as their ancestor, the Dusky Shark [*C. obscurus*] . As such, misidentifications occurs frequently and the number of unconfirmed records of this species is likely high. Therefore, reports of the Galapagos Shark based on visual observations only should always be treated with caution.
6. The situation of the Galapagos Shark has been investigated the most in the Eastern Tropical Pacific (ETP) as well as in the Southwestern Pacific Ocean where topics such as genetics, population structure, and migration behavior have been studied in depth. There is also knowledge about the biology of the Galapagos Shark around the Hawaiian Islands. However, there are remaining huge areas with data deficiencies such as the Western Indian Ocean and the Atlantic Ocean, where information on biology and ecology is scarce or lacking, and only a few investigations have been conducted. For example, in the North Atlantic Ocean, juvenile Galapagos Sharks were once reported occurring at the Azores Archipelago in the middle of the 1990s. However, since then, no further studies targeting this species have been conducted Thus, nothing is known about the status the Galapagos Shark around the Azores and other Macaronesi islands [Madeira, Canary Islands] with the exception that it has been verifiably recorded from here. These data gaps still provi a barrier to successful and effective conservation strategies and management plans for this species.
7. Some aspects of the distribution of the Galapagos Shark remains a conundrum and are still unresolved, such as the lar distribution gap between the Western Indian Ocean and the Western Pacific Ocean. Therefore, attention should be paid to possible occurrences of this species in the Central and Easter Indian Ocean to close remaining knowledge and distribution gaps.

Acknowledgements

I deeply acknowledge the numerous shark scientists from all around the world who provided information or access to hard-to-access literature that helped me with the completion of my review as well as Kaitlyn McQueeney, Camila Brasilino Botelho de Araújo, and Louis David for their permission to use photographic material.

All the results cited above can be found in more detail in this forthcoming publication

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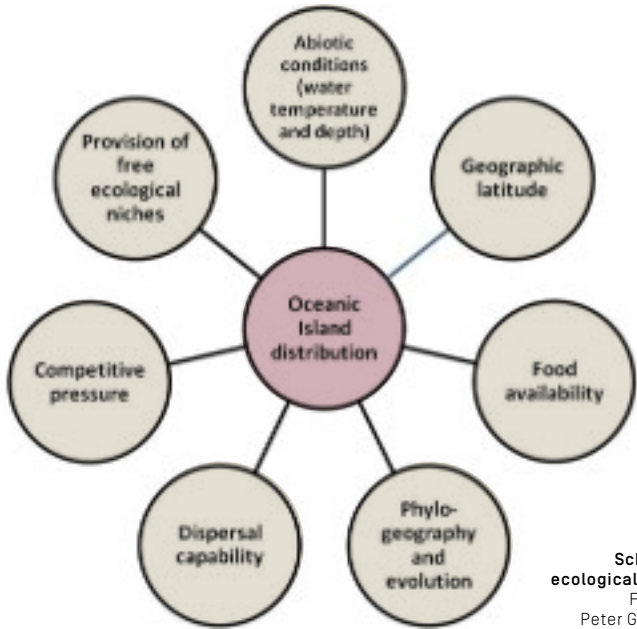
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Scheme of ecological factors
Figure by Peter Gausman



Distribution map
Maps by Peter Gausmann

Hidden Trade, Critical Evidence: Atlantic Oceanic Whitetip Shark Fins Found in Asian Markets

Written by
Candace Fields

Cape Eleuthera Institute

Background

The Oceanic Whitetip Shark (*Carcharhinus longimanus*), a circumtropical pelagic species, was once among the most abundant sharks throughout tropical and subtropical waters. However, this open-ocean predator has faced severe population declines throughout its distribution leading to its listing as Critically Endangered on the IUCN Red List of Threatened Species, just one category away from Extinction. Frequently captured incidentally in tuna fisheries (bycatch) and retained because of the high value of their fins in international markets, the overexploitation of the Oceanic Whitetip Shark has led to the prioritization of the conservation and management of this species at national, regional, and international scales.

The primary managing bodies for this species are tuna-Regional Fisheries Management Organizations (tRFMOs), which work to mitigate declines of threatened incidentally captured species. All major tRFMOs have enacted ‘retention bans’ whereby they prohibit the retention, landing, storing, selling, offering, or transshipping of any part of the Oceanic Whitetip Shark. Parties governed by tRFMOs are required to return any Oceanic Whitetip Shark caught back into the water (dead or alive). Beyond this, in 2014 this species was listed on Appendix II of the Convention on International Trade of Endangered Species in Wild Fauna and Flora (CITES), requiring any international trade to be accompanied by export permits verifying legality, traceability, and sustainability. Taken together, these measures should be preventing this species from entering international trade, however, compliance with these regulations is has yet to be evaluated.

Our recent study, “Mixed stock analysis of major markets and trade records reveals illegal trade of oceanic whitetip shark fins from the Atlantic ocean,” published in Conservation Genetics provides the first genetic assessment of the geographic origin of this species’ fins sold in two major Asian markets (Hong Kong Special Administrative Region [SAR] and Guangzhou, China) between 2014 and 2017. The findings offer direct evidence of illegal international trade and highlight why stronger protections were urgently needed.

Tracing Trade Origins

This work used fin trimmings — portions of the fins removed to improve visual appeal and marketability for sale — collected from both markets between 2014 and 2017 that were previously identified as the Oceanic Whitetip Shark using genetic barcoding. From the 48 samples used, we generated sequences from two mitochondrial regions, the control region and ND4. These were then ‘stitched together’ to get sufficient resolution to evaluate the likely population-of-origin for our samples.

Using mixed-stock analysis, these market-derived sequences were compared against a comprehensive global baseline of known haplotypes from a study by Ruck et al. [2024]. The goal was simple: determine the proportion of market fins originating from each region, and assess whether these proportions matched what was legally reported to CITES during the same period.

Signal of Illegal Atlantic Trade

Between 2014 and 2017, 4,578 kg of Oceanic Whitetip Shark fins were reported to CITES, all originating from Indo-Pacific countries. Yet our genetic analysis revealed a different story.

While most fins in the markets came from Indo-Pacific populations (81.47%), nearly one-fifth (18.53%) were traced to the Atlantic Ocean. This highlights a clear and substantial proportion of illegal, unreported, trade that is inconsistent with both tRFMO retention bans and CITES Appendix II requirements.

The presence of fins originating from the Atlantic contrast with findings for the Silky Shark (*Carcharhinus falciformis*), another pelagic species with near identical protections, for which no Atlantic-origin fins were found in the same markets during the same window.

Together, these results provide the first direct, genetic evidence of the illegal international trade of Oceanic Whitetip Shark fins from the Atlantic.

Implications for Conservation and Compliance

This finding is highly significant for many reasons. First, it demonstrates that Appendix II regulations are insufficient to prevent illegal trade and that gaps in enforcement created opportunities for trafficking. Second, it highlights Atlantic waters as a priority region for strengthened monitoring, including inspections, reporting, and at-sea observer coverage. Last, it identifies specific management failures that undermine recovery efforts for a species already at a high risk of extinction.

Additionally, the discovery of novel haplotypes in market samples also underscores the need for expanded population-level genetic sampling, as improved genetic baselines will help refine mixed-stock analyses and support future monitoring efforts.

Science That Helped Support a Major Policy Shift

At the most recent CITES Conference of the Parties (CoP) that took place in late November through early December of 2025, Parties discussed our study to highlight the need for increased international protections. The evidence from our study, clearly showing an Atlantic contribution to the fin trade despite a total absence of legal Atlantic exports, provided timely scientific support for efforts to strengthen the species’ protection.

Parties voted to uplist the Oceanic Whitetip Shark to CITES Appendix I, prohibiting all international commercial trade. This uplisting represents a critical milestone for conservation of the species and directly addresses the loopholes revealed by our research. Appendix I protection means that no trade can occur for commercial purposes, closing the door on the permitting challenges that plagued Appendix II implementation. It also sends a strong signal to enforcement agencies, traders, and fishing fleets that any international movement of oceanic whitetip shark products is now unlawful.

The Oceanic Whitetip Shark faces an uncertain future, but the new Appendix I listing marks a major step toward its recovery. Our study demonstrates how genetic tools can expose hidden illegal trade and provide essential scientific evidence to guide global conservation action.

Paper citation

Fields, C.Y.A., Cardeñosa, D., Bernard, A., Feldheim, K.A., Gale, S.W., Papastamatiou, Y.P., Shea, K.H., Shivji, M.S., Zhang, H., & Chapman, D.D. 2025. Mixed stock analysis of major markets and trade records reveals illegal trade of oceanic whitetip shark fins from the Atlantic ocean. Conservation Genetics, 26, 943–952. doi.org/10.1007/s10592-025-01714-1

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Fin trimmings collected from major Asian markets

Oceanic Whitetip Shark
[*Carcharhinus longimanus*]

Photo by Daniel Torobekov | Pexels

Photo by Candace Fields



Oceanic Whitetip Shark
(*Carcharhinus longimanus*) in
The Bahamas shark sanctuary

Written by
Ingo Miller
Biopixel Oceans Foundation
James Cook University

Needle in a Haystack: Scientists uncover first Whale Shark aggregation on Australia's east coast

Written by
Ingo Miller
Biopixel Oceans Foundation
James Cook University



Whale Shark (*Rhincodon typus*) swimming through Wreck Bay aggregation site in the Far Northern Great Barrier Reef after successfully equipped with satellite transmitter by Biopixel Oceans Foundation team

Whale Sharks [*Rhincodon typus*], the biggest fish, can grow to the length of a city bus yet finding them in the vast oceans is remarkably difficult, somewhat akin to looking for a needle in a haystack. Despite their large size, they eat some of the tiniest critters in the ocean: zooplankton. As filter-feeders with no interest in anything larger than a shrimp, they are harmless to humans. Unlike other filter-feeding animals — like baleen whales [*Balaenoptera* spp.] that feed in cold, plankton-rich waters at the poles — Whale Sharks live in warm tropical and subtropical oceans around the globe, in waters that have the lowest plankton productivity. To sustain a living in these unproductive waters they call home, Whale Sharks travel vast distances to find hotspots of productivity to feast. Such hotspots typically occur along coastlines and at the edges of continental shelves, where oceanographic conditions, such as upwellings or spawning events cause seasonal productivity booms, leading to abundant zooplankton. Whale Sharks are usually solitary, but they gather in large groups known as aggregations – or constellations as we like to call them, a nod to their star-like patterns – to make use of such productive hotspots. They are one of the few times we can reliably find and study this migratory species, whose movements typically span thousands of kilometres across international waters.

Globally, there are around 30 known Whale Shark aggregation sites, in places like Mexico, the Maldives, and the infamous Ningaloo Reef in Western Australia. Yet until now, none had been documented in large parts of the southwest Pacific, including Australia’s east coast. However, Whale Sharks, usually single animals, are occasionally sighted on the east coast, particularly on the Great Barrier Reef, raising the question of whether an aggregation had simply gone unnoticed thus far.

As we report in Ecology and Evolution, our search for a Whale Shark aggregation was like a detective story, piecing together several layers of information to predict the most likely site on the east coast of Australia/Coral Sea region. We looked at historical sightings, bathymetry maps, oceanographic features, and anecdotal reports – some dating back decades. We looked for ecological, physical, and environmental clues for patterns in space and time, and one location kept popping up as a promising candidate site: Wreck Bay – a remote corner of the far northern Great Barrier Reef. In 2019, with great trepidation we (Biopixel Oceans Foundation) cobbled together enough funds to set out on a ten-day expedition to the remote north to test our theory that Whale Sharks aggregate in Wreck Bay in late November. It was a success, within days, multiple sharks were encountered within Wreck Bay. From this initial finding, we pulled together a massive collaborative team of leading international Whale Shark experts who contributed time, knowledge and resources over three subsequent expeditions between 2021 and 2024. In total, 59 animals were photo-identified by their unique spot patterns. Predominantly juveniles, and one subadult, ranging from 3.5 to 8 metres in length. Three quarters of individuals spotted were male, a common pattern in most aggregation sites. Over 40 sharks were also satellite-tagged, tracking their movements in near real-time. Tracking revealed that the sharks spend around three weeks in Wreck Bay on average, while the aggregation season appears to start in November through to January, peaking between late November – late December. Once the sharks leave the aggregation, they go back to their solitary lifestyles and disperse into the Coral Sea, some going as far as the Gulf of Papua or the Solomon Sea. Remarkably, some tags remained on the sharks long enough to record them returning to Wreck Bay in subsequent years, suggesting a consistent, recurring, and therefore predictable

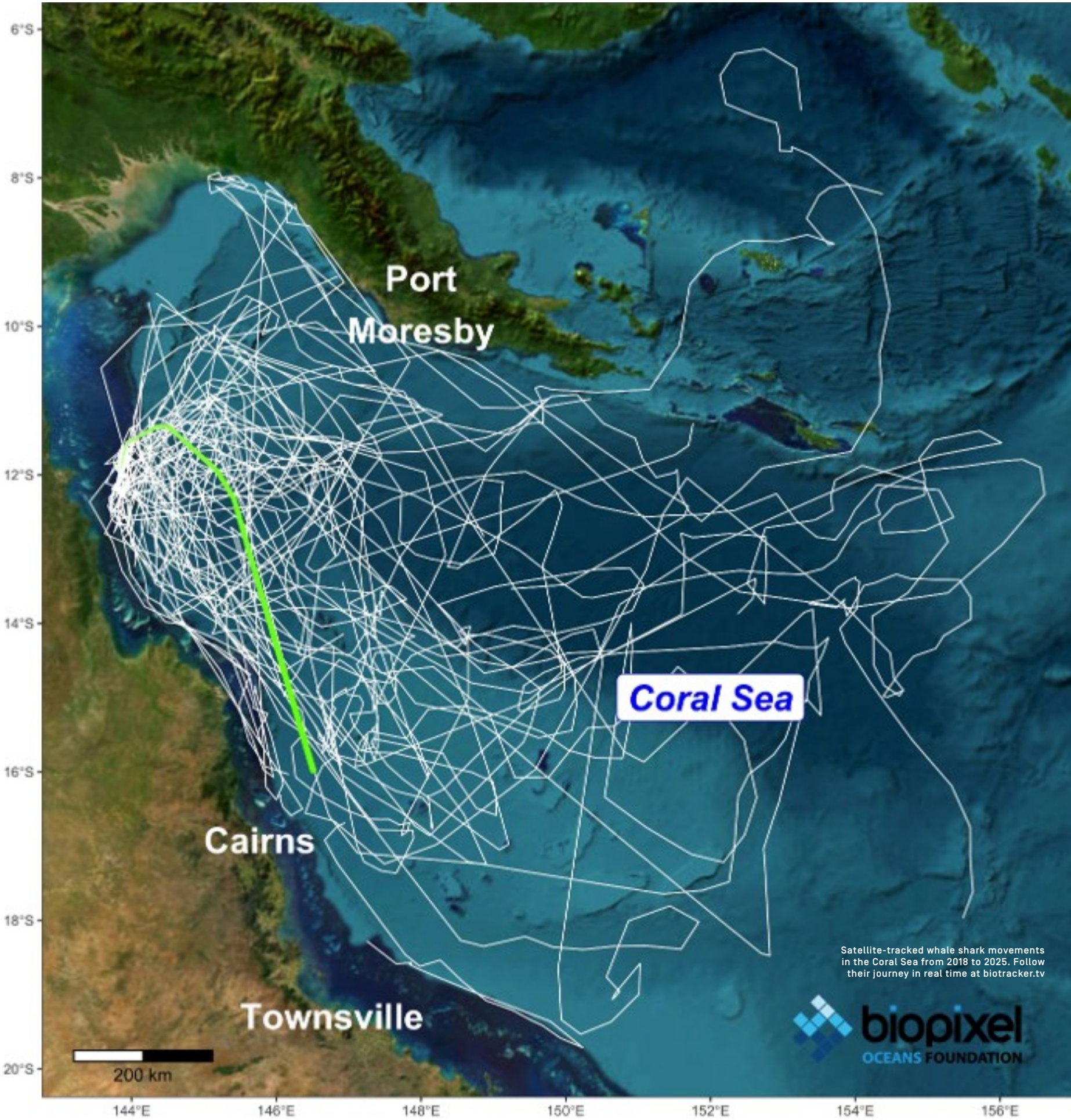
aggregation. Sharks were tracked up to over two years, with track lengths of up to over 11,000 km. Whale Sharks are listed as Endangered on the IUCN Red List of Threatened Species. Their global populations are declining, mainly due to human threats such as fishing, ship strikes, and climate change. Until now the Coral Sea region, indeed the southwest Pacific, had been a major knowledge gap for global population and conservation assessments. That makes our discovery particularly important: it fills a blind spot in global Whale Shark research and ensures this part of the world is now on the map, and data from this site can feed into future regional and global assessments. Unfortunately, at the local scale, the Great Barrier Reef Marine Park Authority has shown no interest in learning more about this important aggregation in the marine park they manage. Yet now that we know about their essential habitat on the east coast, it is vital to assess the threats these gentle giants may face here – now and in the future – and how we can mitigate them. The research also raises the question if there might be further, yet undiscovered aggregation sites on Australia’s east coast, the Coral Sea and beyond.

Paper citation

Miller, I.B., Fitzpatrick, R., Abrantes, K.G., Norman, B., Pierce, S.J., Erdmann, M.V., Hoopes, L.A., Dudgeon, C., Dunbabin, M.D., Dove, A.D., & Beaman, R.J., 2025. The Needle in the Haystack: Uncovering the First Whale Shark (*Rhincodon typus*) Aggregation in the Coral Sea. *Ecology and Evolution*, 15(6), 71552. doi.org/10.1002/ece3.71552

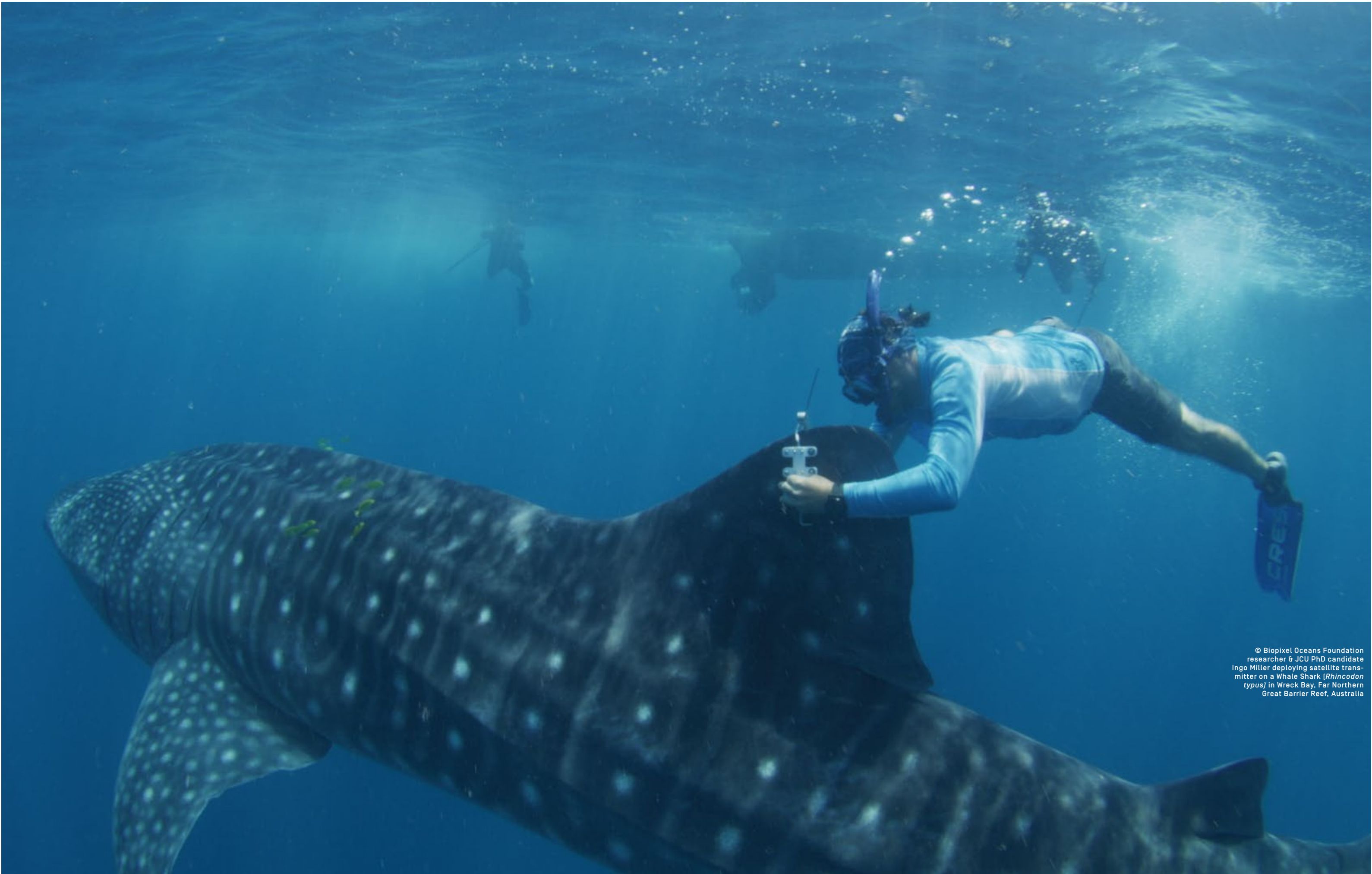
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Satellite-tracked whale shark movements in the Coral Sea from 2018 to 2025. Follow their journey in real time at biotracker.tv





© Biopixel Oceans Foundation
researcher & JCU PhD candidate
Ingo Miller deploying satellite trans-
mitter on a Whale Shark [*Rhincodon*
typus] in Wreck Bay, Far Northern
Great Barrier Reef, Australia

A large school of scalloped hammerhead sharks swimming in clear blue water. The sharks are seen from above, showing their distinctive hammer-shaped heads and white underbellies. They are swimming in various directions, creating a sense of movement and abundance.

NEW EVIDENCE REVEALS SCALLOPED HAMMERHEAD NURSERIES ALONG GUATEMALA'S PACIFIC COAST

Written by
Maria de Belen Chacón
Fundación Mundo Azul

Julio Sánchez-Jiménez
Fundación Mundo Azul
Website: www.fundacionmundoazul.com



Measurements taken from Scalloped Hammerheads (*Sphyrna lewini*) in artisanal landings monitoring in Sipacate, Guatemala

The Scalloped Hammerhead (*Sphyrna lewini*), is listed as Critically Endangered by the IUCN Red List of Threatened Species. It is the most frequently caught shark along Guatemala's Pacific coast (Ruíz Alvarado & Mijangos López, 1999; Ixquiac Cabrera et al., 2009; Avalos-Castillo & Santana-Morales, 2021), representing nearly 68% of all recorded shark landings. Observations of neonates and young-of-the-year (YOY) in shallow waters suggested these areas serve as nurseries, but long-term data confirming this was lacking.

Responding to priorities established in Guatemala's National Plan of Action for the Conservation and Management of Sharks, Rays, and Chimeras (NPOA–Guatemala), the Fundación Mundo Azul conducted a multi-year initiative to identify hammerhead nursery areas along the Pacific coast. This effort combines local ecological knowledge, long-term fisheries artisanal monitoring, and active community participation to deepen our understanding of where and when juvenile Scalloped Hammerheads use coastal habitats, information essential for the conservation of this species.

Identifying Critical Nursery Habitats

Researchers confirmed nursery areas near river mouths and mangrove systems, in shallow, productive zones that offer shelter and food. Neonates and YOY, measuring 40–80 cm total length (TL), were consistently recorded in these habitats (20–50 m deep) during the rainy season, indicating repeated seasonal use. These findings provide valuable insights into the species and support regional conservation efforts (Sánchez-Jiménez et al., 2025).

How Data Were Collected

Between 2017 and 2023, biologists and trained community monitors conducted 1,476 days of artisanal fishery-dependent monitoring in Sipacate, Buena Vista, and Las Lisas. Through a citizen science program, fishers recorded landings and measurements. Over 10,000 hammerheads were documented, with neonates and YOY making up 96% of records. Neonate abundance peaked from May to August, while YOY peaked from June to September across several years, revealing clear and recurring seasonal patterns that align with nursery criteria proposed by Heupel et al. (2007).

Why These Findings Matter

Nursery areas are vital for population recovery, yet they overlap with zones of intense artisanal fishing, exposing young sharks to gillnet bycatch and habitat degradation. Identifying and mapping these habitats provides the scientific evidence needed to guide community-driven protection measures, such as the establishment of Fish Replenishment Zones (FRZs), and to inform national management actions. Therefore, the research directly supports spatial fishery management and strengthens ongoing efforts to conserve hammerheads in the eastern Pacific.

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Fundación Mundo Azul researcher in artisanal landings monitoring in Sipacate, Guatemala

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Community monitor and Fundación Mundo Azul researcher in artisanal landings monitoring in Sipacate, Guatemala



Scalloped Hammerhead (*Sphyrna lewini*) in captured with gillnets in artisanal fisheries in Sipacate, Guatemala

Shark meat on the Italian menu: consumption, awareness and conservation opportunities

Written by
Ginevra Boldrocchi
Department of Human Sciences, Innovation and Territory
Via Valleggio 11, 22100 Como, Italy
Email: Ginevra.boldrocchi@uninsubria.it; IG: @Dj.whale.shark.
project

Globally, sharks and rays continue to face a high risk of extinction, largely driven by overfishing which represents a universal threat to these animals. Despite recent policy advances, the global demand for shark meat remains substantial. According to trade data, just a handful of countries dominate the shark meat trade such as Brazil and Uruguay, while several Mediterranean nations play central roles as processors, exporters, or consumers. Thus, Europe represents a key player: Spain alone accounts for a major share of global shark meat exports, while Italy consistently ranks among the world’s most important importers and consumer markets (Dent & Clarke, 2015).

In this context, Mediterranean countries stand out as a particularly important hotspot. However, public understanding of sharks and the misconceptions surrounding them remains limited, potentially weakening support for their conservation. To address this, we need a deeper look into what people know, what they misunderstand, and how these perceptions influence their choices as consumers. Identifying these knowledge gaps and the factors that shape behaviour is key to designing effective awareness campaigns and guiding consumer demand. This in turn can help current regulations work better and highlight where stronger policy action may be needed.

In our recent study, “Knowledge drives conservation: Tackling the shark consumption issue in Italy – A case study” (2025) published in Marine Policy, we explored consumer knowledge, perceptions, and consumption patterns related to shark products in one of Europe’s major seafood markets.

Background: Why focus on Italy?

Italy has long been one of the top global importers of shark meat, consistently ranking among the leading European markets (Dent & Clarke, 2015; Niedermüller et al., 2021). As one of the world’s largest importers, the country plays a central role in the international shark trade. What happens in Italy can influence demand far beyond its borders. As a key ‘consumption node’, reducing national demand can translate into measurable reductions in international demand and, ultimately, in fishing pressure, making Italy a particularly strategic context for conservation-oriented interventions.

Milan represents a particularly relevant case study. As Italy’s largest and most economically dynamic city, it attracts residents from across the country and reflects a broad cross-section of urban demographics. It also hosts Italy’s largest wholesale fish market and is closely connected to major import routes via one of the country’s busiest cargo airports, ensuring wide access to seafood products. For these reasons, Milan offers an ideal scenario to examine awareness, purchasing behaviour, and exposure to shark products, capturing the preferences of a diverse urban population and providing insights

indicative of broader Italian consumption dynamics.

Therefore, we carried out a structured consumer survey in Milan, which combined quantitative questions on awareness, purchasing behaviour and perceptions with qualitative insights into attitudes toward sustainability, conservation and food safety.

Key Findings

Our survey uncovered a surprising truth: most Italians care about sharks but have no idea they are eating them.

Participants generally demonstrated a solid overall understanding of sharks and expressed positive attitudes toward them, including awareness of the threats these species currently face. More than half of the respondents answered knowledge-based questions correctly and did not view sharks as aggressive or dangerous to humans. This reflects a broader shift in public attitudes seen in recent years, with sharks increasingly understood through an ecological rather than sensationalistic lens — more as vulnerable species than as ‘villains.’

Despite these encouraging attitudes, the study also reveals critical gaps. A particularly important result is that most Italians are unaware of the significant role Italy plays in the global shark trade. Despite being one of the major importers and consumers of shark meat in Europe, this fact is largely unrecognised by the public, revealing a clear disconnect between national market dynamics and consumer awareness.

Another major finding of the study is that almost all participants (93%) stated they had never purchased shark meat. However, when they were shown the common commercial names of shark meat used in Italy (e.g., *palombo*, *verdesca*, *spinarolo*, and *gattuccio*), at that point, nearly 30% realised they had indeed consumed these species.

This shows that a substantial portion of shark consumption is unintentional, likely driven by the Italian shark common names that lack any direct reference to the term ‘shark’. For instance, the Blue Shark (*Prionace glauca*) is translated to as ‘*verdesca*’ losing the connection to the word ‘shark’. This makes it difficult for consumers to identify what they are buying. Considering Italy’s position among the world’s major shark meat importers, this lack of clarity has significant implications for both conservation and public awareness.

Another important aspect emerging from the survey relates to contamination and the potential human-health risks linked to shark consumption. Beyond conservation, shark meat raises clear ecotoxicological concerns. Worldwide research has documented elevated concentrations of trace elements and persistent organic pollutants in the muscle of several commercial species, as well as biomagnification across shark and ray food webs (Boldrocchi et al., 2019, 2021). Such findings highlight that shark consumption may pose potential health risks to frequent consumers, an aspect that strengthens the conservation rationale for reducing demand.

While nearly all respondents acknowledged that fish can accumulate pollutants, only 30% of participants were aware that sharks, as long-lived apex predators, can accumulate especially high levels of mercury and other persistent contaminants. This gap indicates that communication on the health risks associated with shark consumption remains limited and does not effectively reach the public.

One of the most encouraging results is the rapid change in purchasing intention following a brief informational section. After learning about the conservation status of sharks, Italy’s role in the global shark meat trade, and the potential health risks associated with shark consumption, over 90% of respondents stated they would not buy shark meat in the future. After receiving brief information on conservation issues and contaminant bioaccumulation, more than 93% reported they would avoid buying shark products in the future. These results underline that information about contamination strongly influences consumer choices and can serve as an effective entry point for behaviour change.

These findings show that even minimal information can quickly reshape consumer choices and highlight contamination as an effective tool to support shark conservation and public health.

Moreover, an overwhelming 95% of participants expressed support for the introduction of clear, easily recognisable labels to identify shark-derived products. This reflects a widespread desire for transparency and aligns with broader European trends in consumer demand for clear, sustainable seafood information.

Enhanced, visually explicit labelling would help prevent unintentional shark consumption and empower consumers to make choices consistent with their environmental and health values.

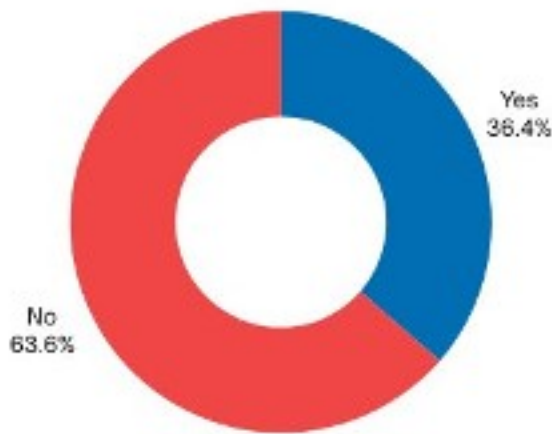


Indeed, public interest in sharks is high, but market transparency is low. Italian consumers demonstrate concern for conservation, yet lack the tools needed to translate these values into behaviour. Italian shark common names obscure the true nature of shark products. So, our results suggest several targeted actions such as implementing clearer, standardised labelling for shark products across the European Union. Education emerged as the most powerful lever for change: providing even brief information on conservation status or sustainability strongly reduced willingness to buy shark meat. This effect became even more pronounced when messaging included human-health considerations linked to contaminant bioaccumulation. Developing public awareness campaigns that integrate a dual approach—protect sharks, protect yourself—offers an effective strategy to shift consumer behaviour rapidly.

Paper citation
Carabelli, A., Dal Maso, M., Carola, M.V., Ba, V., Carraturo, M., Milani, I., Bettinetti, R., & Boldrocchi, G. 2025. Knowledge drives conservation: Tackling the shark consumption issue in Italy–A case study. *Marine Policy*, 180, 106806. doi.org/10.1016/j.marpol.2025.106806

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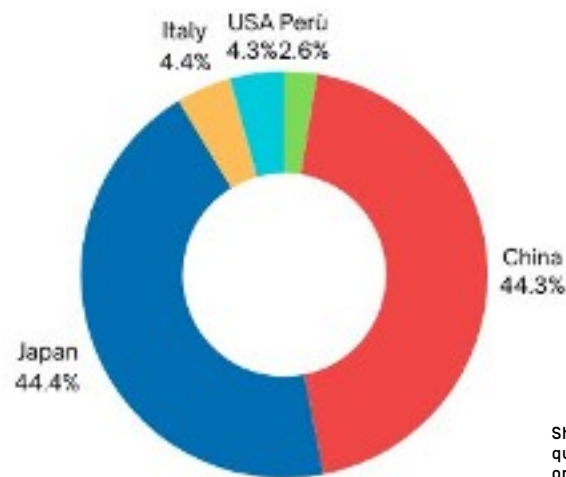
A. Is shark meat legal and traded in Italy?



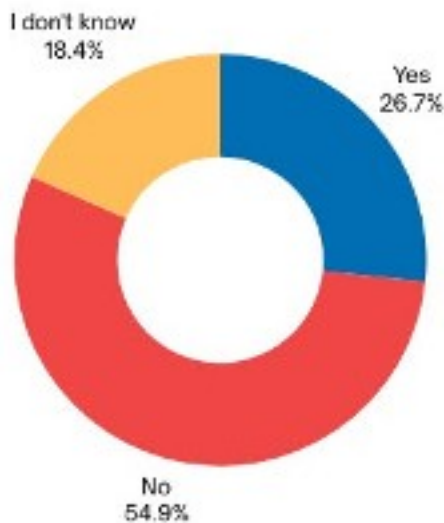
B. Have you ever purchased shark meat?



C. Which of the following countries is the greatest shark meat consumer?



D. Have you ever got the spiny dogfish, common smoothhounds, porbeagle, mako, catshark?



Shark consumption results from a questionnaire-based survey focused on inhabitants of Milan (Italy) (N = 698) – Boldrocchi et al. (2024)





Blue Shark (*Prionace glauca*) in the Azores



Peruvian Chondrichthyes biodiversity updated!: High stakes for chimaeras, sharks, and rays

Shark fins of Smooth
Hammerheads (*Sphyrna zygaena*)

Written by
Sarita Campos-León

Laboratorio Costero de Camaná,
Instituto del Mar del Perú, Arequipa, Peru

Peru, located in the southeastern Pacific, is a true global hotspot for marine life. Imagine a vast ocean pantry stocked by the powerful, cold Humboldt Current and the warmer South Equatorial Current. This dynamic intersection creates a unique biological transition zone where species from tropical, temperate, and cold waters all converge. It’s an ideal environment for incredible marine biodiversity, especially for the group we study: the Chondrichthyes (sharks, rays, and chimaeras). The country also boasts an extraordinary network of over 1,000 rivers feeding into the mighty Amazon. These waterways support a unique freshwater fish diversity, including rays that never see the ocean.

Despite their ecological importance and their prominent role in local fisheries, a complete, scientifically validated national checklist of Peru’s sharks, rays, and chimaeras was long overdue. Confusion from outdated records and misidentifications often complicates conservation and management efforts. To address this, our recently published study provides a rigorous update. We meticulously cross-referenced information from scientific literature, genetic databases, major museum collections, and fishery records. The result? A comprehensive, revised list confirming 110 species within Peru’s geopolitical territory: 56 sharks, 47 rays, and seven chimaeras.

A central contribution of our work was the critical ‘house cleaning’ of historical records. We found that many species previously thought to be ‘probable’ residents of Peruvian waters actually lacked solid, verifiable evidence or were based on misidentifications. Consequently, we had to exclude 23 species (13 sharks and 10 rays) from the official list. For example, species like the Horn Shark (*Heterodontus francisci*), the Sharpnose Sevengill Shark (*Heptranchias perlo*), and the Smalltooth Sawfish (*Pristis pectinata*) were excluded because their documented ranges simply do not extend to this part of the southeastern Pacific, or recent evidence is absent. This refinement is crucial because accurate species counts serve as the fundamental building blocks for effective regional conservation strategies.

Our study did not stop at counting; it tracked the species’ journey through commercial markets. A concerning 56% of the confirmed species are caught and traded nationally or internationally. The main products are diverse: fresh and salted meat (like ‘chinguirito’ a traditional coastal dish), fins, skins, jaws, and even the unique underdeveloped eggs of angel sharks (*Squatina* spp.). Artisanal fisheries are the primary harvesters. While authorized landing sites exist, we documented the persistent issue of informal trade and marine curios — such as jaws and teeth sold as tourist souvenirs. For freshwater rays, the trade is primarily directed toward the ornamental aquarium market.

The conservation status of Peru’s sharks, rays, and chimaeras is troubling. According to the IUCN Red List of Threatened Species, the global conservation status of these species is uncertain: 12 species (11 sharks and one ray) are Critically Endangered,12 species are Endangered (seven sharks and five rays), and 27 species are listed as Vulnerable (10 sharks, 16 rays, and one chimaera). Many of these are economically important sharks, such as the Shortfin Mako (*Isurus oxyrinchus*), Pelagic Thresher (*Alopias pelagicus*),

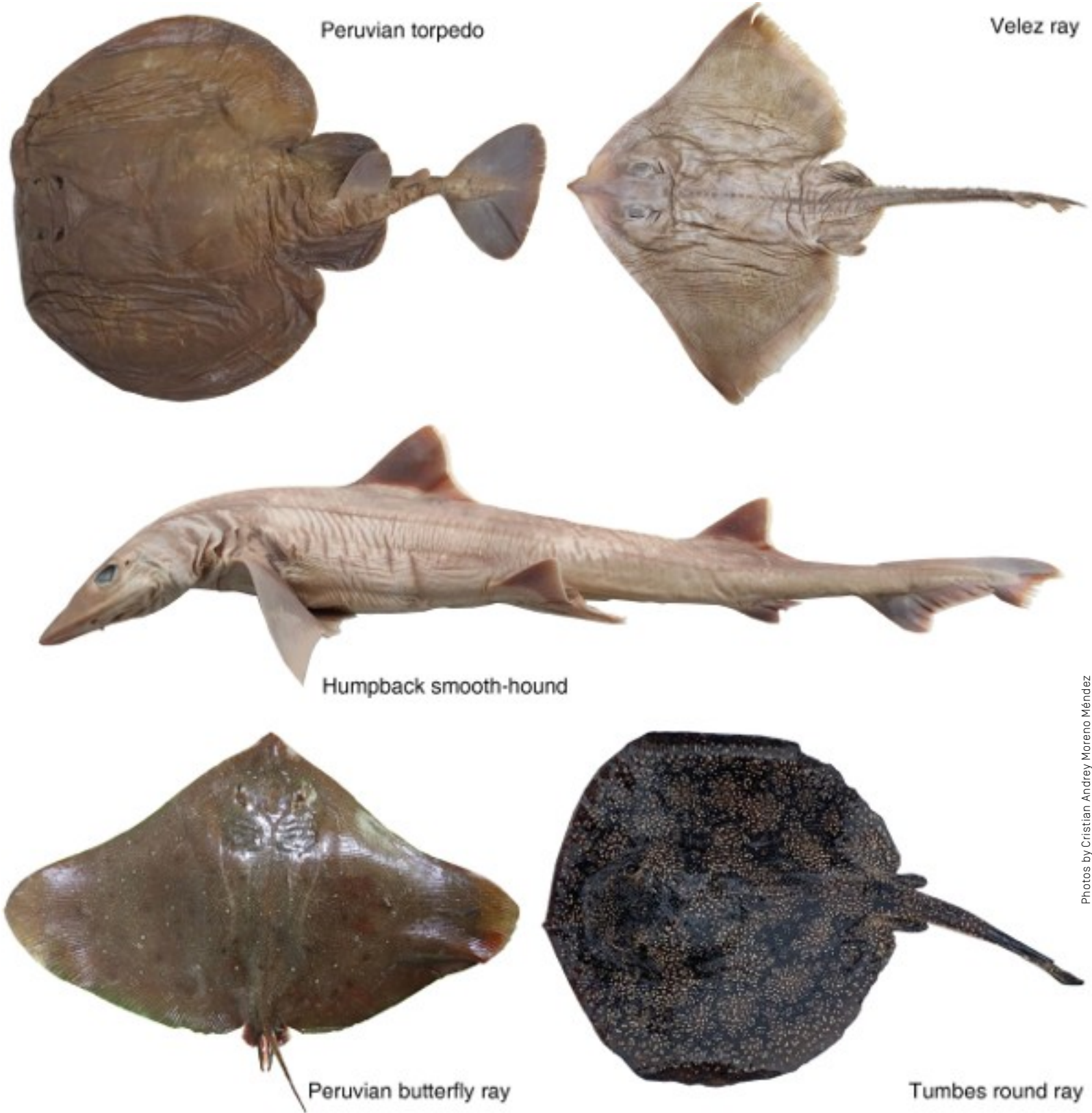
and Scalloped Hammerhead (*Sphyrna lewini*). Furthermore, 37 recorded species are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices, which regulates their international trade. Peru has regulatory tools, including closed seasons, size limits, and the National Plan of Action for Sharks (PAN-Tiburón). However, our research highlights persistent gaps in enforcement, traceability, and accurate species-level catch monitoring. This lack of granular data makes it difficult to manage fishing pressure effectively. We also note that species within the smoothhound shark genus (*Mustelus* spp.) are notoriously difficult to tell apart by eye, leading to confusion in fishery landings.

The recent establishment of three Important Shark and Ray Areas (ISRAs) within Peruvian waters provides a powerful opportunity. These areas, centered on critical habitats, can become the focus of targeted conservation efforts.

Our updated list — the most robust, scientifically substantiated synthesis available — is not the final word, as ongoing research will continue to refine our knowledge. However, it is an urgent call to action. We must strengthen management, improve species identification systems, and promote continuous research, particularly in the poorly explored waters of the southeastern Pacific. The future of Peru’s incredible sharks, rays, and chimaeras depends on it.

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Photos by Cristian Andrey Moreno Méndez



Gorgona Guitarfish
(*Pseudobatos prahli*)

Photo by Billy Bensted-Smith, iNaturalist.org, CC BY-NC



Spinetail Devil Ray
(*Mobula mobular*)

Photo by David Lizardo Sarmiento Barturen



Top left: photo of shark fins. Middle: a commercialized shark teeth. Bottom left: "chiringuito" selling dried ray. Bottom right: Ocellate Freshwater Stingray (*Potamotrygon motoro*) for sale

Sarita Virginia Campos León

WHY ONE SIZE DOESN'T FIT ALL: RETHINKING CONSERVATION NEEDS FOR CARPET SHARKS



Written by Maryam Nakhostin

Dalhousie University, Canada
Earth to Ocean Research Group, Department of Biological Sciences,
Simon Fraser University, Canada

Nicholas K. Dulvy

Dalhousie University, Canada
Earth to Ocean Research Group, Department of Biological Sciences,
Simon Fraser University, Canada
IUCN SSC Shark Specialist Group | North America regional member

With the exception of the Whale Shark (*Rhincodon typus*) and the Indo-Pacific Leopard Shark (*Stegostoma tigrinum*), carpet sharks (Orectolobiformes) rarely appear in popular media, policy discussions, or conservation campaigns. Not all species evoke the same sense of awe as Whale Sharks, fear as (Great) White Sharks (*Carcharodon carcharias*), or fascination as hammerheads (Sphyrnidae family). Instead, most occupy quiet ecological spaces, tucked within coral crevices, gliding over sandy bottoms, or resting in shallow reef flats. Yet this low-profile existence is precisely what makes them so sensitive to overfishing. In our recent paper, *Spatial scale and conservation options for carpet sharks*, we found that while some species face localized pressures, others are jeopardized by broad, region-wide overfishing that exceeds the scale of individual marine-protected areas.

Carpet sharks comprise a diverse assemblage of 45 species across seven families and encompass a wide range of body sizes (from 35 cm to 21 m total length), life-history strategies, and spatial behaviors. Some species have extremely small home ranges and specialized habitat needs (such as the Ginger Carpetshark *Parascyllium sparsimaculatum*); others —like the Whale Shark — move more broadly through coastal systems and overlap heavily with widespread fishing effort. This diversity makes them fascinating from an evolutionary and ecological perspective, but it also means that broad, generalized approaches to shark conservation may not adequately protect them.

Why Carpet Sharks Matter [More Than Most People Realize]

While most carpet sharks are not perceived as “charismatic,” their roles within coastal ecosystems are anything but minor. As mesopredators, benthic specialists, or nocturnal foragers, they help maintain the structure, stability, and function of reef and soft-sediment food webs. They influence prey dynamics, contribute to nutrient cycling, and serve as indicators of coastal ecosystem health. Their presence or absence, provides important signals about habitat integrity and human pressure.

This is especially important in rapidly changing ecosystems. Many carpet shark species occupy the very regions experiencing the greatest anthropogenic stress: expanding urban coastlines, intensifying fisheries, sedimentation from upstream development, coral loss, and climate-driven habitat shifts.

At the global scale, shark and ray populations continue to decline. Recent assessments show that overfishing, both targeted and incidental, remains the leading driver of chondrichthyan declines. Species with restricted distributions and specialized niches have emerged as some of the most threatened. Carpet sharks fall squarely into this high-risk category, yet historically they have received relatively little scientific or management attention.

Understanding their spatial ecology and this spectrum of threat types is therefore not just an academic exercise. It is central to

identifying realistic, achievable conservation pathways.

The purpose of our work was simple: to examine how spatial ecology—specifically species’ geographic ranges, habitat use, and movement patterns—and the scale of threats shape conservation needs and opportunities for carpet sharks. But the implications extend far beyond this group alone. Our findings highlight a broader reality for shark and ray conservation: “MPAs on their own will not solve widespread overfishing, and instead diagnosis and a tailored treatment is likely to be more effective than a single cure-all”. Without strategies tailored to both fine-scale habitats and broad-scale fishing impacts, we risk losing biodiversity that has remained largely invisible to science, management, and the public.

Key Insights from Our Study

Our analysis shows that conservation needs among carpet sharks is strongly shaped by the spatial scale at which threats operate, and that this scale varies widely across species. While some carpet sharks are primarily affected by localized pressures, others are exposed to diffuse fishing mortality across broad geographic regions. This diversity of threat pathways challenges the assumption that a single conservation strategy can be applied uniformly across the group. With the global biodiversity targets committing governments to protect 30% of national land and waters by 2030, Marine Protected Areas (MPAs) seems to be the only conservation option that donors are interested in.

For species with small geographic ranges or strong site fidelity, extinction risk is often driven by exposure to spatially concentrated threats. These species, such as the Halmahera Epaulette Shark tend to occupy discrete habitats such as individual reef systems, coastal embayments, or isolated island shelves, where even limited habitat degradation, coastal development, or localized fishing pressure can affect a large proportion of the population. Population declines in these cases may occur rapidly and remain undetected, particularly for cryptic or poorly monitored species. However, our results show that even for these species, single site-based MPAs are unlikely to be sufficient. Among the 28 threatened and Data Deficient carpet shark species assessed, none could be adequately protected by a single MPA, as even the smallest geographic range exceeded the average size (<10 km²) of typical MPAs.

Instead, conservation needs span a spectrum of spatial scales. Just over one-third of species (39.3%, n = 11) were identified as requiring protection across networks of MPAs, while nearly half (46.4%, n = 13) were classified as needing a combination of site-scale protection and broad-scale conservation measures, reflecting exposure to both localized and widespread threats. A smaller subset of species (14.3%, n = 4) were found to benefit primarily from broad-scale conservation actions, such as fisheries management (catch limits, bycatch mitigation), and may derive limited benefit from site-based protection alone. Together, these findings highlight that many carpet sharks fall between traditional conservation categories, where neither spatial protection nor broad-scale management alone is sufficient.

How well are we doing so far? We also assessed how these recommended strategies align with current practice by comparing them with conservation actions reported in IUCN Red List of Threatened Species assessments. Across all 28 assessed species, only half are currently receiving conservation measures that align with the needs of the species, and just 17.9% benefit from conservation actions implemented specifically for the focal species, rather than from general fisheries or habitat management. Alignment varied among categories, with species requiring combined site-scale and broad-scale measures showing the strongest match between recommendations and action, while species relying on broad-scale measures received no species-specific conservation. This pattern

Blind Shark
[*Brachaelurus waddi*]



highlights a persistent implementation gap between conservation planning and on-the-ground action.

Taken together, these findings demonstrate that [MPAs are an important but insufficient tool for carpet shark conservation when used in isolation. Effective conservation will depend on integrated strategies that combine spatial protection with fisheries management, monitoring, and targeted implementation matched to species ecology and threat scale.

Why This Work Matters Now

This work comes at a critical time for shark conservation. Global concern over shark and ray declines has never been higher, yet conservation responses are increasingly centered on spatial protection, driven in part by international commitments such as the Kunming–Montreal Global Biodiversity Framework and its ‘30 × 30’ target (Target 3: Conserve 30% of Land, Waters and Seas by 2030). Our results reinforce an important caution: spatial protection alone is unlikely to meet the conservation needs of most carpet sharks.

Across the order Orectolobiformes, over half of threatened species require either networks of protected sites or a combination of site-scale protection and broad-scale threat mitigation, largely due to broad geographic ranges and exposure to widespread overfishing. In this sense, many carpet sharks are “area-demanding”: they rely on spatial protection for key habitats or life-history stages, but must also be managed across much larger seascapes through fisheries regulation and other broad-scale measures.

This need for tailored, multi-scale conservation coincides with escalating pressures on coastal ecosystems. Coastal development,

sedimentation, destructive fishing practices, and climate-driven habitat loss increasingly overlap in the shallow, nearshore habitats on which many carpet sharks depend. At the same time, there is growing recognition that conserving sharks is not only about preventing extinctions, but about maintaining the ecological functions they perform. Carpet sharks contribute to benthic processes, prey regulation, and habitat dynamics that underpin the health and resilience of reef and coastal ecosystems.

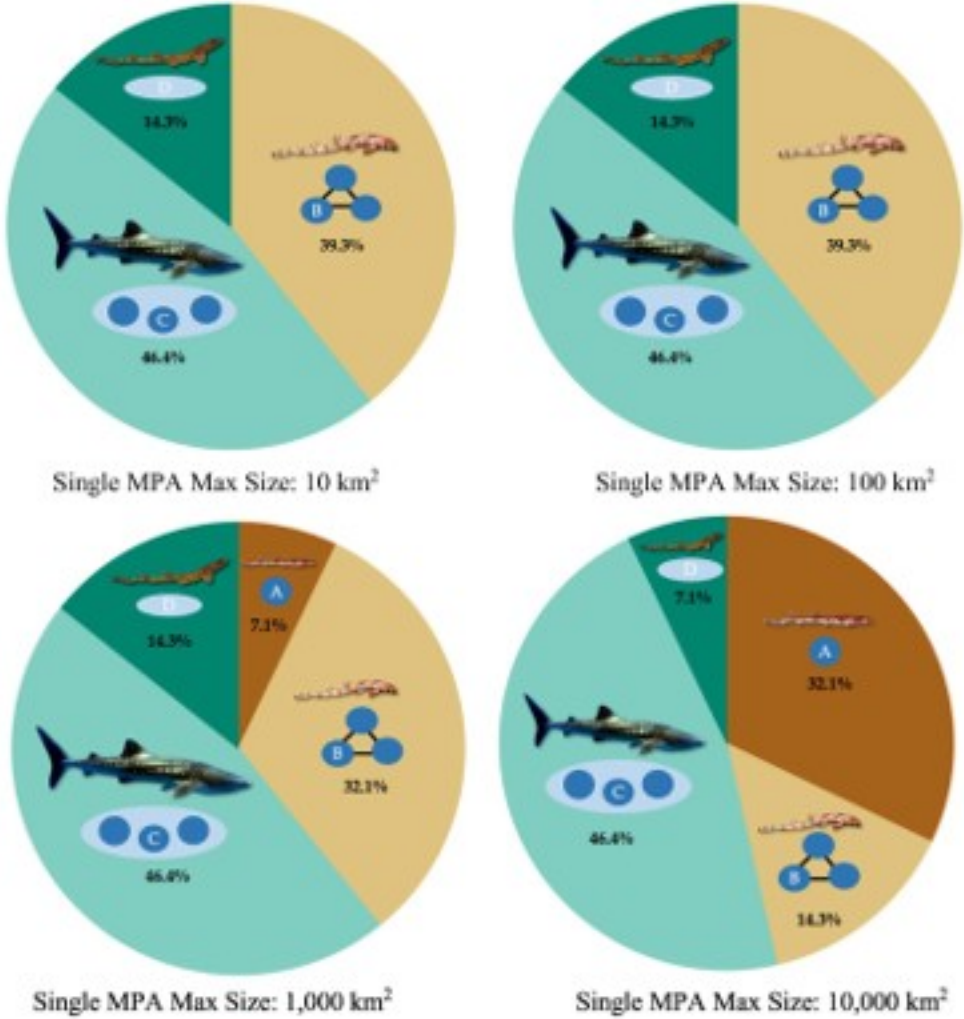
A Call to Action

Carpet sharks have persisted for millions of years, surviving dramatic climatic and ecological change. Today, however, species from these ancient lineages face threats operating at spatial scales that current conservation frameworks often fail to address. Their vulnerability is not due to inherent fragility, but to a mismatch between species ecology and the way conservation is commonly applied.

Protecting carpet sharks requires moving beyond one-size-fits-all solutions. It demands conservation strategies that explicitly consider spatial scale, close the gap between recommended and implemented actions, and prioritize species-specific needs rather than assuming incidental protection. By integrating spatial protection with broad-scale threat mitigation and targeted management, we can ensure that carpet sharks remain part of the world’s marine future and, in doing so, help safeguard the complexity, resilience, and ecological integrity of marine ecosystems.

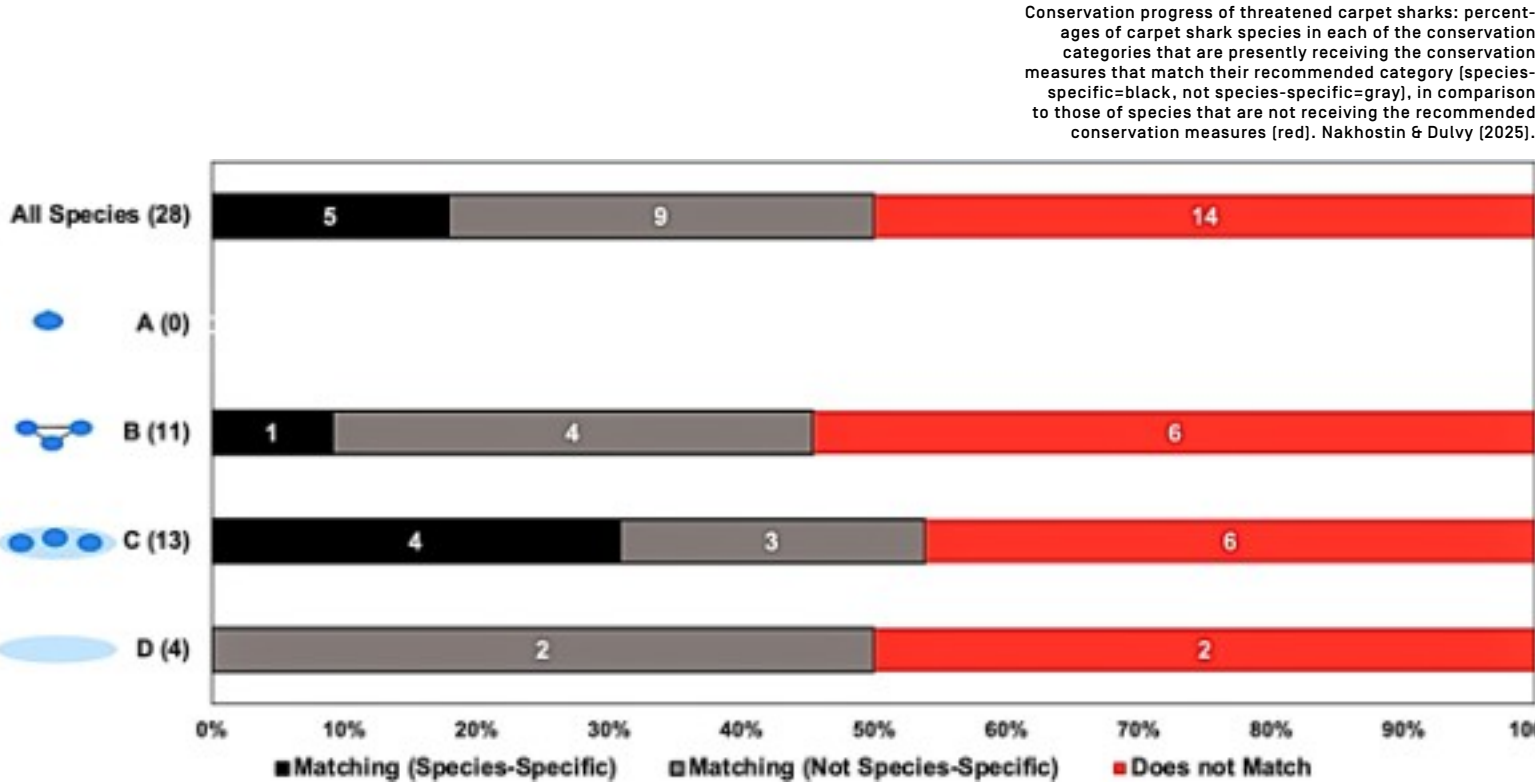
Publication
Nakhostin, M. & Dulvy, N.K. 2025. Spatial scale and conservation options for carpet sharks. *Biological Conservation*, 308, 111211. doi.org/10.1016/j.biocon.2025.111211

Percentages of carpet sharks classified into each of the four conservation categories for Single MPA maximum sizes: 10, 100, 1,000 and 10,000 km2. A- Ginger Carpetshark (*Parascyllium sparsimaculatum*) [Australian National Fish Collection, CSIRO]; B- Halmahera Epaulette Shark (*Hemiscyllium halmahera*) [“Eco Watch” by M.V. Erdmann, California Academy of Sciences], C- Whale Shark (*Rhincodon typus*) [S. ElkCloner]; and D- Taiwan Saddled Bambooshark (*Cirrhoscyllium formosanum*) [OpenCage Systems].



A. Single MPA		
B. MPA Network		
C. Site-scale Measures + Broad-scale Measures		
D. Broad-scale Measures Only		

Conservation measures required for the protection of carpet shark species. A = single dark blue circle, a single MPA (e.g., Ginger Carpetshark, *Parascyllium sparsimaculatum*) [Australian National Fish Collection, CSIRO]; B = multiple connected dark blue circles, network of MPAs/sites (e.g. Halmahera Epaulette Shark, *Hemiscyllium halmahera*) [“Eco Watch” by M.V. Erdmann, California Academy of Sciences]; C = dark blue circles in pale blue oval, combination of network of MPAs/sites and broad-scale conservation action (e.g., Whale Shark, *Rhincodon typus*) [S. ElkCloner]; D = pale blue oval, broad-scale conservation action (e.g., Taiwan Saddled Bambooshark, *Cirrhoscyllium formosanum*) [OpenCage Systems].



Conservation progress of threatened carpet sharks: percentages of carpet shark species in each of the conservation categories that are presently receiving the conservation measures that match their recommended category (species-specific=black, not species-specific=gray), in comparison to those of species that are not receiving the recommended conservation measures (red). Nakhostin & Dulvy (2025).

Unveiling Hidden Diversity: The Role of Genetic Studies in Shark and Ray Conservation

Written by
Sudha Kottillil
Independent Researcher

Scalloped Hammerhead
(*Sphyrna lewini*)



Morning auction at field site
Malvan in Maharashtra

For many years, the Atlantic Cod (*Gadus morhua*) in Norwegian waters was managed as a single, continuous stock. Genetic assessment, however, revealed a more complex reality: the fisheries consisted of two discrete populations – the widely migrating Northeast Arctic Cod and the more resident Norwegian Coastal Cod – that overlapped on shared spawning grounds. While the former remained stable, the latter population was undergoing severe declines. This genetic insight fundamentally reshaped management approaches, enabling population-specific monitoring and more targeted measures to support the recovery of the vulnerable Norwegian Coastal Cod stock.

However, genetic studies remain underutilized in conservation and management. This is true for terrestrial systems where genetic approaches are more commonly applied and is even more pronounced in fisheries management. Typically, genetic factors are considered only when populations are already in crisis, despite the fundamental role of genetic diversity in sustaining healthy and resilient species/populations.

With alarming declines in shark and ray populations, understanding the genetic structure and diversity of these extremely vulnerable groups is essential for designing effective, long-term conservation strategies. Yet only around 10% of the world’s shark and ray species have been assessed for genetic diversity, even though over one-third are threatened with extinction. Thus, there is a clear need for early integration of genetic knowledge, rather than as a last resort. Two of my publications, co-authored with Dr. Kartik Shanker, Chetan Rao, and Dr. Brian Bowen, addressed this gap at both global and regional scales using mitochondrial DNA (COI): [1] our global review [2022] analyzed genetic data for 40 shark and 19 ray species to understand patterns of population structure across the Indian, Atlantic, and Pacific Oceans; and [2] our India-specific study [2025] examined four commonly

caught shark species along the east and west coasts of India to assess connectivity between the Bay of Bengal and the Arabian Sea. Together, these studies offer complementary insights into how population structure varies from local to global scales, and why this must shape conservation planning.

Patterns of genetic structuring

Globally, populations of sharks and rays show genetic differences at large geographic scales, such as across ocean basins (Tier 3), or between biogeographic provinces within an ocean basin (Tier 2), such as between the Red Sea and the Western Indian Ocean. Unlike teleost fishes, they rarely show genetic structuring at finer local scales such as individual bays or archipelagos (Tier 1). This broad-scale pattern was also reflected in India: the species we assessed showed no genetic differentiation between the east and west coasts, indicating gene flow across both Indian coasts.

In sharks, large-bodied pelagic species generally showed structure across ocean basins rather than within them, consistent with long-distance movement and fewer barriers. Reef-associated shark species showed a higher degree of genetic structuring across ocean basins when compared to demersal species, as might be expected. Rays, on the other hand, often had more complex haplotype networks and stronger within-basin structuring, reflecting their more restricted movement patterns and distribution ranges. Two sharks and five pelagic rays showed no genetic differences across the ocean basins.

What influences genetic structure?

A mix of biological traits, behaviors, and environmental features influences gene flow and shapes how shark and ray populations are genetically structured. These are:

- i. Habitat preference: Species living in pelagic, demersal, coastal, or reef-associated habitats show very different levels of structuring. Demersal and reef-associated rays, for instance, displayed strong within-basin genetic structuring due to their limited dispersal and tight association with specific habitats.
- ii. Reproductive strategies and migratory habits: Traits such as site fidelity, residency, philopatry, and migration routes determine how far individuals disperse. Even highly migratory species like Shortfin Makos (*Isurus oxyrinchus*) can show — within an ocean basin — genetic differences because of extended periods of residency and preference for coastal waters, preventing trans-equatorial movement.
- iii. Biogeographic barriers: A variety of natural barriers limit gene flow, including warm equatorial waters, strong or deep ocean currents, straits, mid-ocean ridges, and major geological barriers such as the Isthmus of Panama, the Old-World Barrier, and the Sunda Shelf. For example, equatorial thermal barriers restrict movement for Sand Tiger Sharks (*Carcharias taurus*).

What about commercially important sharks in India?

In India, our study demonstrated that three commonly landed sharks — the Scalloped Hammerhead (*Sphyrna lewini*), Pelagic Thresher (*Alopias pelagicus*), and Spadenose Shark (*Scoliodon laticaudus*) — showed no genetic differentiation between the two coasts. This suggests high connectivity and gene flow across the Bay of Bengal and the Arabian Sea, indicating the need for a broader conservation strategy for the coast. However, our findings for bamboo sharks (*Chiloscyllium* spp.) were more intriguing: genetic patterns blurred the boundaries between the Arabian Carpetshark (*Chiloscyllium arabicum*) and Burmese Bambooshark (*C. burmensis*), suggesting possible taxonomic overlap and pointing to the need for updated assessments and targeted sampling.

What this means for conservation

No consistent structuring pattern was seen among species in similar habitats because the drivers are complex and multifaceted. However, comparative phylogeography reveals that most shark species contain multiple population units with unique genetic signatures, except for a few highly migratory oceanic species. Pelagic rays may require management at the scale of entire ocean basins, while demersal rays may need finer, region-specific strategies. When population partitions do exist, they usually correspond to well-known biogeographic boundaries. This provides a strong starting point for designing conservation and fisheries management plans that align with biological reality—not just political borders.

Genetic studies offer powerful insights into the hidden diversity and structure of shark and ray populations – insights that can directly inform conservation, fisheries management and policy. As global threats escalate, integrating genetic data into management frameworks is no longer optional; it is a critical component of safeguarding these vulnerable species.

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Scalloped Hammerhead (*Sphyrna lewini*)
and Spadenose Shark (*Scoliodon laticaudus*)
landing in Malvan, India



Shark landings in Kochi Fisheries
Harbour, one of the biggest landings
sites along the westcoast

A large group of scalloped hammerhead sharks swimming in clear blue water. The sharks are seen from various angles, with one large shark in the foreground showing its distinctive hammer-shaped head and white underbelly. Other sharks are visible in the background, some swimming towards the camera and others away. The water is a deep, clear blue, and the overall scene conveys a sense of a healthy, natural marine environment.

Across the Eastern Tropical Pacific: the region-wide birthing migration of a Scalloped Hammerhead [*Sphyrna lewini*]

Photo by Pelayo Salinas de León

Written by
Dr. Pelayo Salinas-de-León

Co-Principal Investigator, Shark Ecology and Conservation Program,
Charles Darwin Foundation, Galapagos Islands, Ecuador
Pelayo.salinas@fcdarwin.org.ec, [@Pelayosalinas](https://www.instagram.com/Pelayosalinas)

Shourya Prasad Alva

Policy Officer, Shark Ecology and Conservation Program,
Charles Darwin Foundation, Galapagos Islands, Ecuador
Shourya.prasad@fcdarwin.org.ec

Close up of a Critically Endangered
Scalloped Hammerhead (*Sphyrna
lewini*), Galapagos Marine Reserve

Darwin and Wolf, the northernmost islands of the Galapagos Marine Reserve in Ecuador, are home to the largest global shark biomass ever reported, including one of the few remaining large gatherings of Scalloped Hammerheads [*Sphyrna lewini*]. These aggregations of hundreds (sometimes in the thousands) Scalloped Hammerheads provide one of the greatest underwater spectacles in our blue planet. Globally, the Scalloped Hammerhead is assessed as Critically Endangered in the IUCN Red List of Threatened Species, due to population reductions greater than 80% over the past three generations (Rigby et al., 2019). The principal driver of these population declines is overexploitation by fisheries across their range, both as target and incidental catch. Scalloped Hammerheads are highly sought for the size and quality of their fins. Recent genetic evidence suggests that their fins from the Tropical Eastern Pacific (TEP) region represent over 60% of the international supply at one of the largest global shark fin trade hubs (Fields et al., 2020).

Despite their critical conservation status, we still have a poor understanding of their reproductive biology. For instance, to date, there has been only a single record of a mating event for the species, based on a video obtained by a dive guide at Isla del Coco National Park in Costa Rica (Salinas-de-León et al., 2017). At Darwin and Wolf islands, during the first months of the year, a large proportion of the Scalloped Hammerheads aggregating are adult females showing distended abdomens, a sign associated with a late stage of pregnancy. For over a decade, we have been wondering where all these pregnant sharks migrate to give birth to their young.

Cracking the code: How to track the movements of shy hammer-heads?

Previous studies using passive acoustic telemetry have shown the movement of hammerheads between the Galapagos (Ecuador), Isla del Coco (Costa Rica), and Malpelo (Colombia). While this presence/absence methodology has been a valuable tool for confirming connectivity between these oceanic Marine Protected Areas (MPAs), the pertinent question remained: which nurseries do Scalloped Hammerheads that aggregate at oceanic islands travel to for parturition? To answer this question, we needed to deploy satellite tags that provide a more accurate picture of the exact migratory pathways these sharks undertake. However, this species is known to be extremely sensitive to stress induced by capture and handling, and we did not want to risk post-tagging mortalities. Thus, the question was further refined: how do we approach the extremely shy Scalloped

Hammerhead, known to run from the sound of SCUBA bubbles, for in-water satellite tagging?

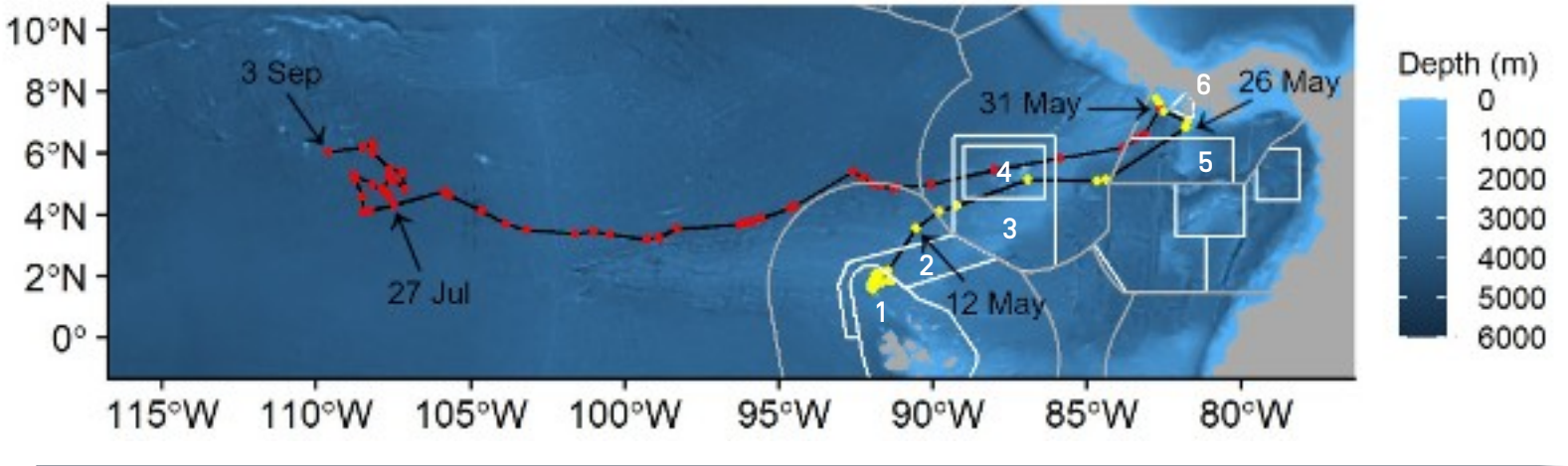
To achieve this, we relied on a combination of Closed Circuit Rebreathers (CCR), a specialized dive equipment that produces neither bubbles nor sound, and externally attached towed satellite tags, which together provided an effective method of choice to track the movements of future Scalloped Hammerhead mammas. To securely deploy these satellite tags, we had some additional assistance from some notable fishy ‘allies’ - the reef fish ‘cleaning stations’ serviced by juvenile Mexican Hogfish (*Bodianus diplotaenia*), King Angelfish (*Holacanthus passer*), and/or Barberfish (*Johnrandallia nigrirostris*). Scalloped Hammerheads frequently visit these spots, where they slow down and relax as smaller fish pick parasites from their skin, providing them with a much-needed underwater spa treatment, while allowing scientists to closely approach and externally deploy the satellite tags.

After patiently waiting for the right female to arrive, sometimes during four hour-long rebreather dives, we used a modified Cressi speargun with a specially designed applicator to insert a titanium dart into the musculature below the hammerhead’s dorsal fin. The towed satellite tag was attached to the dart by an 80-cm-long wire leader, to allow the tag to float on the surface and connect to the ARGOS satellite network when the shark swam close to the sea surface.

Alica’s Story: A likely first birthing migration

In a recent study, Long-distance movements of a Scalloped Hammerhead connect the Galapagos Islands with coastal areas and international waters of the Tropical Eastern Pacific, published in Environmental Biology of Fishes, we documented what is likely the first birthing migration for a Scalloped Hammerhead. Our satellite tagged a shark nicknamed Alicia, a >2.7 m total length, likely pregnant Scalloped Hammerhead. She was monitored for 204 days covering at least 5,783 km across the Eastern Tropical Pacific. After being tagged at Darwin Island, Alicia travelled in May to the Gulf of Chiriquí on the Pacific coast of Panama, where we believe birthing occurred. The Gulf of Chiriquí is a known Scalloped Hammerhead nursery. The time of Alicia’s arrival to the coast coincides with the time of the year (March through June) with the highest abundance of neonates documented in local fisher catches (Robles et al., 2015). Considering that the only mating event recorded for Scalloped Hammerheads occurred in July at Isla del Coco (Costa Rica) and the 9–10 months gestation period reported for the species, the arrival in May to the coast of Panama perfectly connected all the dots, strengthening our birthing migration hypothesis.

Estimated locations for hammerhead Alicia. Black arrows show dates of shark location. Seasons are differentiated by color [cold season: June–November in red; warm season: December–May in yellow]. White boundaries and numbers represent the Marine Protected Areas within the Tropical Eastern Pacific that the shark visited [1—Galapagos Marine Reserve, Ecuador; 2 Hermandad Marine Reserve, Ecuador; 3—Área de Manejo del Bicentenario, Costa Rica; 4—Isla del Coco National Park, Costa Rica; 5—Cordillera de Coiba Managed Resources Area, Panama; 6—Coiba National Park, Panama]. Gray lines represent Exclusive Economic Zone boundaries for countries in the region [ECU: Ecuador; CR: Costa Rica; COL: Colombia; PAN: Panama]. Obtained from Salinas-de-León et al. [2025].



Decoding Alicia’s Post-Birthing Migration Pattern

Whilst we had anticipated the movements of pregnant females from the Galapagos to coastal areas across the Eastern Tropical Pacific, Alicia’s movements after giving birth provided some unexpected insights. Just after six days around coastal areas, Alicia travelled west non-stop for two months, reaching an area approximately 3,000 km west of the coast of Panama and 1,800 km west of Darwin Island, where she was tagged. Alicia remained in this area until the satellite tag battery was exhausted in early September. These movements to offshore areas in international waters occurred between June and September, a period characterized by high levels of primary productivity driven by the northern equatorial upwelling front that develops in the ETP (Ryan et al., 2017). It is plausible that the very directional, long-distance, westerly movements from the coast could be a post-birthing migration related to enhanced foraging opportunities within the Pacific Equatorial Front. Indeed, similar westerly movements north of the equatorial line from the Galapagos Islands have been documented for Silky Sharks (*Carcharhinus falciformis*) and Whale Sharks (*Rhincodon typus*) (Ryan et al., 2017; Salinas-de-León et al., 2024).

Conservation priorities emerging from this study

The long-distance movements of Alicia — linking the oceanic waters around Darwin Island with coastal habitats in Panama to the east and international waters west of the Galápagos — clearly demonstrate exceptionally high regional connectivity across the region. Her satellite tracking data highlight how Scalloped Hammerheads might routinely traverse multiple national jurisdictions and spend substantial time outside existing Marine Protected Areas (MPAs), including in Areas Beyond National Jurisdiction (ABNJ). This is especially true given that nearly 40% of Alicia’s monitored time occurred in international waters west of the Ecuadorian Exclusive Economic Zone, a high-seas corridor where national shark-protection measures do not apply. Such unregulated marine space leaves migrating hammerheads acutely susceptible to fisheries, particularly given the presence of large industrial fishing fleets that directly target shark populations across the ETP region (Alava et al., 2017).

These migratory patterns further exemplify that even well-established MPAs cannot, on their own, effectively safeguard a Critically Endangered species whose life cycle depends on uninterrupted transboundary movements across the region. Instead, effective conservation strategies require coordinated, transboundary cooperation among the countries of the Eastern Tropical Marine

Corridor (CMAR — Colombia, Costa Rica, Panama, and Ecuador) and strengthened fisheries management within ABNJ. The need for cooperative protection is underscored by the regulatory history of the species. Scalloped Hammerheads were uplisted from Endangered to Critically Endangered on the IUCN Red List following their inclusion on Appendix II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in 2014 and their listing under the CMS Sharks Memorandum of Understanding (Sharks MOU) in 2016. Recognition that international trade, principally for fins, continues to drive population declines led to their listing in 2014 on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II. Despite these measures, CITES compliance processes have repeatedly identified ongoing unsustainable and illegal trade, and populations continue to fall across the species’ range.

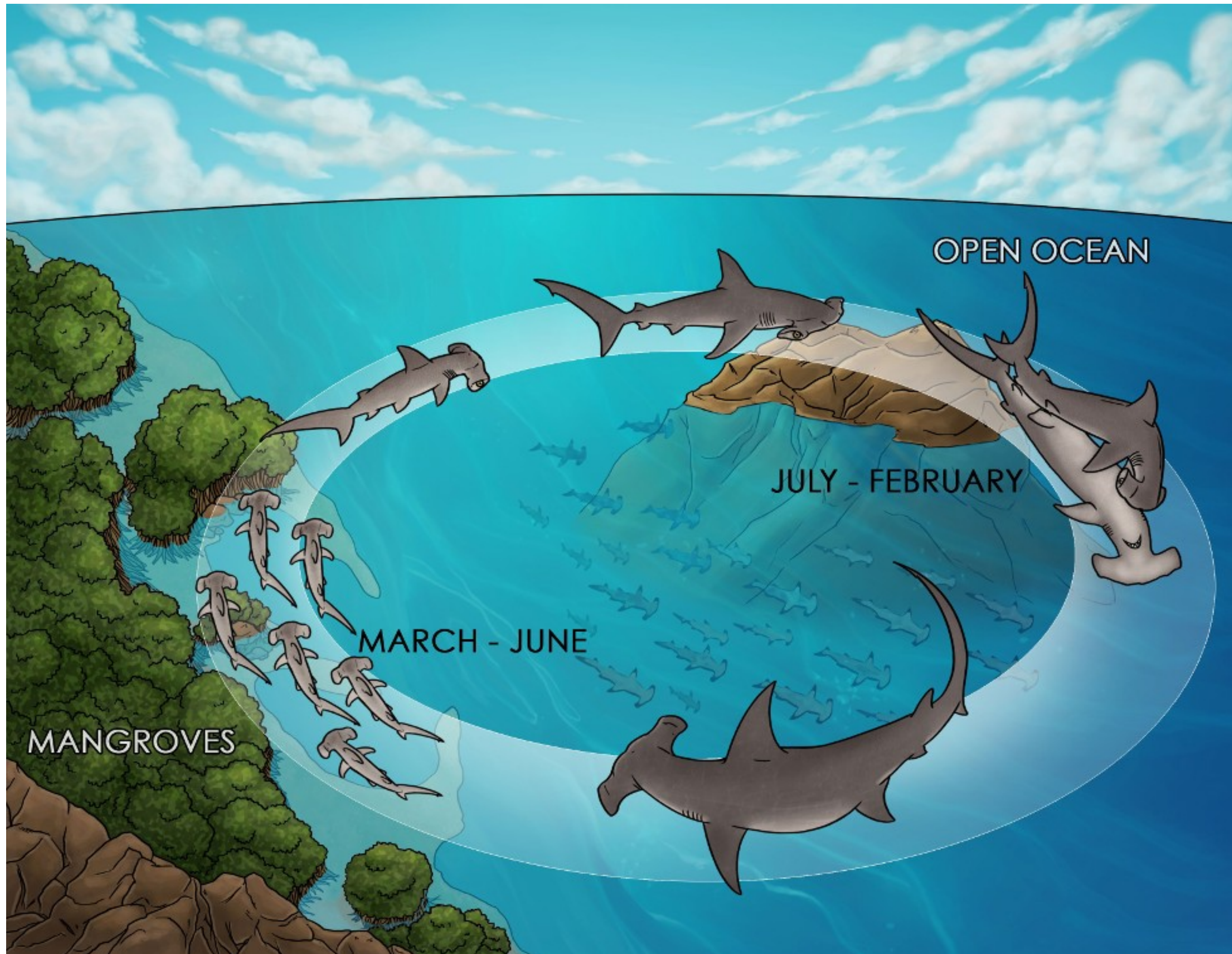
To address these concerns, the Government of Ecuador submitted a proposal in November 2025 to uplist Scalloped Hammerheads to Appendix I of CMS at the Conference of Parties (CoP) 15 meeting in March 2026. An Appendix I listing would be a crucial step towards enhancing transboundary coordination and providing stronger international protection for this highly migratory species. Moreover, it would set the essential groundwork for a parallel and urgently needed proposal for a similar uplisting for Scalloped Hammerheads to Appendix I of CITES at CoP21 in 2028, which would finally prohibit international commercial trade of these majestic and Critically Endangered sharks.

Acknowledgements

This research was funded by the Save Our Seas Foundation, the Darwin and Wolf Conservation Fund, the Rohr Foundation, the Guy Harvey Ocean Foundation, MAC3 Impact Philanthropies, and ROLEX Perpetual Planet Initiative.

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Shiver of Scalloped Hammerheads (*Sphyrna lewini*) at Darwin Island, Galapagos Marine Reserve



A large female Scalloped Hammerhead (*Sphyrna lewini*) shows a distended abdomen, a sign of a late stage of pregnancy, Galapagos Marine Reserve



Researcher deploying a towed satellite tag [red circle] on a Scalloped Hammerhead (*Sphyrna lewini*), Galapagos Marine Reserve

*Pollution in shark
and ray conservation
assessments:
a threat that should
not be overlooked*



Written by
Rachel Ann Hauser-Davis
Laboratório de Avaliação e Promoção da Saúde Ambiental,
Instituto Oswaldo Cruz/Fiocruz, Av. Brasil, 4.365, Manguinhos,
Rio de Janeiro, 21040-360, Brazil
Email: rachel.hauser.davis@gmail.com



Hauser-Davis Research Group team preparing to dissect a *Rhinoptera* sp. specimen for chemical and biochemical analyses



Dr. Rachel Ann Hauser-Davis instructing a team member on how to dissect a *Rhinoptera* sp. specimen's eye

Photos by Rachel Ann Hauser-Davis

Sharks and rays are increasingly recognised as being under pressure from a wide range of anthropogenic threats. Overfishing has long been identified as the most immediate and severe threat to their populations, often resulting in drastic declines and localised extinctions. Habitat degradation — including the loss of critical nursery areas, coastal development, and destruction of coral reefs and mangroves — further compounds the vulnerability of these species. Climate change adds an additional layer of risk, altering ocean temperatures, currents, and prey distributions, which can disrupt migration patterns, reproductive cycles, and overall population dynamics.

Amidst these well-established threats, pollution has emerged as the fourth major threat to sharks and rays, yet it remains underrepresented in both research and conservation planning. This category encompasses a wide array of contaminants, including persistent organic pollutants (POPs), metals and metalloids, microplastics, and chemical residues from industrial, agricultural, and domestic sources. Due to their long lifespans, medium to high trophic position, and slow reproductive rates, sharks and rays are particularly susceptible to pollutant bioaccumulation and biomagnification, which can have cascading effects on individual health, reproductive success, and population viability.

Despite this recognition, its incorporation into conservation assessments remains limited, largely due to the scarcity of quantitative data on the impacts of chemical contaminants, microplastics, and other pollutants on these species. Effective IUCN Red List of Threatened Species assessments rely on robust evidence of population trends, habitat quality, and reproductive success, which are directly influenced by pollution but are often poorly documented. Without systematic monitoring and ecotoxicological evaluations, the role of pollution in driving population declines remains underestimated, potentially leading to the misclassification of threat categories. Therefore, comprehensive pollution assessments are essential, not only to detect sublethal effects, bioaccumulation, and biomagnification processes in sharks and rays due to exposure to legacy metals and Persistent Organic Pollutants (POPs), but also to integrate these findings into predictive models of population viability. Such data would provide the quantitative foundation necessary to accurately infer extinction risks and ensure that conservation strategies adequately address all major anthropogenic pressures, rather than focusing exclusively on fisheries or habitat loss, supporting more effective management and policy interventions for these ecologically critical marine species.

The importance of also assessing Contaminants of Emerging Concern (CECs)

Contaminants of Emerging Concern (CECs) — including human and veterinary pharmaceuticals, certain metals, illicit drugs such as cocaine, personal care products, flame retardants, and per- and

polyfluoroalkyl substances (PFAS) — have attracted increasing attention due to their pervasive presence in aquatic environments and potential biological impacts. Unlike traditional pollutants such as metals or legacy persistent organic pollutants, CECs are often unregulated, persistent at low concentrations, and capable of inducing subtle yet significant sublethal effects, such as endocrine disruption, oxidative imbalances and altered immune responses, and reproductive success. CECs have potential consequences not only for individual health but also for population dynamics and ecosystem stability. However, despite their ecological relevance, studies on CECs in sharks and rays remain scarce.

Mechanistic approaches to assessing pollution impacts on elasmobranch health

In addition to measuring pollutant concentrations, comprehensive assessments should include sublethal and mechanistic endpoints that reveal early signs of physiological stress and potential population-level impacts. These may include subcellular metal partitioning, which identifies how contaminants are distributed among tissues and organelles; providing insights into detoxification and bioaccumulation pathways; and the assessment of oxidative stress biomarkers, such as lipid peroxidation, protein carbonylation, and antioxidant enzyme activities, all of which can reveal the cellular consequences of chronic exposure to metals and organic pollutants. Similarly, inflammation markers, genotoxicity assays, and endocrine disruption indicators can inform on the broader health effects of contaminants. Incorporating these molecular and biochemical endpoints alongside traditional ecological and population metrics allows for a multilevel understanding of pollution impacts, enabling more accurate threat assessments, early detection of ecological risks, and the development of targeted conservation strategies for shark and ray populations.

Sharks and rays as bioindicators

Sharks and rays provide a holistic perspective on marine environmental integrity and broader ecosystem health, as they are valuable bioindicators for marine pollution. Their contaminant burdens not only indicate localised pollution but also reveal broader ecological impacts on prey populations and the structure of food webs. This makes them particularly valuable for identifying emerging threats, monitoring temporal trends in pollution, and assessing cumulative anthropogenic pressures on marine ecosystems. Using sharks and rays as bioindicators also has direct applications for conservation and management. Pollutant data from these species can inform the designation of marine protected areas, guide regulatory policies to reduce contaminant inputs, and prioritise high-risk habitats for monitoring. Additionally, since many sharks and rays are consumed by humans or influence the productivity of fisheries, their contaminant loads can provide early warnings of potential human health risks.

Pollution assessments as an indirect conservation measure

Pollution assessments can also function as an indirect conservation measure by influencing human behaviour and consumption patterns. When the presence of chemical contaminants or toxic metals in seafood is documented and effectively communicated, consumers may avoid products with elevated pollutant levels. For example, awareness of high contaminant concentrations in shark fins could lead to a significant reduction in fin consumption, which in turn reduces fishing pressure on these vulnerable species. This phenomenon has been observed in several case studies worldwide for other groups, where public awareness of contamination prompted declines in the harvesting or consumption of fish and shellfish from polluted areas. For sharks and rays, which are often caught and consumed as shark meat (also often labelled as *dogfish*, or *caçãõ*, or *cazón*) in many regions, such information can significantly reduce fishing pressures, providing a protective effect for populations that are otherwise vulnerable to overexploitation.

Integrating pollution into conservation frameworks

To address this emerging threat, it is paramount to incorporate pollution assessments into existing conservation frameworks. This includes monitoring pollutant levels to identify trends and potential health risks and evaluating ecological impacts due to the effects of pollutants on shark and ray behaviour, physiology, and reproduction to understand the broader ecological consequences. Policy development concerning the mitigation of pollution sources (such as stricter regulations on industrial discharges and plastic waste management, among many others), should also be applied, as well as public awareness and education concerning the impact of pollution on marine life and promoting sustainable practices among coastal communities and industries.

Incorporating chemical stressors into marine conservation frameworks

To address this emerging threat, it is paramount to integrate pollution assessments into existing shark and ray conservation frameworks. This requires a multifaceted approach that combines ecological monitoring, policy intervention, and public engagement.

Firstly, systematic monitoring of pollutant levels in marine environments and shark and ray tissues, including embryonic when available, to assess maternal transfer, is essential to identify temporal and spatial trends, detect contamination hotspots, and evaluate potential risks to individual health and population viability. Secondly, assessing ecological and physiological impacts — including changes in behaviour, reproduction, growth, oxidative stress, and immune function — provides insight into how contaminants affect not only individual organisms but also broader ecosystem processes and trophic interactions. Third, policy development and enforcement are

critical to mitigate sources of pollution, including stricter regulation of industrial effluents, wastewater treatment standards, and improved management of plastic and chemical waste. Finally, public awareness campaigns and education initiatives are needed or should be improved to clearly communicate the ecological and human health consequences of marine pollution, promoting sustainable practices among coastal communities, fisheries, and industries.

By combining these strategies, conservation programs can move beyond traditional threat mitigation (i.e., fisheries management and habitat protection) to address the significant impacts of chemical contamination, ultimately supporting the resilience and long-term survival of shark and ray populations.

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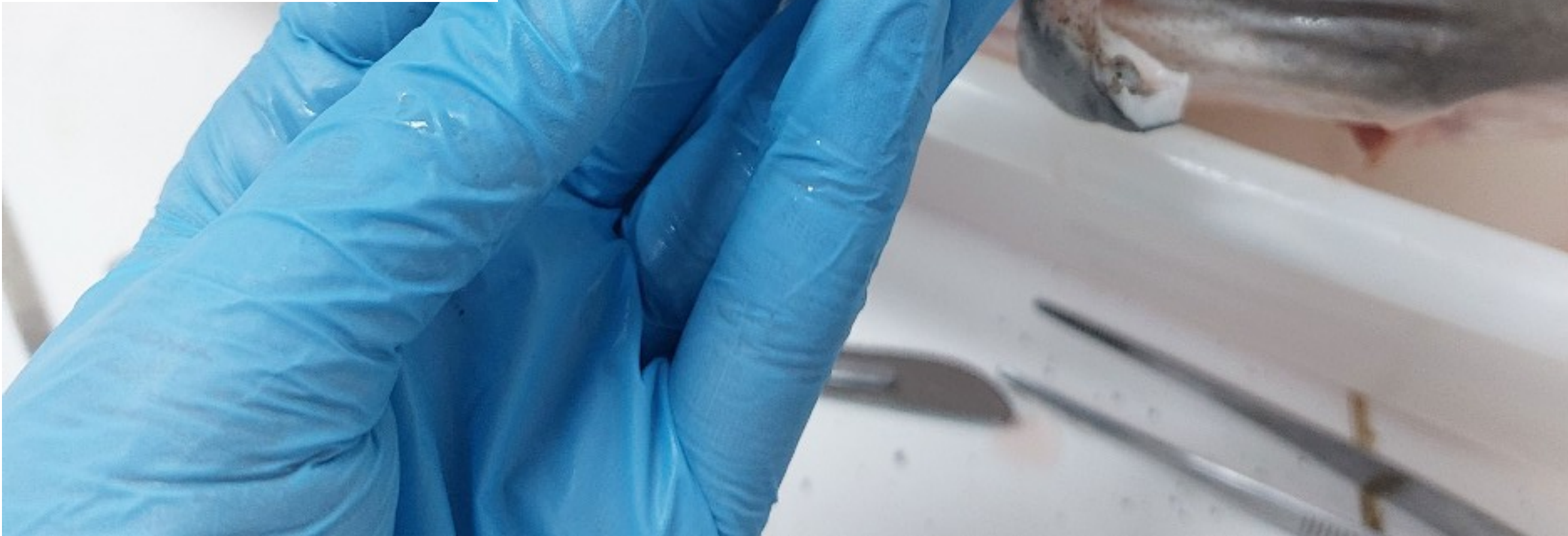
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Enucleated eye from a Carcharhiniform shark collected for biochemical and metalmetalloid analyses





Amazing things scientists learned about sharks and rays in 2025!

By Dr David Shiffman
Scientific and Environmental Consulting,
Washington, DC, USA

2025 was an incredible year for research. Here are some of my favorite discoveries.

It’s rare to find a scientific discovery so fundamental that it results in rewriting textbooks, but Nieder et al. has done just that: for the first time ever, we have scientific evidence that sharks are capable of deliberately producing sounds. It has been discovered that the Rig [*Mustelus lenticulatus*] makes a clicking sound by snapping its teeth together.

Nieder, C., Parmentier, E., Jeffs, A.G., & Radford, C. 2025. Evidence of active sound production by a shark. *Royal Society Open Science*, 12(3), 242212. doi.org/10.1098/rsos.242212

Great Hammerheads [*Sphyrna mokarran*] are known to eat smaller sharks, and by using high-tech video tags, Spencer et al. showed that doing so can provide a huge energetic advantage. A large hammerhead could either eat a relatively large-sized fish every day, or instead hunt a single Blacktip Shark [*Carcharhinus limbatus*] every three weeks, to get the same amount of food.

Spencer, E. T., Hoopes, L. A., Morris, J. J., Chapman, D. D., Hagan, V., Johnson, M., ... & Papastamatiou, Y. P. (2025). Energetic benefits of prey choice for a shark-eating shark. *Oecologia*, 207(7), 1-12. doi.org/10.1007/s00442-025-05758-5

Descriptions of new species of sharks, rays, and chimaeras are always exciting, but often these are small deep-sea species that most humans will never see. However, this year, Bucair et al. described a new species of manta ray, *Mobula yarae*! Additionally, Sagumai et al. rediscovered a Sailback Houndshark [*Gogolia filewoodi*], the first time anyone has seen one in 50 years! And though it wasn’t a new species, Macías-Cuyare et al.’s description of a nurse shark with xanthism, resulting in a nearly golden color for a species that is usually brown, made headlines.

Bucair, N., Hinojosa-Alvarez, S., Marshall, A.D. et al. 2025. An integrative taxonomy investigation unravels a cryptic species of *Mobula Rafinesque*, 1810 (Mobulidae, Myliobatiformes), from the Atlantic Ocean. *Environmental Biology of Fishes*, 108, 1801–1835. doi.org/10.1007/s10641-025-01727-2

Sagumai, J., Samuel, R.H., White, W.T., & Grant, M.I. 2025. Rediscovery of one of the world’s rarest sharks, the sailback houndshark *Gogolia filewoodi*, in Papua New Guinea. *Journal of Fish Biology*. doi.org/10.1111/jfb.70196

Macías-Cuyare, M., Guzmán, G.R.B., & Arauz-Naranjo, D. 2025. First record case of free-living xanthism in the nurse shark *Ginglymostoma cirratum* [Bonnaterre, 1788] from Caribbean Sea. *Marine Biodiversity*, 55, 73. doi.org/10.1007/s12526-025-01558-5

Aquariums can be a powerful tool for understanding the behavior of animals that are too difficult to study in the wild. Using a variety of smaller benthic shark species, Smith et al. showed that several species interact (‘play-like’) with toys after eating a meal, resulting in some frankly adorable videos in addition to evidence that sharks may be smarter than most people give them credit for.

Smith, A.B., Landesman, J., Williamson, L. & Sun, P.Y. 2025. Interaction with Enrichment Objects Depends on Color and Increases After Feeding in Some Elasmobranchs but not Others. *Applied Animal Behaviour Science*, 106829. doi.org/10.1016/j.applanim.2025.106829

One way for scientists to learn more about the ocean is to partner with non-scientists who spend more time on the water than we do. This year, some recreational SCUBA divers were fortunate enough to observe and document the rare Blue Shark [*Prionace glauca*] mating behavior. Vossгаetter et al. wrote up the discovery and its significance for their conservation.

Vossгаetter, L., Müller, L., Cruz, I., et al. 2025. First documentation of putative mating behavior in blue sharks [*Prionace glauca*] reveals a potential reproductive area in the Northeast Atlantic. *Web Ecology*, 25, 213–219, doi.org/10.5194/we-25-213-2025

2025 also featured the Convention on International Trade in Endangered Species of Wild Fauna and Flora’s (CITES) 20th Conference of Parties (CoP), resulting in 70 species of sharks and rays gaining international trade protections. So it is great to learn from Bond et al. that CITES protections actually do really help sharks and rays, resulting in many Parties improving their fisheries management, and others creating shark and ray conservation regulations for the first time!

Bond, M.E., Booth, H., Tanna, A., ...,& Jabado, R.W, 2025. Trade regulations drive improved global shark and ray management. *Marine Policy*, 106733. doi.org/10.1016/j.marpol.2025.106733

Speaking of conservation, this year featured important scientific analyses about the impact of some major human industries on sharks. Werry & Meager. described possible conservation impacts of offshore wind infrastructure on sharks and rays, and Judah et al. analyzed the risks from deep sea mining.

Werry, J.M. & Meager, J.J. 2025. An ecological risk assessment for the impacts of offshore wind farms on sharks and rays in Australia. *Global Ecology and Conservation*, 62, e03806. doi.org/10.1016/j.gecco.2025.e03806

Judah, A.B., Mull, C.G., Dulvy, N.K., et al. 2025. Deep-sea mining risks for sharks, rays, and chimaeras. *Current Biology*, 35(21), 5353–5362. doi.org/10.1016/j.cub.2025.09.019

What was your favorite scientific discovery in 2025? Let us know on social media!



Horn Shark
[*Heterodontus francisci*]



Assess Working Group IUCN Red List of Threatened Species Update 2025

Alexandra Z.A. Morata

IUCN SSC Shark Specialist Group | Program Officer

Brittany Finucci

IUCN SSC Shark Specialist Group | Red List Authority Coordinator
Earth Sciences New Zealand, Wellington, New Zealand

Michael Grant

College of Science and Engineering, James Cook University,
Townsville, QLD, Australia
IUCN SSC Shark Specialist Group | Oceania regional member

The IUCN SSC Shark Specialist Group is considered the Red List Authority on the status of all species of sharks, rays, and chimaeras. The 2025 IUCN Red List of Threatened Species' latest update was published on October 10, 2025, and details of assessments can be found here: www.iucnredlist.org. In total, an updated 117 (43 sharks, 72 rays, and 2 chimaeras) assessments were published. Table 1 provides an overview of the updated statuses for these species.

Generally, unless new information that might impact the status of a species is made available, each IUCN Red List assessment is valid for ten years. Over the next few years, a total of 161 species (80 sharks, 76 rays, and 5 chimaeras) are scheduled for (re) assessment. A list of species for re-assessment is provided in Table 2.

We extend our sincere gratitude to IUCN SSC Shark Specialist Group members and non-members who have contributed to these assessments.

We welcome your contributions to support us with undertaking these assessments. For any questions regarding these or upcoming assessments, please reach out to Brittany Finucci, IUCN SSC Shark Specialist Group Red List Authority Coordinator: brit.finucci@gmail.com



Crested Hornshark
(*Heterodontus galeatus*)

Table 1: Updated table of shark, ray, and chimaera IUCN Red List of Threatened Species assessments indicating the previous category species were assigned to and the new category as published in October 10, 2025. CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, LC – Least Concern, DD – Data Deficient, NE – Not Evaluated. | Source: IUCN Red List of Threatened Species 2025

Scientific name	Common name	Previous category	New category 2025
SHARK			
Carcharhiniformes			
PENTANCHIDAE			
<i>Apristurus brunneus</i>	Brown Catshark	DD	LC
<i>Apristurus kampae</i>	Longnose Catshark	DD	LC
<i>Apristurus pinguis</i>	Bulldog Catshark	LC	LC
<i>Apristurus platyrhynchus</i>	Flatnose Catshark	LC	LC
<i>Apristurus sinensis</i>	South China Catshark	DD	LC
<i>Apristurus spongiceps</i>	Spongehead Catshark	DD	LC
<i>Asymbolus submaculatus</i>	Variegated Catshark	LC	LC
<i>Asymbolus vincenti</i>	Gulf Catshark	LC	LC
<i>Galeus gracilis</i>	Slender Sawtail Shark	DD	LC
<i>Halaelurus sellus</i>	Rusty Catshark	LC	LC
<i>Parmaturus xaniurus</i>	Filetail Catshark	LC	LC
SCYLIORHINIDAE			
<i>Aulohalaelurus labiosus</i>	Black Spotted Catshark	LC	LC
<i>Cephaloscyllium cooki</i>	Cook's Swellshark	DD	LC
<i>Cephaloscyllium hiscosellum</i>	Reticulate Swellshark	LC	LC
<i>Cephaloscyllium signourum</i>	Flagtail Swellshark	DD	LC
<i>Cephaloscyllium speccum</i>	Speckled Swellshark	DD	LC
<i>Cephaloscyllium ventriosum</i>	Swell Shark	LC	LC
<i>Cephaloscyllium zebrum</i>	Narrowbar Swellshark	DD	LC
SPHYRNIDAE			
<i>Eusphyra blochii</i>	Winghead Shark	EN	CR
TRIAKIDAE			
<i>Hemitriakis abdita</i>	Draksnout Hound Shark	DD	LC
<i>Hemitriakis falcata</i>	Sicklefin Hound Shark	LC	LC
<i>Mustelus californicus</i>	Gray Smoothhound	LC	LC
<i>Mustelus henlei</i>	Brown Smoothhound	LC	LC
<i>Mustelus lunulatus</i>	Sicklefin Smoothhound	LC	LC
Heterodontiformes			
HETERODONTIDAE			
<i>Heterodontus francisci</i>	Horn Shark	DD	LC
<i>Heterodontus galeatus</i>	Crested Hornshark	LC	LC
Lamniformes			
ODONTASPIDIDAE			
<i>Carcharias taurus</i>	Sand Tiger Shark	CR	CR
Orectolobiformes			
BRACHAELURIDAE			
<i>Brachaelurus waddi</i>	Blind Shark	LC	LC

ORECTOLOBIDAE			
<i>Orectolobus floridus</i>	Floral Banded Wobbegong	LC	LC
<i>Orectolobus hutchinsi</i>	Western Wobbegong	LC	LC
<i>Orectolobus parvimaculatus</i>	Dwarf Spotted Wobbegong	LC	LC
<i>Orectolobus reticulatus</i>	Network Wobbegong	DD	LC
<i>Orectolobus wardi</i>	Northern Wobbegong	LC	LC
PARASCYLLIIDAE			
<i>Parascyllium elongatum</i>	Elongate Carpetshark	DD	DD
<i>Parascyllium sparsimaculatum</i>	Ginger Carpetshark	DD	LC
RHINCODONTIDAE			
<i>Rhincodon typus</i>	Whale Shark	EN	EN
Squaliformes			
DALATIIDAE			
<i>Isistius plutodus</i>	Large-tooth Cookiecutter Shark	LC	LC
<i>Squaliolus aliae</i>	Smalleye Pygmy Shark	LC	LC
ETMOPTERIDAE			
<i>Etmopterus brachyurus</i>	Short-tail Lanternshark	DD	LC
<i>Etmopterus lli</i>	Li's Lanternshark	NE	DD
SOMNIOSIDAE			
<i>Scymnodon macracanthus</i>	Largespine Velvet Shark	DD	VU
SQUALIDAE			
<i>Squalus hima</i>	Indian Spurdog	NE	DD
Squatiniiformes			
SQUATINIDAE			
<i>Squatina californica</i>	Pacific Angelshark	NT	VU
RAY			
Myliobatiformes			
DASYATIDAE			
<i>Hemistrygon fluviorum</i>	Estuary Stingray	NT	VU
<i>Hemistrygon parvonigra</i>	Dwarf Black Stingray	DD	VU
<i>Neotrygon annotata</i>	Plain Maskray	NT	LC
<i>Neotrygon leylandi</i>	Painted Maskray	LC	LC
<i>Neotrygon ningalooensis</i>	Ningaloo Maskray	DD	LC
<i>Neotrygon yakkoei</i>	Japanese Bluespotted Maskray	NE	NT
<i>Urogymnus dalyensis</i>	Freshwater Whipray	LC	LC
GYMNURIDAE			
<i>Gymnura australis</i>	Australian Butterfly Ray	LC	LC
MOBULIDAE			
<i>Mobula mobular</i>	Spinetail Devil Ray	EN	CR
<i>Mobula tarapacana</i>	Sicklefin Devil Ray	EN	CR
<i>Mobula thurstoni</i>	Bentfin Devil Ray	EN	CR

MYLIOBATIDAE			
<i>Aetomylaeus caeruleofasciatus</i>	Blue-banded Eagle Ray	LC	LC
<i>Myliobatis californicus</i>	Bat Ray	LC	LC
POTAMOTRYGONIDAE			
<i>Heliotrygon gomesi</i>	Gome's Round Ray	NE	VU
<i>Paratrygon aiereba</i>	Discus Stingray	DD	CR
<i>Paratrygon orinocensis</i>	Orinoco Discus Stingray	NE	VU
<i>Paratrygon parvaspina</i>	Smallspine Discus Stingray	NE	VU
<i>Potamotrygon adamastor</i>	Branco River Freshwater Stingray	LC	EN
<i>Potamotrygon albimaculata</i>	Tapajós Freshwater Stingray	NE	VU
<i>Potamotrygon boesemani</i>	Suriname Freshwater Stingray	NT	VU
<i>Potamotrygon brachyura</i>	Giant Freshwater Stingray	DD	VU
<i>Potamotrygon falkneri</i>	Paraná Freshwater Stingray	DD	LC
<i>Potamotrygon garmani</i>	Garman's Freshwater Stingray	NE	VU
<i>Potamotrygon henlei</i>	Henle's Freshwater Stingray	LC	VU
<i>Potamotrygon histrix</i>	Porcupine Freshwater Stingray	DD	NT
<i>Potamotrygon humerosa</i>	False Reticulate Freshwater Stingray	DD	NT
<i>Potamotrygon jabuti</i>	Pearl Freshwater Stingray	NE	EN
<i>Potamotrygon marquesi</i>	Marques' Freshwater Stingray	NE	NT
<i>Potamotrygon motoro</i>	Ocellate River Stingray	DD	LC
<i>Potamotrygon orbignyi</i>	Reticulate Freshwater Stingray	LC	LC
<i>Potamotrygon pantanensis</i>	Pantanal Freshwater Stingray	NE	VU
<i>Potamotrygon schroederi</i>	Schroeder's Freshwater Stingray	DD	VU
<i>Potamotrygon scobina</i>	Whitespotted Freshwater Stingray	DD	NT
<i>Potamotrygon signata</i>	Parnaíba Freshwater Stingray	DD	VU
<i>Potamotrygon tatianae</i>	Tatiana's Freshwater Stingray	NE	VU
<i>Potamotrygon tigrina</i>	Tiger Freshwater Stingray	EN	EN
<i>Potamotrygon wallacei</i>	Wallace's Freshwater Stingray	NE	EN
<i>Potamotrygon yepezi</i>	Fernández-Yépez's Freshwater Stingray	DD	EN
UROTRYGONIDAE			
<i>Urobatis halleri</i>	Round Stingray	LC	LC
Rajiformes			
ANACANTHOBATIDAE			
<i>Sinobatis bulbicauda</i>	West Australian Legskate	LC	LC
ARHYNCHOBATIDAE			
<i>Bathyraja aguja</i>	Aguja Skate	LC	LC
<i>Bathyraja mariposa</i>	Butterfly Skate	LC	DD
<i>Bathyraja panthera</i>	Leopard Skate	LC	DD
<i>Bathyraja spinosissima</i>	Pacific White Skate	LC	LC
<i>Insentiraja subtilispinosa</i>	Western Looseskin Skate	LC	LC
<i>Notoraja hirticauda</i>	Ghost Skate	DD	LC
<i>Notoraja ochroderma</i>	Pale Skate	DD	LC

RAJIDAE			
<i>Amblyraja hyperborea</i>	Arctic Skate	LC	LC
<i>Beringraja binocularata</i>	Big Skate	LC	LC
<i>Caliraja inornata</i>	California Skate	LC	LC
<i>Caliraja stellulata</i>	Pacific Starry Skate	LC	LC
<i>Dentiraja falloarga</i>	False Argus Skate	DD	LC
<i>Dentiraja flindersi</i>	Pygmy Thornback Skate	DD	DD
<i>Dentiraja healdi</i>	Heald's Skate	LC	LC
<i>Leucoraja circularis</i>	Sandy Skate	EN	VU
<i>Leucoraja fullonica</i>	Shargreen Skate	VU	VU
<i>Leucoraja longirostris</i>	Brown Longnose Skate	NE	DD
<i>Leucoraja melitensis</i>	Maltese Skate	CR	CR
<i>Leucoraja naevus</i>	Cuckoo Skate	LC	NT
<i>Neoraja caerulea</i>	Blue Pygmy Skate	LC	LC
<i>Neoraja iberica</i>	Iberian Pygmy Skate	LC	LC
<i>Okamejei arafurensis</i>	Arafura Skate	LC	LC
<i>Raja microocellata</i>	Smalleyed Skate	NT	NT
<i>Zearaja maugeana</i>	Maugean Skate	EN	EN
Rhinopristiformes			
RHINOBATIDAE			
<i>Rhinobatos sainsburyi</i>	Goldeneye Shovelnose Ray	LC	LC
TRYGONORRHINIDAE			
<i>Zapteryx exasperata</i>	Banded Guitarfish	DD	VU
Torpediniformes			
NARCINIDAE			
<i>Narcinops lasti</i>	Western Numbfish	LC	LC
<i>Narcinops nelsoni</i>	Eastern Numbfish	LC	LC
<i>Narcinops ornata</i>	Ornate Numbfish	LC	LC
<i>Narcinops tasmaniensis</i>	Tasmanian Numbfish	LC	LC
<i>Narcinops westraliensis</i>	Banded Numbfish	LC	LC
TORPEDINIDAE			
<i>Tetronarce californica</i>	Pacific Torpedo	LC	LC
CHIMAERA			
Chimaeriformes			
RHINOCHIMAERIDAE			
<i>Harriotta avia</i>	Australasia Narrow-nosed Spookfish	NE	LC
<i>Harriotta raleighana</i>	Narrownose Chimaera	LC	LC

Table 2: Table of **upcoming** shark, ray, and chimaera IUCN Red List of Threatened Species assessments. CR – Critically Endangered, EN – Endangered, VU – Vulnerable, NT – Near Threatened, LC – Least Concern, DD – Data Deficient, NE – Not Evaluated.

Scientific name	Common name	Current Red List Category
SHARK		
Carcharhiniformes		
CARCHARHINIDAE		
<i>Carcharhinus falciformis</i>	Silky Shark	VU
<i>Carcharhinus leiodon</i>	Smoothtooth Blacktip Shark	EN
<i>Carcharhinus obscurus</i>	Dusky Shark	EN
PENTANCHIDAE		
<i>Apristurus breviventralis</i>	Shortbelly Catshark	LC
<i>Apristurus exsanguis</i>	New Zealand Catshark	LC
<i>Apristurus garricki</i>	Garrick's Catshark	LC
<i>Apristurus indicus</i>	Smallbelly Catshark	LC
<i>Apristurus iterum</i>		NE
<i>Asymbolus funebris</i>	Blotched Catshark	DD
<i>Asymbolus galacticus</i>	Starry Catshark	LC
<i>Bythaelurus alcockii</i>	Arabian Catshark	DD
<i>Bythaelurus dawsoni</i>	Dawson's Catshark	LC
<i>Dichichthys albimarginatus</i>	Whitetip Catshark	LC
<i>Figaro boardmani</i>	Australian Sawtail Shark	LC
<i>Galeus priapus</i>	Phallic Catshark	LC
<i>Halaelurus boesemani</i>	Speckled Catshark	VU
<i>Halaelurus quagga</i>	Quagga Catshark	DD
<i>Parmaturus albipenis</i>	White-clasper Catshark	LC
<i>Parmaturus macmillani</i>	McMillan's Catshark	DD
PROSCYLLIIDAE		
<i>Ctenacis fehlmanni</i>	Harlequin Catshark	LC
PSEUDOTRIAKIDAE		
<i>Gollum attenuatus</i>	Slender Smoothhound	LC
<i>Planonasus parini</i>	Dwarf False Catshark	LC
SCYLIORHINIDAE		
<i>Aulohalaelurus kanakorum</i>	New Caledonia Catshark	DD
<i>Cephaloscyllium isabellum</i>	Carpet Shark	LC
SPHYRNIDAE		
<i>Sphyrna alleni</i>	Allen's Hammerhead	NE
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CR
<i>Sphyrna mokarran</i>	Great Hammerhead	CR
<i>Sphyrna tiburo</i>	Bonnethead Shark	EN
<i>Sphyrna zygaena</i>	Smooth Hammerhead	VU
TRIAKIDAE		
<i>Iago garricki</i>	Longnose Hound Shark	LC
<i>Iago gopalakrishnani</i>	Indian Houndshark	NE
<i>Mustelus lenticulatus</i>	Rig	LC

Heterodontiformes		
HETERODONTIDAE		
<i>Heterodontus omanensis</i>	Oman Bullhead Shark	DD
Lamniformes		
ALOPIIDAE		
<i>Alopias pelagicus</i>	Pelagic Thresher	EN
<i>Alopias superciliosus</i>	Bigeye Thresher	VU
<i>Alopias vulpinus</i>	Common Thresher	VU
MITSUKURINIDAE		
<i>Mitsukurina owstoni</i>	Goblin Shark	LC
Orectolobiformes		
HEMISCYLLIIDAE		
<i>Chiloscyllium arabicum</i>	Arabian Carpetshark	NT
<i>Hemiscyllium hallstromi</i>	Papuan Epaulette Shark	VU
<i>Hemiscyllium ocellatum</i>	Epaulette Shark	LC
<i>Hemiscyllium trispeculare</i>	Speckled Carpetshark	LC
PARASCYLLIIDAE		
<i>Parascyllium collare</i>	Collared Carpetshark	LC
<i>Parascyllium ferrugineum</i>	Rusty Carpet Shark	LC
Squaliformes		
DALATIIDAE		
<i>Dalatias licha</i>	Kitefin Shark	VU
<i>Isistius brasiliensis</i>	Cookie-cutter Shark	LC
ECHINORHINIDAE		
<i>Echinorhinus cookei</i>	Prickly Shark	DD
ETMOPTERIDAE		
<i>Centroscyllium kamoharai</i>	Bareskin Dogfish	LC
<i>Etmopterus abernethyi</i>		NE
<i>Etmopterus brachyurus</i>	Short-tail Lanternshark	LC
<i>Etmopterus burgessi</i>	Broadnose Lanternshark	LC
<i>Etmopterus caudistigmus</i>	Tailspot Lanternshark	LC
<i>Etmopterus granulosus</i>	Southern Lanternshark	LC
<i>Etmopterus lucifer</i>	Blackbelly Lanternshark	LC
<i>Etmopterus molleni</i>	Moller's Lanternshark	DD
<i>Etmopterus pseudosqualiolus</i>	False Pygmy Shark	LC
<i>Etmopterus schmidtii</i>		NE
<i>Etmopterus unicolor</i>	Brown Lanternshark	DD
<i>Etmopterus viator</i>	Traveller Lanternshark	LC
<i>Etmopterus westraliensis</i>	West Australian lanternshark	NE
OXYNOTIDAE		
<i>Oxynotus bruniensis</i>	Prickly Dogfish	NT
SOMNIOSIDAE		
<i>Centroscymnus owstonii</i>	Roughskin Dogfish	VU
<i>Scymnodalatias albicauda</i>	Whitetail Dogfish	DD

<i>Scymnodalatias sherwoodi</i>	Sherwood's Dogfish	DD
<i>Somniosus antarcticus</i>	Southern Sleeper Shark	LC
<i>Somniosus longus</i>	Frog Shark	DD
SQUALIDAE		
<i>Cirrhigaleus australis</i>	Southern Mandarin Shark	DD
<i>Squalus bucephalus</i>	Bighead Spurdog	DD
<i>Squalus griffini</i>	Northern Spiny Dogfish	LC
<i>Squalus melanurus</i>	Blacktailed Spurdog	DD
<i>Squalus rancureli</i>	Cyrano Spurdog	NT
<i>Squalus raoulensis</i>	Kermadec Spiny Dogfish	LC
<i>Squalus suckleyi</i>	North Pacific Spiny Dogfish	LC
Squatiniformes		
SQUATINIDAE		
<i>Squatina aculeata</i>	Sawback Angelshark	CR
<i>Squatina africana</i>	African Angelshark	NT
<i>Squatina albipunctata</i>	Eastern Angelshark	VU
<i>Squatina argentina</i>	Argentine Angelshark	CR
<i>Squatina david</i>	David's Angelshark	NT
<i>Squatina dumeril</i>	Atlantic Angelshark	LC
<i>Squatina oculata</i>	Hidden Angelshark	CR
<i>Squatina squatina</i>	Angelshark	CR
RAY		
Myliobatiformes		
DASYATIDAE		
<i>Brevitrygon imbricata</i>	Bengal Whipray	VU
<i>Brevitrygon walga</i>	Scaly Whipray	NT
<i>Hypanus rubioi</i>	Spadenose Stingray	NE
<i>Maculabatis arabica</i>	Pakistan Whipray	CR
<i>Maculabatis randalli</i>	Arabian Banded Whipray	LC
<i>Maculabatis toshi</i>	Brown Whipray	LC
<i>Neotrygon kuhlii</i>	Kuhl's Maskray	DD
<i>Pastinachus sephen</i>	Cowatil Ray	NT
<i>Taeniura lessoni</i>	Oceania Fantail Ray	DD
MOBULIDAE		
<i>Mobula yarae</i>	Atlantic Manta Ray	NE
MYLIOBATIDAE		
<i>Aetomylaeus milvus</i>	Ocellate Eagle Ray	EN
<i>Aetomylaeus nichofii</i>	Banded Eagle	VU
<i>Aetomylaeus wafickii</i>	Wafic's Eagle Ray	NE
<i>Myliobatis tenuicaudatus</i>	Southern Eagle Ray	LC
RHINOPTERIDAE		
<i>Rhinoptera javanica</i>	Javanese Cownose Ray	EN
UROLOPHIDAE		

<i>Urolophus deforgesi</i>	Chesterfield Stingaree	LC
<i>Urolophus neocaledoniensis</i>	New Caledonian Stingaree	LC
<i>Urolophus papilio</i>	Butterfly Stingaree	LC
UROTRYGONIDAE		
<i>Urotrygon asterias</i>	Munda Round Ray	NE
Rajiformes		
ARHYNCHOBATIDAE		
<i>Arhynchobatis asperrimus</i>	Longtailed Skate	DD
<i>Bathyraja leucomelanos</i>	Domino Skate	LC
<i>Bathyraja pacifica</i>	Pacific Blonde Skate	LC
<i>Bathyraja shuntovi</i>	Longnose Deepsea Skate	DD
<i>Brochiraja aenigma</i>	Enigma Skate	DD
<i>Brochiraja albilabiata</i>	Whitelip Skate	DD
<i>Brochiraja asperula</i>	Smooth Deepsea Skate	DD
<i>Brochiraja heuresa</i>	Eureka Skate	DD
<i>Brochiraja leviveneta</i>	Blue Deepsea Skate	DD
<i>Brochiraja microspinifera</i>	Small Deepsea Skate	DD
<i>Brochiraja spinifera</i>	Prickly Deepsea Skate	DD
<i>Brochiraja vittacauda</i>	Ribbontail Skate	DD
<i>Irolita waitii</i>	Southern Round Skate	LC
<i>Irolita westraliensis</i>	Western Round Skate	DD
<i>Notoraja alisae</i>	Velcro Skate	LC
<i>Notoraja fijiensis</i>	fijian Velvet Skate	LC
<i>Notoraja inusitata</i>	Strange Skate	LC
<i>Notoraja lira</i>	Broken Ridge Skate	DD
<i>Notoraja longiventralis</i>	Longlobe Velvet Skate	LC
<i>Notoraja sapphira</i>	Sapphire Skate	DD
<i>Pavoraja arenaria</i>	Sandy Skate	DD
<i>Pavoraja nitida</i>	Peacock Skate	LC
RAJIDAE		
<i>Amblyraja reversa</i>	Reverse Skate	DD
<i>Dentiraja confusa</i>	Australian Longnose Skate	CR
<i>Dentiraja polyommata</i>	Argus Skate	LC
<i>Dipturus brevicaudatus</i> / <i>Zearaja brevicaudata</i>	Shorttail Yellownose Skate	VU
<i>Dipturus canutus</i>	Grey Skate	EN
<i>Dipturus gudgeri</i>	Bight Skate	NT
<i>Dipturus innominatus</i>	Smooth Skate	LC
<i>Dipturus nasutus</i> / <i>Zearaja nasuta</i>	Rough Skate	LC
<i>Okamejei ornata</i>	Ornate Skate	LC
<i>Raja maderensis</i>	Madeira Skate	VU
<i>Raja pita</i>	Pita Skate	DD
<i>Raja radula</i>	Rough Skate	EN
Rhinopristiformes		
RHINOBATIDAE		

<i>Acroteriobatus andysabini</i>	Malagasy Blue-spotted Guitarfish	NE
<i>Acroteriobatus leucospilus</i>	Greyspot Guitarfish	EN
<i>Acroteriobatus omanensis</i>	Oman Guitarfish	DD
<i>Acroteriobatus salalah</i>	Salalah Guitarfish	NT
<i>Acroteriobatus stehmanni</i>	Socotra Blue-spotted Guitarfish	NE
<i>Acroteriobatus variegatus</i>	Stripenose Guitarfish	CR
<i>Acroteriobatus zanzibarensis</i>	Zanzibar Guitarfish	DD
<i>Pseudobatos productus</i>	Shovelnose Guitarfish	NT
<i>Rhinobatos austini</i>	Austin's Guitarfish	DD
<i>Rhinobatos holcorhynchus</i>	Slender Guitarfish	DD
<i>Rhinobatos nudidorsalis</i>	Bareback Guitarfish	DD
<i>Rhinobatos punctifer</i>	Spotted Guitarfish	NT
TRYGONORRHINIDAE		
<i>Aptychotrema timorensis</i>	Spotted Shovelnose Ray	VU
<i>Trygonorrhina dumerilii</i>	Southern Fiddler Ray	LC
<i>Trygonorrhina fasciata</i>	Eastern Fiddler Ray	LC
Torpediniformes		
HYPNIDAE		
<i>Hypnos monopterygius</i>	Coffin Ray	LC
NARCINIDAE		
<i>Benthobatis moresbyi</i>	Indian Blind Numbfish	LC
<i>Narcine oculifera</i>	Bigeye Numbfish	DD
NARKIDAE		
<i>Heteronarce bentuviai</i>	Eilat Sleeper Ray	DD
<i>Heteronarce mollis</i>	Soft Sleeper Ray	DD
<i>Typhlonarke aysoni</i>	Blind Electric Ray	LC
TORPEDINIDAE		
<i>Torpedo adenensis</i>	Aden Torpedo	EN
<i>Torpedo sinuspersici</i>	Gulf Torpedo	DD
CHIMAERA		
Chimaeriformes		
CHIMAERIDAE		
<i>Chimaera carophila</i>	Brown Chimaera	LC
<i>Hydrolagus bemisi</i>	Pale Ghostshark	LC
<i>Hydrolagus novaezealandiae</i>	Dark Ghostshark	LC
RHINOCHIMAERIDAE		
<i>Harriotta chaetirhamphus</i>		NE
<i>Neoharriotta pumila</i>	Arabian Sicklefin Chimaera	LC

THE IUCN RED LIST STATUS OF SHARKS, RAYS, AND CHIMAERAS



EXTINCT



CRITICALLY
ENDANGERED



ENDANGERED



VULNERABLE



NEAR
THREATENED



LEAST
CONCERN



DATA
DEFICIENT



Total of 1,266 species
assessed - data
extracted October 2025



Swell Shark
(*Cephaloscyllium ventriosum*)

Fast Genetic Tools for Marine Conservation: New Scientific Paper and Practical E-book Now Available

Rapid DNA and eDNA Tools
are Transforming Shark
and Ray Protection

Written by
Marcela Maki Alvarenga

CIBIO, Centro de Investigacao em Biodiversidade e Recursos Geneticos, InBIO Laboratorio Associado, Campus de Vairao, Universidade do Porto, Vairao, Portugal | Departamento de Biologia, Faculdade de Ciencias, Universidade do Porto, Porto, Portugal | BIOPOLIS Program in Genomics, Biodiversity and Land Planning, CIBIO, Campus de Vairao, Vairao, Portugal | CENIMP, Centro Nacional para a Identificacao Molecular do Pescado, Instituto de Biologia, Universidade Federal do Rio de Janeiro (UFRJ), Rio de Janeiro, Brazil

Ingrid Vasconcellos Bunholi
Department of Marine Science, The University of Texas at Austin, Marine Science Institute, Port Aransas, Texas, USA

Beatriz Rochitti Boza
Departamento de Biologia Estrutural e Funcional, Instituto de Biociencias, Universidade Estadual Paulista (UNESP), Campus de Botucatu, Botucatu, Brazil

Vanessa Paes da Cruz
Departamento de Biologia Estrutural e Funcional, Instituto de Biociencias, Universidade Estadual | Paulista (UNESP), Campus de Botucatu, Botucatu, Brazil

Patricia Charvet
Programa de Pos-graduacao em Sistemática, Uso e Conservacao da Biodiversidade (PPGSis), Universidade Federal do Ceara (UFC), Fortaleza, Brazil | Projeto Trygon, Curitiba, Brazil

A new study published in Molecular Ecology Resources provides the most comprehensive overview to date of rapid DNA and eDNA-based identification tools for sharks, rays, and chimaeras. These ‘rapid molecular tools,’ which include techniques such as multiplex Polymerase Chain Reaction (PCR), Quantitative PCR (qPCR), Droplet Digital PCR (ddPCR), and Loop-mediated isothermal amplification (LAMP), are changing how researchers and environmental agencies detect threatened species and combat illegal wildlife trade.

The paper evaluates how these tools are currently used around the world, highlighting their growing importance for conservation and fisheries management. Rapid molecular methods allow authorities and researchers to identify species from water samples, tissue fragments, fins, or processed products, delivering quick and reliable results in contexts where traditional sequencing is too slow, expensive, or inaccessible.

Despite their potential, the study shows that there is still a lack of standardized protocols and that many biodiversity hotspots remain underserved. To help bridge this gap, the authors compiled an extensive catalog of primers, probes, and rapid molecular tools complete assays, offering a valuable resource for professionals working in monitoring and enforcement.

By mapping the current landscape of rapid genetic tools, the publication provides a clear roadmap for improving species identification and strengthening conservation actions for some of the ocean’s most vulnerable animals.

At the end of this project, the research team also developed a practical, accessible e- book to guide practitioners step-by-step using these tools.

A Practical Companion: The e-book “From Sample to Rapid DNA and eDNA Identification”

This e-book was created to further explain the scientific article by offering something urgently needed for practical purposes: a clear, easy-to-use guide for anyone who needs to identify species using DNA or eDNA, whether in the lab, in the field, or in enforcement operations.

It guides readers through the entire process: from designing a project and choosing the right assay, to collecting samples and interpreting genetic results. Concepts in molecular biology are explained simply but accurately, and the content distinguishes between methods that rely on sequencing and those that do not, highlighting the main rapid identification techniques available today.

Although focused on sharks, rays, and chimaeras (Chondrichthyes), the e-book presents principles and workflows applicable to many other groups. It includes four visual flow charts that guide readers through each stage of a molecular identification project, from defining objectives to validating the results, easing the process of making an analysis and implementation.

Above all, this open-access e-book aims to democratize the use of genetic tools, helping researchers, managers, and environmental professionals apply molecular identification efficiently, reliably, and with confidence. By bridging scientific knowledge and practical application, it directly contributes to protecting marine biodiversity and combating illegal wildlife trade.

Paper citation
Alvarenga, M.M., Bunholi, I.V., Adachi, A.M.C.L., Cruz, M.M., Feitosa, L.M., de Jesus, E.V., Lopes, M.E.L., Povill, C., Souza, D., Torres, Y., Solé-Cava, A.M., Domingues, R.R., Charvet, P., Paes da Cruz, V. 2025. Rapid DNA/eDNA-Based ID Tools for Improved Chondrichthyan Monitoring and Management. Molecular Ecology Resources, 25(8), e70044. doi.org/10.1111/1755-0998.70044
Read the e-book here: marcela-alvarenga.weebly.com/booklet--rapid-dnaedna-based-id-tools.html

Contact
Marcela Maki Alvarenga
marcela.alvarenga@cibio.up.pt
+351 913770777 (whatsapp)
CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos
InBIO, Research Network in Biodiversity and Evolutionary Biology
BIOPOLIS Program in Genomics, Biodiversity and Land Planning
Faculdade de Ciências, Universidade do Porto
Campus Vairão, Portugal
marcela-alvarenga.weebly.com

Social Media
Marcela Alvarenga – Instagram @marcelaalvarenga.bio | BlueSky @marcelaalvarenga.bsky.social
Ingrid Bunholi – X @ingridbunholi | BlueSky @ingridbunholi.bsky.social | Instagram @ingridbunholi
Patricia Charvet – X PatriciaCharve2 | Instagram @patricia.charvet | BlueSky @patriciacharvet.bsky.social
Vanessa Paes – Instagram @vane_paes @lbgp_botucatu
Beatriz Boza – Instagram @biaboza



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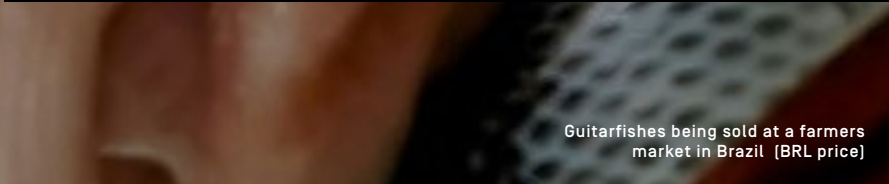
FROM SAMPLE to RAPID DNA and eDNA IDENTIFICATION
An Easy Step-by-Step Guide

Beatriz Rochitti Boza
Ingrid Vasconcellos Bunholi
Patricia Charvet
Vanessa Paes da Cruz
Marcela Maki Alvarenga

Revisions: Megan Do & Rafael Almeida da Silveira
Translation: Megan Do



Shark meat being sold at a fishmonger in Brazil



Guitarfishes being sold at a farmers market in Brazil (BRL price)



Ray meat being sold at very low prices (BRL) in Brazil



Ray meat being sold at very low prices (BRL) in Brazil



Marcela Alvarenga collecting rays being sold

Unveiling the Ocean's Giants: New Field Guide Celebrates Manta and Devil Rays

Written by
Dr. Guy Stevens
Chief Executive & Founder, The Manta Trust

Nuno Barros
Department of Integrative Marine Ecology,
Stazione Zoologica Anton Fisheries & Policy
Assistant Manager, The Manta Trust



Field Guide to Manta & Devil Rays of the World



Guy Stevens ■ Nuno Barros ■ Betty Laglbauer ■ Marc Dando ■ Daniel Fernando ■ Giuseppe Notarbartolo di Sciara

Funded and published by the Manta Trust, the new *Field Guide to the Manta and Devil Rays of the World* was written by leading experts in manta and devil ray (Mobulidae family) research and conservation. The guide seeks to shed light on the complex world of these zooplanktivores, while at the same time providing the latest scientific updates on taxonomy, ecology, and threats to these species.

Beautifully illustrated and full of images, this 100-page volume covers all ten valid species of manta and devil rays. It is the first comprehensive guide designed for field use, dedicated solely to this remarkable family of rays.

Designed for a wide variety of users — from marine scientists and conservationists, to divers, policymakers, and enforcement officers — the guide provides the knowledge needed to better understand, identify, and ultimately help protect these ocean giants. Because the guide is meant to be used in the field and in wet environments, it is ring bound and printed on water resistant durable paper. The guide is also available in four languages: English, French, Spanish, and Portuguese.

The Threats: Living Slowly, Disappearing Quickly

Manta and devil rays are now recognized as some of the most vulnerable species in the ocean. Their slow growth, late maturity, and low reproductive rate make them particularly susceptible to overexploitation.

A new global mobulid fisheries review (Laglbauer et al. 2025) estimates the global mobulid catch to be ~265,000 individuals per year, throughout at least 85 countries; numbers which are incompatible with a sustainable future for these species. Despite greater protective legislation in the last decade, there is increasing and adaptive illegal and unreported meat and gill plate trade (Palacios et al. 2024), powering fisheries retention worldwide. Unsurprisingly, data compiled or inferred from sightings, landings, and catches shows significant declines of more than 80% in all manta and devil ray species, across all ocean basins, and declines of up to 99% in some cases (Laglbauer et al. 2025). Such trends recently led to the 2025 reassessment of the three oceanic devil ray species (Spinetail Devil Ray *Mobular mobular*, Sicklefin Devil Ray *M. tarapacana*, Bentfin Devil Ray *M. thurstoni*) as Critically Endangered on the IUCN Red List of Threatened Species.

Why this Guide is Needed: A Tool for Science, Policy, and Protection

The similarities between manta and devil rays pose identification challenges that make it hard to collect accurate data on these species, which in turns hampers conservation management efforts. Besides the different patterns and color morphs within the same species, as well as similarities between species sub-groups, post-mortem color changes. Further, processed meat and dried gill plates pose additional identification challenges to scientists and enforcement personnel.

This Field Guide to the Manta and Devil Rays of the World distills decades of knowledge into a format that is accessible and visually stunning. More than 200 photographs, illustrations, and identification plates accompany detailed species accounts, highlighting diagnostic features and range maps. A dichotomous species key allows readers to identify species accurately in the field, whether observing living animals underwater, examining landings in fisheries, or inspecting

specimens in trade. Additionally, a new dried gill plate identification key can be a crucial tool for enforcement personnel.

For marine biologists and students, this guide offers a much-needed reference that synthesizes recent taxonomic advances. For enforcement officers and policymakers, it provides a critical tool for ensuring the correct implementation of fisheries and trade regulations and conservation measures.

Enforcement of national and international regulations, such as the Convention of International Trade of Endangered Flora and Fauna Species (CITES), remains challenging, in part because of the difficulty of identifying species from landed or processed specimens. This is where the Field Guide to the Manta and Devil Rays of the World becomes especially valuable. Its precise illustrations and diagnostic keys enable customs officials, fisheries observers, and law enforcement personnel to distinguish species reliably, improving compliance with CITES and national protection laws.

One of the features is the new and comprehensive ‘Safe Handling and Release Guidelines’ for manta and devil rays. Across four pages, the authors illustrate gear-specific recommendations, developed for this book by a wider group of experts, as well as common ‘what not to do’s’ to maximize the chances of post-catch survival. These recommendations can — and are already — being used to update fisheries management, such as tuna Regional Fisheries Management Organizations (t-RFMO) retention bans.

Uniting Knowledge and Wonder: A Call to Action

Beyond its scientific and policy relevance, the book captures the sheer beauty and mystery of manta and devil rays. Detailed illustrations by marine artist Marc Dando and high-quality underwater photography invite readers to appreciate the elegance of these animals and the subtle variations in patterns that make each individual unique. It is both a practical field manual and a celebration of biodiversity. For students, it offers inspiration; for researchers, a definitive reference; for divers, a guide to richer encounters; and for conservationists, a tool to strengthen protection efforts globally.

The Field Guide to the Manta and Devil Rays of the World arrives at a critical moment. As ocean pressures intensify, the survival of manta and devil rays depends on informed actions which are supported by accurate science and effective policy, from those conducting field research to those shaping marine regulations or patrolling ports and markets.

Accessible, authoritative, empowering, and visually captivating, it is more than a book; it is a bridge between people and the ocean’s most graceful travellers. By deepening our understanding of manta and devil rays, it gives us the tools to ensure that these icons of the sea continue to glide through our oceans for generations to come.

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Reef Manta Ray (*Mobula alfredi*)
courtship train_Rasfari Maldives in 2017



Reef Manta Ray (*Mobula alfredi*) courtship train in Rasfari Maldives in 2017

Illustrating Protection: A Field Guide to India's Protected Sharks and Rays

Ornate Eagle Ray
[*Aetomylaeus vespertilio*]

Wildlife and Ocean Fest: Dive into Conservation Celebrations! Did you Celebrate?

Important days related to wildlife and marine conservation are celebrated each year. These celebrations serve as opportunities to spread awareness by educating and engaging the public in conservation efforts and highlighting the critical role of marine life in maintaining the health of our planet.

Illustrations by the IUCN SSC Shark Specialist Group and Eloisa Pinheiro



World Wetland Day [February 2nd]: Wetlands are critical ecosystems that support biodiversity, provide coastal protection, and sustain fisheries. As wetland loss accelerates due to climate change and human activities, so does the risk to these important species. Conserving wetlands means protecting sharks, rays, and the future of our oceans. This year's theme was 'Protecting Wetlands for Our Common Future'.



World Seagrass Day [March 1st]: Seagrass meadows are vital components of marine ecosystems, offering numerous ecological benefits. They serve as critical habitats, supporting a diverse array of marine life. Despite their ecological importance, seagrass ecosystems face numerous threats, including coastal development, pollution, and climate change. Thus, preserving and restoring seagrass meadows are important for maintaining the health and diversity of marine ecosystems. To spread awareness, this year's theme was 'Nurturing the Oceans' Lifelines: Seagrass'.



World Wildlife Day [March 3rd]: On this day we highlighted the importance of sharks, rays, and chimaeras to marine ecosystems. As apex predators and ecosystem engineers, these species regulate prey populations, maintain habitat health, and support biodiversity. By investing in their conservation, we are securing a healthier, more sustainable future for both wildlife and communities. This year's theme was 'Wildlife Conservation Finance: Investing in People and Planet'.



International Day for Biological Diversity [May 22nd]: The United Nations designated 22 May as the International Day for Biological Diversity. This year's theme was "Harmony with nature and sustainable development" to increase public education, awareness, and recognition of the significant challenges human activities pose to biological diversity as well as the role of biodiversity as a global asset to future generations.



World Ocean Day [June 8th]: Overfishing is the greatest threat to sharks, rays, and chimaeras, affecting 100% of threatened species. The SSC is moving forward to ensure that this knowledge converts into plans and interventions that lead into conservation action for priority species groups. Our vision is a world where sharks, rays, and chimaeras are valued and managed sustainably. This year's theme is 'Sustainable Fishing Means More'.



Angel Shark Day [June 26th]: There are at least 24 species of angel sharks (Order Squatiniformes) and they occur across the world. Currently, this species group is amongst the most threatened group of sharks, with over 50% considered threatened with extinction according to the IUCN Red List of Threatened Species due to over-fishing. On this day we raised their profile and the need to better conserve these species.

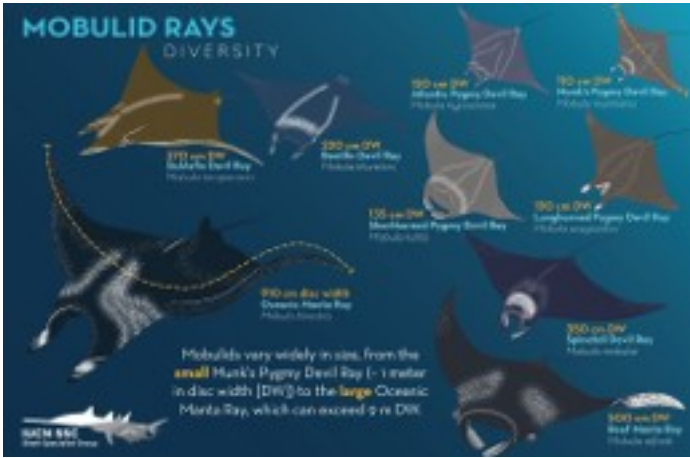
Shark Awareness Day [July 14th): Last year we put the spotlight on mobulid rays to try and secure conservation actions for these highly threatened species. Mobulid rays have been listed under international agreements like the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS). But overfishing and a growing demand for their meat and gill plates still put them at risk. Stronger action is needed to make sure these rays are safe for the future.



International Whale Shark Day [August 30th): Whale Sharks are the world’s largest fish, yet they feed on some of the smallest creatures in the sea, filtering plankton as they glide through tropical waters. These species are listed on several international agreements such as CITES and CMS. However, these gentle giants are still at risk from accidental catch, vessel strikes, and habitat alterations, resulting in their Endangered status on the IUCN Red List. On International Whale Shark Day, we celebrated their magnificence while calling for urgent, collective conservation action.



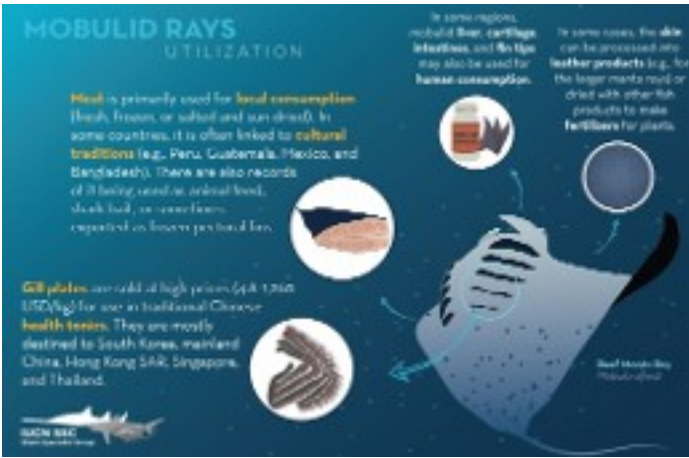
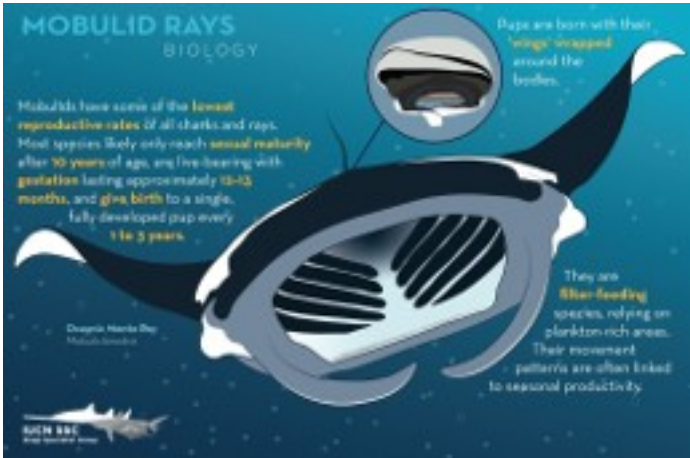
World Manta Day [September 17th): Known for their massive size, elegance, and intelligence, manta rays can live for decades and often return to the same areas annually. Unfortunately, this pattern puts these species at risk of overfishing incidentally or targeted for their gill plates. Habitat degradation is still prevalent and have resulted in ALL manta species listed as threatened on the IUCN Red List. On this day we celebrated these gentle giants while calling for stronger protections, better fisheries management, and community-led efforts to secure their future.



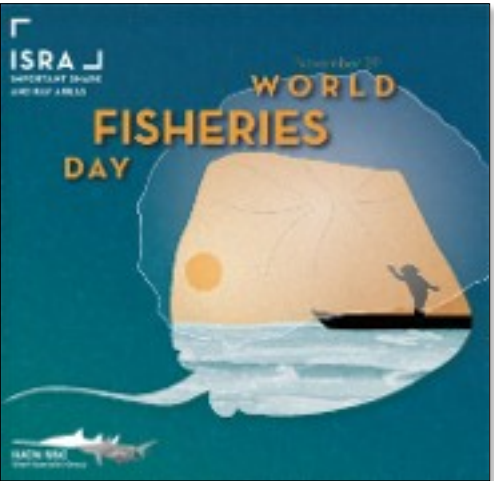
International Sawfish Day [October 17th): In 2022, we completed the IUCN Red List assessments for sawfishes, resulting in ALL species listed as Critically Endangered, making them one of the most threatened family of sharks and rays. While listed on CITES and CMS, threats like gillnets, habitat destruction, and illegal trade continue to push sawfish toward extinction. On this day we spotlighted these unique animals and call for stronger protections and conservation efforts to secure their recovery.



International Ghost Shark Day [October 30th): Most ghost sharks, the chimaeras, live primarily in deep, dark waters (>200 m) around the world. There is still limited information on many of these species but it does not mean that they should be overlooked in conservation. Most information available is based on catches from deepwater fishing. On this day we are shining light on chimaeras to spread awareness on these beautiful species.



Basking Shark Day [November 3rd): The Basking Shark (*Cetorhinus maximus*) is one of the world’s largest fish (second only to Whale Sharks). Once heavily targeted for their fins, liver oil, and meat, Basking Shark populations declined dramatically in many regions. Today, they remain threatened because of fisheries, vessel strikes, and disturbance from boat traffic and tourism. This species is listed as Endangered on the IUCN Red List of Threatened Species, reminding us that even the ocean’s gentle giants need protection.



World Fisheries Day [November 21st): Overfishing is the greatest threat to their survival, with 90% of threatened species affected by fishing alone. Despite significant progress in fisheries management around the world, incidental capture remains a major threat with an increasing number of species retained. World Fisheries Day reminds us how much work is still needed, but also how much is possible. By strengthening sustainable fisheries practices and reducing fishing mortality, we can help secure a more resilient future for these species and the ecosystems and communities that rely on them.

Funding Opportunities



ASAP Species Rapid Action Fund

www.speciesonthebrink.org/rapid-action-fund

Status: Open

During a conservation project, conservation emergencies or a need for unforeseen activities may arise. In such cases, time is of the essence. Fast action can make all the difference to a species' chance of survival. That is why ASAP is offering grants of up to SGD 13,500 to ASAP Partners for urgent and emergency conservation of ASAP species. The fund will provide rapid disbursement of small amounts of funds to address urgent requests from the field for conservation actions. Grants can be used in the following ways:

- To address unforeseen conservation emergencies where urgent action is needed; and
- For the seamless continuation of important current conservation actions. Proposals to support the on-going costs of a long-term conservation project are not eligible except where there is an unforeseen funding gap, and where the seamless continuation of activities is imperative for the ongoing or long-term conservation of the ASAP species in question. They invite ASAP Partners to submit proposals to the ASAP Species Rapid Action Fund. Proposals will be reviewed on a rolling basis throughout the year; they can be submitted at any time.

ASAP Species Conservation Grant

www.speciesonthebrink.org/species-conservation

Status: Open

ASAP Species are some of the most at risk of extinction on the planet. The ASAP Species Conservation Grant is designed to support ASAP Partners in their efforts to conserve ASAP Species and their habitats. To be considered for an ASAP Species Conservation Grant, an organisation must be an existing ASAP Partner. ASAP Partners are invited to submit pre-proposals for a maximum of SGD 16,000. The duration of the ASAP-funded project or project component should be 12 months or less. The priorities for ASAP Species Conservation Grants are:

- projects within Southeast Asia, but priority conservation actions for ASAP species outside this region will be considered where there is strong justification.
- projects submitted by national organisations and those where the Project Lead is from the country in which the conservation actions take place.
- ASAP Species that are receiving less conservation attention globally than is average for ASAP Species, and to applications making a clear case that the species in question is severely under-supported globally.

Please note that funding for this opportunity is limited and the grant will close once funding is allocated.

ASAP Species Continuation Grant

www.speciesonthebrink.org/species-continuation

Status: Open

The ASAP Species Continuation Grant is open to ASAP Partners who have previously received funding from either the ASAP Species Conservation Grant or the ASAP Species Rapid Action Fund. There are two components to the ASAP Species Continuation Grant: funding to enable follow-up conservation activities for ASAP Species and funding to address the organisational needs or priorities of ASAP Partners. Applications must address both components. Proposals should be submitted in Singapore Dollars for a maximum of SGD 30,000 a year, with activities relating to project implementation and organisational development included in each year of the grant. Up to SGD 20,000 a year can be for project activities, with up to SGD 10,000 a year to support organisational development. Proposals can be for a maximum of three years.

ASAP Partner Networking Grant

www.speciesonthebrink.org/partner-networking

Status: Open

The ASAP Partner Networking Grant is designed to facilitate collaboration and networking between ASAP Partners to catalyse conservation action for ASAP Species. To be eligible:

- All applicants must be ASAP Partner organisations.
- The application must detail how the collaboration will further the conservation of ASAP Species. This can be for a single or multiple ASAP Species.

Proposals should be submitted in Singapore Dollars for a maximum of SGD 13,500. The duration of the ASAP-funded activities should be 6 months or less.

Funding Opportunities



The Rufford Foundation Rufford Small Grants for Nature

apply.ruffordsmallgrants.org

Status: Open

This fund is broken into multiple stages to support nature conservation projects in developing countries at the small-scale or pilot projects, rather than providing a small amount of funding for a large-scale project.

- 1st Rufford Small Grant: The first stage of funding from The Rufford Foundation up to £7,000. Having completed your project and provided updates and a final report, you can apply for a 2nd Rufford Small Grant.
- 2nd Rufford Small Grant: The second stage of funding up to £8,000. Having completed your project and provided updates and a final report, you can apply for a Booster Grant.
- Booster Grant: The third stage of funding going up to £12,000. The project must develop important elements of previous projects funded by earlier grants. Projects should consider how it might be sustained in the long-term. Ideally, it should have plans to approach other funders for support, especially if it is intend to request further funding under the Completion Grant.
- Completion Grant: The fourth and final stage of funding up to £18,000. By this there should be co-funding to develop important elements of previous work.



Oak Foundation

oakfnd.org

Status: Open

The Oak Foundation make grants to not-for-profit organisations across the globe that aim to make the world a safer, fairer, and more sustainable place to live. Each programme has its own strategy, funding criteria, and geographic scope. The Oak Foundation provide grants to organisations that work in our programme areas. They have a rigorous due diligence and selection process, which includes extensive discussions, financial reviews, and site visits to ensure that the organisations have robust internal processes and controls, a clear strategy, and the capacity to thrive. The Oak Foundation generally commit multi-year, core support (i.e., general operating support), or flexible project grants that align with our programme strategies.



The Béatrice Ederer-Weber Foundation

ederer-stiftung.ch

Status: Open

In the area of animal welfare, the foundation focuses primarily on contributing to the conservation of biodiversity. It also supports projects that offer humane solutions to the problem of stray animals. The foundation supports projects in Switzerland and abroad, mainly in cooperation with partner organizations. Organizations and their projects to be supported should meet the following criteria:

- Clear and coherent description of the project's content, goals, and target audience.
- Transparency regarding the sponsoring organization, financing, control structures and other requested information.
- Verifiable performance record in the field of activity.

Upcoming Meetings

Please visit the respective websites and communication from the host organisation for more information



Ocean Decade Conference

April 7–9, 2027
Rio de Janeiro, Brazil

oceandecade.org/news/rio-de-janeiro-launches-countdown-to-2027-ocean-decade-conference/

Taking place in April 2027, the Conference is a flagship event of the United Nations (UN) Decade of Ocean Science for Sustainable Development 2021–2030 ('Ocean Decade') and will unite governments, scientists, civil society, Indigenous leaders, youth, the private sector, and philanthropy to accelerate ocean action.

The Conference will bring together up to 2,000 participants for three days of dialogue, partnership, and action. Preceding the main sessions, a programme of partner-led satellite events, exhibitions, and networking opportunities on 5–6 April will create a dynamic forum for diverse engagement across all sectors taking place throughout the city of Rio.

Co-organized by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Brazil's Ministry of Science, Technology and Innovation (MCTI), and the City of Rio de Janeiro, the 2027 edition will build on the outcomes of the 2024 Ocean Decade Conference in Barcelona, Spain, and carry forward the ambition of the Ocean Decade. The hosting of the Conference is further testament to Brazil's leadership in the Ocean Decade since the establishment of its National Decade Committee – the first in the world – in 2027.



Sharks International 2026

May 04–08, 2026
Colombo, Sri Lanka

si2026.org

The 5th Sharks International conference is set to take place from 4th to 8th May 2026 in Colombo, Sri Lanka. This will be the fifth edition of the world's largest conference on sharks, rays, and chimaeras, held every four years. Sharks International 2026 will be a space to share ideas, spark new collaborations, and build lasting partnerships and friendships. This conference will also offer various exciting opportunities for networking and professional development. Attendees can look forward to a range of workshops, plenary sessions, and panel discussions featuring renowned experts in shark, ray, and chimaera research, conservation, and policy. With a particular emphasis on inclusivity, equity, and diversity, we are dedicated to ensuring that voices from across the globe – especially those from the Global South – are heard and represented.



CITES Thirty-fourth meeting of the Animals Committee

July 13–17, 2026
Geneva, Switzerland

cites.org/eng/ac/34

The 78th meeting of the Standing Committee of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) will take place in July 2026. The Animals Committee provides policy guidance to the Secretariat on the implementation of the Convention, oversees the management of the Secretariat's budget, and oversees and coordinates the work of other committees and working groups.

Upcoming Meetings



8th International Marine Conservation Congress

November 13–17, 2026
Edinburgh, Scotland

conbio.org/mini-sites/imcc8

The International Marine Conservation Congress (IMCC) is a biennial global conference organized by the Society for Conservation Biology's Marine Program (SCB Marine). It is one of the largest and most interdisciplinary gatherings in marine conservation, bringing together researchers, students, policy makers, and other ocean stakeholders from around the world to advance marine science, policy, and practice.

The aim of IMCC is to emphasize not just presenting scientific results but also translating science into effective conservation actions, policy, outreach, and management solutions. At IMCC meetings you can find plenary talks, workshops, panel discussions, poster sessions, networking events, and training opportunities designed to foster collaboration, innovation, and real-world impact.

IMCC had its first meeting in 2009 and has since been hosted in diverse locations around the world, including Washington, D.C. (United States), Victoria (Canada), Glasgow (UK), St. John's (Canada), Kuching (Malaysia), Kiel (Germany), and Cape Town (South Africa). These events regularly draw several hundred to over 800 delegates and provide a forum for advancing marine conservation science and policy on a global scale.



7th World conference on Marine Biodiversity

November 17–20, 2026
Bruges, Belgium

www.wcmb2026.org

The 7th edition of the World Conference on Marine Biodiversity (WCMB) will be organized in Bruges between November 17th and 20th 2026.

The WCMB 2026 will fly the UN Ocean Decade flag, as it has been endorsed as a United Nations (UN) Ocean Decade Event. The overall theme of the Conference is "The marine biodiversity insights we need, for the ocean we want". As the Conference will take place a little over halfway through the UN Ocean Decade, it will provide an excellent opportunity to take stock of ongoing actions and initiatives, but also evaluate what still needs to be tackled by the end of the Decade.

IUCN SSG Sponsors & Supporters



The IUCN SSC Shark Specialist Group is fiscally sponsored by Re:wild, a 501(c)(3) non-profit organization with headquarters in Austin, TX, USA (tax ID: 26-2887967).



Sharks and rays need you!
Please donate and help us make a difference.

Sharks and rays are some of the most threatened species in the world, more so than land animals. Populations are declining at alarming rates and 37% of species are already threatened with extinction. With your support we can find solutions and take actions to conserve these incredible animals before it is too late.

The IUCN SSC Shark Specialist Group achievements over the last 30 years have been possible due to the generous support of funders, members, and other volunteers from countless organizations. Our members volunteer their time, effort and expertise to advance our mission and vision.

We would like to express our most sincere gratitude for the generous grants, collaborations, and support to our group, our teams, our projects, and our efforts. We appreciate the support that has been provided over the years and look forward to continuing our journey and endeavors together into the future.



**Shark
Conservation
Fund**



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for the Environment, Climate Action,
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