ISRA
IMPORTANT SHARK AND RAY AREAS

IMPORTANT SHARK AND RAY AREA (ISRA): GUIDANCE ON CRITERIA APPLICATION

IUCN SPECIES SURVIVAL COMMISSION
SHARK SPECIALIST GROUP

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PURPOSE OF THIS DOCUMENT

This document provides the Important Shark and Ray Area Criteria (ISRA Criteria) and practical guidance on their use and application. Its purpose is to assist in an independent, expert-based process to inform the selection of areas that are critical for the persistence, and recovery, of all sharks, rays, and chimaeras. This guidance document is intended as a primary resource to inform the nomination of preliminary Areas of Interest (pAoI) and development of candidate Important Shark and Ray Areas (cISRAs) prior to and during regional, expert-driven workshops.

EXECUTIVE SUMMARY

The ISRA concept, developed by the IUCN SSC Shark Specialist Group, is modelled on the successful example of identifying Important Marine Mammal Areas (IMMAs). Its overall structure is based on guidance from other approaches for identifying sites or seascapes of biodiversity importance, including Important Bird and Biodiversity Areas (IBAs), Ecologically or Biologically Significant Areas (EBSAs), Key Biodiversity Areas (KBAs), and Important Marine Turtle Areas (IMTAs).

The ISRA identification process (hereafter 'ISRA process') aims to develop an expert-driven approach to ensure that **discrete portions of habitats, critical to all shark, ray, and chimaera species (hereafter 'sharks'), are delineated and used in various place-based conservation and management initiatives across global waters**. 'Important' in this context refers to any ecological property or value of an area that can affect the wellbeing of sharks within the ISRA and is crucial to maintain or improve their conservation status.

The identification of ISRAs is a biocentric process based on the application of scientific criteria supported by the best available science. This makes the ISRA process independent from political or socio-economic pressure and a valuable resource for the integration of sharks into existing and future

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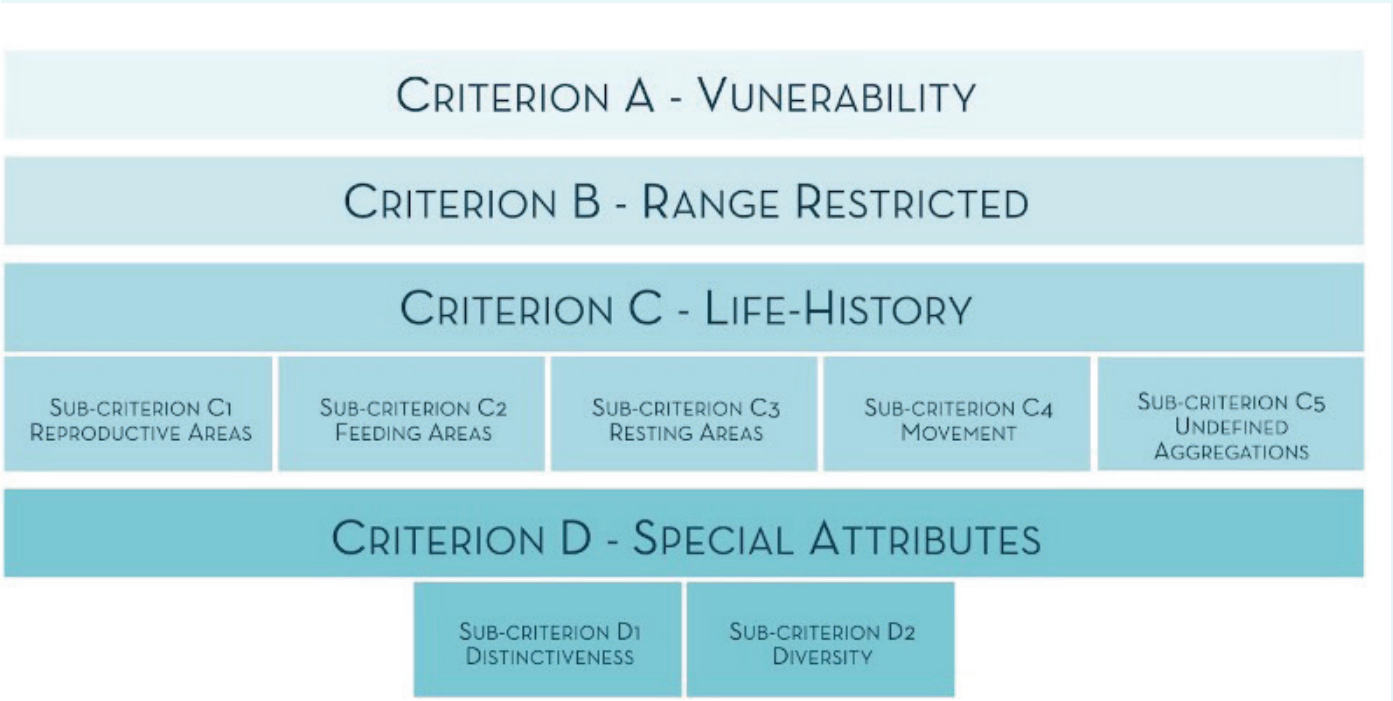
The term 'sharks' refers to class Chondrichthyes comprising all species of sharks, rays, and chimaeras.

national, regional, and international conservation strategies including designing protected areas, marine spatial planning, or approaches such as KBAs or EBSAs. Uptake of ISRAs into conservation and management is a key goal and will be achieved by providing decision-makers and relevant stakeholders with actionable knowledge to support the implementation of area-based shark conservation.

Well-defined and scientifically rigorous criteria are the foundation of the ISRA process and its applicability. The ISRA Criteria described in this document are intended to provide a framework to methodically and objectively identify areas of importance to sharks that are crucial for their persistence and recovery. They consider the complex biological and ecological needs of sharks, including areas important to threatened or range-restricted species, the specific habitats that support life-history characteristics and vital functions (e.g., reproduction, feeding, resting, movement), distinctive attributes, and the diversity of species within an area. Through extensive scientific and expert-driven consultation, as well as rigorous peer-review, four criteria with seven sub-criteria were developed. The ISRA Criteria are:



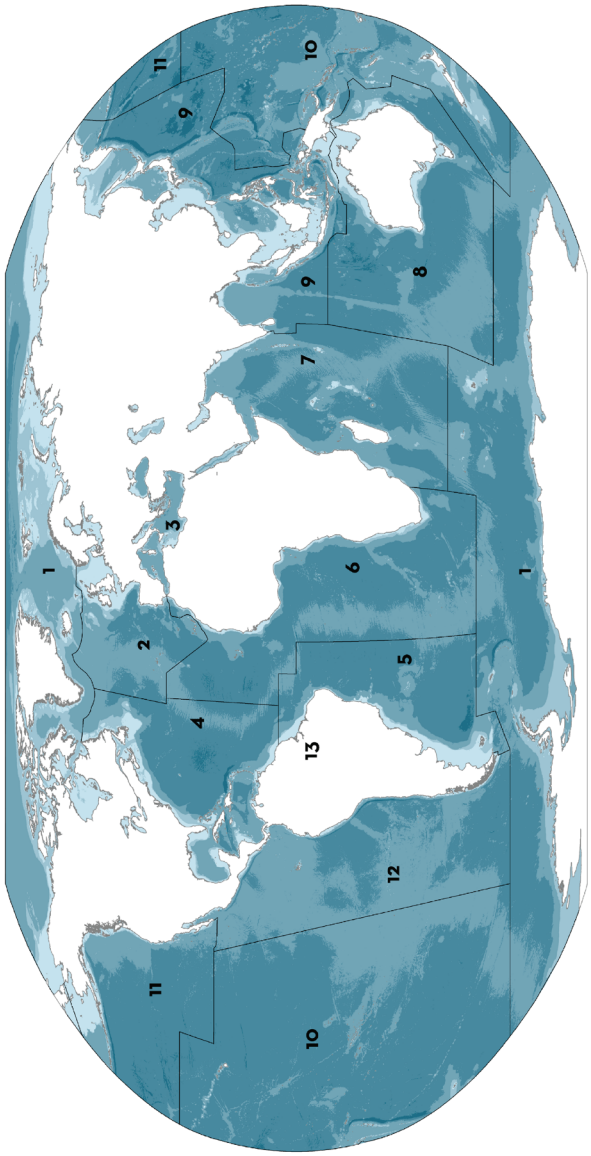
As outlined in the ISRA Implementation Strategy, the process for identification of an ISRA on a region-by-region basis is as follows:

1. Preliminary Area of Interest (pAoI) nominations and workshop preparation;
2. Development of candidate ISRAs (cISRAs) at a regional expert workshop;
3. cISRA review process and ISRA classification; and
4. ISRA delivery, reporting, and publication.

To delineate ISRAs, a series of regional workshops bringing together shark experts are organised by the IUCN SSC Shark Specialist Group. Thirteen ISRA Regions, covering the world's marine and inland waters, have been delineated (see map next page). Once all regions have been assessed, the process will come full circle through regional re-assessments, whereby areas can be re-examined and refined where necessary. Such updating may take up to a decade. In this time, both environmental changes (e.g., ocean warming, changed species ranges) and knowledge progress (e.g., ecological knowledge, updates to species extinction risk assessments) will likely occur, which makes the revision of a regional ISRA configuration desirable, if not necessary.

The ISRA approach is intended to contribute towards global conservation goals. ISRAs will support the design and implementation of protected area networks through their adoption into national and regional policy frameworks. This would ensure the inclusion of essential shark habitats and biodiversity features into future conservation and management initiatives. Through the identification of ecological networks and important areas for sharks, ISRAs represent a vital and timely step towards improving global shark and biodiversity conservation, with potentially wide-ranging policy outcomes.

ISRA REGIONS



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ACRONYMS

AoI	Area of Interest
cISRA	Candidate ISRA
EBSA	Ecologically or Biologically Significant Area
EOO	Extent of Occurrence
EPBC	*Environment Protection and Biodiversity Conservation Act* (Australia)
ESA	Endangered Species Act (United States)
IBA	Important Bird and Biodiversity Area
IMMA	Important Marine Mammal Area
IMTA	Important Marine Turtle Area
IoK	Inventory of Knowledge
IRP	Independent Review Panel
ISRA	Important Shark and Ray Area
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LME	Large Marine Ecosystem
MMPATF	Marine Mammal Protected Areas Task Force
pAoI	Preliminary Area of Interest
SOSF	Save Our Seas Foundation
SSC	Species Survival Commission
SSG	IUCN SSC Shark Specialist Group

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BACKGROUND

Sharks are facing a global extinction crisis. One-third of species are estimated to be threatened (Critically Endangered, Endangered, or Vulnerable) according to the IUCN Red List of Threatened Species™ (hereafter 'IUCN Red List'). Despite substantial efforts to conserve species at national and international levels through improved governance as well as fisheries and trade regulations, many shark populations continue to decline at alarming rates. Rapid changes in the way we manage sharks are needed. It is this recognition, and the observation and success of other biogeographical approaches for identifying sites or seascapes of biodiversity importance, that has led to the development of the ISRA approach.

The development of the ISRA Criteria was a collaborative effort, guided by the successful approaches of Important Bird and Biodiversity Areas (IBAs), Ecologically or Biologically Significant Areas (EBSAs), Key Biodiversity Areas (KBAs), Important Marine Mammal Areas (IMMAs), and Important Marine Turtle Areas (IMTAs). The ISRA Criteria have undergone rigorous review through global shark and biodiversity expert workshops and consultation to ensure their application to sharks is robust.

Draft ISRA Criteria were developed based on input and discussions from two workshops held online in January 2022, attended by 110 global shark and biodiversity experts working across academia, government, and non-governmental organisations. A third policy-focused workshop was held in February 2022 and attended by 57 participants from national and regional government and non-governmental organisations who provided input on considerations and strategies to facilitate the adoption of ISRAs into national and regional policy frameworks. These workshops focused on highlighting the rationale and need for ISRAs, the implementation process of IMMAs as an example of a spatial approach, and a comparative analysis of the selection criteria of existing area-based biogeographical approaches (IBAs, EBSAs, KBAs, and IMMAs) and their applicability to sharks.

Discussions and observations resulting from these workshops were documented and are detailed in the *Report of the First Workshop for the Development of Important Shark and Ray Area (ISRA) Selection and Review Criteria* and the *Report of the Second Workshop on Adoption of ISRAs into National and Regional Policy*. Further refinement of the ISRA Criteria was undertaken at a hybrid (online and in-person) workshop held on 4–8th April 2022 in Gland, Switzerland.

The ISRA approach is structured and designed to be applied in all aquatic ecosystems where sharks occur. The identification of ISRAs requires the careful collation and examination of scientific data, and the application of the ISRA Criteria region-by-region to determine the importance of an area to the persistence of sharks. This process will create knowledge products as a tool to promote and enhance conservation efforts, management strategies, and scientific research on sharks. This includes the creation of an online eAtlas with spatial information layers, regional and expert workshop reports, downloadable factsheets, and ISRA Inventories of Knowledge (IoK). Knowledge products (eAtlas and factsheets) are available on the ISRA website where they can be easily accessed by decision makers, scientists, conservationists, and the general public.

This *Important Shark and Ray Area (ISRA): Guidance on Criteria Application* document is intended to direct and facilitate the use of the ISRA Criteria. For each criterion, a rationale and guidelines for its application are provided. It also includes information on the alignment of ISRA Criteria with the criteria of other approaches for identifying sites or seascapes of biodiversity importance (Annex C and D).

The development of ISRAs is an evidence-driven, purely biocentric process. ISRAs are only identified based on scientific criteria that describe their importance for the survival and persistence of one or more shark species found there. Any areas within global oceans and inland waters that are assessed and are found to meet one or more of the criteria, qualify for identification as an ISRA.

VISION AND MISSION

ISRAS ARE DISCRETE, THREE-DIMENSIONAL PORTIONS OF HABITAT, IMPORTANT FOR ONE OR MORE SHARK SPECIES, THAT ARE DELINEATED AND HAVE THE POTENTIAL TO BE MANAGED FOR CONSERVATION.

VISION

ENHANCED CONSERVATION OF ALL SHARK SPECIES THROUGH THE IMPLEMENTATION OF A SYSTEMATIC PLACE-BASED APPROACH, SUPPORTED BY THE IDENTIFICATION OF ISRAS THROUGHOUT THESE SPECIES' RANGES.

MISSION

TO MOBILIZE SCIENTISTS AND CONSERVATIONISTS TO ENSURE THE RANGES OF ALL KNOWN SHARK SPECIES ARE GLOBALLY INVESTIGATED, SO THAT ISRAS ARE IDENTIFIED WITHIN SUCH RANGES AND MAPPED; AND PROVIDE DECISION-MAKERS AND OTHER RELEVANT STAKEHOLDERS WITH ACTIONABLE KNOWLEDGE NECESSARY FOR THE IMPLEMENTATION OF ADEQUATE SYSTEMATIC PLACE-BASED CONSERVATION.

OVERVIEW OF ISRAS

ISRAs are areas of importance to sharks based on the biological, ecological, or environmental requirements of each species. Their identification is critical to inform conservation, increase research, and enable management of sharks. The delineation of ISRAs is a robust scientific process designed to consider all shark species regardless of public interest, commercial importance, or management priorities.

Purpose of the ISRA Criteria

The ISRA Criteria provide an independent, expert-based, and scientific framework to objectively identify areas of importance to sharks, crucial for their persistence and, where required, recovery.

Value and Usefulness

ISRAs will be of interest to stakeholders concerned with the management and/or conservation of sharks, such as scientists, conservationists, national and regional governments, and the public and private sector, among others. It is recognised that not all ISRAs will be fully integrated into area-based planning and management, however, this approach will be useful in:

- Informing the identification, design, and management of protected areas;

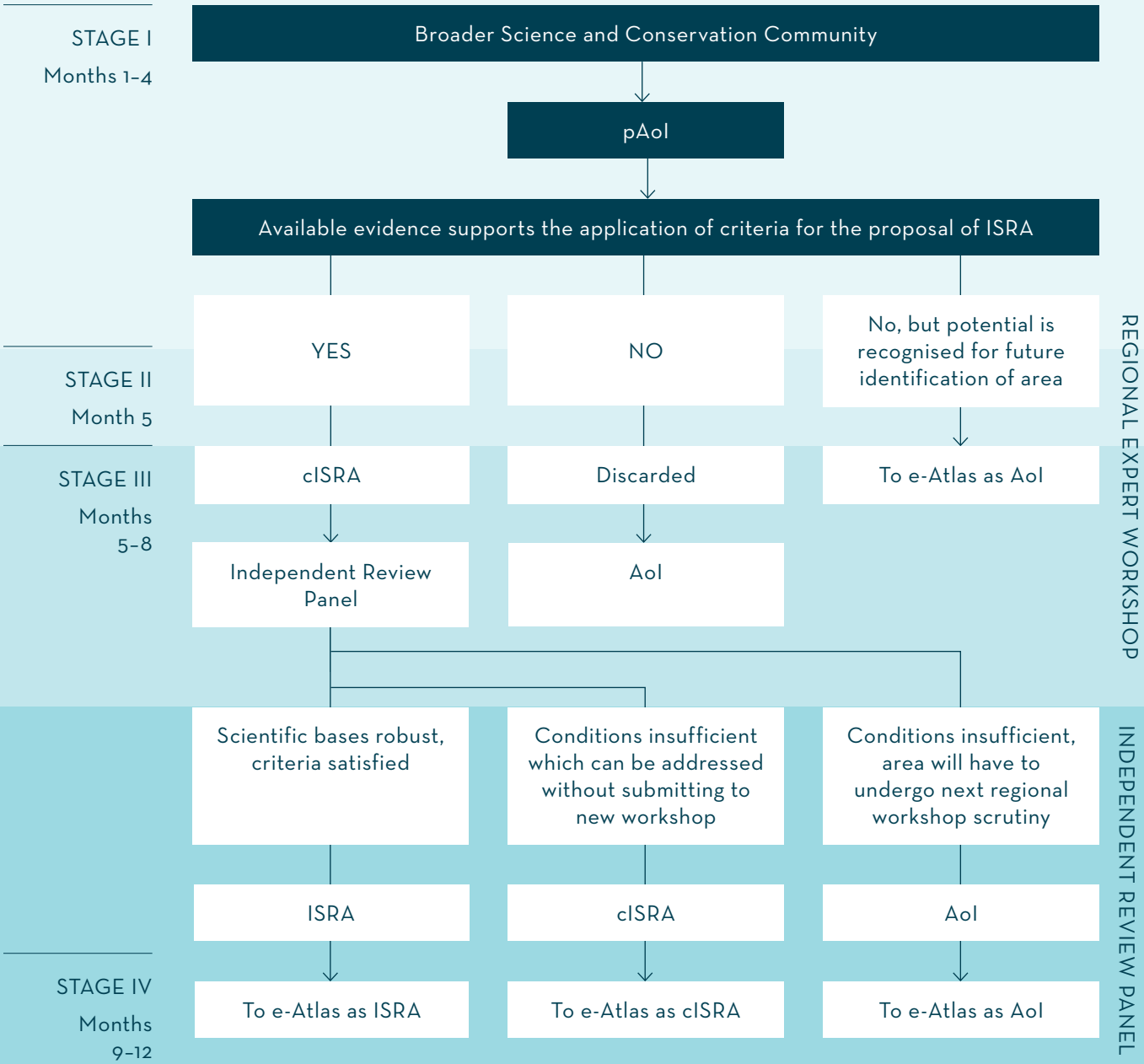
- Facilitating the greater integration of sharks into other biogeographical conservation planning approaches (e.g., KBAs and EBSAs);
- Providing guidance and science-based, actionable knowledge to national and regional decision makers on shark critical habitats to support management actions such as marine spatial planning, fisheries closures, observer coverage, monitoring, control, and surveillance, as well as environmental impact assessments;
- Highlighting overlap between ISRAs and threatening processes in high-risk areas, such as fishing or other environmental exploitation (e.g., deep-sea mining or mangrove clearing);
- Identifying knowledge gaps that need to be filled through research on the biology and ecology of sharks and their potential responses to climate or other environmental changes; and
- Consolidating and mapping information on shark occurrence, status, and habitat usage into a freely available format.

Identification and Review Process

ISRAs are delineated through a regional identification process (refer to ISRA Process Flowchart on the next page). Regional workshops are organised by the SSG after consultation with its Regional Vice-Chairs. Workshop invitations are extended to regional SSG members and non-members who have knowledge and expertise useful for identifying ISRAs, assessing the evidence, and applying the ISRA Criteria. Sources of information for consideration and assessment during the workshops are actively sought during an engagement period prior to each regional workshop and become part of the ISRA Inventory of Knowledge (IoK). In addition, each candidate ISRA (cISRA) is subject to peer review through an Independent Review Panel (IRP) composed of recognised shark experts who have not been involved in the regional workshops, but who have an in-depth understanding of sharks, habitats, and the ISRA Criteria.

PROCESS FLOWCHART

FROM PRELIMINARY AREA OF INTEREST TO IMPORTANT SHARK AND RAY AREA



pAoI: preliminary Area of Interest; AoI: Area of Interest; cISRA: candidate Important Shark and Ray Area; ISRA: Important Shark and Ray Area

Scope of the ISRA Criteria

The four ISRA Criteria (and associated Sub-criteria) can be applied to all environments where sharks occur (marine, estuarine, and freshwater) and consider the diversity of species, their complex behaviours and ecology, and their biological requirements. Each criterion (and sub-criterion) has been developed to be relevant to all taxonomic groups, however, not all sharks may qualify for each of the ISRA Criteria (e.g., not all species are threatened or display aggregating behaviour).

The ISRA Criteria address ways in which to identify an ISRA according to the known regular or predictable presence and/or activity of sharks within that area. Each region should be assessed against all criteria or sub-criteria through the identification of Qualifying (and/or Supporting) Species associated with that area. An area can qualify as an ISRA based on one criterion (with the exception of Criterion A - see rationale and details below) but can also qualify based on multiple criteria and/or species. The ISRA Criteria are not hierarchical in nature (i.e., being identified with Criterion A does not mean that an ISRA is more important than an ISRA identified using Criterion C), but they are presented sequentially for the purpose of assessment. Annex A provides examples on applying the ISRA Criteria.

Requirements for Species Inclusion

Species are considered as Qualifying or Supporting Species if they occur regularly or predictably within the cISRA. Those that occurred historically but that no longer occur, or vagrants that do not normally occur in a habitat within the cISRA boundary, should not be considered. Some species are only known from a single site, for example, where the holotype or type series are the only known records. These species may not meet the above requirement for inclusion as there is a lack of information on the regularity or predictability of occurrence. Data on these species are lacking (although, for a variety of reasons, they may not necessarily be assessed as Data Deficient on the IUCN Red List). In some instances, where the collection site is well documented (i.e., a defined geographic location as opposed to a fish market) these species can be included as Supporting Species.

Because of insufficient species-specific information on subpopulation delineation in sharks in general, the ISRA Criteria were designed to be applied at the species level. While subpopulations of sharks are currently not considered in the ISRA approach, it is recognized that with increased knowledge of species, these may need to be considered in the future.

When evaluating distinctive behaviours or attributes (Sub-criterion D1), only sharks displaying these behaviours and attributes on a regular or predictable basis can be considered. Sharks which display a non-replicated biological, ecological, or behavioural attribute should not be considered. Furthermore, only sites or areas with naturally occurring shark aggregations or assemblages can be considered under the ISRA approach, with shark provisioning sites excluded (e.g., where tourism operators use a variety of stimuli to attract sharks).

Data Sources

ISRAs are identified using the best available scientific data. Sources will generally include observational data (e.g., sightings, movement data, fisheries-independent and -dependent data). The use of non-observational data (e.g., predictive or speculative species distribution modelling) for ISRA identification is discouraged. Valid data sources are peer-reviewed publications, grey literature, or local ecological knowledge if judged to be reliable by workshop participants and the Independent Review Panel. The reliability of emerging scientific methods will be considered as appropriate.

Documentation

To promote the identification and delineation of ISRAs across regions, as well as encourage their adoption into policy, the documentation and data assembled (e.g., workshop and strategy reports, ISRA eAtlas, factsheets, spatial layers) need to be reliable and accessible. All documentation and data for ISRAs will be based on expert consultations, a peer-review process, and will be freely available on the ISRA website (www.sharkrayareas.org).

Re-assessments

ISRAs will be regularly re-assessed, ideally every ten years (or sooner if deemed necessary), to account for new knowledge and/or environmental change. Re-assessments will only be undertaken during regional workshops.

Alignment with other Conservation Planning Approaches

Other approaches for identifying sites or seascapes of biodiversity importance exist, including the Ramsar Convention on Wetlands of International Importance (Ramsar), IBAs, EBSAs, KBAs, IMMAs, and IMTAs.

These approaches have also used scientific selection criteria to identify areas or sites which contribute to global biodiversity, or to the persistence of species (see Annex C). Where possible, the ISRA Criteria were developed to align with the criteria of these approaches (see Annex D). Where relevant data are available for sharks and one or more criteria and threshold/s are met, an ISRA may be proposed as a KBA or EBSA through the appropriate processes. While details of the alignment with IMTAs and Ramsar criteria are not provided, these are included in Annex C so they can be referred to during the delineation process.

ISRA Coordination

The ISRA process (identification, nomination, review, delineation) is coordinated under the guidance of the SSG. The tasks undertaken include: (1) team management and coordination including finance, human resources, and administration; (2) ISRA network expansion and management including data acquisition and ISRA identification, data management, analysis and storage, and public provision of the ISRA tool; (3) ISRA uptake in the conservation arena; and (4) team and ISRA policy development and communication. Additional details regarding this coordination are provided in the ISRA Implementation Strategy.

ISRA Boundary Delineation and Mapping

Any AoI, cISRA, and ISRA, identified in the ISRA process will be mapped and available through the online eAtlas. Once an area has been assessed against the ISRA Criteria, it is critical to define its boundaries. Delineating these boundaries requires a thorough evaluation of existing bathymetric and habitat maps, species occurrence and movement data, and other supporting best available evidence. Such spatial data appraisal is critical to adequately ensure that shark biological, ecological, and behavioural considerations are included.

ISRA Criteria

The ISRA Criteria are non-hierarchical in design, but it is advised that cISRAs are assessed sequentially. Any cISRA need only satisfy one criterion or sub-criterion to successfully qualify for ISRA status but can also qualify based on multiple criteria and/or species. The exception is Criterion A with rationale and details described below.

ISRA CRITERIA

CRITERIA	DESCRIPTION
Criterion A Vulnerability	Areas important to the persistence and recovery of threatened sharks. (*This criterion must be associated with an additional criterion.*)
Criterion B Range Restricted	Areas holding the regular and/or predictable presence of range-restricted sharks, that are occupied year round or seasonally.
Criterion C Life-History	Areas that are important to sharks for carrying out vital functions across their life-cycle (i.e., reproduction, feeding, resting, movement, or undefined aggregations).
Sub-criterion C1 Reproductive Areas	Areas that are important for sharks to mate, give birth, lay eggs, or provide refuge and other advantages to the young.
Sub-criterion C2 Feeding Areas	Areas that are important for shark nutrition at one or more life-cycle stages.
Sub-criterion C3 Resting Areas	Areas that are important for sharks to conserve energy, often related to environmental conditions or temporal factors.
Sub-criterion C4 Movement	Areas used by sharks regularly or predictably during their movements, such as migrations, which contribute to connectivity of other functionally important areas.
Sub-criterion C5 Undefined Aggregations	Areas where an aggregation or assemblage of sharks regularly and/or predictably occur, year round or seasonally, but the function of the aggregation or assemblage is currently unknown.
Criterion D Special Attributes	Areas important for sharks considered for distinct biological, behavioral, or ecological attributes (unique or associated with a unique habitat type), or which support an important diversity of species.
Sub-criterion D1 Distinctiveness	Areas with sharks that display distinct biological, behavioral, or ecological characteristics.
Sub-criterion D2 Diversity	Areas that sustain an important diversity of sharks.

Terms used in the ISRA Criteria

A definition of the terms used in ISRA Criteria and Sub-criteria are available under ISRA Definitions.

Each criterion and sub-criterion (A, B, C1, C2, C3, C4, C5, D1, D2) is summarised in turn using the following two descriptive sections:

1. **Statement of Requirement**

The ISRA Criteria are first described in a qualifying statement which summarises the essence of the criterion. It is these statements which must be considered when making a rationale for a cISRA and when assessing the supporting evidence.

2. **Principle of Criterion**

This section expands upon the initial statement of requirement to include further details on the rationale of the criterion, potential sources of qualifying information, and other key considerations which can inform the application of the criterion.

CRITERION A – VULNERABILITY

Statement of Requirement

Areas important to the persistence and recovery of threatened sharks.

Principle of Criterion

Threatened sharks are those that are listed on the IUCN Red List as Critically Endangered, Endangered, or Vulnerable.

Under Criterion A, this could also refer to sharks at risk of extinction as reflected in other national regulatory and legal frameworks that assess the extinction risk of species (e.g., the United States Endangered Species Act [ESA] or the *Australian Environment Protection and Biodiversity Conservation Act* [EPBC]). Instances where these other assessments are used should be subject to critical evaluation prior to and during workshops by relevant experts and subject to scrutiny by the Independent Review Panel.

To ensure the application of this criterion to areas supporting the persistence and recovery of sharks, and not merely as an observation of threatened species occurrence, Criterion A must be associated with at least one additional criterion (B, C, or D) describing the type of usage of the area by the species.

CRITERION B – RANGE RESTRICTED

Statement of Requirement

Areas holding a regular and/or predictable presence of range-restricted sharks which are occupied year-round or seasonally. The distribution of sharks can be restricted to that habitat geographically or by environmental conditions.

Principle of Criterion

Sharks with very restricted natural ranges are especially susceptible to extinction if their natural habitats are eliminated or significantly disturbed. Their distribution may be restricted to those habitats by geographical features (e.g., land masses, bathymetric barriers) or by environmental conditions (e.g., habitat type, temperature, salinity, or depth).

Under Criterion B, range-restricted sharks are defined as species whose distribution is entirely limited to one Large Marine Ecosystem (LME) or two adjoining LMEs. In some cases, the IUCN Red List metric Extent of Occurrence (EOO) may be useful to identify range-restricted sharks. However, it is cautioned that EOO thresholds may not always adequately reflect range restriction as they are very small (i.e., <100 to <20,000 km^2).

The use of LMEs to assess the scale of range restriction largely circumvents this issue as LMEs are at a spatial scale more appropriate to what can be considered range-restricted in sharks. Large Marine Ecosystems align with broad biogeographic patterns of fish distribution and many sharks are endemic to a singular LME or to two adjoining LMEs.

Large Marine Ecosystems have been delineated for continental, polar, and large island/island chain marine waters. However, restricted ranges may also be considered for species that primarily occur outside of designated LMEs (e.g., oceanic waters, offshore islands, or inland waters). In these cases, if the species distribution is similar to, or less than, the spatial extent of a LME, or two adjoining LMEs, then it may be considered range restricted (see section on ‘ISRA Boundary Delineation’).

CRITERION C – LIFE-HISTORY

Areas that are important because they are used by sharks to carry out vital functions across their life-cycle (i.e., reproduction, feeding, resting, or movement).

The Life-History Criterion is further described in the following five Sub-criteria.

SUB-CRITERION C1 – REPRODUCTIVE AREAS

Statement of Requirement

Areas which are important for sharks to mate, give birth, lay eggs, or provide refuge and other advantages to the young.

Principle of Criterion

Sub-criterion C1 refers to areas which are critical to the reproductive success of sharks.

Reproductive areas include sites which can be identified as 'nursery areas' and that are important for newborns, young-of-the-year, or juveniles of viviparous species; or 'egg nursery areas' that are important for egg laying and development until hatching and the development of newborns and juveniles of oviparous species. Reproductive areas provide advantages to newborn and juvenile sharks such as predator avoidance and access to food sources during usage of these areas.

Sub-criterion C1 can extend to areas where the regular or predictable presence of mature sharks has been recorded for mating, and/or where pregnant females aggregate to avoid aggressive males and conserve energy during mating season.

SUB-CRITERION C2 – FEEDING AREAS

Statement of Requirement

Areas that are important for shark nutrition at one or more life-cycle stages.

Principle of Criterion

Sub-criterion C2 refers to areas where sharks are known to derive nutrition and that are supported by the regular and predictable occurrence of prey.

This sub-criterion can apply to any life-cycle stage from newborns or young-of-the-year, or juveniles in inshore and estuarine habitats to sub-adult or adult sharks. Areas where feeding activities are known to occur are especially important for fitness, growth, and persistence of sharks.

Sub-criterion C2 applies to areas or conditions (e.g., season, temperature, nutrients, or water activity) where natural aggregations or assemblages of sharks regularly and predictably occur or where sharks come to feed during biological or ecological events of a prey species (e.g., large species migrations [such as sardine runs], spawning events, marine mammal breeding grounds) or at geomorphological features (e.g., submerged reefs, or seamounts). Included here are those areas which support filter-feeding species that often predictably occur in areas of high planktonic productivity (e.g., upwellings).

Predictable spatial or temporal dynamic features (e.g., hydrographic features such as fronts and eddies) which are associated with known feeding activities of sharks are also recognised under this criterion.

SUB-CRITERION C3 – RESTING AREAS

Statement of Requirement

Areas that are important for sharks to conserve energy, often related to environmental conditions or temporal factors.

Principle of Criterion

Sub-criterion C3 refers to areas where an aggregation or assemblage of sharks spends time during its daily activity cycle and which can be influenced by environmental conditions (e.g., tidal cycle) or temporal factors (e.g., time of day).

Resting areas are a key component of the daily activity of many sharks. This is most relevant to sharks with distinctly diurnal, nocturnal, or crepuscular activity, and/or sharks that are largely influenced by daily environmental cycles, in particular tidal cycles, which limit access to important habitat.

Resting areas are often distinct from areas which are used for reproduction or feeding purposes and provide an essential refuge for species. They are especially important to ensure sharks can conserve energy, avoid stress, as well as evade predators and threats from conspecifics.

SUB-CRITERION C4 – MOVEMENT

Statement of Requirement

Areas used by sharks regularly or predictably during their movements, such as migrations, which contribute to the connectivity of other functionally important areas.

Principle of Criterion

Sub-criterion C4 addresses the predictable movement of sharks, aggregations, or assemblages from one place to another, often occurring seasonally and related to a vital function such as reproduction or feeding.

Repeated movements are common in many species of sharks and can encompass a variety of spatial and temporal scales; from short tidally-mediated journeys, seasonal movements along coastlines, to trans-oceanic and trans-equatorial crossings, as well as vertical (in some cases daily) migrations between deeper and shallower water (ranging from tens to hundreds of metres). These areas ensure the connectivity of other areas with important life-history functions (Sub-criteria C1, C2, C3, and C5).

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Statement of Requirement

Areas where an aggregation or assemblage of sharks regularly and/or predictably occur, year-round or seasonally, but the function of the aggregation or assemblage is currently unknown.

Principle of Criterion

Sub-criterion C5 refers to aggregations or assemblages of sharks in an area which engage in or display a behaviour that is known to occur but is not [yet] attributed to a known vital function (e.g., reproduction, feeding, resting, or movement) or predator avoidance (e.g., schooling).

With further understanding, these aggregations may be attributed to one of the other ISRA Sub-criteria (i.e., C1, C2, C3, or C4). Recognising these aggregations and the areas where they occur is important to ensure that data deficiency does not preclude their consideration in the ISRA process.

CRITERION D – SPECIAL ATTRIBUTES

Areas important for sharks considered for distinct biological, behavioural, or ecological attributes (unique or associated with a unique habitat type), or which support an important diversity of species.

The Special Attributes Criterion is further described in the following two Sub-criteria.

SUB-CRITERION D1 – DISTINCTIVENESS

Statement of Requirement

Areas with sharks that display distinct biological, behavioural, or ecological characteristics.

Principle of Criterion

The variety of sharks and their biological, behavioural, and ecological attributes, along with their adaptations to these factors could result in distinctive and/or unique characteristics. Recognising areas of distinctiveness is important to ensure the persistence of adaptive unique traits of sharks.

Sharks considered under Sub-criterion D1 for distinctiveness must display these characteristics on a recurrent basis. Sharks which display a non-replicated biological, ecological, or behavioural characteristic should not be considered.

Areas identified under Sub-criterion D1 may include areas where sharks potentially have suffered loss of connectivity from the global population and developed distinct characteristics (i.e., shark species displaying a different behaviour from the same species in other parts of the world), or areas where sharks are known to display distinctive behaviours such as devil rays (*Mobula* spp.) frequenting cleaning stations or skates (e.g., Pacific White Skate, *Bathyraja spinosissima*) laying eggs at hydrothermal vents.

SUB-CRITERION D2 – DIVERSITY

Statement of Requirement

Areas that sustain an important diversity of sharks.

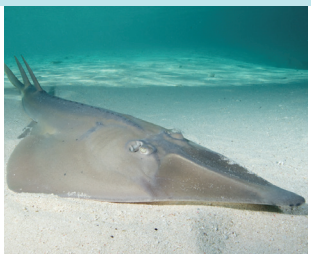
Principle of Criterion

Sub-criterion D2 refers to areas that may host a high diversity of sharks (i.e., the area is important for a high or exceptional number of shark species). Care must be taken to ensure these areas contain core habitat for the species being considered, to avoid situations where only peripheral portions of many species' ranges happen to overlap.

The attribution of Sub-criterion D2 is based on a relative assessment, depending on the broader shark diversity. This diversity may be considered at the ISRA regional level or at a sub-regional level (i.e., a body of water within a broader region) where a significant difference in the diversity of sharks between sub-regions is noted. ISRA regions are divisible into a small number of sub-regions accounting for the biogeography and oceanography of the broader region. Where an ISRA region encompasses both tropical and temperate zones, differences in species diversity are expected and it is likely more appropriate to consider diversity at the sub-regional level (e.g., in the ISRA Central and South American Pacific region, the Gulf of California has a far higher diversity than southern Chile).

The threshold number of species for the attribution of Sub-criterion D2 is set independently for each ISRA region. Species richness maps will be consulted to understand maximum diversity in regions which will guide the setting of regional-specific thresholds through consultation between the SSG, regional experts, and the IRP. Thresholds are likely to be set at a lower level for regions and/or sub-regions with low diversity and at a higher level for regions and/or sub-regions with high diversity.

Sub-criterion D2 is not applicable to areas containing a single species and therefore technically containing 100% of local diversity (e.g., where one freshwater ray species occurs in one river system). Only Qualifying Species can be used to justify Criterion D2. Areas supporting a high diversity of species are critical for the persistence of shark biodiversity and ensure that ISRAs capture the uniqueness of such community structures.




ISRA BOUNDARY DELINEATION

After applying the ISRA Criteria and identifying a cISRA, the best available evidence is required to inform the clear delineation of the area's boundaries. Each cISRA should include a rationale with a robust description of the process used to define its boundaries. To support decision-making, the following sections provide an overview of recommended best practices.

Assembling Spatial Datasets to Derive ISRA Boundaries

Each cISRA requires a general description of the physical and ecological conditions of the area. Depending on the ISRA Criteria met, this should include information on species distribution; species occurrence for vital life-history functions; usage of the area (i.e., seasonal, ontogenetic, or intermittent usage); and environmental and geographical data (e.g., bathymetric maps, habitat types and suitability). Scientific (and any other) evidence such as telemetry data (e.g., movement tracks), sightings, fisheries-independent and fisheries-dependent data (including those from observers), and local ecological knowledge should be selected to help determine the cISRA boundaries.

Predictive or speculative analytical processes should not be the primary evidence for the identification of cISRAs. These are often developed to determine the distribution or occurrence of species beyond their documented range (e.g., species distribution modelling) and are not recommended in the boundary delineation process. However, results from descriptive modelling can be used if they have been ground-truthed using, for example, scientific surveys to confirm a species' presence and/or habitat use.

Determining the Size of an ISRA

There is no limit on the minimum or maximum size of an ISRA. Where possible, boundaries should be mapped to encompass the whole extent of important habitats that support the Qualifying Species of an area. Although ISRAs have fixed boundaries, they should be large enough to consider and encompass ecological processes, life-history traits, seasonal changes, oceanographic factors, and/or migrations.

Refining cISRA Boundaries to Spatially Define Core Shark Areas

Refining cISRA boundaries should be based on geographical, environmental, and/or ecological features. This is a critical component of how these areas can guide the design and implementation of effective spatial planning. Delineation of a cISRA and its boundaries will require information on:

1. Static, spatially bound, habitat and/or environmental conditions, including the geographical extent of habitat features (e.g., bathymetric contours, continental slopes, seamounts, coral reefs, seagrass beds, mangrove forests, estuaries, and rivers) used by the Qualifying Species. This information should be supported by scientific data (e.g., sightings, fisheries data, movement tracks) and is considered the most appropriate for delineating boundaries.

2. Dynamic habitat and/or non-permanent environmental conditions, including the regular and/or predictable occurrence of fronts and eddies, upwellings, prey aggregations (including spawning events), or any other spatial, temporal, or environmental features that might influence the presence of sharks (e.g., depth, temperature, season) that are representative of the area used by the Qualifying Species (e.g., Basking Shark, *Cetorhinus maximus*, association to fronts in the northeast Atlantic). All cISRAs defined using dynamic environmental features should be based on the average spatial extent of these features recorded across a minimum of five years of assessment, with the data used being no older than 15–20 years. Such information should be used in conjunction with direct observed evidence from various data sources (e.g., sightings, fisheries data, movement tracks).

3. Accurate depth range used by the Qualifying Species within the area. Because sharks may be restricted to certain depths and may have preferences for particular areas of the water column, a depth boundary of the cISRA used by the Qualifying Species should be provided. For example, some demersal species do not occupy the water column above the benthos (e.g., Peppered Catshark, *Galeus piperatus*, with a depth range between 130–1,326 m). Furthermore, while many pelagic sharks do occur at the water surface, some smaller vertical-migrating deep-water species are not found at the surface, (e.g., Spined Pygmy Shark, *Squaliolus laticaudus*, which generally moves between 200 m and 500 m depth in the pelagic zone). If precise information on depth ranges is not available, the extent of the boundary should be large enough to encompass bathymetry zones likely to be of relevance to the Qualifying Species and should be supported by scientific data. For ease of visualization, a cISRA should be spatially placed on the water surface, noting that its delineation may not necessarily include surface waters. Depth range descriptions for Qualifying Species in the cISRA must include the following classification system (which combines benthic and pelagic habitat zones; shelf and slope includes continental and insular):

- Shelf/Epipelagic (0–199 m)
- Upper slope/Mesopelagic (200–999 m)
- Deep slope/Bathyal/Bathypelagic (1,000–3,999 m)
- Abyssal/Abyssopelagic (4,000–5,999 m)
- Hadal/Hadopelagic (>6,000 m)

4. Results from descriptive modelling or analysis based on observational data. Habitat use descriptions for the Qualifying Species could be used to define the boundaries of the cISRA if they are based on direct observations (i.e., habitat use description from telemetry data, kernel density analyses, or kriging interpolations).

Depending on the evidence type used to delineate boundaries (i.e., direct observations or data derived from descriptive modelling), the rationale for defining the cISRA boundaries can be hierarchically categorized from 'very strong' to 'weak' (Table 1). A 'weak' rationale does not mean that a cISRA will get rejected as long as it is supported with scientific evidence. However, with a 'very strong' or 'strong' rationale, it is less likely that the IRP will require further information to support the proposed boundary and more likely that a cISRA will be approved for full ISRA status.

Table 1. Rationale to define boundaries of cISRAs based on the type of evidence available.

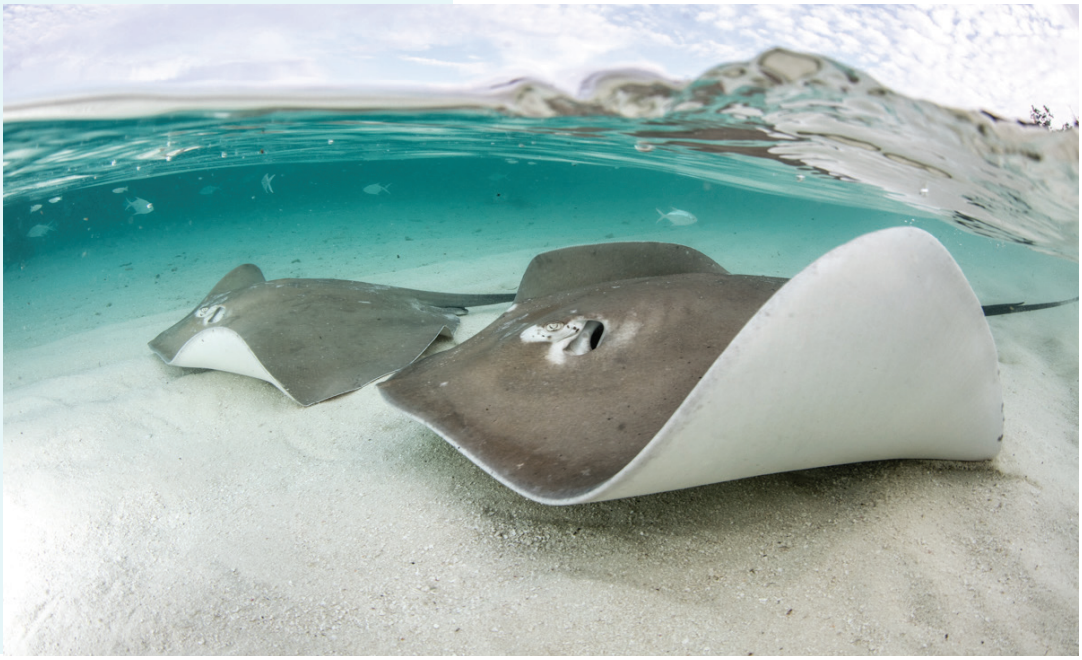
Rationale	Features of habitats or environmental conditions
Very strong	Static, spatially bound, habitat and/or environmental conditions, supported by direct observations.
Strong	Dynamic habitat and/or non-permanent environmental conditions, supported by direct observations.
Moderate	Static, spatially bound, habitat and/or environmental conditions, supported by descriptive modelling.
Weak	Dynamic habitat and/or non-permanent environmental conditions, supported by descriptive modelling.

Mapping Spatial Buffers

Delineation of the final cISRA boundary may include the application of spatial buffers around those Qualifying Species and habitat features used to meet the ISRA Criteria. Use of any spatial buffers should be considered on a case-by-case basis to account for: (a) movement within and around important shark areas for the purpose of one or more criteria or sub-criteria; (b) maintaining biological and/or ecological representativeness and connectivity; (c) inclusion of all important habitat features; and (d) minimizing the complexity of the resulting polygon so that it can easily be used in spatial planning (Figures 1, 2).

Merging Areas

An ISRA may be delineated to represent a large block of habitat or, overlapping ecologically linked sites for each area meeting the ISRA Criteria. In many cases, multiple Qualifying Species may occur within an area and a cISRA (or multiple cISRAs) identified for them may overlap. ISRA delineation may require refining the boundaries using additional biological, behavioural, and ecological data (particularly in areas with an overlap of one or more ISRA Criteria). These data can help determine the extent of the boundaries and ensure they are biologically, behaviourally, and ecologically representative. When cISRAs overlap, boundaries should be adjusted to comprise all the important habitats and/or conditions required by each species. In addition, if overlapping cISRAs are based on similar criteria, it is recommended to merge these into one cISRA (Table 2, Figure 2).



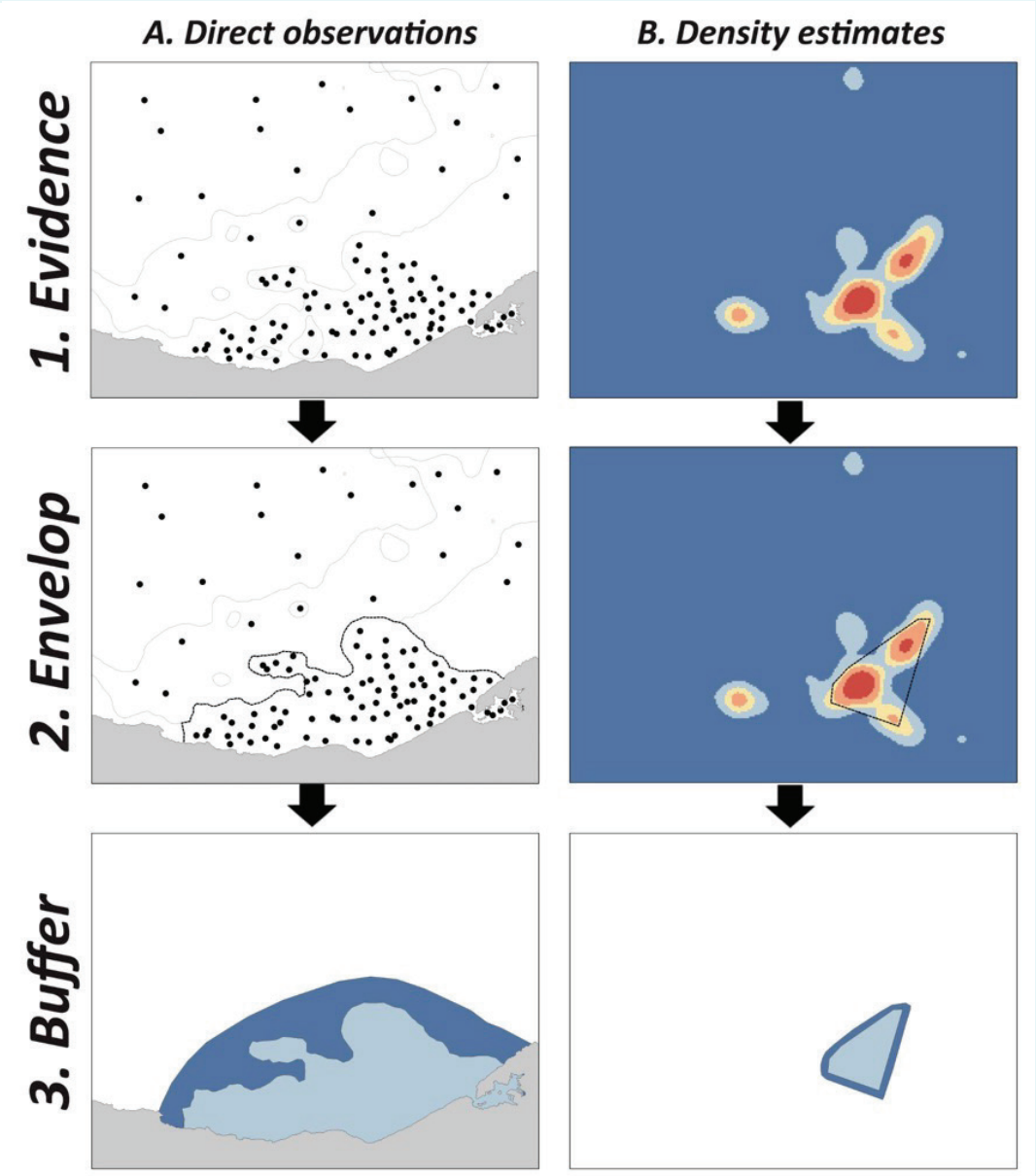


Figure 1. Examples of methods and steps (1, 2, 3) to delineate boundaries for cISRAs based on different sources of evidence data (A, B). **1. Evidence** and the use of direct observations (A) of a species that could come from fishing data, direct observations (i.e., visual census, Baited Remote Underwater Video Surveys) and without associated effort or habitat information; density estimates (B) with support of effort, habitat, and environmental information (i.e., density contours based on telemetry data or derived from drone surveys, catch per unit effort [CPUE] from fishing data). **2. Envelop** describes methods to draw boundaries around the different types of evidence data, including restriction to a depth contour (A) containing most observations or related to the ecology of Qualifying Species included in the cISRA; definition of boundaries around a probability threshold and selection of areas with higher densities (B), such as a kernel utilisation density threshold. **3. Buffer zones** (dark blue) may be defined around the primary areas qualifying against the ISRA Criteria (light blue) to ensure the inclusion of all important habitats and produce simple shaped areas to facilitate visualization.

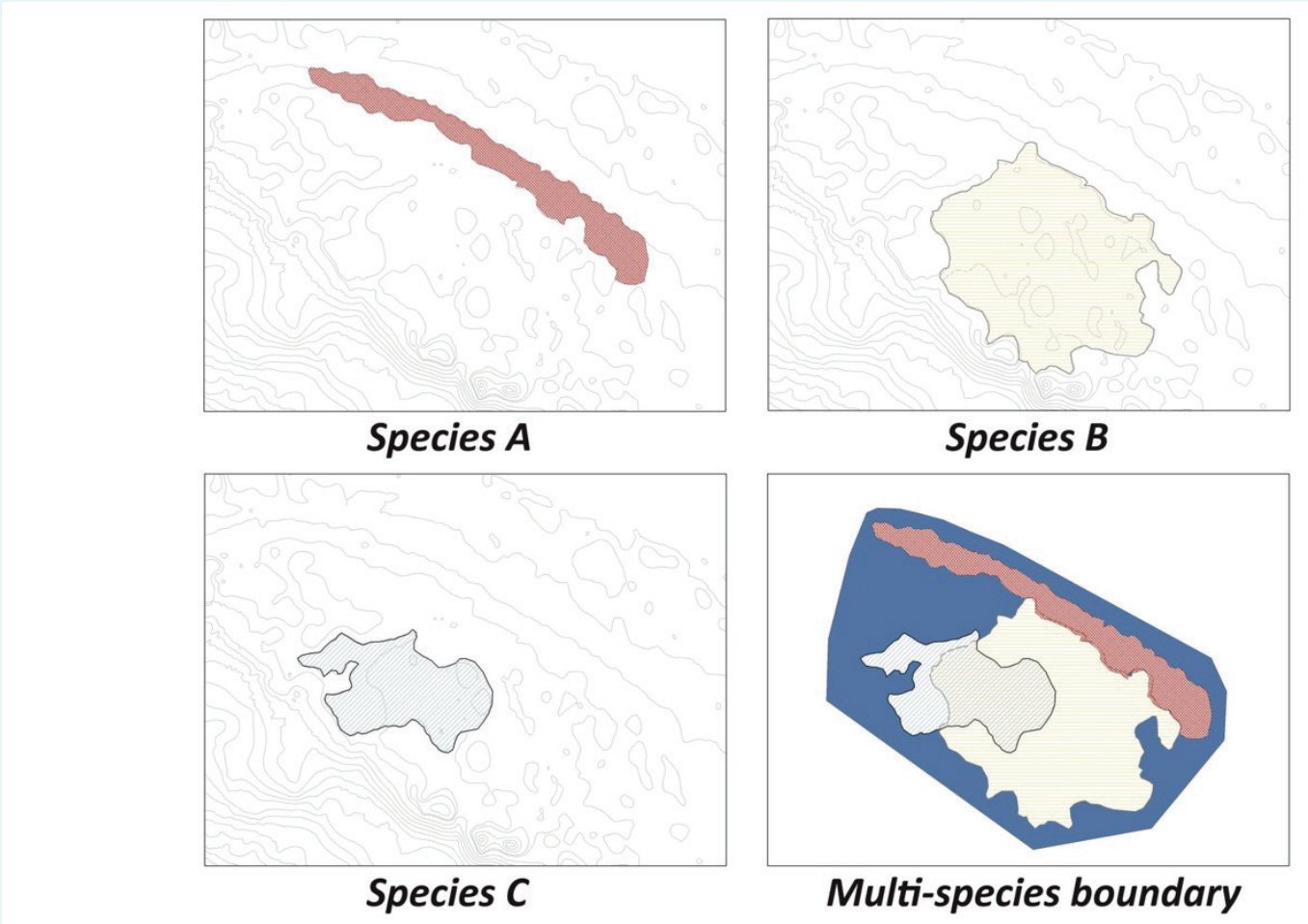


Figure 2. Examples of a method to delineate boundaries for multi-species cISRA based on different evidence available. **Species A:** boundaries delineated based on bathymetry containing direct observations. **Species B:** boundaries defined based on results from catch data. **Species C:** boundaries defined based on kernel density analysis. The boundaries for these three species overlap and could be merged into a single multi-species boundary to ensure the inclusion of important habitats and/or features for all Qualifying Species and produce simple shaped areas to facilitate their use in spatial planning. In the multi-species boundary, core areas (coloured as the individual species) and buffer zone (blue) are presented.

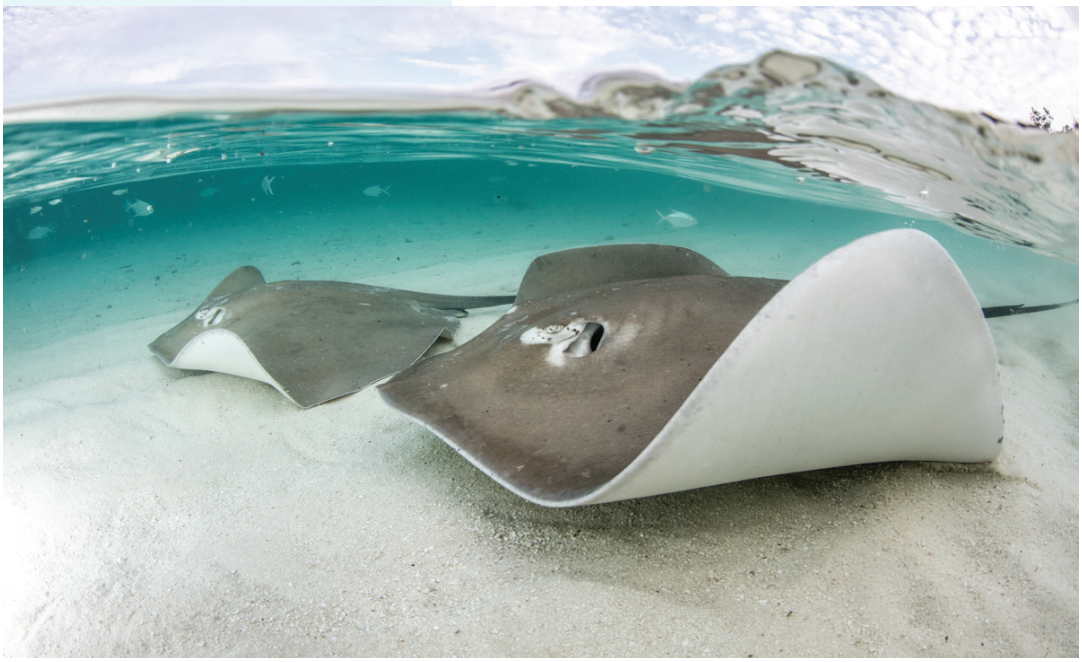
Recommendations to inform merging of overlapping cISRAs into a single cISRA are provided in Table 2 and Annex B. These are only recommendations to assist in the decision-making process and the final decision relies on what experts consider appropriate for each cISRA delineation. When overlapping cISRAs are merged, the rationale for doing so must be clearly articulated.

Table 2. Recommendations for merging overlapping cISRAs based on the ISRA Criteria.

When to merge ovelapping cISRAS	When overlapping cISRAs share an ISRA Criterion in their proposal and the boundary overlap is greater than 70%. OR When overlapping cISRAs share an ISRA Sub-criterion in their proposal and the boundary overlap is greater than 50%. OR When the boundary overlap between cISRAs is greater than 50% and there is a similarity of habitats or other underlying conditions which were used to meet the shared ISRA Criterion for their proposal. OR When overlapping cISRAs do not share a ISRA Criterion but share similar habitats or underlying conditions and the boundary overlap is greater than 70%. These similar habitats or underlying conditions may have been used to meet the ISRA Criteria for Qualifying Species.
When not to merge overlapping cISRAs	When overlapping cISRAs share an ISRA Criterion in their proposal but do not have similar habitats or other underlying conditions. OR When overlapping cISRAs do not share either an ISRA Criterion in their proposal or similar habitats or other underlying conditions, and the overlap is less than 70%. OR When boundary overlap is less than 50%.
When to merge cISRAs into a single submission for a non-adjoining network of areas	Even when cISRAs do not overlap in their boundaries, spatially close cISRAs could be merged into a single submission for a non-adjoining network of areas. This could be done when individuals of the same species meeting ISRA Criteria A (Vulnerability) or B (Range Restricted) use the non-overlapping cISRAs, and these cISRAs share the same criteria for their proposal. However, separate submissions for each of these cISRAs could be made.

Adapting for Future Changes to ISRA Boundaries

Over time, delineated ISRAs may need to be adapted in response to changes in data availability, environmental conditions, distribution shifts, or decreasing populations. It is recognized that some of these conditions may change at a faster pace than the timeframe for assessing ISRAs (ideally every ten years). However, ISRAs can only be re-assessed during regional workshops and current ISRA boundaries can only then be adapted or changed to encompass these changes.



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ISRA DEFINITIONS

Terms Used in the ISRA Criteria

Definition of terms used in ISRA Criteria and Sub-criteria in relation to sharks. All definitions indicated with an asterisk (*) are sourced from the International Union for Conservation of Nature (IUCN).

Aggregation

A group of individuals of the same species that typically comes together during a specific life-history process such as breeding, feeding, resting, or migrating; in some instances, the reason for this clustering of individuals can be unknown.

Area

Sites within the range of a species that are usually occupied, excluding cases of vagrancy.

Area of Interest (AoI)

An area considered during a regional workshop but found to have insufficient information to satisfy the ISRA Criteria and therefore does not become a candidate ISRA (cISRA). In contrast, a preliminary Area of Interest (pAoI) is an area proposed for consideration at a regional workshop and has the potential to become a cISRA.

Assemblage

A group of individuals of more than one species of sharks collectively occurring and/or engaging in the same or similar behaviours at the same time and location.

Biocentric (or Ecocentric)

Based solely on considerations of the scientifically derived biological or ecological nature of the criteria used to identify an ISRA, with the exclusion of elements connected to policy, management, or human effects.

Biological

Relating to the demographic and/or life-history processes and functions required by sharks to survive (e.g., physiology, population dynamics, genetics, reproductive function).

Candidate ISRA (cISRA)

A preliminary Area of Interest (pAoI) assessed against the ISRA Criteria during a regional expert workshop, and found to have sufficient information to qualify, is nominated to become a candidate ISRA (cISRA). The Independent Review Panel will review any cISRA proposal before it can become an ISRA. A nominated pAoI which does not have sufficient information to become a cISRA can become an Area of Interest (AoI) with the potential to be re-assessed in the future and become a cISRA when more information is available.

Chimaera

Cartilaginous fishes of the order Chimaeriformes (subclass Holocephali), related to sharks and rays (subclass Elasmobranchii) in the class Chondrichthyes. Also known as 'ghost sharks'.

Chondrichthyans

Class Chondrichthyes, any member of the cartilaginous fishes including the sharks and rays (subclass Elasmobranchii), and chimaeras (subclass Holocephali).

Conditions

Environmental factors which might support the presence of sharks in an area. This can include areas of high biological productivity (e.g., upwellings) or prey abundance.

Deep-water Sharks

Sharks that predominantly inhabit, or which spend most of their life-cycle, at depths below 200 m (i.e., beyond the edge of the continental or insular shelf).

Demersal Sharks

Sharks that occur or live near or on the seafloor.

Distinct

A special attribute referring to a unique or rare biological, behavioural, or ecological characteristic of a species.

Diversity

Relates to the number of species that are contained in a given area. Also referred to as 'alpha (α) diversity'.

Ecological

Relating to the role(s) or function(s) that species play in the community or ecosystem in which they occur.

Ecosystem*

A dynamic complex of vegetal, animal, and microorganism communities and their non-living environment that interact as a functional unit.

Endemic*

Native to, and restricted to, a particular geographical region.

Environmental Factor

Any element, abiotic or biotic, that influences species and their distribution. This can include temperature, salinity, oceanic conditions, or depth.

Estuarine

Referring to sharks which occur in ecosystems where oceanic water is diluted with freshwater run-off from the land.

Extent of Occurrence*

The area contained within the shortest continuous imaginary boundary which

can be drawn to encompass all the known, inferred, or projected sites of present occurrence of a taxon, excluding cases of vagrancy.

Feeding

The process by which sharks obtain food. Predation is a biological process in which an animal kills and feeds on another animal. Filter-feeding is a form of feeding whereby suspended food particles (e.g., zooplankton) are extracted from the water. Gill plates or gill rakers are used for this purpose by filter-feeding sharks.

Habitat

The physical and ecological attributes of the environment in which an animal lives.

Important

Refers to any ecological property or value of the location that can affect the wellbeing of the species, assemblages, aggregations, or individuals within the ISRA, and necessary to maintain or improve their conservation status.

Independent Review Panel (IRP)

This body is composed of recognised shark experts who have not been involved in the nomination of pAoIs or workshops to develop cISRAs, but who have an in-depth understanding of species, habitats, and ISRA Criteria. They are responsible for reviewing cISRAs and assessing whether they can be confirmed as ISRAs.

Inventory of Knowledge (IoK)

An internal document containing the compilation of ecological knowledge (e.g., regional species list, Red List status, biological and physical data) used to support the process of the regional ISRA workshop.

IUCN Red List of Threatened Species*

Listing of the conservation status of the world's flora and fauna administered by IUCN (www.iucnredlist.org). Also referred to as 'IUCN Red List'.

Large Marine Ecosystem (LME)

Areas of coastal oceans delineated based on ecological characteristics such as bathymetry, hydrography, productivity, and trophically linked populations. Large Marine Ecosystems cover areas in the order of 200,000 km^2 or greater with 66 areas delineated around the world (NOAA or LME hub).

Life-cycle

Life-cycle stages of sharks, generally classified into four stages based on size and age of the species, including: (1) newborn or young-of-year; (2) juvenile; (3) sub-adult; and (4) adult. Age and size for each stage differ across species.

Life-history

The changes in characteristics and behaviours that occur across one or more life-cycle stages of an individual, related to vital functions (e.g., reproduction, feeding, resting, or movement).

Marine Spatial Planning

The process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and/or social objectives that usually have been specified through a political process. Marine spatial planning includes ecosystem-based, area-based, integrated, adaptive, strategic, and participatory approaches.

Movement

The predictable (as opposed to random) movement of individuals from one place to another, often related seasonally with breeding or feeding activities; can also be nomadic.

Movement includes migrations, which can be horizontal or vertical. Horizontal migrations are common in many species of sharks and can range from short, seasonally driven, movements along coasts, to long distance trans-oceanic and trans-equatorial crossings that are cyclic and predictable. Vertical migrations can involve diel, seasonal, or ontogenetic movements.

Nursery Area

An area used to sustain newborn or young-of-the-year (<1 year) sharks. It is defined by three criteria where: (1) sharks are more commonly encountered in the area than other areas; (2) sharks have a tendency to remain or return for extended periods (weeks or months); and (3) the area or habitat is repeatedly used across years (Heupel et al., 2007). Some species use discrete nursery areas for different developmental stages: one for egg laying and embryo development (egg case nursery) and one for newly hatched juveniles (juvenile nursery) (Martins et al., 2018). Nursery areas remain undefined for many species, particularly deep-water and oviparous species.

Oceanic Sharks

Sharks that live in the open ocean, mainly beyond the edge of the continental and insular shelves.

Oviparous

See 'reproduction'.

Population*

Set of individuals from the same wild species that share the same habitat.

The term 'population' is used in a specific sense in the IUCN Red List Categories and Criteria and is different from its common biological usage. 'Population' is defined as the total number of individuals of the taxon.

Qualifying Species

Species that satisfy one or more of the ISRA Criteria.

Range*

The amount of space needed by an animal to meet its survival needs.

Range Restricted

Sharks that are restricted to specific areas or habitats by geographical features (e.g., land masses) or by environmental conditions (e.g., habitat type, depth).

Ray

Any species from the orders Rhinopristiformes, Torpediniformes, Rajiformes, or Myliobatiformes (class Chondrichthyes; subclass Elasmobranchii). Often referred to as 'batoid'.

Regular

The year-round or seasonal occurrence of a species at a site during one or more stages of its life-cycle.

Reproduction

The process by which sharks produce young thereby providing for the continued existence of the species. The ways by which sharks reproduce are either oviparous (egg-laying) or viviparous (live-birth, pupping). Oviparous is a reproductive mode in which females lay eggs that hatch in the external environment; also known as 'egg laying'. Skates, chimaeras, and some shark species display this reproductive mode producing eggs encased in a tough 'leathery' egg case. Viviparous is a reproductive mode in which females give birth to live offspring.

Residency

Sharks that typically, and commonly occur in an area including those that only occur intermittently or seasonally.

Resting Area

Location where a species, aggregation, or assemblage of sharks spend time during their daily activity cycle to conserve and restore energy.

Shark

Any species from the orders Hexanchiformes, Echinorhiniformes, Squaliformes, Pristiophoriformes, Squatiniformes, Heterodontiformes, Orectolobiformes, Lamniformes, or Carcharhiniformes (class Chondrichthyes; subclass Elasmobranchii). This term is also generally used to define all chondrichthyans (i.e., sharks, rays, and chimaeras).

Subpopulation*

A morphologically, behaviourally, ecologically, and/or geographically distinct variety within a species.

The term 'subpopulation' is used in a specific sense in the IUCN Red List Categories and Criteria and is different from its common biological usage. Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

The ISRA Criteria are not designed to be applied to subpopulations of sharks.

Supporting Species

Sharks that have their habitat within the cISRA/ISRA but that do not satisfy any of the ISRA Criteria. This may include species for which there is limited ecological data. Those that may have occupied an area historically but no longer occur, or vagrants, should not be listed as 'Supporting Species'.

Threatened*

Species listed on the IUCN Red List as Critically Endangered, Endangered, or Vulnerable (www.iucnredlist.org). Assessed using a globally standardised methodology to reflect varying degrees of threat of extinction.

Vagrant

A shark that is only occasionally found within the boundaries of a region and is not known to occur regularly and predictably in that area.

Viviparous

See 'reproduction'.

Wetlands

All lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas and tidal flats, mangroves and other coastal areas, coral reefs, and all human-made sites such as fish ponds, rice paddies, reservoirs and salt pans (Ramsar Convention on Wetlands of International Importance).

ANNEX A - ISRA CRITERIA GUIDING EXAMPLES

The following are provided only as examples and do not imply that these case study areas should be proposed as a preliminary Area of Interest (pAoI).

The information below describes the possible application of the ISRA Criteria and likely qualifying scenarios which can guide those preparing pAoI submissions.

N.B. Some aspects of these case studies have been generalized and statements may not be wholly reflective of actual biological or ecological attributes of species and areas.

ISRA Case Study One

Patos Lagoon, Rio Grande do Sul, Brazil

This case study is designed to provide an example of 'Vulnerability' (Criterion A) in combination with other criteria. It presents two Qualifying Species but other Qualifying or Supporting Species may occur in 'the area'.

N.B. Some aspects of this case study have been generalised and statements may not be wholly reflective of actual biological or ecological attributes of species and areas. The following is provided only as an example and does not imply that this case study area should be proposed as a pAoI or delineated as an ISRA.

Qualifying Species and Criteria

Common name	Genus	Species	Criteria
Brazilian Guitarfish	*Pseudobatos*	*horkelii*	A*; B; C1
Striped Smoothhound	*Mustelus*	*fasciatus*	A*; B; C1

** Criterion A must be associated with at least one additional criterion.*

Summary Description of the Qualifying Criteria

Patos Lagoon ('the area') is an estuarine and inshore coastal environment in southern Brazil. The area is a nursery for both the Brazilian Guitarfish and the Striped Smoothhound. Both are listed as Critically Endangered on the IUCN Red List.

Criterion A: The Brazilian Guitarfish and the Striped Smoothhound are assessed as threatened on the IUCN Red List, therefore the area meets Criterion A since it is important for the persistence and recovery of these threatened sharks. The application of Criterion A for this area is justified by additional criteria as described below.

Criterion B: Both species are restricted to two adjoining LMEs, the Patagonian Shelf LME and the South Brazil Shelf LME. The area therefore qualifies under Criterion B as it contains a regular and predictable presence of these range-restricted species.

Criterion C: The Brazilian Guitarfish and Striped Smoothhound undertake inshore movements for pupping. Nursery areas for both species have been identified in the area and it therefore meets Sub-criterion C1 as an important reproductive area where these sharks give birth, and which then provides refuge and advantage to the young. If these species are found to feed or rest in the lagoon and coastal zone, the area may also meet Sub-criteria C2 and C3. The area is not a migratory corridor for these species, but rather the endpoint of an inshore movement and so does not meet Sub-criterion C4. Since these species' occurrence and use of the area is known and linked to reproduction, there are no undefined aggregations, and the area does not meet Sub-criterion C5.

Criterion D: There is no additional information to suggest the area is likely to meet Sub-criterion D1. Two Qualifying Species occur in the area which is a low number relative to the diversity of southern Brazil and therefore the area does not meet Sub-criterion D2.

Supporting Information

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Pollom R, Barreto R, Charvet P, Chiaramonte GE, Cuevas JM, Herman K, et al. 2020. *Mustelus fasciatus*. The IUCN Red List of Threatened Species e.T44581A2995765. doi.org/10.2305/IUCN.UK.2020-3.RLTS.T44581A2995765.en

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ISRA Case Study Two

Macquarie Harbour, Tasmania, Australia

This case study is designed to provide an example of multiple criteria including 'Range Restricted' (Criterion B) and 'Distinctiveness (Sub-criterion D1)'. It presents a single Qualifying Species but there may be other Qualifying or Supporting Species in 'the area'.

N.B. Some aspects of this case study have been generalised and statements may not be wholly reflective of actual biological or ecological attributes of species and areas. The following is provided only as an example and does not imply that this case study area should be proposed as a pAoI or delineated as an ISRA.

Qualifying Species and Criteria

Common name	Genus	Species	Criteria
Maugean Skate	*Dipturus*	*maugeanus*	A*; B; C1; C2; C3; D1

** Criterion A must be associated with at least one additional criterion.*

Summary Description of the Qualifying Criteria

Macquarie Harbour ('the area') is a temperate estuary in southwest Tasmania, Australia. It is the only known location of the Maugean Skate. Although the species was once known from another southwest Tasmanian estuary (Bathurst Harbour), it has not been recorded there in ~20 years. This species is Endangered on the IUCN Red List and under Australia's national environmental legislation, the *Environment Protection and Biodiversity Conservation Act 1999*.

Criterion A: The Maugean Skate is assessed as threatened on the IUCN Red List; therefore, the area meets Criterion A since it is important for the persistence and recovery of this threatened shark. The application of Criterion A for this area is justified by additional criteria as described below.

Criterion B: The extent of occurrence of the Maugean Skate is <1,900 km^2. As such, it was assessed under the 'small geographic range' criterion of the IUCN Red List. This species is found in a singular LME, the Southeast Australia LME. The area therefore qualifies under Criterion B as it contains a regular and predictable presence of this range-restricted species.

Criterion C: All vital functions of the life-cycle of the Maugean Skate are carried out in the area including reproduction (this oviparous species lays egg-cases in a specific depth range in the harbour), feeding, and resting. Therefore, the area meets Sub-criteria C1, C2, and C3. The skate is localised and resident to the harbour and is non-migratory; therefore, the area does not meet Sub-criterion C4. Since the species' occurrence and use of the area is known and linked to reproduction, feeding, and resting, there are no undefined aggregations, and the area does not meet Sub-criterion C5.

Criterion D: The Maugean Skate is considered a Gondwanan relict and is the only estuarine adapted skate in the world. These factors make this species ecologically distinct and therefore the area meets Sub-criterion D1. A single Qualifying Species occurs in the area and therefore the area does not meet Sub-criterion D2.

Supporting Information

Bell JD, Lyle JM, Semmens JM, Awruch C, Moren D, Currie S, et al. 2016. Movement, habitat utilisation and population status of the endangered Maugean skate and implications for fishing and aquaculture operations in Macquarie Harbour, Fisheries Research and Development Corporation

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Last PR, Gledhill DC, Sherman CS. 2016. *Zearaja maugeana*. The IUCN Red List of Threatened Species. e.T64442A68650404. https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T64442A68650404.en

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Treloar MA, Barrett NS, Edgar GJ. 2016. Biology and ecology of *Zearaja maugeana*, an Endangered skate restricted to two south-western Tasmanian estuaries. *Marine and Freshwater Research* 68: 821–830. doi.org/10.1071/MF15478

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ISRA Case Study Three

Eastern North Pacific Salmon Shark transition zone

This case study is designed to provide an example of 'Movement' (Sub-criterion C4) and to demonstrate that species assessed as non-threatened on the IUCN Red List may be Qualifying Species. It presents a single Qualifying Species but there may be other Qualifying or Supporting Species in 'the area'.

N.B. Some aspects of this case study have been generalised and statements may not be wholly reflective of actual biological or ecological attributes of species and areas. The following is provided only as an example and does not imply that this case study area should be proposed as a pAoI or delineated as an ISRA.

Qualifying Species and Criteria

Common name	Genus	Species	Criteria
Salmon Shark	*Lamna*	*ditropis*	**C4**

Summary Description of the Qualifying Criteria

The Eastern North Pacific covers numerous ecoregions, from the cold temperate waters of the Aleutian Islands and the Gulf of Alaska to the subtropical waters of the Eastern Central Pacific. This region incorporates a diverse array of coastal, deep-water, and pelagic environments and supports a migration corridor for the pelagic Salmon Shark. This species is Least Concern on the IUCN Red List.

Criterion A: The Salmon Shark is not a threatened species and therefore the area does not meet Criterion A.

Criterion B: The Salmon Shark has a very wide range throughout the North Pacific which is not restricted to a single or two adjacent LMEs. The area does not meet Criterion B as this species is not range-restricted.

Criterion C: Female Salmon Sharks undertake a regular and predictable migration through a 'transition zone' ('the area') which connects important areas. The highest zone of utilization by Salmon Sharks is the Coastal Alaska Downwelling ecoregion in the north followed by the California Current ecoregion to the southeast. The sharks move through the transition zone between these (and other) ecoregions. This area therefore meets Sub-criterion C4. The transition zone is not known to be important for reproduction, feeding, or resting since it is primarily a migratory corridor. As such, the area does not meet Sub-criteria C1, C2, or C3. Since the species' occurrence and use of the area is known and linked to migration, there are no undefined aggregations and the area does not meet Sub-criterion C5.

Criterion D: There is no information to suggest the area meets Sub-criterion D1. A single Qualifying Species occurs in the area and therefore the area does not meet Sub-criterion D2.

Supporting Information

Rigby CL, Barreto R, Carlson J, Fernando D, Fordham S, Francis MP, et al. 2019. *Lamna ditropis*. The IUCN Red List of Threatened Species. e.T39342A124402990. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39342A124402990.en

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ISRA Case Study Four

Sand Island, Johnston Atoll, Central Pacific Ocean

This case study is designed to provide an example of 'Undefined Aggregations' (Sub-criterion C5). It presents a single Qualifying Species but there may be other Qualifying or Supporting Species in 'the area'.

N.B. Some aspects of this case study have been generalised and statements may not be wholly reflective of actual biological or ecological attributes of species and areas. The following is provided only as an example and does not imply that this case study area should be proposed as a pAoI or delineated as an ISRA.

Qualifying Species and Criteria

Common name	Genus	Species	Criteria
Grey Reef Shark	*Carcharhinus*	*amblyrhynchos*	**A*; C5**

** Criterion A must be associated with at least one additional criterion.*

Summary Description of the Qualifying Criteria

Sand Island ('the area') sits within Johnston Atoll in the remote Central Pacific Ocean. Little research has been conducted on sharks in the atoll, but a seasonal (March to May) daytime aggregation of female Grey Reef Sharks

has long been known to occur just offshore of Sand Island. This species is Endangered on the IUCN Red List.

Criterion A: The Grey Reef Shark is assessed as threatened on the IUCN Red List; therefore, the area meets Criterion A since it is important for the persistence and recovery of this threatened shark. The application of Criterion A for this area is justified by additional criteria as described below.

Criterion B: The Grey Reef Shark has a very wide range throughout the Indo-Pacific which is not restricted to a single or two adjacent LMEs. The area does not meet Criterion B as this species is not range restricted.

Criterion C: The precise function of the daily Grey Reef Shark aggregation is unknown but may be related to embryonic development, adult growth, or to a navigational 'landmark'. This aggregation has not yet been attributed to a particular vital function. The area therefore meets Sub-criterion C5 as the aggregation of sharks occurs regularly, predictably, and seasonally, but its purpose is undefined. Therefore, the area does not currently meet Sub-criteria C1, C2, C3, or C4. However, it is important to note that further research may reveal that this aggregation is linked to a vital function or life-history activity.

Criterion D: There is no information to suggest the area meets Sub-criterion D1. A single Qualifying Species occurs in the area and therefore the area does not meet Sub-criterion D2.

Supporting Information

Economakis AE, Lobel PS. 1998. Aggregation behavior of the grey reef shark, *Carcharhinus amblyrhynchos*, at Johnston Atoll, Central Pacific Ocean. *Environmental Biology of Fishes* 51: 129–139. doi.org/10.1023/A:1007416813214

Simpfendorfer C, Fahmi, Bin Ali AD, Utzurrum JAT, Seyha L, Maung A, et al. 2020. *Carcharhinus amblyrhynchos*. The IUCN Red List of Threatened Species. e.T39365A173433550 https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T39365A173433550.en

ISRA Case Study Five

Julian Rocks, New South Wales, Australia

This case study is designed to provide an example of an area with a range of Qualifying Species meeting various criteria with a focus on 'Life-History' (Criterion C), including 'Resting Areas' (Sub-criterion C3), and 'Diversity' (Sub-criterion D2). The case study presents a full list of both Qualifying and Supporting Species occurring in 'the area'.

N.B. Some aspects of this case study have been generalised and statements may not be wholly reflective of actual biological or ecological attributes of species and areas. The following is provided only as an example and does not imply that this case study area should be proposed as a pAoI or delineated as an ISRA.

Qualifying Species and Criteria

Common name	Genus	Species	Criteria
Colclough's Shark	*Brachaelurus*	*colcloughi*	A*; B; C3; D2
Blind Shark	*Brachaelurus*	*waddi*	B; C3; D2
Gulf Wobbegong	*Orectolobus*	*halei*	C1; C3; D2
Spotted Wobbegong	*Orectolobus*	*maculatus*	C1; C3; D2
Ornate Wobbegong	*Orectolobus*	*ornatus*	C1; C3; D2
Zebra Shark	*Stegostoma*	*tigrinum*	A*; C1; C3; D2
Grey Nurse Shark	*Carcharias*	*taurus*	A*; C1; C3; D2
Bottlenose Wedgefish	*Rhynchobatus*	*australiae*	A*; C3; D2
Giant Guitarfish	*Glaucostegus*	*typus*	A*; C3; D2
Eastern Shovelnose Ray	*Aptychotrema*	*rostrata*	B; C2; C3; D2
Eastern Fiddler Ray	*Trygonorrhina*	*fasciata*	B; C2; C3; D2
Coral Sea Maskray	*Neotrygon*	*trigonoides*	B; C2; C3; D2
Common Stingaree	*Trygonoptera*	*testacea*	B; C3; D2
Kapala Stingaree	*Urolophus*	*kapalensis*	B; C3; D2

** Criterion A must be associated with at least one additional criterion.*

Supporting Species

These species have habitat in the area but do not satisfy the ISRA Criteria.

Common name	Genus	Species
Grey Carpetshark	*Chiloscyllium*	*punctatum*
Whale Shark	*Rhincodon*	*typus*
White Shark	*Carcharodon*	*carcharias*
Bronze Whaler	*Carcharhinus*	*brachyurus*
Common Blacktip Shark	*Carcharhinus*	*limbatus*
Sandbar Shark	*Carcharhinus*	*plumbeus*
Tiger Shark	*Galeocerdo*	*cuvier*
Great Hammerhead	*Sphyrna*	*mokarran*
Bowmouth Guitarfish	*Rhina*	*ancylostoma*
Coffin Ray	*Hypnos*	*monopterygius*
Smooth Stingray	*Bathytoshia*	*brevicaudata*
Brown Stingray	*Bathytoshia*	*lata*
Australian Whipray	*Himantura*	*australis*
Broad Cowtail Ray	*Pastinachus*	*ater*
Blotched Stingray	*Taeniurops*	*meyeni*
Southern Eagle Ray	*Myliobatis*	*tenuicaudatus*
Spotted Eagle Ray	*Aetobatus*	*ocellatus*
Australian Cownose Ray	*Rhinoptera*	*neglecta*
Reef Manta Ray	*Mobula*	*alfredi*

Summary Description of the Qualifying Criteria

Julian Rocks ('the area') is a warm-temperate rocky reef offshore from northern New South Wales on the east coast of Australia. It sits within the southeast Australian ISRA Sub-region which includes 111 shark species. The area supports a diverse assemblage of sharks and is known to support vital life-history functions of numerous species.

Criterion A: At least 18 threatened shark species occur in the area including species assessed as Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) on the IUCN Red List. Qualifying Species that meet Criterion A are Colclough's Shark (VU), Zebra Shark (EN), Grey Nurse Shark (CR), Bottlenose Wedgefish (CR), and Giant Guitarfish (CR). The area meets Criterion A since it is important for the persistence and recovery of these threatened sharks. The application of Criterion A for this area is justified by additional criteria as described below.

Criterion B: Seven Qualifying Species occurring in the area are endemic to eastern Australia and can be considered range restricted. These sharks occur only in two adjoining LMEs, the Northeast Australia LME and the East-Central Australia LME. These species are Colclough's Shark, Blind Shark, Eastern Shovelnose Ray, Eastern Fiddler Ray, Coral Sea Maskray, Common Stingaree, and Kapala Stingaree. The area therefore meets Criterion B as it contains a regular and predictable presence of these range restricted species.

Sub-criterion C1: Mating Zebra Sharks, pupping Grey Nurse Sharks, and neonate Gulf Wobbegong, Spotted Wobbegong, and Ornate Wobbegongs have all been observed in the area (the latter suggesting a nursery area for the wobbegongs). As such, the area meets Sub-criterion C1 as it is important for the reproduction of these species.

Sub-criterion C2: The Eastern Shovelnose Ray, Eastern Fiddler Ray, and Coral Sea Maskray feed in the area. As such, the area meets Sub-criterion C2 as it provides features or conditions which form the basis on which these sharks derive nutrition.

Sub-criterion C3: Wobbegongs and blind sharks (Colclough's Shark and Blind Shark) are primarily nocturnal and rest during the day on the rocky reefs under overhangs and in holes, sometimes in assemblages. The Zebra Shark, Bottlenose Wedgefish, and Giant Guitarfish rest on sandy substrate between rocky areas. The Grey Nurse Shark displays resting behaviours where activity levels and movement is reduced. These resting behaviours include 'hovering' where sharks appear to be motionless alongside the rocky reef during the day. All batoid Qualifying Species rest on soft substrates in the area. As such, the area meets Sub-criterion C3 as it is an important resting site for all these species.

Sub-criterion C4: There is no information to suggest the area meets Sub-criterion C4.

Sub-criterion C5: There is no information to suggest the area meets Sub-criterion C5.

Sub-criterion D1: There is no information to suggest the area meets Sub-criterion D1.

Sub-criterion D2: The D2 threshold was set at 10% of the sub-regional shark diversity. The area includes 14 Qualifying Species which represents 13% of southeast Australian shark diversity. As such, the area meets Sub-criterion D2 as it sustains an important diversity of sharks.

Supporting Information

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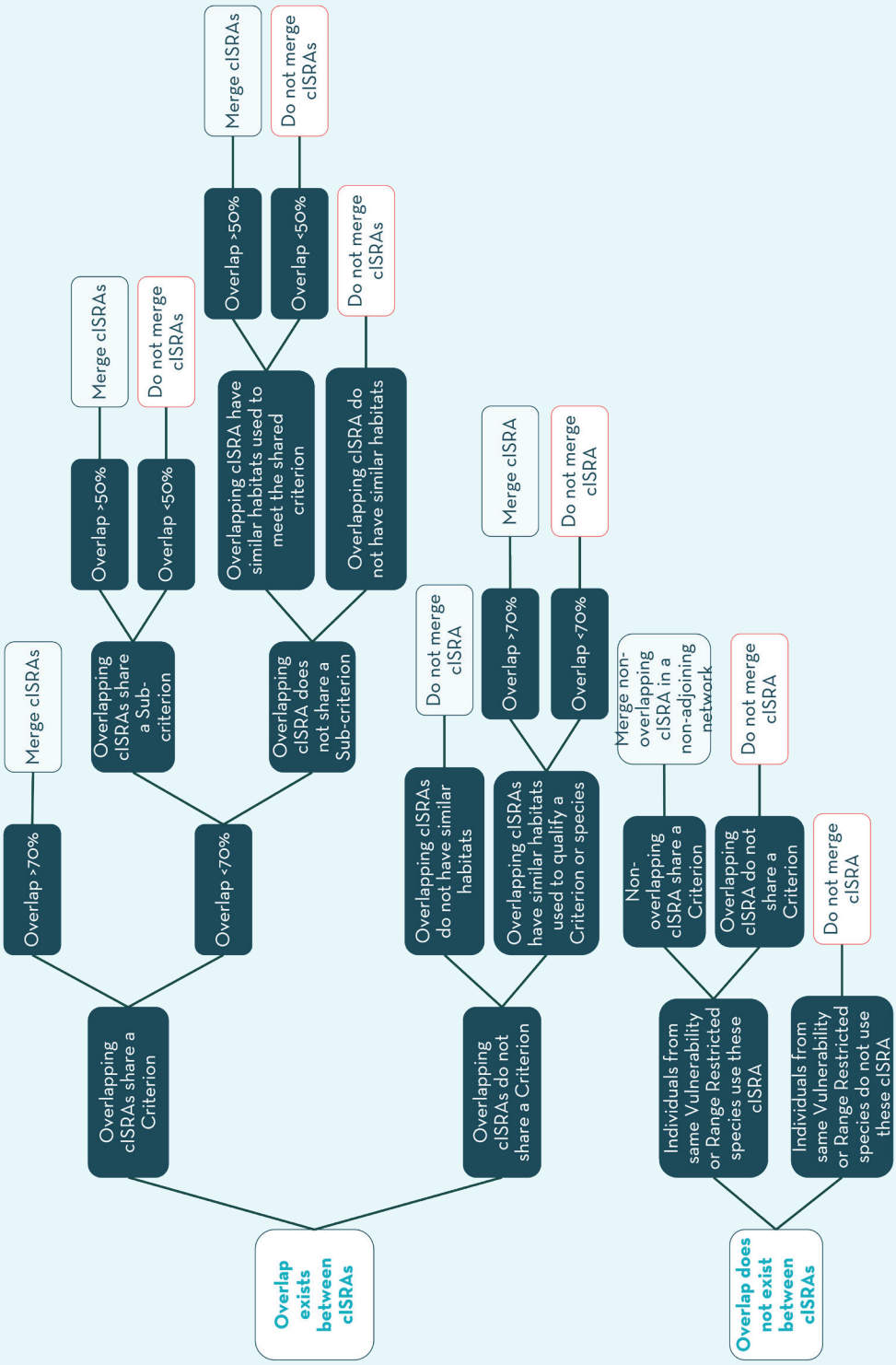
Smith KR, Scarpaci C, Scarr MJ, Otway NM. 2014. Scuba diving tourism with critically endangered grey nurse sharks (*Carcharias taurus*) off eastern Australia: Tourist demographics, shark behaviour and diver compliance. *Tourism Management* 45: 211–225. doi.org/10.1016/j.tourman.2014.05.002

ANNEX B - MERGING cISRA PROCESS DECISION CHART

This flowchart outlines a decision-making process to inform the merging of overlapping cISRAs. These are recommendations only and final decisions should be referred to ISRA workshop experts.



ANNEX C - LIST OF IBA, EBSA, KBA, IMMA, IMTA, AND RAMSAR SITES CRITERIA

Important Bird and Biodiversity Areas (IBAs) (www.birdlife.org)

A1 - Globally threatened species Criterion: The site is known or thought to regularly hold significant numbers of a globally threatened species. The site qualifies if it is known, estimated, or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered, Endangered or Vulnerable. Specific thresholds are set for species within each of the threat categories that need to be exceeded at a particular IBA. The list of globally threatened species is maintained and updated annually for IUCN by BirdLife International.

A2 - Restricted-range species Criterion: The site is known or thought to hold a significant population of at least two range-restricted species.

Notes: Restricted-range bird species are those having a global range size less than or equal to 50,000 km^2. 'Significant population': it is recommended that site-level populations of at least two restricted-range species should be equal to or exceed 1% of their global population. This criterion can be applied to species both within their breeding and non-breeding ranges.

A3 - Biome-restricted species Criterion: The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome-realm.

Notes: Bioregion-restricted assemblages are groups of species with largely shared distributions which occur (breed) mostly or entirely within all or part of a particular bioregion. Bioregions are defined by the WWF classification of biome-realms. Many biome-realms hold large numbers of species restricted to them, often across a variety of different habitat types; networks of sites must be chosen to ensure, as far as possible, adequate representation of all relevant species. In data-poor areas, knowledge of the quality and representativeness of the habitat types within sites alongside incomplete knowledge of the presence of bioregion-restricted species can be used to inform site selection. Many biome-realms cross political boundaries; where this is so, national networks of sites are selected to ensure that all

relevant species in each country are adequately represented in IBAs. Thus biome-realms require that the networks of sites take account of both the geographical spread of the biome-realm and the political boundaries that cross them, as appropriate. Under 'significant component' it is recommended to use 30% of the number of bioregion-restricted species within a biome-realm within a country or five bioregion-restricted species, whichever is greatest.

A4 - Congregations Criterion: The site is known or thought to hold congregations of ·1% of the global population of one or more species on a regular or predictable basis.

Notes: Sites can qualify whether thresholds are exceeded simultaneously or cumulatively, within a limited period. In this way, the criterion covers situations where a rapid turnover of birds takes place (including, for example, sites important for migratory land birds).

Ecologically or Biologically Significant Areas (EBSAs) (www.gobi.org)

Criterion 1 - Uniqueness or rarity: Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations, or communities, and/or (ii) unique, rare, or distinct habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features.

Criterion 2 - Special importance for life-history stages of species: Areas that are required for a population to survive and thrive.

Criterion 3 - Importance for threatened, endangered, or declining species and/or habitats: Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.

Criterion 4 - Vulnerability, fragility, sensitivity, or slow recovery: Areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.

Criterion 5 - Biological productivity: Area containing species, populations, or communities with comparatively higher natural biological productivity.

Criterion 6 - Biological diversity: Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.

Criterion 7 - Naturalness: Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.

Key Biodiversity Areas (KBAs) (www.keybiodiversityareas.org)

Each of the below Criteria has one or more associated quantitative thresholds. Please refer to the KBA Standard for details.

Criterion A - Threatened Biodiversity A1 - Threatened species: Sites qualifying as KBAs under criterion A1 hold a significant proportion of the global population size of a species facing a high risk of extinction and so contribute to the global persistence of biodiversity at genetic and species levels.

Criterion B - Geographically restricted biodiversity

B1 - Individual geographically restricted species: Sites qualifying as KBAs under criterion B1 hold a significant proportion of the global population size of a geographically restricted species, and so contribute significantly to the global persistence of biodiversity at the genetic and species level.

B2 - Co-occurring geographically restricted species: Sites qualifying as KBAs under criterion B2 hold a significant proportion of the global population size of multiple restricted-range species, and so contribute significantly to the global persistence of biodiversity at the genetic and species level.

B3 - Geographically restricted assemblages: Sites qualifying as KBAs under criterion B3 hold assemblages of species within a taxonomic group that are globally restricted, and so contribute significantly to the global persistence of biodiversity at the genetic, species, and ecosystem levels.

Criterion C - Ecological integrity: Sites qualifying as KBAs under criterion C hold wholly intact ecological communities with supporting large-scale ecological processes, and so contribute significantly to the global persistence of biodiversity at the ecosystem level.

Criterion D - Biological processes:

D1 - Demographic aggregations: Sites qualifying as KBAs under criterion D1 hold a significant proportion of the global population size of a species during one or more life history stages or processes, and so contribute significantly to the global persistence of biodiversity at the species level.

D2 - Ecological refugia: Sites qualifying as KBAs under criterion D2 hold a significant proportion of the global population size of a species during periods of environmental stress, and so contribute significantly to the global persistence of biodiversity at the species level.

D3 - Recruitment sources: Sites qualifying as KBAs under criterion D3 are sites where a significant proportion of the global population size of a species is produced, and so contribute significantly to the global persistence of biodiversity at the species level.

Criterion E - Irreplaceability: Sites qualifying as KBAs under criterion E have very high irreplaceability for the global persistence of biodiversity as identified through a complementarity based quantitative analysis of irreplaceability.

Important Marine Mammal Areas (IMMAs) (www.marinemammalhabitat.org)

Criterion A - Species or Population Vulnerability: Areas containing habitat important for the survival and recovery of threatened and declining species or populations largely based on IUCN Red List assessments

Criterion B - Distribution and Abundance: This criterion refers to areas that are important because marine mammals use them intensively. Such areas may contain habitat that consistently supports an important percentage of a species population, either year-round or seasonally, or that supports small populations of isolated (or at least semi-isolated) resident animals.

Sub-criterion B1 - Small and Resident Populations: Areas supporting at least one resident population, containing an important proportion of that species or population, which are occupied consistently.

Sub-criterion B2 - Aggregations: Areas with underlying qualities that support important concentrations of a species or population.

Criterion C - Lifecycle Activities: Discrete areas that are important to marine mammals because they are used by an important proportion of the population to carry out vital functions in the species' life cycle. This includes reproduction, feeding, and migration. Enhanced protection of such areas – and the maintenance of relevant habitat features within them – may be necessary to ensure the long-term survival of species or populations.

Sub-criterion C1 - Reproductive Areas: Areas and conditions that are important for a species or population to mate, give birth, and/or care for young until weaning.

Sub-criterion C2 - Feeding Areas: Areas and conditions that provide an important nutritional base on which a species or population depends.

Sub-criterion C3 - Migration Routes: Areas used for important migration or other movements, often connecting distinct life cycle areas or connecting different parts of the year-round range of a non-migratory population.

Criterion D - Special Attributes: This criterion refers to areas that are judged important because of the special attributes of species or populations that depend on them. Some areas with particular types of habitat or ecological processes require enhanced protection to ensure the long-term survival of species or populations with special attributes.

Sub-criterion D1 - Distinctiveness: Areas which sustain populations with important genetic, behavioural, or ecologically distinctive characteristics.

Sub-criterion D2 - Diversity: Areas containing habitat that supports an important diversity of species.

Important Marine Turtle Areas (IMTAs) (Important Marine Turtle Areas Guidelines 1.0)

An IMTA must fall into one of these two categories:

Biologically significant: Areas that are important for courtship, mating, nesting / hatching; areas and conditions that provide an important habitat on which a species or population depends for vital processes such as feeding, resting, and ontogenetic development; areas used as migration corridors or

for other movements, connecting distinct life-cycle areas, or the different parts of the year-round range of a non-migratory population.

Culturally significant: Socioeconomic and cultural activities occurring within an area do not degrade the integrity of marine turtle habitat and do not entail unsustainable use of marine turtles; specifically these may include areas where these species have a salient role in shaping cultural heritage, such as diet, materials, medicine, and/or social practices; areas that contain prehistoric, historic, and/or contemporary cultural resources related to marine turtles; or areas that embody traditional or contemporary beliefs/practices of cultural, religious and/or spiritual significance in relation to marine turtles.

Furthermore, the area must meet at least one of the following criteria, as described by supporting information, research data, and/or other evidence:

Relative importance to the population: Areas that are of particular importance to marine turtle populations, because of age class of turtles, number of individuals included, or other defining characteristics (e.g., > 50 percent of total RMU [regional management unit] nesting abundance, high density of foraging turtles regularly observed or inferred from tracking data).

Species or populations of particular conservation concern: Areas containing habitat important for the survival and recovery of species or populations at particularly high risk of extinction and/or under most severe threats, ideally according to an established conservation status assessment framework (e.g., IUCN Red List Critically Endangered, Endangered, or Vulnerable; MTSG's [Marine Turtle Specialist Group] conservation priorities portfolio; national scale endangered species lists; documented significant historical depletion).

Aggregations or congregations: Areas with underlying qualities that support important concentrations of a species or population, especially those composed of multiple species or populations, or which are important to the persistence of turtle populations or human cultural practices related to marine turtles.

Distinctiveness areas: Areas which sustain populations with important genetic, behaviourally or ecologically distinctive characteristics, including refugia from environmental change, or areas of distinct or important cultural significance in relationship to marine turtles.

Diversity areas: Areas containing habitat that supports an important diversity of species, populations, genetic lineages, or human cultural practices (e.g., area regularly supports three or more species, RMUs, or genetic management units).

Ramsar Sites (https://www.ramsar.org)

Group A of the Criteria. Sites containing representative, rare, or unique wetland types.

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria. Sites of international importance for conserving biological diversity; criteria based on species and ecological communities.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life-cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds:

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Specific criteria based on fish:

Criterion 7: A wetland should be considered internationally important if it

supports a significant proportion of indigenous fish subspecies, species, or families, life-history stages, species interactions, and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Specific criteria based on other taxa:

Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

ANNEX D – ALIGNMENT WITH OTHER CONSERVATION PLANNING APPROACHES

Criterion A: Vulnerability

ISRA Criterion A is in alignment with, or related to:

- IBA Criterion A1 'Globally Threatened Species' where a 'site is known or thought to regularly hold significant numbers of a globally threatened species and the site qualifies if it is known, estimated, or thought to hold a population of a species assessed as Critically Endangered, Endangered, or Vulnerable on the IUCN Red List'.
- EBSA Criterion 3 'Importance for threatened, endangered, or declining species' which defines crucial habitats for endangered, threatened, or declining species, or areas with significant assemblages of such species.
- KBA Criterion A 'Threatened species' which identifies 'sites that hold a significant proportion of the global population size of a species facing a high risk of extinction, and so contribute to the global persistence of biodiversity at genetic and species levels'.
- IMMA Criterion A 'Species or Population Vulnerability' which identifies 'areas containing habitat important for the survival or recovery of threatened and declining species or populations'.

Criterion B: Range Restricted

ISRA Criterion B is in alignment with, or related to:

- IBA Criterion A2 'Restricted-range Species' which identifies 'sites known or thought to hold a significant population of at least two range-restricted species'.
- IBA Criterion A3 'Biome-restricted species' which identifies 'sites known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome-realm'.
- EBSA Criterion 4 'Vulnerability, fragility, sensitivity, or slow recovery'

which refers to 'areas that contain a relatively high proportion of sensitive habitats, biotopes, or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery'.

- KBA Criterion B1 'Individual geographically restricted species', which identifies 'sites holding a significant proportion of the global population size of a geographically restricted species (including species that are geographically concentrated in a few areas within a broad global range)'.
- KBA Criterion B2 'Co-occurring geographically restricted species' which identifies 'sites holding a significant proportion of the global population size of multiple restricted range species within a taxonomic group' (e.g., for Chondrichthyes, at least two co-occurring species with global range size less than or equal to 50,000 km^2).
- KBA Criterion B3 'Geographically restricted assemblages' which identifies 'sites holding assemblages of species within a taxonomic group (e.g., Chondrichthyes) that are globally restricted (e.g., restricted to a bioregion)'. However, KBA Criterion B3 is triggered by species assemblages rather than individual species and bioregions are defined differently.
- IMMA Sub-criterion B1 'Small and Resident Populations' where an 'area supports at least one resident population, containing an important proportion of that species or population, which are occupied consistently'.

Criterion C: Life-History

Sub-criterion C1: Reproductive Areas

ISRA Sub-criterion C1 is in alignment with, or related to:

- IBA Sub-criterion B3a 'Regionally important congregations' and biogeographical populations where a 'site is known or thought to hold, on a regular basis, approximately 1% of a biogeographic or other distinct population for breeding'.
- EBSA Criterion 2 'Special Importance for Life-history Stages of Species' which defines 'areas that are required for a population to survive and

thrive. Some geographical areas or topographic features are more suitable, or important, for particular life-stages and functions than others. Areas containing: (i) breeding grounds, spawning areas, nursery areas, juvenile habitat, or other areas important for life history stages of species; or (ii) habitats of migratory species (feeding, wintering or resting areas, breeding, moulting, migratory routes)'.

- KBA Criterion D 'Biological Processes' which identifies the 'demographic and life-history processes that maintain species such as reproduction and migration'.
- KBA Criterion D1 'Demographic aggregations' which identifies 'sites holding a significant proportion of the global population size of a species as an aggregation during one or more life-cycle processes' (e.g., breeding).
- KBA Criterion D3 'Recruitment Sources' which identifies 'sites holding a significant proportion of the global population size of a species, and so contribute significantly to the global persistence of biodiversity at the species level'. KBA Criterion D3 is the only KBA species-based criterion that can be triggered by immature individuals, as long as they contribute significantly to the mature population.
- IMMA Sub-criterion C1 'Reproductive Areas' which identifies 'areas and conditions that are important for a species or population to mate, give birth, and/or care for young until weaning'.

Sub-criterion C2: Feeding Areas

ISRA Sub-criterion C2 is in alignment with, or related to:

- IBA Criterion A4 'Congregations' where a 'site is known or thought to hold congregations of ·1% of the global population of one or more bird species on a regular or predictable basis'.
- EBSA Criterion 2 'Special Importance for Life-history Stages of Species' which defines areas 'that are required for a population to survive and thrive', under notation '(ii) habitats of migratory species (feeding, wintering or resting areas, breeding, moulting, migratory routes)'.
- KBA Criterion D1 'Demographic aggregations', which identifies 'sites

holding a significant proportion of the global population size of a species as an aggregation during one or more lifecycle processes' (e.g., feeding).

- IMMA Sub-criterion C2 'Feeding Areas' which identifies 'areas and conditions that provide an important nutritional base on which a species or population depends'.

Sub-criterion C3: Resting Areas

ISRA Sub-criterion C3 is in alignment with, or related to:

- IBA criterion A4 'Congregations' where a site is known or thought to hold congregations of ·1% of the global population of one or more bird species on a regular or predictable basis'. These bird congregations can include roosting assemblages (e.g., shorebird roosts) which are functionally similar to shark resting areas.
- EBSA Criterion 2 'Special Importance for Life-history Stages of Species' which defines 'areas that are required for a population to survive and thrive', under notation '(ii) habitats of migratory species (feeding, wintering or resting areas, breeding, moulting, migratory routes)'.
- KBA Criterion D1 'Demographic aggregations', which identifies 'sites holding a significant proportion of the global population size of a species as an aggregation during one or more lifecycle processes' (e.g., resting).

Sub-criterion C4: Movement

ISRA Sub-criterion C4 is in alignment with, or related to:

- IBA Criterion A4 'Congregations' where a 'site is known or thought to hold congregations of ·1% of the global population of one or more bird species on a regular or predictable basis'.
- EBSA Criterion 2 'Special Importance for Life-history Stages of Species' which defines 'areas that are required for a population to survive and thrive', under notation '(ii) habitats of migratory species (feeding, wintering or resting areas, breeding, moulting, migratory routes)'.
- KBA Criterion D1 'Demographic aggregations', which identifies 'sites

holding a significant proportion of the global population size of a species as an aggregation during one or more life cycle processes' (e.g., migration), this may include where the threshold is met cumulatively, i.e., numbers of individuals collectively occurring in an area (e.g., migration corridor) over a period of time (e.g., seasonally) which account for 1% of the population using the area during that time.

- IMMA Sub-criterion C3 'Migration Routes' which defines 'areas used for important migration or other movements, often connecting distinct lifecycle areas or connecting different parts of the year-round range of a non-migratory population'.

Sub-criterion C5: Undefined Aggregations

ISRA Sub-criterion C5 is in alignment with, or related to:

- IBA Criterion A4 'Congregations' where a 'site is known or thought to hold congregations of ·1% of the global population of one or more bird species on a regular or predictable basis'.
- EBSA Criterion 2 'Special importance for life-history stages of species' which defines 'areas that are required for a population to survive and thrive including: (i) breeding grounds, spawning areas, nursery areas, juvenile habitat or other areas important for life history stages of species; or (ii) habitats of migratory species (feeding, wintering or resting areas, breeding, moulting, migratory routes)'.
- KBA Criterion D1 'Demographic Aggregations' which identifies 'sites which hold a significant proportion of the global population size of a species during one or more life-history stages or processes, and so contribute significantly to the global persistence of biodiversity at the species level. Aggregations typically occur for breeding, feeding, or during migration and are indicated by highly localised relative abundance'.
- IMMA Sub-criterion B2 'Aggregations' where 'areas are identified with underlying qualities that support important concentrations of a species or population'.
- IMMA Criterion C 'Lifecycle Activities' which identifies discrete 'areas that are important because they are used by an important proportion

of the population to carry out vital functions in the species' lifecycle. This includes reproduction, feeding, and migration, wherein enhanced protection of such areas – and the maintenance of relevant habitat features within them – may be necessary to ensure the long-term survival of species or populations'.

Criterion D: Special Attributes

Sub-criterion D1: Distinctiveness

ISRA Sub-criterion D1 is in alignment with, or related to:

- EBSA Criterion 1 'Uniqueness and Rarity' which defines that an 'area contains species that are either (i) unique (the only one of its kind), or rare (occurs only in few locations or populations)'.
- KBA Criteria A1 (Threatened species), B1 (Individual geographically restricted species), or B2 (Co-occurring geographically restricted species) based on 'assessment parameter (vi) distinct genetic diversity'.
- IMMA Sub-criterion D1 'Distinctiveness' which identifies 'areas that sustain populations with important genetic, behavioural, or ecologically distinctive characteristics'.

Sub-criterion D2: Diversity

ISRA Sub-criterion D2 is in alignment with, or related to:

- IBA Criterion A3 'Biome-restricted Species' where the 'site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome-realm'.
- EBSA Criterion 6 'Biological Diversity' defines 'areas that contain a comparatively higher diversity of ecosystems, habitats, communities or species, or have higher genetic diversity'.
- KBA Criterion B3 'Geographically restricted assemblages', which **identifies** 'sites holding assemblages of species within a taxonomic group (e.g., Chondrichthyes) that are globally restricted'.
- IMMA Sub-criterion D2 'Diversity' which identifies 'areas which contain habitat that supports an important diversity of species'.

ANNEX E - FREQUENTLY ASKED QUESTIONS

What is an ISRA?

An Important Shark and Ray Area (ISRA) is a discrete, three-dimensional portion of habitat, important for one or more shark, ray, or chimaera species, that has the potential to be delineated and managed for conservation.

Does the identification of ISRAs consider human activities?

ISRAs are completely biocentric, based only on the needs of sharks. Other considerations such as human activities and livelihoods that are an integral part of the environment are not encompassed in this process. We acknowledge that these important aspects should be considered by policymakers when using area-based approaches to conservation.

Are ISRAs Marine Protected Areas (MPAs)?

ISRAs are not MPAs. An ISRA is an area identified as important for sharks. The goal of ISRAs is not to develop MPAs or similar spatial approaches. ISRAs are a tool to guide the development, design, and application of area-based conservation initiatives (including MPAs). They can be used by governing bodies to access critical habitat information when developing conservation measures.

Are ISRAs a tool for regulating fisheries and/or other threatening processes?

ISRAs are not a management or compliance tool, but rather a scientifically based biocentric approach solely focusing on identifying important areas for sharks. The ISRA database and eAtlas can be used by governments, organisations, or researchers to inform and implement management strategies.

Do ISRAs contain a legal mandate?

No, the identification of an ISRA does not imply or create any legal obligations.

Will every ISRA become an MPA?

No. Some ISRAs may already be part of MPAs, other ISRAs may never become MPAs, but it will still be useful to know the distribution of species within those areas and be able to monitor changes. ISRAs are essentially a data layer for an individual shark species or population.

What types of species assessments can be used to identify ISRAs based on Criterion A?

Shark species listed on the IUCN Red List in the categories of Critically Endangered, Endangered, or Vulnerable qualify for ISRA Criterion A. However, other available processes and assessments (e.g., national regulatory, and legal frameworks such as the US Endangered Species Act, *Australia's Environment Protection and Biodiversity Conservation Act* [EPBC], or national assessments of extinction risk) can also be used to identify an ISRA based on Criterion A.

What is the Independent Review Panel and what are its duties?

The Independent Review Panel is composed of individuals recognised by the SSG as having relevant expertise. They have an in-depth understanding of species, habitats, and ISRA Criteria but must not have been involved in the ISRA selection process. Their role is to ensure a rigorous, peer-reviewed process before an ISRA can be confirmed.

How do ISRAs consider climate change?

Climate change is likely to affect the distribution of species therefore affecting the locations of ISRAs. This will be addressed by the periodic revision of ISRAs (every ten years or sooner if deemed necessary).

Will subpopulations be considered in ISRAs?

The ISRA Criteria have not been designed to be applied at the subpopulation level because of insufficient species-specific information available for sharks at that level.

If an area has not been identified as an ISRA does that mean it is not important?

No, identification of an ISRA has been undertaken to recognise the location as a regular habitat of sharks according to their usage or occurrence there under one or more of the ISRA Criteria. If an area where sharks occur has not been identified as an ISRA, it may simply be because there is not yet sufficient data available, or it has not been nominated as a preliminary Area of Interest (pAoI). Nominations of pAoIs can be made by contacting the ISRA Team, or through the ISRA website (www.sharkrayareas.org).

What are the ISRA Criteria?

There are four ISRA Criteria with seven Sub-criteria as follows:

Criterion A: Vulnerability

Criterion B: Range Restricted

Criterion C: Life-History

- Sub-criterion C1: Reproductive Areas
- Sub-criterion C2: Feeding Areas
- Sub-criterion C3: Resting Areas
- Sub-criterion C4: Movement
- Sub-criterion C5: Undefined Aggregations

Criterion D: Special Attributes

- Sub-criterion D1: Distinctiveness
- Sub-criterion D2: Diversity

How were the ISRA Criteria developed?

The ISRA Criteria were developed by a consultative process led by the IUCN SSC Shark Specialist Group, IUCN Ocean Team, and IUCN Marine Mammal Protected Areas Task Force. Four workshops were held in early 2022 to gather feedback and discuss key biological, ecological, and behavioural traits of sharks which affect their habitat use in the context of area-based planning. Draft ISRA Criteria then went through a thorough process of peer-review before finalisation.

Will ISRAs prioritise economically or culturally important species?

No, ISRAs are delineated based on a robust, scientific process that is

designed to consider all chondrichthyans (sharks, rays, and chimaeras) regardless of public interest or commercial importance.

What happens if an ISRA overlaps with another biogeographical designation (e.g., KBA or EBSA)?

Identification of an ISRA in any region can also overlap with other existing biogeographical conservation approaches (e.g., KBAs or EBSAs) and does not mean that the area identified for sharks will be automatically integrated into these approaches. Instead, the ISRA should remain intact and as a separate measure to further support the identification and conservation of shark biodiversity at those sites.

Why were ISRAs developed instead of using the Key Biodiversity Area approach?

ISRAs are not identified using quantitative thresholds like KBAs but rather based on qualitative criteria designed to encompass the broad range of habitat needs and the biological or ecological complexities of sharks. Where relevant data are available for sharks and one or more KBA criteria and threshold/s are met, an ISRA may be proposed as a KBA through the appropriate processes.

What is the process for identifying an ISRA?

Anyone can propose a potential ISRA by nominating and gathering background information to create a preliminary Area of Interest (pAoI). These then go to the formal expert workshops for consideration where they may be proposed and become candidate ISRAs (cISRAs). Some may not reach this stage and remain as proposals. cISRAs will then go to an Independent Review Panel who will either accept the cISRA to become an ISRA, or send it back as a cISRA or AoI, to be reconsidered in the future.

Are ISRAs peer-reviewed?

Yes. Candidate ISRAs (cISRAs) proposed at a workshop are reviewed by the Independent Review Panel to assess whether they qualify based on the ISRA Criteria, before becoming ISRAs and being added to the global repository.

What data are used to identify ISRAs?

ISRAs are identified using the best available scientific data. Sources will

generally include observational data (e.g., sightings, movement data, fisheries-independent data, fisheries-dependent data including from observers) whereas the use of non-observational data (e.g., species distribution modelling) for ISRA identification is discouraged. Valid data sources are peer-reviewed publications, grey literature, or local ecological knowledge if judged to be reliable by workshop participants and the Independent Review Panel.

Can ISRAs be identified in Areas Beyond National Jurisdictions (ABNJ)?

Yes, sharks are not confined to human geopolitical boundaries and many species are considered oceanic and live or occur in ABNJs. Areas that are considered of importance for the persistence of these sharks can be identified as ISRAs.

How can ISRAs be identified in data-poor regions?

In situations where regions are data poor, assembled experts at workshops will need to make difficult decisions on how and where to identify ISRAs. It may be that a data gap analysis reveals the need for specific research that can be stimulated by the expert assessments and recommendations from the workshops.

Can any entity or person identify an ISRA?

No. However, any entity or person can propose a preliminary Area of Interest (pAoI), which can be submitted to the IUCN SSC Shark Specialist Group for examination during the relevant regional workshop. Candidate ISRAs based on pAoIs can only be identified at regional workshops. Once these candidate areas have also been reviewed by the Independent Review Panel, if approved, they can be considered ISRAs.

If I want an ISRA in my country, how do I proceed, who do I contact?

Contact details for the ISRA Team can be found at www.sharkrayareas.org

What are 'sharks'?

The term 'shark' refers to all species of Chondrichthyes comprising of all nine shark orders (Hexanchiformes, Echinorhiniformes, Squaliformes, Pristiophoriformes, Squatiniformes, Heterodontiformes, Orectolobiformes, Lamniformes, and Carcharhiniformes), all four ray orders (Rhinopristiformes,

Torpediniformes, Rajiformes, and Myliobatiformes) and all chimaeras (Chimaeriformes). New species of sharks are still being described and their taxonomy is continuously being revised. For sharks, the authoritative taxonomic reference is Eschmeyer's Catalog of Fishes:

https://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp.

What does 'important' mean within the context of ISRAs?

The term 'important' refers to any ecological property or value of the location that can affect the wellbeing of the species, assemblages, aggregations, or individuals within the ISRA, and necessary to maintain or improve their conservation status.

What is a threatened shark species?

Shark species listed on the IUCN Red List in the categories of Critically Endangered, Endangered, or Vulnerable globally (www.iucnredlist.org).

What is a Qualifying Species?

Species that satisfy one or more of the ISRA Criteria.

What is a Supporting Species?

Sharks that have habitat within the ISRA but that do not satisfy one of the ISRA Criteria. This includes species for which there is little ecological data. Those that may have occupied an area historically but no longer occur, or vagrants, should not be listed as Supporting Species.

What is the difference between a pAoI, AoI, and cISRA?

An area nominated as a potential location for an ISRA, is classified as a preliminary Area of Interest (pAoI). These pAoIs are then assessed against the ISRA Criteria during the regional expert workshops, and if they have sufficient information to qualify, they are nominated to become a candidate ISRA (cISRA). The Independent Review Panel will assess any cISRA before it can become an ISRA. Nominated pAoIs which do not have sufficient information to become a cISRA can become an Area of Interest (AoI) with the potential to be assessed in the future and become a cISRA when more information is available.

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