



Report on the American Elasmobranch Society Global Wedgefish & Guitarfish Symposium 2021

Edited by David A. Ebert, Paula Carlson, Rachel M. Aitchison,
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Photo: Giant Guitarfish (credit: Peter Kyne)



American Elasmobranch Society Global Wedgefish & Guitarfish Symposium 2021

SYMPOSIUM SUMMARY

Cartilaginous fishes of the Order Rhinopristiformes ('rhino rays') represent one of the most threatened groups of animals in the world. The majority of species (72%) are considered threatened with extinction according to the IUCN Red List of Threatened Species. The inaugural American Elasmobranch Society (AES) Global Wedgefish and Guitarfish Symposium brought together a series of presentations focusing on the non-sawfish rhino rays (i.e., wedgefishes, guitarfishes, giant guitarfishes, banjo rays).

The symposium was held virtually over two days in November 2021 and comprised 27 presentations on research, conservation, and management of these fishes. Presenters came from 18 countries spread around the world, providing a truly global symposium. This report provides an abstract for each symposium presentation.

The Symposium had 280 people registered from 37 countries, with 78 being current AES members and 202 non-AES members. The 10 countries with the most registered people were the United States (84), Australia (31), Brazil (24), Peru (12), United Kingdom (12), South Africa (11), India (9), Thailand (8), Singapore (7), and Sri Lanka (7) (Table 1). AES members were represented by 18 countries, with non-members from 33 countries.

The Symposium is supported by the American Elasmobranch Society, Save Our Seas Foundation, Pacific Shark Research Center (Moss Landing Marine Laboratories), Dallas World Aquarium, Charles Darwin University, and the Georgia Aquarium. We thank Tonya Wiley and Josh Moyer for assistance with the Symposium.

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Table 1. Symposium registrations by country

Country	# registered
United States	84
Australia	31
Brazil	24
Peru	12
United Kingdom	12
South Africa	11
India	9
Thailand	8
Singapore	7
Sri Lanka	7
Canada	6
Germany	6
Indonesia	6
Bangladesh	5
France	5
Chile	4
Italy	4
Malaysia	4
Mozambique	4
New Zealand	4
Mexico	3
Portugal	3
Taiwan	3
United Arab Emirates	3
Japan	2
Switzerland	2
Ghana	1
Greece	1
Hong Kong	1
Iran	1
Pakistan	1
Panama	1
Senegal	1
Spain	1
Tanzania	1
The Netherlands	1
Turkey	1

SYMPOSIUM SCHEDULE - 13 NOVEMBER

Times are in US Pacific Standard Time

Time	Presenter	Title
8:00	David Ebert	Playing for time: Guitar- and violyn sharks, is this the last dance?
8:10	Peter Kyne	The global state of wedgefishes and guitarfishes
8:20	Rima Jabado	Rhino rays – uncovering the drivers behind their exploitation in data-poor areas
8:30	Sarah Fowler	Implementing CITES listings for the rhino rays: Wedgefish, guitarfish and sawfish
8:40	Rachel Aitchison	Revision of Southwestern Indian Ocean <i>Rhinobatos</i> (Rhinopristiformes: Rhinobatidae)
8:50	Aletta Bester-van der Merwe	Towards a molecular assessment of <i>Rhynchobatus</i> species from the South West Indian Ocean region
9:00	Michaela van Staden	From the west side to the east side: Population connectivity and genetic diversity of two southern African endemic <i>Acroteriobatus</i> species
9:10	Stephanie Venables	A multi-technique approach to understanding wedgefish ecology in the Bazaruto Seascape, Mozambique
9:20	Break	
9:30	Gareth Jordaan	Movement patterns and growth rate of the Whitespotted Wedgefish <i>Rhynchobatus djiddensis</i> in southern Africa based on tag-recapture data
9:40	Rhett Bennett	Western Indian Ocean wedgefishes (Rhinidae): Ecological knowledge, fisheries, and management
9:50	Alifa Bintha Haque	High fishing pressure and trade driving rhino rays towards extinction – a case study from the Bay of Bengal, Bangladesh
10:00	Guido Leurs	The status of guitarfishes within two large intertidal areas in West Africa
10:10	Ryan Daly	Long-term catch trends and risk assessment of the Critically Endangered Whitespotted Wedgefish (<i>Rhynchobatus djiddensis</i>) from South Africa
10:20	Mariana Martins	Conservation challenges and perspectives for the Brazilian Guitarfish
10:30	Nicole Phillips	Rapid assessment environmental DNA surveys to define the contemporary distributions of wedgefishes, giant guitarfishes, and guitarfishes
10:40	Paula Carlson	Closing remarks

SYMPOSIUM SCHEDULE - 20 NOVEMBER

Times are in US Pacific Standard Time

Time	Presenter	Title
14:00	Paula Carlson	Creating connections: Engaging zoo and aquarium visitors in the conservation of wedgefish and guitarfish
14:10	Beth Firchau	AZA SAFE: Working smarter and harder together for sharks and rays
14:20	Jolene Hanna Jen Hazeres	Bowmouth Guitarfish – An evolution of species management from local to international applications within the aquarium and zoo industry
14:30	Jim Gelsleichter	Hormonal and nutritional changes in plasma of captive Bowmouth Guitarfish through sexual maturity and reproductive events
14:40	Matt McDavitt	A novel luxury dish made from wedgefish rostra
14:50	Adriana Gonzalez Pestano	The Pacific Guitarfish <i>Pseudobatos planiceps</i> (Rhinobatidae), a review with focus in Peru
15:00	Brooke D'Alberto	Population productivity of shovelnose rays: Inferring the potential for recovery
15:10	Christina Choy P.P.	Unravelling the wedgefish (Rhinidae) and giant guitarfish (Glaucostegidae) trade in Singapore
15:20	Break	
15:30	Stan Shea	King of shark fins. Not quite sharks...So what is in my shark fin soup? – A rapid survey on the availability of shark-like batoid fins in Hong Kong, SAR & Guangzhou, China retail markets
15:40	Benaya Simeon	Revealing wedgefish and giant guitarfish fishery from the core of Indo-Pacific
15:50	Daniel Fernando	Management gaps for rhino rays in Sri Lanka
16:00	Moazzam Khan	Managing the unmanaged fisheries of guitarfish and wedgefishes in Pakistan
16:10	David Ebert	Open discussion
16:30	David Ebert Paula Carlson Peter Kyne	Workshop closing

ABSTRACTS

Revision of Southwestern Indian Ocean *Rhinobatos* (Rhinopristiformes: Rhinobatidae)

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The shark-like rays (Rhinopristiformes) are found worldwide and are among some of the most threatened species of cartilaginous fishes. The guitarfishes (Rhinobatidae) are one of five families in this order, comprising three genera and 37 species - 23 of which are assessed as Vulnerable or higher by the International Union for Conservation of Nature (IUCN). Current fisheries and conservation efforts are limited, however, due to unresolved taxonomic issues and poor species descriptions. Presently, there are three species of *Rhinobatos* from the Southwestern Indian Ocean (SWIO): Austin's Guitarfish (*Rhinobatos austini*), Slender Guitarfish (*Rhinobatos holcorhynchus*), and Bareback Guitarfish (*Rhinobatos nudidorsalis*). These three *Rhinobatos* species are of particular concern because they are often mistaken for one another and as a consequence, are assessed as Data Deficient by the IUCN. Prior to its description in 2017, *R. austini* was often misidentified as the poorly known, offshore occurring *R. holcorhynchus*. *R. nudidorsalis* was described in 2004 from a single specimen caught near the Mascarene Ridge, but may have been previously misidentified as *R. holcorhynchus*. Since the descriptions of *R. austini* and *R. nudidorsalis*, additional specimens of both species have become available. Here, we confirm the separation of these species using a linear discriminant analysis (LDA) incorporating new morphometric data from the three SWIO guitarfishes and four additional Indian Ocean congeners. Furthermore, we redescribe the three SWIO species to provide taxonomic clarity and enhance field identifications. This will lead to improvements in fisheries monitoring, management, and conservation strategies for SWIO guitarfishes.

Western Indian Ocean wedgefishes (Rhinidae): Ecological knowledge, fisheries and management

Rhett Bennett¹, Dave van Beuningen¹, Michael Markovina¹, Christelle Razafindrakoto¹, Jorge Siteo¹, Naseeba Sidat¹, Stela Fernando², Isabel da Silva³, Hugo Costa¹, Anthony Bernard⁴, Vivienne Dames⁴, Ryan Daly⁵, Bruce Mann⁵, Gareth Jordaan⁵, Aletta Bester-van der Merwe⁶, Aidan Price⁶, Tamaryn Asbury⁶

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The family Rhinidae (wedgefishes) is among the most threatened marine fish families globally. At least three Rhinidae species occur within the Western Indian Ocean (WIO), all of which are classified as Critically Endangered, yet information on their ecology and fishery threats is limited. We assessed coastal fisheries, coastal habitats, and the shark fin trade to provide new information on rhinids in the WIO. Bottlenose Wedgefish (*Rhynchobatus australiae*) and Shark Ray (*Rhina ancylostoma*) are captured in artisanal fisheries in Kenya, Tanzania, Mozambique, and Madagascar, including pregnant females and juveniles. Whitespotted Wedgefish (*Rhynchobatus djiddensis*) is caught in southern Mozambique and was confirmed in the illegal shark fin trade through genetic barcoding of confiscated fins. Over 1,400 hours of baited remote underwater video (BRUV) across five WIO countries recorded 381 elasmobranchs (37 species), including just one *R. ancylostoma* (southwest Madagascar), one *R. australiae* (Tanzania) and 30 *R. djiddensis* (southern Mozambique, northeast South Africa). These findings highlight generally low densities of rhinids in the WIO, with coastal fisheries having major impacts on their populations. Southern Mozambique and northeast South Africa represent a hotspot for *R. djiddensis* and other threatened elasmobranchs and should be considered a priority elasmobranch conservation area. While dart tagging revealed predominant residency in *R. djiddensis*, some individuals undertook large-scale coastal movements suggesting that transboundary movements between South Africa and Mozambique are likely, thus requiring cross-border alignment of management for this species. Few species-specific protection measures are in place for rhinids in the WIO; however, these findings are being presented to governments of WIO countries, to inform improved management.

Towards a molecular assessment of *Rhynchobatus* species from the South West Indian Ocean region

Aletta E. Bester-van der Merwe¹, Aidan Price¹, Katie Gledhill² Juliana D. Klein¹, Michaela van Staden¹, Mark E. Bond², David A. Ebert^{3,4}, Jeremy Kiszka², John Nevill⁵, Angus Macdonald⁶, Bruce Mann⁷, Rhett Bennett⁸

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The *Rhynchobatus* genus (wedgfishes) has been targeted by illegal fishing globally and in the South West Indian Ocean (SWIO) due to their fins fetching some of the highest prices in the international shark-fin trade. *Rhynchobatus* species, including Bottlenose Wedgfish (*Rhynchobatus australiae*) and Whitespotted Wedgfish (*Rhynchobatus djiddensis*), have recently been classified as Critically Endangered (CR) on the IUCN Red List of Threatened Species. However, species composition and distributional ranges in the Western Indian Ocean remain unclear, impeding assessments of population trends over time, that are required for conservation and management strategies. Here we performed molecular species identification based on the cytochrome oxidase c subunit 1 (CO1) and nicotinamide adenine dehydrogenase subunit 2 (NADH2) gene regions to identify wedgfishes in the SWIO to species level, including South Africa (n=29), Tanzania (n=18), the Seychelles (n=27), Madagascar (n=11), and southern Mozambique (n=3). All samples to date from South Africa and southern Mozambique were identified as *R. djiddensis* while the rest were all *R. australiae*, providing valuable information on the distribution ranges of these species in the SWIO and thereby challenging the currently accepted distribution range of *R. djiddensis*. The CO1 and ND2 datasets were combined with sequence data from the mitochondrial control region (mtCR) to conduct a preliminary assessment of genetic diversity and connectivity within and between species/sampling locations. Furthermore, we developed 14 microsatellite loci from high throughput sequencing data that proved to be informative in *R. australiae* and *R. djiddensis* when tested in a subset of samples. These genetic resources could further aid with the genetic characterization of populations of these and other species of the *Rhynchobatus* genus.

Creating connections: Engaging zoo and aquarium visitors in the conservation of wedgefish and guitarfish

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Elasmobranchs have been popular species in zoo and aquarium exhibit collections for many years. As natural populations of these iconic species decline, engaging visitors in their conservation has become increasingly important. Creative use of informational graphics, social media, and awareness campaigns are examples of traditional tools used to educate the public about the need for elasmobranch research and conservation. In October 2017, zoo and aquarium professionals joined universities, conservation, and research agencies to highlight sawfish species worldwide in an annual celebration known as International Sawfish Day (ISD). The popularity of this event each year surpassed expectations and created new opportunities for future collaborations. Members of the Association of Zoos and Aquariums (AZA) and the European Association of Zoos and Aquaria (EAZA) who originally spearheaded ISD, maintain studbooks for numerous elasmobranch species including several guitarfish species. In conjunction with AZA's SAFE Sharks and Rays initiative, the collective reach of these programs has the potential to increase collaboration between zoos and aquariums and other stakeholders in elasmobranch research and conservation. Events such as International Sawfish Day can be used as a model for collaboration and provide opportunities for engaging visitors and the general public in the conservation of Critically Endangered wedgefish and guitarfish species.

Unravelling the wedgefish (Rhinidae) and giant guitarfish (Glaucostegidae) trade in Singapore

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The global demand for wedgefish and giant guitarfish products and urgency to conserve wild populations led to their inclusion on the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) Appendix II in 2019. Between March (when listings were proposed) and November 2019 (when listings entered into force), we (1) documented the composition of imports and landings, (2) estimated the scale of trade, (3) described the supply chain, (4) identified products to species-level using DNA barcoding, and (5) analyzed the completeness of product labels in Singapore – one of the most important trading hubs for elasmobranch products. At fishery ports, six species, including the rediscovered Clown Wedgefish (*Rhynchobatus cooki*) were identified from 215 individuals. Bottlenose Wedgefish (*Rhynchobatus australiae*) dominated 66% of the imports and landings. The conservative estimate of 2,223 kilograms imported and landed over four months is concerning given the threatened status of these species and the documented skewed size distribution. Individuals were largely imported with fins removed from Indonesia and Malaysia, suggesting that local businesses are likely utilizing by-products of the fin trade. DNA barcoding identified four species in different products readily available to consumers. Notably, nearly 20% of sampled products were labelled very generally or even mislabelled as a non-threatened bony fish. All 94 elasmobranch product labels lacked species and only 30% indicated country of origin. A multi-pronged approach with trade monitoring, additional traceability, labelling requirements, and enhanced fisheries management will aid local authorities in strengthening CITES enforcement and ensuring sustainable use of these species.

Population productivity of shovelnose rays: Inferring the potential for recovery

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There is recent evidence of widespread declines of shovelnose ray populations (Order Rhinopristiformes) in heavily fished regions. These declines, which are likely driven by high demand for their fins in Asian markets, raises concern about their risk of over-exploitation and extinction. Using life-history theory and incorporating uncertainty into a modified Euler-Lotka model, the maximum intrinsic rates of population increase (r_{max}) were estimated for nine species from four families of Rhinopristiformes, using four different natural mortality estimators. Estimates of mean r_{max} , across the different natural mortality methods, varied from 0.03 to 0.59 year⁻¹ among the nine species, but generally increased with increasing maximum size. Comparing these estimates to r_{max} values for other species of chondrichthyans, the species Bottlenose Wedgefish (*Rhynchobatus australiae*), Giant Guitarfish (*Glaucostegus typus*), and Blackchin Guitarfish (*Glaucostegus cemiculus*) were relatively productive, while most species of guitarfishes (Rhinobatidae) and banjo rays (Trygonorrhinidae) had relatively low r_{max} values. If the demand for their high-value products can be addressed, then population recovery for some species is likely possible but will vary depending on the species.

Long-term catch trends and risk assessment of the Critically Endangered Whitespotted Wedgefish (*Rhynchobatus djiddensis*) from South Africa

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The Whitespotted Wedgefish (*Rhynchobatus djiddensis*) is a Critically Endangered shark-like ray in the family Rhinidae. Throughout its Western Indian Ocean distribution, it is targeted for its valuable meat and fins and is reported to have undergone major population declines. However, there remains a need for species specific time-series data to accurately assess localised population declines. This study used two independent long-term (37 to 40 years) time-series catch data from competitive shore angling and shark nets to investigate the size composition and catch per unit effort (CPUE) and conduct a risk assessment for the population on the east coast of South Africa. From 1977 to 2017, the competitive shore fishery captured 7,703 individual *R. djiddensis*, whilst shark nets in the same region captured 2,856 individuals from 1981 to 2017. The net catches, with a sex ratio of 1.8:1 females to males, were larger than those of the anglers. Although the mean annual sizes of net-caught individuals were above the size of reported sexual maturity, there was little evidence to suggest that any individuals captured were reproductively active. Both the competitive shore fishery and shark net catches exhibited strong seasonal trends with the majority of *R. djiddensis* catches occurring from October to May, peaking in the austral summer. CPUE from the competitive shore fishery declined substantially between 1977 and 2017 and shark net catches exhibited a significant ($p < 0.05$) fourfold decline in annual CPUE from 1981 to 2017. Ultimately, a risk assessment showed a 65.1% decline in abundance over a period of three generation lengths which indicates that the sampled population of *R. djiddensis* should be classified as Endangered according to the IUCN Red List using criterion A2b. The conservation implications of this are discussed.

Playing for time: Guitar- and violyn sharks, is this the last dance?

David A. Ebert^{1,2,3}

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Shark-like rays, e.g., wedgefishes and guitarfishes, are among some of the most threatened species of cartilaginous fishes globally. These ‘flatsharks’ have life history characteristics, such as slow-growth, late maturity, and low fecundity, combined with a mostly nearshore coastal (<100m deep) habitat makes them exceptionally vulnerable to overfishing and habitat degradation. These characteristics are similar to their better-known, more charismatic brethren the sawfishes (Pristidae), which are among the most critically endangered shark-like rays, with many having been extirpated from much of their historical range. While steps have been taken to address concerns over these charismatic shark-like rays, three families with this order (Glaucostegidae, Rhinidae, Rhinobatidae) exhibit similar life history and habitat characteristics that make them exceptionally vulnerable to overexploitation, leading to extirpation and possible extinction. In addition to the highly sought-after flesh for human consumption, the fins are of extremely high value in the shark-fin trade, with fin prices for the larger species bringing significantly higher value than the meat. A current global reassessment of the Red List status of wedgefishes and guitarfishes found that over 70% were assessed as Vulnerable or higher, with 23 species being assessed as Critically Endangered. As such, extinction risk is extremely high, and these species are in urgent need of conservation and management action globally. This timely symposium will bring together aquatic biologists and researchers to present the latest ongoing research focusing on taxonomy, habitat and ecology, fisheries, use and trade, and conservation efforts, and how they are engaging the public.

Management gaps for rhino rays in Sri Lanka

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The rhino rays, including wedgefishes and guitarfishes (Families Rhinidae, Glaucostegidae, and Rhinobatidae), are facing severe threats due to overfishing. Sri Lanka is no exception with over 50,000 vessels exploiting coastal and pelagic waters, using indiscriminate methods including trawl nets, gillnets, and bottom-set nets. While complete utilisation is largely practiced, the expanding and lucrative trade for shark and ray commodities, including fins, meat, skin, and cartilage, has increased pressure. All known rhino rays in Sri Lankan waters are globally assessed by the IUCN Red List as Critically Endangered. In 2019, the wedgefishes and giant guitarfishes were listed on Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). Since 2017, our fishery surveys (>1,300) undertaken across Sri Lanka have documented over 26,829 chondrichthyan specimens, of which 1,067 (4%) are rhino rays, comprising two wedgefish, one giant guitarfish, and three guitarfish species. With this data, in 2021 CITES Non-Detriment Findings were developed by Sri Lanka to inform the magnitude of potential sustainable exploitation. There is no doubt that implementation of management recommendations will be a challenge, however, more alarming is the fact that non-CITES listed species are yet to receive attention from fisheries managers. This includes Stripenose Guitarfish (*Acroteriobatus variegatus*), a Critically Endangered species found only along the west coast of India and across Sri Lanka. Such examples highlight the need for additional CITES listings to drive management forward while demonstrating the necessity for more proactive shark and ray management at the national level.

AZA SAFE: Working smarter and harder together for sharks and rays

Beth Firchau¹

¹AZA SAFE Sharks and Rays

The Association of Zoos and Aquarium (AZA) is dedicated to supporting and promoting zoos and public aquariums as leaders in animal care, welfare, and conservation. The AZA SAFE (Saving Animals From Extinction) program focuses the time, talent, and resources of AZA member facilities and their global conservation partners to achieve greater impact addressing critical conservation efforts by species. Now in its four year, the AZA SAFE Sharks and Rays program has evaluated its progress to date and is building a road map for future efforts. Empowering the combined resources of its international membership, the program's goals are built upon responsive leadership and effective collaboration driving significant conservation impact. The status of the AZA SAFE Sharks and Rays Project, initiatives being explored to encourage closer alignment in conservation efforts, and opportunities to support and participate in the program will be shared.

Implementing CITES listings for the rhino rays: Wedgefish, guitarfish, and sawfish

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¹Blue Resources Trust, Colombo, Sri Lanka; ²Save Our Seas Foundation, Geneva, Switzerland; ³Sea Shepherd Legal, Vienna, Austria; ⁴James Cook University, Townsville, Australia

CITES and CMS are complementary Multilateral Environmental Agreements for the conservation and management of wild species. CITES lists all sawfishes in Appendix I and the six giant guitarfishes and ten wedgefishes in Appendix II (which also includes all mobulid rays and 14 shark species). CMS lays the legal foundation for internationally coordinated conservation measures throughout a species' migratory range and lists many CITES species in its Appendices and Migratory Sharks MOU. CITES regulates international trade by ensuring that exports are from legally-obtained specimens of listed species and requires Non-Detriment Findings (NDF) verify sustainability of wild populations before permits are issued. Permits facilitate the traceability of products from origin to final destination. Thus, CITES can complement local, national, and regional management and data collection measures, provide additional data to support stock assessments, and encourage improved compliance with fisheries rules (including addressing IUU fisheries). Before preparing an NDF, CITES Authorities may require support and advice from fisheries scientists and regional fishery bodies on, for example, determining sustainable catch levels. Many CITES shark species are transboundary, in which case range States may benefit from regional data and advice, similar to regional fisheries bodies providing advice to their Members on total sustainable catch and national quotas. While CITES is mainly directed towards the regulation of commercial trade, it also covers the international shipment of scientific samples. The presentation introduces a guidance tool for developing CITES NDFs, including a precautionary approach for data-poor species, and explains procedures for shipping scientific samples of listed species.

Hormonal and nutritional changes in plasma of captive Bowmouth Guitarfish through sexual maturity and reproductive events

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The guitarfish or “shark rays” are a group of cartilaginous fishes related to the sharks that are known for their ray-like rostra or “heads” and shark-like torsos. Recently, it has been reported that the guitarfishes are the most threatened group of marine fishes on a global basis because of their slow rates of population growth and overexploitation in commercial fisheries. Because of this, it is important to use accurate information on guitarfish life history (e.g., growth, reproduction) to develop effective management and conservation plans for this group; however, very little scientific work has been conducted on these fishes. In this study, we examined changes in plasma concentrations of reproductive hormones and metabolic factors in a female Bowmouth Guitarfish (*Rhina ancylostoma*) maintained in captivity for over a decade; a time period that included sexual maturation and multiple pregnancy cycles. The goal of the study was to characterize patterns in the concentrations of these analytes in relation to maturity and reproductive events with the purpose of using this approach as a non-lethal method for investigating reproduction in wild populations. Results from this study would also be useful for improving captive breeding in this species. Plasma concentrations of the gonadal steroid hormone, 17 β -estradiol, increased specifically during the period of maturation and pregnancy, demonstrating a role for this hormone in these events. Changes in plasma glucose, calcium, and cholesterol were also observed during gestation; however, these patterns were not diagnostic of pregnancy. Changes in additional hormones are also discussed.

The Pacific Guitarfish *Pseudobatos planiceps* (Rhinobatidae), a review with focus in Peru

Adriana Gonzalez-Pestana^{1,2}, Astrid Jiménez^{1,3}, Sergio Pingo^{1,3}, Joanna Alfaro-Shigueto^{1,2}, Ximena Vélez-Zuazo⁴, Jeffrey C. Mangel^{1,5}

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This review reports on the biology, ecology, fisheries, and management of the Pacific guitarfish with a focus in Peru. Species life-history traits are little studied with only length-at-maturity and litter size known. The Pacific guitarfish is a mesopredator that feeds on crustaceans, mollusks and teleosts off Peru and its consumption of pelagic fish is unique to its genus. The species is one of the most landed batoids in Peru; a country with one of the largest batoid fisheries in eastern Pacific. Between 1964 and 2018 landings declined, with a maximum in 1981 (4711 t) and a minimum in 2015 (2 t). It is targeted in artisanal gillnet, beach seine and trawling fisheries, with higher landings during the austral summer in central and northern Peru. The species also occurs as bycatch in industrial trawl fisheries targeting Peruvian hake. A coastal demersal-net artisanal fishery in northern Peru between December 2012 and June 2014 was assessed (183 fishing sets) in which most of 796 individual Pacific guitarfish were captured. Most specimens were mature and the mean annual catch per unit effort was 12.60 ± 3.47 guitarfish km⁻¹ x12 h⁻¹. In northern Peru - the region with the highest consumption of elasmobranchs - the guitarfish has ancient cultural and economic importance. Its conservation status is Vulnerable (IUCN Red List) with no species-specific fisheries management in Peru. The banning of coastal bottom trawling, mechanized and manual beach seines may have improved species conservation in Peru, but illegal fishing continues. Information presented here can help guide research and management priorities.

Bowmouth Guitarfish – An evolution of species management from local to international applications within the aquarium and zoo industry

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The species Bowmouth Guitarfish (*Rhina ancylostoma*) has been an engaging ambassador in public aquaria for over a decade. The evolution of its husbandry management and subsequent AZA SAFE Candidate Program are evidence of the success that can be attained through professional care. IUCN states that adequate research of this species in their natural habitat has yet to be documented and currently lists the *R. ancylostoma* as Critically Endangered. These two items together provide strong stimulus for our future collaboration in research and conservation. Newport Aquarium has been graced with the opportunity to work with *R. ancylostoma* from acquisition through disposition of captive bred specimens. Advancing our knowledge of successful breeding in captivity will prove to be vital to sustaining this species in the future.

High fishing pressure and trade driving rhino rays towards extinction- a case study from the Bay of Bengal, Bangladesh

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Rhinopristioid rays are among the most globally threatened cartilaginous fishes. Fishing pressure and limited knowledge in the Indo-West Pacific resulted in unnoticed population depletion. Rhino rays (except sawfishes) are an essential component of the Bangladeshi artisanal fishery; however, they are understudied. Between 2018 and 2021, using a mixed-method approach (socioecological and biological), we studied the rhino ray population, fisheries, and trade. At least 11–12 rhino rays were commonly found in Bangladesh, of which ten were taxonomically verified. The target catch is seasonal, with high adult and gravid female mortality. All interviewed fishers reported life-long rhino ray catch in sizable numbers either targeted by un-baited longlines or by-caught in gillnets and set-bag nets. Fishers noted a steep decline in the catch in the past decade and cited the disappearance of wedgefishes (*Rhynchobatus* spp). The unregulated catch is fueled by substantial international trade on high-quality products (fins, meat, skin) and remains undocumented. Each trader bought between 9,000–33,000 kg of rhino rays annually during 2015–2018. Southcentral shallow-water chars (coastal islands) are perceived as essential habitats (5–36 m depth). Bangladesh only protects two species; hence catch and trade on most species are not illegal. Compliance with international trade control treaties (CITES) or the Bangladeshi law was low, with most fishers (78%) unaware of specific regulations. It is crucial to adopt precautionary principles to prevent further population declines. We propose actions rooted in sustainability and inclusiveness: trade mitigation, monitoring and enforcement, fisheries management based on the biological sustainability of the species, habitat protection, and finally, fishers' inclusiveness in conservation decision-making.

Rhino rays – uncovering the drivers behind their exploitation in data-poor areas

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Rhino rays (order Rhinopristiformes) are considered amongst the marine species most at risk of extinction. These species have limited productivity making them susceptible to population decline from overexploitation. They face an uncertain future and there is a need for urgent coordinated action to ensure their long-term survival. This study focuses on understanding the status and uncovering the drivers behind their exploitation in four data-poor countries: India, Mauritania, Senegal, and Sri Lanka. These are hotspots of species richness or endemism, are data-poor in terms of fisheries, have some of the poorest coastal communities, and species distribution overlap with intense fishing pressure. Data were collected by interviewing fishers and traders to record knowledge and current perceptions, as well as through landing site surveys to collect data on species and assess how fisheries are impacting them. Overall results indicate exploitation for these species is not always driven by the high value of fins but rather by demand for their meat, consumed locally as animal protein. Landing site surveys indicate a low abundance of species where fishers describe historical high abundances, indicative of potential localized extinctions going unnoticed. The complexities in understanding these fisheries highlight that conventional fisheries management measures are unlikely to yield results, especially when governance is weak in terms of enforcement and policy implementation. Actions need to be adaptive and taken at local scales with solutions developed by engaging with fishers to ensure their livelihoods and protein needs are taken into consideration while identifying potential mitigation measures or solutions to reduce demand.

Movement patterns and growth rate of the Whitespotted Wedgefish *Rhynchobatus djiddensis* in southern Africa based on tag-recapture data

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Information on the movement ecology of endangered species is critical for the implementation of effective conservation measures. This study made use of a long-term dart tagging dataset to reveal the movement patterns and growth rates of two size classes of the Critically Endangered Whitespotted Wedgefish (*Rhynchobatus djiddensis*) within its southern African distribution, which can have important implications for fisheries management. A total of 4,768 individuals were tagged with 340 recaptures recorded, ranging from 1 to 2,639 days (7.2 years) at liberty. Most of the tag releases and recaptures occurred within the KwaZulu-Natal central region in South Africa, with catches increasing significantly during summer (October to March). Most recaptures (43%) were recorded within 5 km of the tagging (release) site. Tagged adults recorded significantly greater distances moved than juveniles ($p < 0.002$) but there was no significant difference between juveniles or adults in terms of their direction of movement ($p > 0.30$). A Francis growth model showed that smaller individuals had a substantially faster growth rate (198.69 [SE 21.75] mm year⁻¹) compared with larger individuals (57.41 [SE 27.83] mm year⁻¹) confirming that the species is relatively slow-growing. Ultimately, this study identified important knowledge gaps in the broadscale movement patterns of *R. djiddensis* and provided new information on the growth rate of this Critically Endangered species. Filling in these knowledge gaps will aid in conservation measures for two important size classes of the *R. djiddensis* population as the species faces increasing targeted fishing pressure.

The global state of wedgefishes and guitarfishes

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Rhino rays (Batoidea: Rhinopristiformes) represent one of the most threatened orders of vertebrates. The majority of species (72%) are threatened with extinction. The recent attention and conservation concern directed at highly threatened sawfishes (Rhinopristiformes: Pristidae) is now turning towards other rhino ray families. Here we overview wedgefish and guitarfish extinction risk status. The wedgefishes (Rhinidae) and giant guitarfishes (Glaucostegidae) face an extremely high risk of extinction (90% and 100% of species are Critically Endangered, respectively). Guitarfishes (Rhinobatidae) are also under significant threat (66% of species are threatened) especially in tropical regions, while extinction risk is lower (38% of species are threatened) among the banjo rays (Trygonorrhinidae). Wedgefishes and giant guitarfishes were added to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II in 2019. Species-specific management and conservation measures are however lacking at the national and subnational level. Significant challenges remain to be overcome to permit species recovery and sustainable management. Raising awareness and placing a spotlight on wedgefishes and guitarfishes is one step. Public aquariums have a central role to play in this space, and advances in captive breeding may become more important as global populations of some species slide towards extinction. Naturally, this has to complement measures addressing the root cause of population decline – overexploitation.

The status of guitarfishes within two large intertidal areas in West Africa

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Guitarfishes and wedgefishes are among the most threatened elasmobranch species groups, caused by overfishing and coastal habitat degradation. These species are highly adapted to utilize benthic habitats and are often associated with coastal ecosystems. Off the West African coast, the Blackchin Guitarfish (*Glaucostegus cemiculus*) and Common Guitarfish (*Rhinobatos rhinobatos*) are frequently captured in local artisanal fisheries. Here, guitarfishes are believed to play an essential role within the functioning of large intertidal areas, like the Banc d'Arguin (Mauritania) and the Bijagos Archipelago (Guinea Bissau). Long-term data on the artisanal fisheries within the Banc d'Arguin National Park indicates that catches of guitarfishes continue to rise, with a doubling in catches from 1.4 kg per fishing day in 2006 to 2.8 kg per fishing day in 2020. Here, *G. cemiculus* is among the ten most captured species. Reconstructed population trends based on semi-structured interviews with the fishing communities in the Bijagos Archipelago indicate a clear decline in catch-per-unit-effort of guitarfishes over the past 40 years. Based on a recent initiated fishery observer program, guitarfishes are among the most captured species within the archipelago. Length frequency and direct field-observations of newborn *G. cemiculus* suggest the intertidal mangrove forests of the Bijagos Archipelago may be an important nursery area for this Critically Endangered species. In addition, the fishery observer program also led to the first documented record of the elusive African Wedgefish (*Rhynchobatus luebberti*) in the archipelago since 2006. The trophic ecology of guitarfishes indicates that these species use these large intertidal areas along the West African coast as feeding areas. Our results show contradicting trends for both areas but show high exploitation rates and ongoing threats for these endangered species. We furthermore highlight the importance of long-term fishery data and local capacity building, and the reconstruction of essential population trends using local ecological knowledge.

Conservation challenges and perspectives for the Brazilian Guitarfish

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The Brazilian Guitarfish (*Pseudobatos horkelii*) is endemic to the Southwestern Atlantic and represents an important example of population decline in marine fish from this area, with over 80% of abundance decreasing in the last decades. This led this species to be categorized as Critically Endangered in 2000 and later protected by the Brazilian Law, but illegal trade and catches are still recurrent. Here, we aimed to summarize the conservation challenges regarding this species in Brazilian waters. Illegal landing, trade, and import of *P. horkelii* seems to be the major cause of concern. Population withdrawn is biased towards pregnant females, which aggregate in shallow waters for reproduction. Although considerable captures are incidental, artisanal and recreational fisheries, especially in southern Brazil, target *P. horkelii* aggregations, highlighting the underestimation of individuals captured per year. These activities are driven by a demand for specifically guitarfish or other elasmobranchs meats, which are usually mislabeled. Additional stressors such as pollution have also been recently addressed for this and other guitarfish species, suggesting exposure to considerable levels of carcinogenic compounds. Coastal habits, combined to an intrinsic maternal transfer rates of contaminants, suggest that *P. horkelii* might be additionally stressed by anthropogenic pollution at a sublethal and transgenerational level. Considering that nursery areas are not efficiently protected, seasonal prohibition or controlling of fishing efforts in these areas should be pondered. Inspection and updated assessments of population dynamics are urgently needed and, finally, public awareness towards fish consumers, combined with proper labeling could enhance guitarfish protection in Brazil.

A novel luxury dish made from wedgefish rostra

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In 1997, a chef from Singapore invented a new luxury dish as a variation on traditional Teochew steamed fish, but using a novel and formerly unutilized ingredient, wedgefish rostra. The dish is called “shark head” or “shark lips” in Chinese. In 2000, the dish won second place in a Tokyo Chinese cooking competition, increasing its recognition and popularity. The dish spread from the inventor’s business to Chinese restaurants throughout Singapore and peninsular Malaysia, also expanding on a limited basis into Sabah, Sarawak, Jakarta, Cambodia, and even Hong Kong, including restaurants specializing Chinese cuisines other than Teochew. Shark head is made by removing the skin from the fresh or frozen rostrum, steaming the snout for several hours, and then covering or brazing the cooked rostrum with a variety of delectable sauces, meats, and vegetables. The prepared rostrum is an attractive white wedge covered in a thick sauce, wherein the slabs of interstitial jelly on both sides of the rostral process are often sliced at intervals to create bite-size morsels. The rostrum contains no meat, just clear interstitial gel whose texture is revered as akin to sea cucumber, bone marrow, or gelatin. Given the elaborate preparation, most restaurants require advanced notice to serve the dish. Shark head is touted as an opulent food akin to sharkfin; an average serving costs US\$22, with the largest rostrum able to serve 10 diners (costing US \$220). Shark head is also advertised as a collagen-rich health food allegedly beneficial for skin health and joint problems.

Managing the unmanaged fisheries of guitarfish and wedgefishes in Pakistan

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Rhino rays (Batoidea: Rhinopristiformes) have long been commercially exploited in Pakistan (Northern Arabian Sea). It is estimated that their commercial landings ranged between 4,206 m. tons in 1981 to 403 m. tons in 2021. Analysis of the landing data from Karachi Fish Harbor (the largest fish landing center in Pakistan) revealed that seven species of guitarfish and wedgefish are landed. Granulated Guitarfish (*Glaucostegus granulatus*) contributed about 61.69% in total annual landings of this group followed by Widenose Guitarfish (*Glaucostegus obtusus*) contributing about 23.29% in total annual landings of guitarfish and wedgefish. Annandales' Guitarfish (*Rhinobatos annandalei*) and Bowmouth Guitarfish (*Rhina ancylostoma*) contributed 7.32 and 5.97% in total annual landings respectively. Spotted Guitarfish (*Rhinobatos punctifer*), Halavi Ray (*Glaucostegus halavi*), Smoothnose Wedgefish (*Rhynchobatus laevis*), and Salalah Guitarfish (*Acroteriobatus salalah*) collectively contributed about 1.73% in total annual landings. *R. laevis* is the rarest of all the members of Order Rhinopristiformes. There are no targeted fisheries for guitarfish and wedgefish in Pakistan, but these fishes are mainly caught as bycatch of bottom-set gillnetting and shrimp trawling. Under national legislations including CITES Management Authority Act (Pakistan Trade Control of Wild Fauna and Flora Act, 2012) putting a ban on export of CITES listed species, Sindh Wildlife Protection, Prevention, Conservation and Management Act, 2020 putting a ban on catching of all shark, Sindh Fisheries Ordinance, 1980 Rule No. 5(3) SO (FISH)/L &A) 2016 banning catching, marketing and sale of guitarfishes and wedgefishes of less than 30 cm and Balochistan Sea fisheries Ordinance 1970 Rule No. SO (Coord)Fish/2-I/2013/3148-54 banning catching, retention, marketing, and trade of all guitarfishes and wedgefishes. Despite these legislations, the fishing, marketing, and trade (including export of fins) continued unabated rather completely unmanaged. In order to ensure implementation on the legislations, staff of Fisheries Departments were provided training, awareness material was published, and fishermen were taken on-board. This strategy worked in some of the important landing centres where fisheries department is actively controlling landings of guitarfishes and wedgefishes with the help of fishermen communities. It is planned to replicate such efforts in other landing centres which will help conservation of these threatened and protected species in Pakistan.

Rapid assessment environmental DNA surveys to define the contemporary distributions of wedgefishes, giant guitarfishes, and guitarfishes

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Environmental DNA (eDNA) is a novel survey tool for rare and threatened aquatic species. The collection and filtration of water samples from marine and freshwater environments allows for screening of DNA from target species, or for broader 'meta-barcoding' approaches to examine biodiversity and species communities. eDNA can be used to complement other survey approaches (e.g., net surveys, baited remote underwater videos, interviews), or as a preliminary investigation into species occurrence to drive the design of surveys using these other techniques. eDNA protocols have proved a valuable tool for threatened sawfishes (family Pristidae), which have experienced severe global range contractions, to assess their occurrence in many parts of their historic and contemporary ranges. Here, we discuss the potential of using eDNA as a tool to survey and monitor wedgefishes (Rhinidae), giant guitarfishes (Glaucostegidae), and guitarfishes (Rhinobatidae), three ray families consisting of species facing a high risk of extinction. Surveys are urgently required to understand where some of the rarest and most threatened species still persist; eDNA offers a rapid assessment approach that can complement fisheries and market surveys to define contemporary distributions, ultimately guiding conservation and management strategies. We use specific case studies for its application in West Africa and Southeast Asia.

“King of shark fins” not quite sharks... so what is in my shark fin soup? – A rapid survey on the availability of shark-like batoid fins in Hong Kong, SAR & Guangzhou, China retail markets

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Sharks are not the only chondrichthyans facing global population declines and extinction risks. Many shark-like batoids, including sawfishes, wedgefishes, giant guitarfishes and guitarfishes are also suffering from overexploitation. Fins of some shark-like batoids can be found sold as shark fins under the category name of “*Qun chi*” in Hong Kong SAR and Guangzhou, China markets, and are reputable for quality and texture, placing fishing pressures on their dwindling populations. This study serves to fill a knowledge gap about the availability of shark-like batoid fins in Hong Kong SAR and Guangzhou, China’s retail markets through market surveys. Results confirmed that in both markets, shark-like batoid fins are sold at least under the category name of “*Qun chi*”, and include several species of shark-like batoids in the international trade. The study proves that these fins have a clear role in Hong Kong and mainland China’s markets, and it is recommended that the trade needs to be better understood and managed. Furthermore, this study hoped to set a baseline for the market before associated species were listed onto CITES, to offer the possibility of comparison with any data collected after CITES listings and to assess the effectiveness of implementation, at the world’s key fin-trading hubs.

Revealing wedgefish and giant guitarfish fishery from the core of Indo-Pacific

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Wedgefish and giant guitarfish known as rays species which highly threatened by extinction. Indonesia is a country which located in the core of Indo-Pacific, the hotspot habitat of wedgefish and giant guitarfish, which also known with its shark fishery production. Basic information would be needed to promote and improve wedgefish and giant-guitarfish conservation efforts in Indonesia. The aims of this research is to identify biological and fisheries aspect of wedgefish and giant guitarfish which caught and landed in Indonesia. Landing monitoring was conducted on two fishing ports located in edge of Indian Ocean since 2014 to 2020: and in three fishing ports of the Java Sea in 2019 to 2020. There were differences catches number between locations: 8000 individuals caught from Java Sea in last 2 years; and less than 1000 individuals for last 7 years in the edge of Indian Ocean. We recorded 4 wedgefish species and 2 giant guitarfish species with each different distribution pattern, however all species could be caught in Java Sea. Immature individuals were caught by dominantly by danish-seine in the Java Sea as secondary catch and mature individuals catches in the edge of Indian Ocean by longline. Based on number of catches, size, and species distribution we concluded that Java Sea is important for wedgefish and giant guitarfish conservation effort, however human dimension need to be considered to support the conservation effort.

From the west side to the east side: Population connectivity and genetic diversity of two southern African endemic *Acroteriobatus* species

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Many chondrichthyans are threatened with an elevated risk of extinction; however, rays were recently found to be more threatened than originally estimated – with 36% of species being assessed in threatened categories. One of these species is the southern African endemic Lesser Guitarfish, (*Acroteriobatus annulatus*), which was recently assessed as Vulnerable by the IUCN Red List of Threatened Species. This status change from Least Concern to Vulnerable was justified by an estimated population decline of 30–49% over the past three generation lengths (15 years), combined with a suspected reduction in the area of occupancy resulting from a range shift in response to climate change. Assessing marine biodiversity, in terms of genetic diversity and population structure, remains paramount for the effective implementation of conservation and management plans. In particular, the detection of barriers to dispersal is crucial in order to identify isolated units that are at a greater risk of extinction due to reduced genetic diversity. Here, we identified single nucleotide polymorphic (SNP) loci using the 3RAD approach to: 1) assess the degree of population connectivity within *A. annulatus*, and 2) compare the levels of intraspecific genetic diversity between *A. annulatus* and its congener Bluntnose Guitarfish (*Acroteriobatus blochii*). For this, samples were obtained for 67 *A. annulatus* specimens from seven locations along the south and east coasts of South Africa, and for 24 *A. blochii* specimens from two locations on the west coast. The preliminary genetic characterisation of these populations provides valuable insight into the vulnerability of these species that are required to respond to ongoing environmental changes.

A multi-technique approach to understanding wedgefish ecology in the Bazaruto Seascape, Mozambique

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Southern Mozambique is a hotspot for marine megafauna and coastal waters support a range of rare and threatened elasmobranchs, including three Critically Endangered wedgefish species. The region experiences a high level of fishing pressure, particularly from artisanal gill and seine net fisheries. Despite their protected status in Mozambique, these species continue to be landed incidentally, and for their highly prized fins and meat. Protected area managers throughout the Bazaruto Seascape have expressed willingness to improve conservation strategies for wedgefish, yet knowledge of local population status and movement ecology is lacking. Launched in 2020, Marine Megafauna Foundation's wedgefish research project aims to rapidly gather baseline information on Bottlenose Wedgefish (*Rhynchobatus australiae*) and Shark Ray (*Rhina ancylostoma*), the two most commonly encountered species. Here, we overview our findings to date, and outline future research directions. Since the project's inception, we have identified aggregation sites for *R. australiae* at deep, rocky reefs where individuals are observed at cleaning stations and shallow, sandy habitats. Using photo identification techniques, we have identified >60 individual *R. australiae*, and are collecting tissue samples for taxonomy and population genetic studies. To better understand habitat use and movements, we have fitted external and internal acoustic tags (Vemco V16) on both species and deployed three miniPAT satellite tags on *R. australiae*. Future work includes the continuation of current research, as well as a local threat assessment of target fisheries and by-catch in the region, with the ultimate goal of providing recommendations for implementing effective, science-based protection measures for wedgefish in the Bazaruto Seascape.

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