The IMMA Handbook

March 2024

Marine Mammal Protected Areas Task Force

IUCN SSC WCPA

IMMA

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This is an updated version of the "Guidance on the identification of Important Marine Mammal Areas (IMMAs)", and replaces the September 2022 version of that document.

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Acronyms

ABMT	area-based management tool
ABNJ	Areas Beyond National Jurisdiction
ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area
AoI	Area(s) of Interest
BIA	Biologically Important Area
CBD	Convention on Biological Diversity
CCH	Cetacean Critical Habitat
cIMMA	candidate IMMA
CMS	Convention on the Conservation of Migratory Species of Wild Animals
DAF	Data Appraisal Form
EBSA	Ecologically or Biologically Significant Area
IBA	Important Bird and Biodiversity Area
IBAT	Integrated Biodiversity Assessment Tool
ICMMPA	International Committee on Marine Mammal Protected Areas
IMMA	Important Marine Mammal Area
IMPAC	International Marine Protected Areas Congress
IoK	Inventory of Knowledge
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
MPA	marine protected area
MMPA	marine mammal protected area
MMPATF	IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force
MSP	marine spatial planning
NOAA	National Oceanic and Atmospheric Administration
pAoI	preliminary Area of Interest
PAC	priority area for conservation
SAC	Special Area of Conservation
SSC	IUCN Species Survival Commission
WCPA	IUCN World Commission on Protected Areas

1. Purpose of this Document

The goal of this document is to present the IMMA selection criteria and provide practical guidance on their use for the identification of Important Marine Mammal Areas (hereafter IMMAs). It is intended that this document will be used as the primary resource for scientific experts attending regional workshops to be a guide through the process of nominating areas as candidate IMMAs. However, it will also be useful for a large number of other users to help in understanding how IMMAs are identified, what the scientific rationale is for their designation and how IMMAs should be interpreted.

2. Background

Compilation and evaluation of the world's marine mammal protected areas (MMPAs) in the 1990s-2000s showed clearly that the current global network of MPAs was failing to provide even modest habitat protection for the 131 extant species of marine mammals (Hoyt, 2012). IMMAs were developed as a strategic response to the conservation crisis in ocean biodiversity, and specifically the insufficient protection of marine mammals and their habitats. IMMAs are intended to function as a tool to focus the conservation spotlight on the places that most matter to marine mammals.

The Marine Mammal Protected Area Task Force began developing the Important Marine Mammal Areas initiative in 2013, modelled on the successful example of BirdLife International's Important Bird and Biodiversity Areas (IBAs) classification scheme[1]. The IMMA selection criteria were developed after an extensive scientific and public consultation undertaken between 2013 and 2015. The eight criteria and sub-criteria were designed to capture important aspects of marine mammal biology, ecology and population structure and to encompass multiple aspects of species vulnerability, distribution, abundance, and key life cycle activities, as well as areas of high diversity. Any candidate IMMA needs to satisfy at least one of the criteria or sub-criteria to qualify for IMMA status. Each candidate IMMA is reviewed by an independent panel of experts and those that are accepted as IMMAs are displayed through the publicly accessible website, searchable database, e-Atlas and downloadable brochures (www.marinemammalhabitat.org). The IMMA spatial layers are available upon request.

IMMAs are serving as tools for conservation and monitoring (see for examples Agardy et al., 2019 and Tetley et al. 2022), happening through the existing channels of CBD EBSAs, IUCN KBAs, as well as various national and international (high seas) MPA processes. IMMAs are valuable tools to contribute to marine spatial planning (MSP) which is used by many countries. IMMAs are also valuable for monitoring the health of marine mammal populations in the face of ocean acidification, overfishing and climate change. The intention is that national agencies will use the tool not only for the conservation of marine mammal species, but for the habitats for which they serve as umbrella species. Thus, IMMAs are becoming an essential tool to help conserve biodiversity. With the current UN deliberations on the high seas, the intention is that IMMAs will be able to step into a much wider role throughout the world ocean. The compilation of marine mammal ecological knowledge on the IMMA website makes it openly available to, and readily

[1] www.birdlifeinternational.org/importantbirdareas.html

actionable by, non-specialists. It also allows the information to be easily used in management, policy and industry processes.

In summary, the IMMA process is valuable for:

- informing the design and management of Marine Mammal Protected Areas (MMPAs) and protected area networks, as well as determining gaps in the protection of marine mammals in existing networks;
- providing comprehensive marine mammal information spatial layers for marine spatial planning and ocean zoning;
- allowing marine mammals to be considered in the national or regional processes to delineate marine protected areas (MPAs) and MPA networks, EBSAs, and KBAs;
- supporting the negotiation of legally binding instruments under the United Nations Convention on the Law of the Sea (UNCLOS) regarding the protection of biodiversity in Areas Beyond National Jurisdiction (ABNJs);
- prioritising areas where guidelines or regulations are needed by management bodies, e.g., in reference to the risk of oil spills, ship strikes, marine mammal bycatch, or effects of underwater noise;
- identifying areas that are potentially useful for monitoring the effects of climate change on marine mammal biology, behaviour, and habitat; and
- training Regional IMMA Expert Groups for the future identification and implementation of IMMAs.

3. What is an IMMA?

An IMMA is:

> A discrete portion of habitat, important for one or more marine mammal species, that has the potential to be delineated and managed for conservation.

An IMMA is not a protected area. Some IMMAs may indeed already be protected to some extent, while other areas may require conservation attention or would benefit from protection. The IMMA designation is intended to help provide a lever for enhanced conservation, monitoring and consideration in future developments.

It is recognised that dedicated efforts to document marine mammal habitats have only covered a fraction of the global ocean. It is important to bear in mind that waters not identified as Important Marine Mammal Areas (IMMAs), candidate IMMAs (cIMMAs) or areas of interest (AoI), and therefore outside of these denominations, may still be important for the long-term survival and well-being of marine mammals. Human activities taking place in marine environments everywhere around the world must be conducted responsibly.

4. IMMA Identification Process

IMMAs are identified through a science-based, expert-led process. This process aims to engage a wide range of representatives within the marine mammal science and conservation communities who hold much of the scientific data and evidence necessary to support and assess

IMMAs.

IMMAs are identified through a series of regional expert workshops. Prior to each regional workshop, experts are identified and invited based on their knowledge, experience and skills relevant to the marine mammal species and habitats in the region. Invited experts include marine mammal scientists, and others with specialist local knowledge, such as indigenous people. Prior to each workshop, a data gathering exercise is conducted by engaging with experts and other data holders in the region in question who are asked to contribute to a regional Inventory of Knowledge (IoK).

The IMMA identification process consists of three stages: identification and nomination of preliminary Areas of Interest (pAoI) (Stage 1), compilation and evaluation of the evidence supporting a candidate IMMA (cIMMA) during a regional workshop (Stage 2), and review of cIMMA proposals by an expert panel, resulting in the acceptance or rejection of proposed IMMAs (Stage 3). Details of each stage are provided below:

Stage 1 – Nomination of preliminary Areas of Interest (pAoI)

The starting point in the process is the nomination of preliminary Areas of Interest (pAoI). The IMMA Secretariat of the Task Force makes a 'call for information' announcement several months in advance of a IMMA workshop (see Stage 2). At that point any expert or interested party may propose a pAoI by completing a simple template. Participants invited to attend workshops are encouraged to develop pAoI in advance of the workshops.

Stage 2 – Workshop to develop 'candidate IMMAs'

At each regional workshop, participants review all submitted pAoI, as well as other existing sites designated for conservation (such as EBSAs, KBAs and MPAs with marine mammal habitat), to determine whether they meet one or more of the IMMA criteria and might then be developed into proposals for cIMMAs. Participants use their regional and species-specific knowledge to develop cIMMAs, based on their review and where appropriate integration of the submitted pAoI and discussion among workshop participants and other regional experts. Workshop-agreed cIMMAs are then submitted to the IMMA Secretariat and are sent to the Independent scientific review panel for evaluation (Stage 3).

Stage 3 – Independent review and IMMA Status Qualification

The IMMA Secretariat, in consultation with the relevant IUCN specialist groups, nominate an independent panel (consisting of scientists with the necessary regional and species expertise). The panel review the cIMMAs from a given workshop and decide whether they can be accepted as IMMAs. The panel considers the following when making its decision:

(a) the rationale for the proposed boundaries, and
(b) how well the scientific evidence satisfies the IMMA criteria,

Accepted IMMAs
Confirmed IMMAs and their associated documentation are made publicly available by the IMMA Secretariat on the Task Force website via a searchable and downloadable database, and a

dedicated online IMMA e-Atlas. Individual IMMA fact sheet pages are created on the website, together with summaries of key information on every individual IMMA, and information on how to obtain the IMMA spatial layers (ESRI shapefiles, KML). Finally, detailed brochures are completed for each IMMA, and posted on the website for download as PDFs.

IMMAs not accepted

Areas that are not accepted as full IMMAs by the review panel, because they do not present convincing evidence that they satisfy the criteria, remain as Areas of Interest (AoI). Both IMMAs and AoI are included in the searchable database and displayed on the IMMA e-Atlas, with a different colouration, recognising that, although not IMMAs, AoI have been deemed to be of interest and can potentially become IMMAs in the future when more information becomes available. an AoI can only become an IMMA after undergoing a new workshop and review process. In the case of a substantial proposal for a cIMMA not becoming an IMMA due to unforeseen issues or delays following the review process, it may in rare cases be held by the IMMA Secretariat until it is able to satisfy the requirements raised by the review panel. The Secretariat, consulting with the review panel if needed, can then determine if the cIMMA merits promotion to a full IMMA.

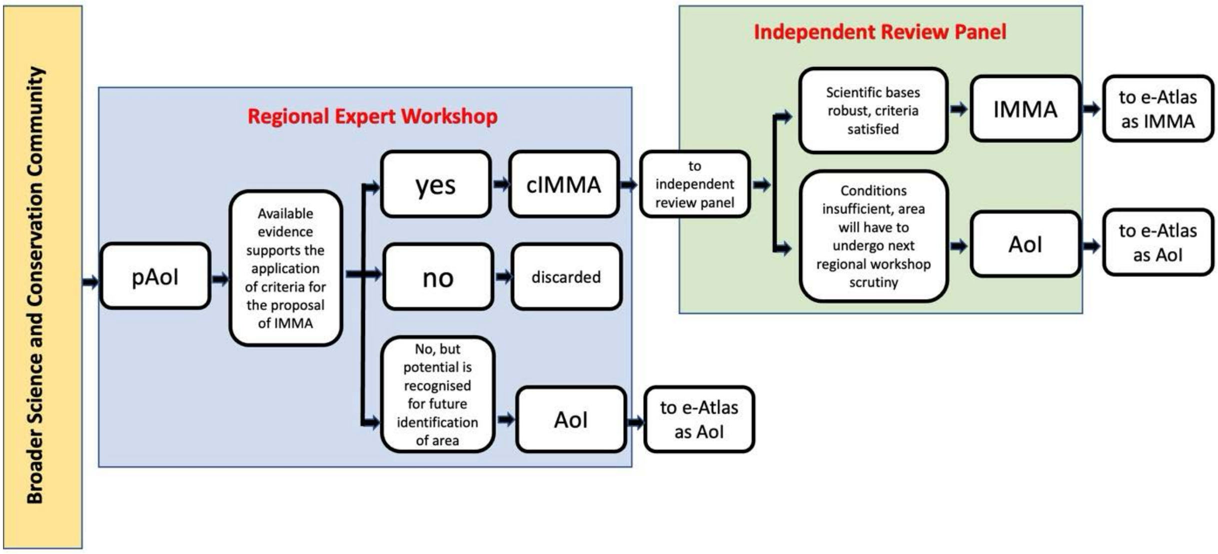

Figure 1 – Flow diagram illustrating the entire process involved in IMMA identification.

Creation of regional Expert Groups

Participation in the IMMA process establishes a common understanding of the IMMA criteria and products and the final cIMMAs are a product of the entire workshop, rather than of individuals. The three-step approach allows for engagement across a large number of experts and spectrum of expertise, and for input even from those that cannot physically attend workshops. Following the workshops, participants, as well as other experts who significantly contributed to cIMMA proposals, become members of a Regional IMMA Expert Group. These groups in turn become informed and motivated scientific advocates for the IMMA network. Two or more Regional Coordinators are designated at every workshop to facilitate the connection between the Expert group and the IMMA Secretariat.

5. IMMA Selection Criteria and Definitions

5.1 Definition of 'Important'

'Important' in the context of an IMMA identification refers to any environmental condition or biological property of an area that contributes to creating a suitable habitat for any particular marine mammal species, thereby furthering its survival and flourishing.

5.2 Definition of Qualifying and Supporting Species

- Qualifying species are those species that satisfy one or more of the IMMA criteria. Species that trigger the diversity criterion (D2) are considered Qualifying Species even if they don't satisfy any other criteria.
- Supporting species are those that obviously have habitat within the IMMA but that do not satisfy one of the IMMA criteria. Species that may have occupied an area historically but no longer occur, vagrants, single sightings or strandings of species that normally occur in habitat outside the IMMA boundary should not be listed as supporting species.

5.3 Species and Taxonomy

The list of recognised marine mammal species and subspecies compiled by the Committee on Taxonomy of the Society for Marine Mammalogy is considered the taxonomic authority for marine mammals and represents the most current accepted taxonomic information. This list, which is updated at least once per year, is the list used by the Task Force, and should be followed when assigning qualifying and supporting species in cIMMAs.

The normal situation is to use 'species' as the taxonomic entity on which IMMAs are identified.

Subspecies can be included as qualifying or supporting species in certain conditions. The policy is to use as default the genus + species name only for nominate subspecies that are not listed as endangered on the Red List (e.g. *Tursiops truncatus truncatus* would be listed as *Tursiops truncatus* only). The subspecies, and the trinomial name, can be used for qualifying or supporting species in two circumstances:

1. where two subspecies occur in the same cIMMA (e.g., *Tursiops truncatus truncatus*, and *Tursiops truncatus gephyreus*); and
2. Where a subspecies is listed as threatened on the Red List and qualifies for criterion A.

5.4 IMMA Selection Criteria

The IMMA selection criteria are meant to capture aspects of the biology, ecology and population structure of marine mammals that are relevant in the identification of habitat important for them. It is advised that prospective IMMAs are assessed against the criteria sequentially in the order given below. Any candidate site need only satisfy one of the listed criteria or sub-criteria to successfully qualify for IMMA status (the only exception to this is Criterion A which cannot be applied alone).

The IMMA selection criteria are as follows:

Criterion A - Species or Population Vulnerability

Criterion B - Distribution and Abundance
Sub-Criterion B1 - Small and Resident Populations
Sub-Criterion B2 - Aggregations

Criterion C – Key Life Cycle Activities
Sub-Criterion C1 - Reproductive Areas
Sub-Criterion C2 - Feeding Areas
Sub-Criterion C3 - Migration Routes

Criterion D - Special Attributes
Sub-Criterion D1 - Distinctiveness
Sub-Criterion D2 - Diversity

Each criterion and sub-criterion (A, B1, B2, C1, C2, C3, D1, and D2) is further explained below, using the following four descriptive sections for each in turn:

Statement of Requirement - A qualifying statement which aims to summarise the essence of the criterion. It is these statements which must be considered when drafting the rationale for a candidate IMMA and in the assessment of the evidence which supports it.

Principle of Criterion - Expanded information regarding this criterion, which may include the sources of qualifying information, potential scale, or associated authorities which may be needed to inform the use of the specific criterion.

Guiding Examples – A number of example scenarios of how this criterion might be applied. A number of IMMA examples are also provided in **Annex 2**, Table A2.1.

Criterion A: Species or Population Vulnerability

Statement of Requirement

Areas containing habitat important for the survival and recovery of threatened species.

Principle of Criterion

The term 'threatened species' refers to marine mammal species, subspecies or subpopulations (IUCN Red List terminology) that have been formally assessed for the IUCN Red List of Threatened Species (www.iucnredlist.org) as either Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) (IUCN, 2012). Enhanced protection measures for these threatened species are regarded as conservation priorities under various international and regional conservation agreements, and by some national governments. Such measures may include the assignment of a legal status that brings associated protection as well as the identification and explicit protection of areas important to their survival and recovery. In some instances, in addition to the IUCN Red List, it may be appropriate to consider a threatened status assigned under other regional or national threat-listing bodies. These instances, however, should be exceptional and subject to critical evaluation by relevant experts during workshops as well as scrutiny during the expert review.

To include an area on the basis of Criterion A, it is necessary to provide evidence that there is important habitat that supports the threatened or vulnerable species. Therefore, an area can be nominated as a cIMMA on the basis of Criterion A, but there MUST also be a second criterion used for its nomination. cIMMAs cannot be nominated on the basis of Criterion A alone.

Note that Criterion A would not apply in a situation such as in New Zealand, where common bottlenose dolphins (*Tursiops truncatus*) are listed as 'threatened - nationally endangered' in national listings (Baker et al., 2019) because they are globally extremely common and listed as Least Concern on the IUCN Red List (Wells et al., 2019).

Examples of IMMAs that used criterion A include:

(1) areas supporting species or populations listed internationally as CR/EN/VU status (collectively 'Threatened') on the IUCN Red List.
- Bazaruto Archipelago to Inhambane Bay IMMA, Southern Shelf Waters and Reef Edge of Palau IMMA, and the Mersing Archipelago IMMA all identified on the basis of important habitat for the dugong, which is listed as VU on the Red List.
- Akamas and Chrysochou Bay IMMA, Akrotiri IMMA and Chios and Turkish coast IMMAs all of which provide caves for EN Mediterranean monk seals.
- Caspian Seal Breeding Area IMMA and Caspian Seal Transitory Migration and Feeding Area IMMA for the EN Caspian seal.
- IMMAs identified on the basis of important habitat for coastal dolphins/porpoises listed as threatened on the IUCN Red List e.g. Indus estuary and creeks IMMA (habitat for Indian Ocean humpback dolphin listed as EN, and finless porpoise listed as VU), Chilika Lagoon IMMA (habitat for Irrawaddy dolphins listed as EN), Moreton Bay IMMA (habitat for Australian humpback dolphin and the dugong both VU on the Red List).
- Samoan Archipelago IMMA and Society Archipelago IMMAs both included the Oceania subpopulation of humpback whales listed as EN on the IUCN Red List.

(2) areas supporting species listed as threatened by national or regional bodies (other than the Red List), such as:
- the submerged Dogger Bank for North Sea harbour porpoises listed as Threatened and Declining by the OSPAR Convention (OSPAR, 2009); or
- deep-water canyons for the Scotian Shelf population of northern bottlenose whales listed as Endangered under the Canadian Species at Risk Act (DFO, 2009).

Please see **Annex 2**: IMMA Criteria and Guiding Examples**,** for more examples.

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, either year-round or seasonally, or that supports small populations of isolated (or at least semi-isolated) resident animals. The intention of this criterion is to highlight important concentrations of marine mammals. Human impacts on such sites may have disproportionately greater effects on a species or population than impacts on areas that support lower densities of marine mammals. Criterion B is described further in the following two sub-criteria:

Sub-criterion B1: Small and Resident Populations

Statement of Requirement

Areas supporting at least one resident population, containing an important proportion of that species or population, that are occupied consistently.

Principle of Criterion

Some populations of marine mammals are numerically small and occupy small or discrete areas in relation to the species' global distribution. These characteristics make such populations important and may also make them vulnerable and therefore provide a rationale for IMMA status.

Note that listing and citing the evidence for a species under Criterion B1 in a cIMMA proposal will make it unnecessary to include Criteria C1 and C2 for the same species (a 'small and resident population' will necessarily require both feeding and breeding habitat within the cIMMA).

Note also that there is no specific quantification of 'small' in the context of this criterion. Rather, the criterion is applied taking into consideration and relative to the global distribution and abundance of the species being evaluated.

Examples of IMMAs that used criterion B1 include:

(1) where an entire species or subspecies inhabits a relatively small, discrete area e.g.
- Heard Island, Kerguelen and surrounding waters IMMA for Kerguelen Islands Commerson's dolphins (*Cephalorhynchus commersonii kerguelenensis*);
- Central West Coast, North Island, IMMA for Māui dolphins (*Cephalorhynchus hectori maui)*;
- vaquitas in the Gulf of California (Rojas-Bracho and Reeves, 2013); Galápagos fur seals and sea lions (Wolf et al., 2008); Juan Fernández and Guadalupe fur seals (Acuña and Francis, 1995); Saimaa and Ladoga seals (Trukanova, 2013).

(2) one of few sites globally where the species or subspecies occurs:
- Madeira and Desertas Islands IMMA with caves for Mediterranean monk seals

(3) areas that are discrete and occupied year-round by an important proportion of a species:
- Main Hawaiian Archipelago IMMA with resident populations of many cetacean species.
- Southern Egyptian Red Sea Bays, Offshore Reefs and Islands IMMA with resident Risso's dolphin, spinner dolphin and Indo-Pacific bottlenose dolphins.

(4) where a population is so small that a single event, in an important part of its distribution, could jeopardize the population's survival:
- Ionian Archipelago IMMA and Gulf of Ambracia IMMA both with small resident and declining populations of Mediterranean common dolphins.

- E.g. various ‘transient’ killer whale populations (de Bruyn et al., 2013).

Sub-criterion B2: Aggregations

Statement of Requirement

Areas with underlying qualities that support important concentrations of a species or population.

Principle of Criterion

Most marine mammal species are wide-ranging and capable of movements over great distances. Some areas, because of intrinsic attributes, support important seasonal aggregations of marine mammals and, as such, are potential candidates for IMMA status.

Examples of IMMAs that used criterion B2 include:

(1) where an important proportion of the individuals of a species or population regularly congregate in a specific area during a portion of the year:

- Aggregations of southern right whales in waters off Tasmania in the Southeastern Australian and Tasmanian Shelf waters IMMA

(2) where individuals occur in the same area in observed densities of potential global importance:

- Alboran Deep IMMA with important aggregations of Cuvier’s beaked whales, Risso’s dolphins and Pilot whales and the Western Ligurian Sea and Genoa Canyon IMMA important for Cuvier’s beaked whales.
- Western Antarctic Peninsula IMMA with important aggregations of humpback whales, fin whales, killer whales, Antarctic fur seal, leopard seal, crabeater seal and Weddell seal.
- Irrawaddy dolphin and Australian humpback dolphin aggregations in the Kikori Delta IMMA.

(3) where aggregations are observed in multiple years, either consecutively or episodically, e.g., due to climatic or oceanic ‘anomalies’ such as thermal domes (Bailey et al., 2009), polar gyres and polynyas (Laidre et al., 2008); or

- Savu sea and surrounding areas IMMA and the Dhofar IMMA where seasonal upwelling provides important habitat for aggregating sperm whales and pygmy blue whales (*Balaenoptera musculus brevicauda*), *and* Arabian sea humpback whales, respectively.

(4) where marine mammals occur regularly and are concentrated to an extent that a single event could significantly alter the long-term survival probability of a species or population, e.g.,

- Common dolphins in the Gulf of Corinth IMMA
- Caspian seals in the Caspian Seal Moulting and Haul-Out Areas IMMA.

Other examples of species that may satisfy this criterion include: grey whales off north-eastern Sakhalin Island, Russia (Bradford et al., 2008) and North Atlantic right whales in Massachusetts Bay and eastern Cape Cod Bay (Nichols et al., 2008);

Criterion C: Key Life Cycle Activities

This criterion pertains to 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

Statement of Requirement

Areas that are important for a species or population to mate, give birth, and/or care for young until weaning.

Principle of Criterion
Reproductive areas are considered important to the health and long-term survival of species and populations whose life history strategies involve distinct areas and times for reproductive activities. These are areas, sometimes used seasonally, where an important proportion of the animals mate, give birth and/or care for dependent young.

Examples of IMMAs that used criterion C1 include

(1) Habitat that is used annually as haul-out sites by one or more pinniped populations for giving birth, nursing young and/or mating:
- Cabo Blanco IMMA for breeding Mediterranean monk seals.
- South Australian Gulfs and Adjacent Waters IMMA for breeding Australia sea lions.
- Gough Island and Adjacent Waters IMMA for breeding Subantarctic fur seal and southern elephant seals.

(2) specific sites or systems that have favourable conditions for giving birth and caring for young immediately after birth:
- Central and Western Torres Strait IMMA an important breeding area for dugongs.
- Geographe Bay to Eucla Shelf and Coastal Waters IMMA and Cape Coastal Waters IMMA both important calving grounds for southern right whales.
- Mozambique Coastal Breeding Grounds IMMA and Southern Great Barrier Reef Lagoon and Coast IMMA important calving grounds for humpback whales.
- Muscat Coastal Waters and Offshore Canyons IMMA important habitat for breeding spinner dolphins, common bottlenose dolphins, and Long-beaked common dolphins (*Delphinus delphis capensis*)

Sub-criterion C2: Feeding Areas

Statement of Requirement
Areas and conditions that provide an important nutritional base on which a species or population depends.

Principle of Criterion
Feeding areas used regularly and intensively, though sometimes seasonally, by marine mammals could be characterized by biological productivity generally or by the abundance and ready availability of particular nutritional resources. These may result from processes that concentrate prey, or promote healthy abundant vegetation, which are accessible to marine mammals and where they can forage undisturbed.

Examples of IMMAs that used criterion C2 include:

(1) Places where oceanic features drive processes supporting important biological productivity including upwellings:

- For example, those in the Humboldt Current System off Chile and Peru (Molina-Schiller et al., 2005), in the Gulf of St. Lawrence near the mouth of Saguenay Fjord, Canada, or in the northwestern Arabian Sea in the Indian Ocean. This may also include frontal systems such as the Sub-tropical Convergence off southern Africa (Best and Shell, 1996) which promote concentrations of prey for oceanic marine mammals.
- Macquarie Island and Ridge IMMA, where large populations of seals and sea lions provide a source of food annually for killer whales.
- Gulf of Masirah and Offshore Waters IMMA, where seasonal upwelling provides food for humpback whales.

(2) Places where bathymetric features and the hydrodynamic processes around them that act to concentrate prey for marine mammals:

- For example, shelf breaks such as those around the Grand Banks of Newfoundland (Fuller and Myers, 2004), Hanna Shoal, a 'seamount' in the southern Chukchi Sea off northern Alaska, which is a critical foraging area for walruses (Jay et al., 2012), coral atolls and submerged banks such as many in the tropical Indian Ocean and South Pacific.
- Feeding grounds for sperm whales in the complex bathymetry of the Wakatobi and Adjacent Waters IMMA and the Albany Canyon IMMA.
- Southwest to Eastern Sri Lanka IMMA which has steep bathymetry and productive waters that are feeding grounds for sperm whales and blue whales.

(3) Places where river mouths and larger estuarine habitats that can promote the stable presence of prey aggregations through terrestrial run-off, warm water plumes, (Kudela et al., 2010), or glacial meltwater (Lydersen et al., 2014, Goetz et al., 2012). For example:

- Berau and East Kutai District IMMA – feeding grounds throughout the year in an estuary used by Indo-Pacific humpback dolphins.
- Kikori Delta IMMA – feeding grounds throughout the year in an estuary used by Australian humpback dolphins and snubfin dolphins.

(4) Places where sea bottom features allow for the presence of species (e.g., sea grass) that are obligate food sources for aquatic mammals such as sirenians (Marsh et al., 2011).

- Aldabra Atoll IMMA, Moreton Bay IMMA, and Farasan Archipelago IMMA – all feeding grounds for dugong with large sea grass beds.

(5) Places where seal colonies are located and animals feed in the oceans surrounding the central colony

- New Zealand Subantarctic Islands IMMA where New Zealand sea lion and New Zealand fur seals forage.

Sub-criterion C3: Migration Routes

Statement of Requirement

Areas used for migration or other movements, often connecting distinct areas where specific life-cycle functions occur (e.g. feeding, or breeding) or movements to different parts of the annual range of a species.

Principle of Criterion
Migration routes and associated transit areas used regularly and intensively by travelling marine mammals are considered important for the long-term survival of species and populations. These include corridors, bottlenecks, straits, stepping stones and rest areas, which are used regularly for long-distance movements or other movements important to the species.

This criterion may also apply to significant seasonal movements, as a species moves to different parts of the year-round range of a non-migratory population. However, it is important to show that the movement is not localised and that the distances involved are substantial.

Important Note: Where an IMMA is identified on the basis of criterion C3 alone, the IMMA will be tagged as a '*Migratory Corridor*' or 'MIMMA' and will be shown on the e-Atlas in a different shade than other multi-species and multi-criteria IMMAs. This is because migratory corridors are typically used only seasonally and are often very large in size, taking up a large area on the e-Atlas, and therefore they need to be displayed slightly differently to users.

Examples of IMMAs that used criterion C3 include:

(1) Places that are used for (annual) migrations of marine mammals. Such areas may be associated with fixed submarine features such as mid-ocean rises, ridges or shelf edges, for example those used by migrating fin (Silva et al., 2013), sei (Prieto et al., 2014) and common minke whales (Víkingsson and Heide-Jørgensen, 2015) in the North Atlantic.
- Mascarene Islands and Associated Ocean Features IMMA – migratory route and sea mounts used by humpback whales and sperm whales

(2) Places that are migratory corridors (MIMMAs), for example, areas used by grey whales in North America and Russia (Mate et al., 2015), and North Atlantic right whales along the eastern United States (Gowan and Ortega-Ortiz, 2014);
- Western Australian Humpback Whale Migration Route IMMA, Eastern Indian Ocean Blue Whale Migratory Route IMMA and Southeast African Coastal Migration Corridor IMMA.

(3) Places where straits, act as major thoroughfares for marine mammals, for example, such as the Bering Strait for bowhead whales and many other Arctic and increasingly sub- Arctic/temperate region marine mammals (Citta et al., 2012; Clarke et al., 2013).
- Tanon Strait IMMA used by spinner dolphins moving between feeding and resting areas
- Savu Sea and Surrounding Areas IMMA where blue whales move between north-west Australia and Banda-Seram Seas.
- Alborán Straits IMMA migratory corridor connecting fin whales and sperm whales in the northern Alborán Sea and Strait of Gibraltar.

(4) Places where islands/archipelagos act as resting spots or stopovers for marine mammal populations undertaking long migrations over open ocean, such as the Aleutian Islands in the North Pacific (Zerbini et al., 2006) which are critical to the movements of long-distance migrating species such as humpback whales (Kennedy et al., 2014) and gray whales (Mate et al., 2015).
- E.g. Cook Islands Southern Group IMMA stopover for migrating humpback whales in the Pacific.

Criterion D: Special Attributes

This criterion refers to areas that are deemed important because of the special attributes of species or populations that depend on them.

Sub-criterion D1: Distinctiveness

Statement of Requirement

Areas that sustain populations with important genetic, behavioural or ecologically distinctive characteristics.

Principle of Criterion
Certain marine mammal populations, due to their geographic isolation or adaptation to particular types of habitat, have characteristics that are rare in comparison to other populations. Such characteristics may include genetic distinctiveness, distinct morphology, or rare or unusual behaviour or ecological linkages. Habitats that in some way support or encourage these characteristics are regarded as important.

Examples of IMMAs that used criterion D1 include:

(1) Places where populations are genetically and demographically isolated from other populations of the species but have not (yet) been formally described or recognized, e.g., killer whale eco-types (de Bruyn et al., 2013);

- *Sea of Azov IMMA with morphologically distinct Black Sea harbour porpoises.
- Karadag and Opus IMMA where Black Sea bottlenose dolphins show distinct piebald colouring.
- Hellenic Trench IMMA with genetically and culturally distinct sperm whales and genetically distinct Cuvier's beaked whales.

(2) Places where populations exhibit behaviour (social, foraging, resting, etc.) or other features suggestive of local adaptation, e.g., common bottlenose dolphins that beach themselves when driving prey against the shoreline in South Carolina and Georgia, USA (Duffy-Echevarria et al., 2008); or killer whale populations that beach themselves to capture pinnipeds in Patagonia, Argentina (Vila et al., 2008) or rub on rocky beaches for unknown purposes in British Columbia, Canada (Williams et al., 2006).

- South Georgia IMMA is the only known place where Weddell seals breed on land
- Marquesas Archipelago IMMA unusual coastal distribution of the usually pelagic melon-headed whale

Sub-criterion D2: Diversity

Statement of Requirement

Areas containing habitat that supports an important diversity of marine mammal species.

Principle of Criterion
Certain areas attract a variety of marine mammal species in important numbers whilst sustaining further biological diversity. Care must be taken in evaluating this feature to ensure that the area

contains core habitat for the species being considered, to avoid situations where only peripheral portions of many species' ranges happen to overlap (Williams et al., 2014). For this type of analysis, simple range maps can often be misleading.

The attribution of the diversity criterion is based on a relative assessment, depending on the documented marine mammal diversity in any particular region. In regions hosting a low number of marine mammal species the threshold to qualify as high diversity will be lower than in regions with a higher number of documented species.

The threshold number of species for the attribution of the D2 criterion in any particular region is based on the inventory of existing knowledge submitted by experts prior to a workshop region which provides information on the total number of species known from a region. The threshold is determined by the IMMA Secretariat in consultation with the review panel prior to each workshop. However, the minimum number of species necessary to qualify an area under the Diversity criterion globally has been set as 5; therefore, in regions that host a small number of marine mammal species (e.g., the Black Sea or the Caspian Sea), it will not be possible to apply the Diversity criterion.

Species used to satisfy the diversity criterion should occur regularly within the IMMA; those that occurred historically but no longer occur, vagrants, single species records, or strandings of species that normally occur in habitat outside the IMMA boundary should not be used to satisfy this criterion.

Species that trigger Criterion D2 become, by definition, Qualifying Species even if they support the identification of an IMMA on the basis of that criterion alone.

Examples of IMMAs that used criterion D2 include:

(1) Places where a large number of species are regularly present, including where certain physical structures are observed to attract important diversities of marine mammals e.g., seamounts in the Southeast Pacific (Kaschner, 2007; Kaschner et al., 2009), or steep bathymetry and high currents around Pemba Island in Tanzania (Braulik et al. 2017). The following are examples of IMMAs where this criterion is used.

- Hikurangi Trench IMMA (22 species), Berau and East Kutai District IMMA (25 species), Cook Islands Southern Group IMMA (15 species), and Greater Pemba Channel IMMA (13 species).

6. Boundary Delineation and Size of candidate IMMAs

Once an area has been successfully assessed against the IMMA selection criteria, the resulting cIMMA will require the clear delineation of a boundary. Scientific evidence, bathymetric maps, and other forms of qualifying information (e.g., density models, tracking plots, or habitat maps), will be necessary to determine where boundaries should be placed so that they are selected on the basis of robust biological, ecological and behavioural rationales. The process is typically iterative and should take note of the following recommended best practices.

Each candidate IMMA should include a description of the rationale used to determine the location of the boundary.

6.1 Size

There is no pre-defined limit for the minimum or maximum size for an IMMA. when in doubt and wherever possible, delineation should aim to develop area boundaries that are large enough to allow the improvement in the conservation status of the species or population described in the rationale for cIMMA identification, as well as encompassing the important habitat for the species listed.

6.2 Boundaries

- With respect to IMMA boundaries, delineations that are based on spatially fixed information (e.g. submerged banks, sea grass beds, continental slopes, seamounts, bathymetric contours or other fixed habitat features) and supported by data (i.e., species sighting data, tracking data etc), are considered to be most fit for purpose.

- Evidence that has been derived through analytical processes (i.e., modelled by experts) can be used to inform the setting of a boundary, but should, where possible, be supported by information on habitat features or environmental conditions. Furthermore, modelled outputs should be qualified by existing records (i.e., directly observed information) or ground-truthed, and not used speculatively to extrapolate to other areas.

- Habitat or environmental conditions that are not spatially stable or consistent (fronts, upwellings, productivity patches, or other aggregations of prey) may also be used for the delineation of an IMMA boundary, alongside direct observed or modelled evidence of the species considered in the IMMA rationale. However, it is advised that boundaries based on these features must be drawn using the average spatial extent of these features determined across a minimum of 5 years of assessment, with that data used being no older than 20 years.

- While expert knowledge can be used in the process of IMMA boundary delineation it should not be solely based on expert- knowledge.

The following list presents the options for delineating IMMA boundaries and the strength of those options. The boundaries of cIMMAs can be drawn using any of the below options, but the higher the option sits in the hierarchy, the more likely it is that the cIMMA will be approved for full IMMA status.

1	Strongest Rationale	features of habitat or environment that are spatially stable, supported by directly observed marine mammal data or evidence
2	Moderate Rationale	features of habitat or environment that are spatially stable, supported by modelled marine mammal data or evidence
3	Moderate Rationale	dynamic features of habitat or environment that are not spatially fixed, supported by directly observed marine mammal data or evidence
4	Weakest Rationale	dynamic features of habitat or environment that are not spatially fixed, supported by modelled marine mammal data or evidence

During the review process, cIMMA proposals that rely on information sources of lower confidence may be judged to require further information to support the proposed boundary.

A combination of categories of features may also be used for any given cIMMA, for example when the cIMMA has multiple species or qualifying criteria the information a joint rationale for a single boundary developed with the necessary supporting evidence.

6.3 Merging areas, discontinuous areas and buffers

Spatial buffers can be used to ensure an IMMA is of adequate size, either by providing a suitable sized bounding of a single area or by encompassing a number of discontinuous sites. At the same time, the inclusion of non-relevant land or water should be minimized. Additionally, although it can be made clear at which periods of time the species may be most prevalent within the IMMA (especially when meeting criteria focused on seasonal activities) the proposed area boundary should be spatially and temporally fixed. For examples of potential methods for delineating boundaries around varying evidence types see Figure 2.

In many cases, cIMMA identification will include different criteria and multiple species. Initial mapping based on available data may therefore produce multiple overlapping and incongruent polygons for one candidate IMMA. In these cases, it will be necessary to resolve a final boundary that adequately encompasses these areas. During this stage boundaries will be adjusted, and a final single boundary selected that encompasses the majority of the important habitat for each qualifying species with the potential to be managed for conservation purposes. For examples of approaches to create cIMMA boundaries for multiple species and data types see Figure 3.

In some instances, the most appropriate boundary that contains the relevant features of importance may comprise a number of disjunct or overlapping sites. In certain circumstances, where similar species/features meeting the same criteria overlap spatially, cIMMAs are likely to be merged to create coherent descriptions of areas of importance to these species. See **Annex 4** for an example of the decision-making process which could be used to assist if multiple spatially overlapping cIMMA could be merged into one or more cIMMA boundaries and submissions.

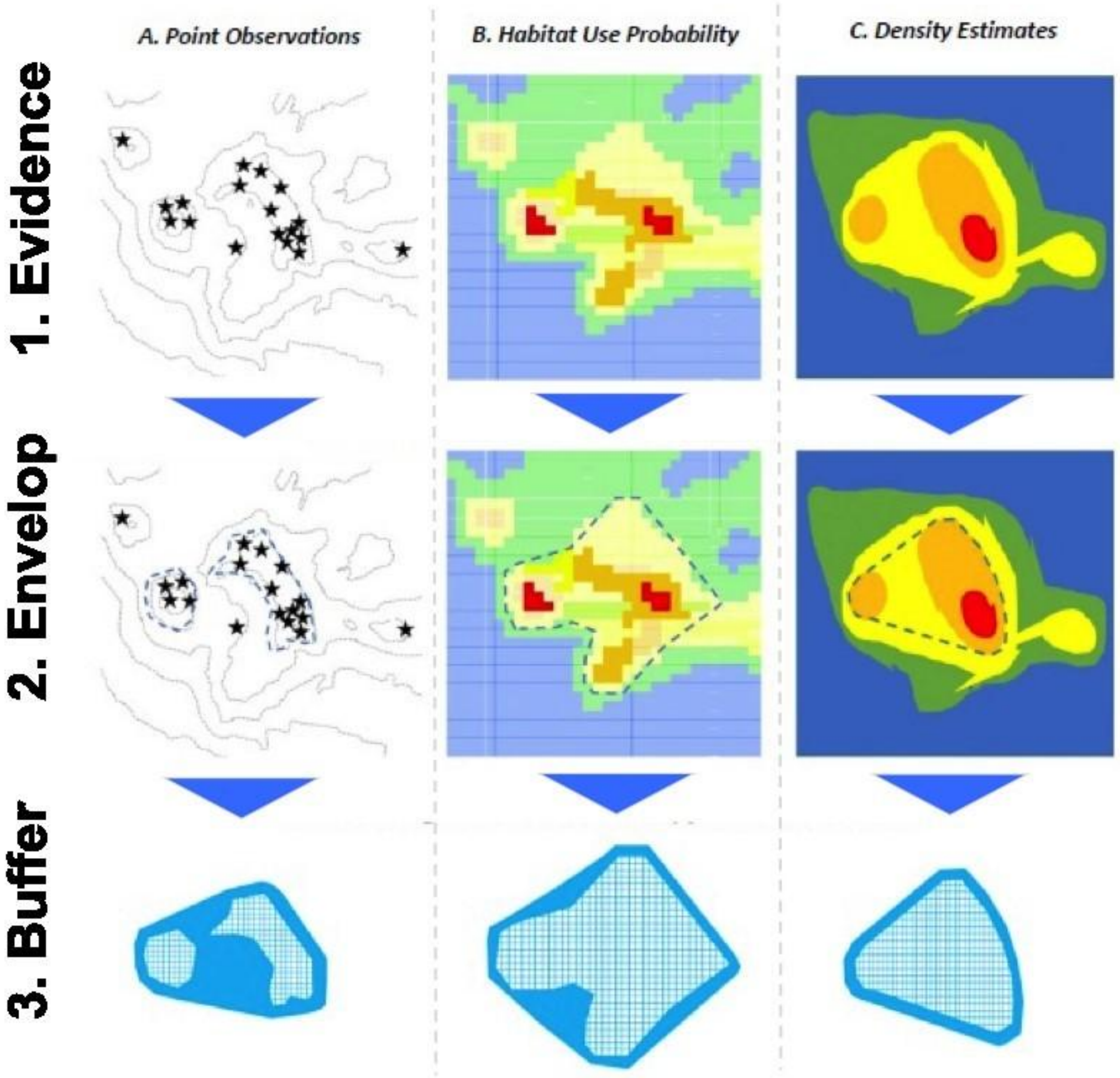

Figure 2. Examples of potential methods (A, B, C) and steps used for delineating boundaries around varying evidence types (1,2,3). These include **1. Evidence** and the use of A: point observations of a species which may not have supporting effort or habitat information associated with them; B. modelled habitat use probability predictions which may not have associated effort but consider a suite of supporting habitat information; and C: density surface estimates based on approaches utilising both search effort and supporting habitat information. **2. Envelop** depicts ways in which to optimally draw suitable envelops around the best supporting evidence available from each data type. These include A: the use of an appropriate bathymetric contour to encompass most observations; B: selection of an appropriate threshold of probability, which is clipped to exclude unnecessary outlying areas; and C: the selection of the minimum area containing the threshold density. **3. Buffer** provides best practice examples for delineating cIMMA boundaries around supporting evidence to a) ensure the areas include all important habitat and b) minimize the complexity of the resulting shape so that it can more easily be used in development of area-based management tools. In these cases, the main evidence area (blue hatch) and advised precautionary buffer (blue filled) across the areas are shown.

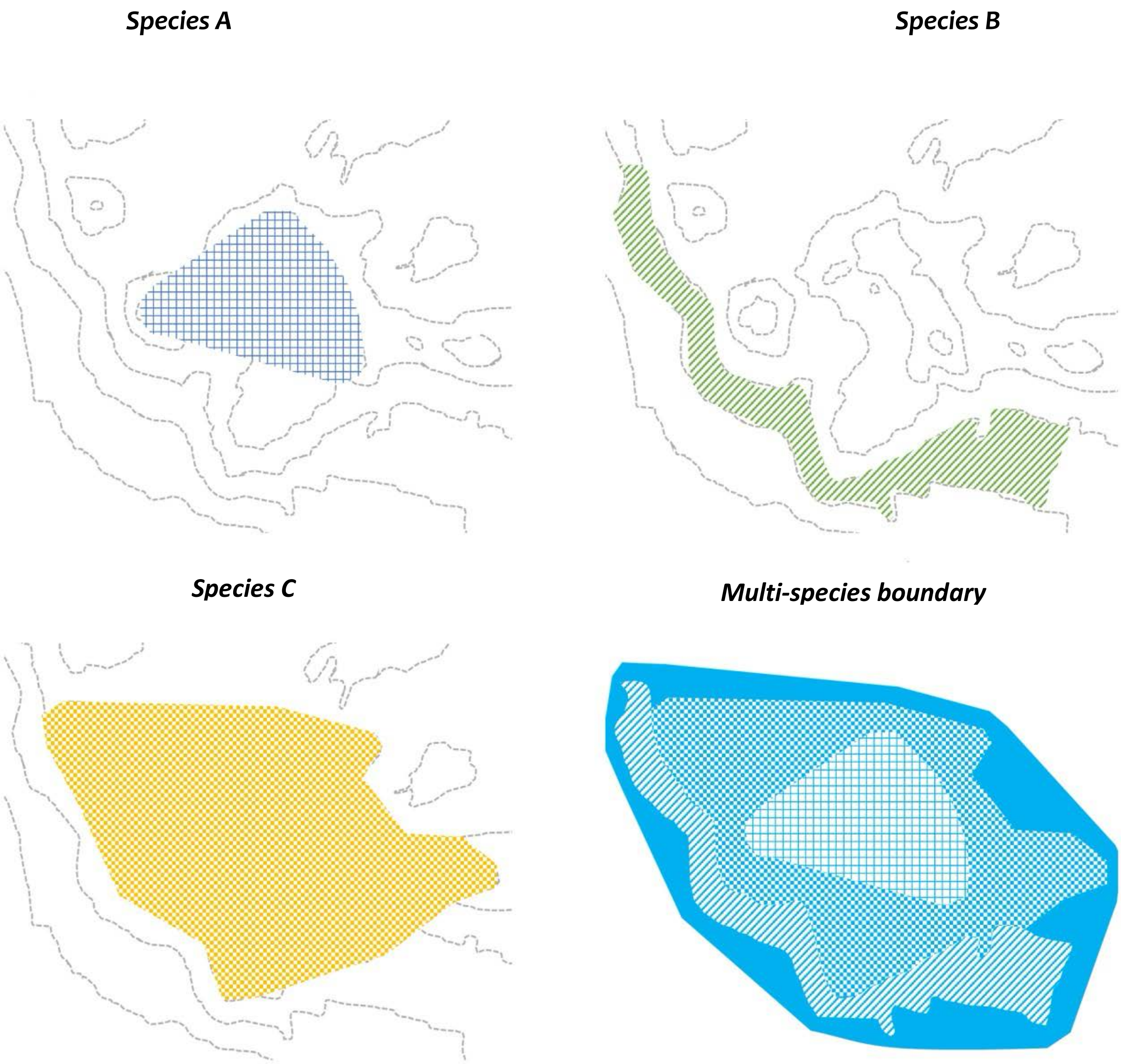

Figure 3. Potential approaches for the delineation of a cIMMA boundary for multiple species and types of evidence, including. **Species A** – boundary delineated using a species density model; **Species B** – boundary delineated using bathymetric contours containing sightings records of a species within its known area of habitat preference; and **Species C** – boundary delineated using a habitat suitability model of a threshold considered to contain that area of habitat which supports the use of the proposed IMMA criteria selected. In cases where these three cIMMA scenarios could be merged into a single cIMMA boundary submission (see **Annex 4**. for an example of a decision-making chart), an appropriately conceived **Multi-species boundary** can be used to delineate cIMMA boundaries around supporting evidence to: a) ensure the areas include all important habitat, and b) minimize the complexity of the resulting shape so that it can more easily be used in development of area-based management tools. In these cases, the main areas of evidence for each qualifying species (blue line, square and cross hatching) and advised precautionary buffer (blue filled) are shown.

6.4 Three-dimensional areas: Depth limits

Due to the 3-dimensional nature of the marine environment a final depth boundary of the cIMMA should be provided in the rationale of the chosen area. If precise information regarding the depth at which animals use the cIMMA habitat is not available a general indication of the broad bathymetric zones which are likely to be of relevance can be included in the rationale (see Figure 4 for a guide to suggested zones).

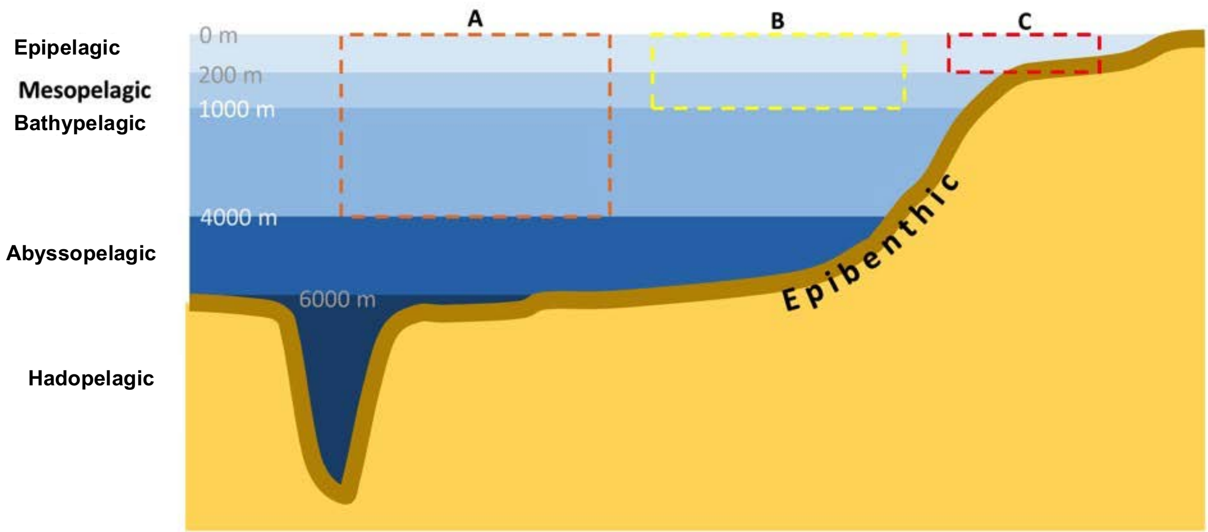

Figure 4. Example of bathymetric zones to be used in detailing the cIMMA depth boundary including **A.** cIMMA for a deep-diving species expected to utilise the 0 m-4000 m of the water column; **B.** cIMMA containing a diversity of near-surface and shallow-diving species observed to use the 0 m-1000 m of the water column; and **C.** cIMMA for a shelf restricted species known to utilise both the 0 m-200 m of the water column and the shelf Epibenthic zone (i.e., forage in sea bottom sediments).

6.5 Boundaries of seasonal or changing habitat

Stable boundaries are necessary for any IMMA to be effectively used to inform management. However, the delineation process can also take into consideration how future changes in the availability of evidence or the re-distribution of animals (which may occur over time for a variety of factors, including anthropogenic degradation and climate change) may alter habitat use. Such considerations are therefore needed when providing the reasoning for the selection of the boundary (both with respect to extent and reliability).

For example, when considering the boundaries of potentially important breeding habitat for ice-breeding Caspian Seals (see Caspian Seal Breeding Area IMMA), global heating combined with reducing water levels in the Caspian are causing breeding habitat to move. As a result, the IMMA boundaries were drawn to encompass a larger area that reasonably ensures that all important habitat is encompassed at present and ahead for the coming ten years. Where considerations like this apply, they should be included in the supporting cIMMA documentation, and will also be reviewed by the independent panel of reviewers and the IMMA Secretariat.

7. Scientific Evidence and Delineation

The following 'Primary' currencies of information are considered most suitable for use in the assessment of the selection criteria for the identification of IMMA:

P-I	abundance of animals
P-II	probability of occurrence
P-III	observed sightings /behaviour
P-IV	area of occupancy
P-V	extent of suitable
habitat P-VI	range

In addition, the following 'Secondary' currencies of information are also considered useful as supporting the identification of IMMA:

S-I	records of habitat use
S-II	measures of difference
S-III	indices of diversity

These common Primary and Secondary data types are highlighted to allow the consideration of a wide range of data and analytical approaches.

For more information on the types of data that can be used for IMMA identification see **Annex 5**.

8. IMMA Frequently Asked Questions (FAQ)

GENERAL QUESTIONS

Q. *What is the difference between an MPA and an IMMA?*
A. IMMAs are not MPAs. An IMMA is an area identified as important for a marine mammal population. The purpose of identifying IMMAs is to attract the attention of policy- and decision-makers to the opportunity or need to ensure the favourable conservation status of marine mammals in that specific area through the implementation of the most appropriate management measures, which can include an MPA designation. However, IMMAs per se are a knowledge product identified by science which is totally devoid of management implications.

Q. *Which marine mammal species are covered?*
A. All of the cetacean species comprising Cetartiodactyla; all species of Pinnipedia and Sirenia; and some species from the Mustelidae and Ursidae families, are considered for IMMAs. For a list of marine mammal species see the list compiled by the Committee on Taxonomy of the Society for Marine Mammalogy. This list is also what we use when considering species and common names

Q. *Can aquatic mammals living in non-marine environments also be included in an IMMA?*
A. All aquatic mammal species, including those living in brackish and fresh waters, such as rivers and lakes, are covered by IMMAs. Polar bears and marine otters are included in IMMAs, but freshwater otters are outside of the scope of this effort.

Q. *Is there a difference between global, regional and local IMMAs?*
A. No. Unlike Red List assessments, there is no geographic hierarchy of IMMAs. IMMAs are always identified on a regional basis, and accrue to the global repository as successive regional workshops produce results.

Q. *Are IMMAs competing with IUCN's KBAs as conservation tools?*
A. No. IMMAs are not identified based on quantitative thresholds like KBAs; generally, IMMAs are identified with qualitative criteria. However, IMMAs that can be identified using KBA criteria can become KBAs for marine mammals. A statement jointly signed by the IUCN Marine Mammal Protected Areas Task Force and the IUCN Biodiversity and Protected Areas Task Force provides the background for such integration of the two conservation tools.

Q. *How will IMMAs support CBD EBSAs?*
A. EBSAs that were identified during CBD-hosted workshops before 2016 were already relying on information about the presence of marine mammal habitat as supplied by the IUCN Marine Mammal Protected Areas Task Force. IMMAs provide a more structured means of supporting future CBD effort in the identification of new EBSAs.

IDENTIFYING IMMAS

Q. *What are the IMMA criteria?*
A. The IMMA criteria can be viewed online at www.marinemammalhabitat.org and they can be found in Section 5 of this document.

Q. *What is the process for IMMA identification?*
A. Anyone can propose a potential IMMA by nominating and gathering background scientific information to create and submit a preliminary Area of Interest (pAoI). The pAoI then go to the formal regional expert workshops for consideration and they may then become candidate IMMAs (cIMMAs). Some pAoI may not progress and remain as proposals. cIMMAs will then go to an independent review panel who will either accept it as an IMMA, or turn it down, in which case it may become an Area of Interest (AoI) that then goes on the IMMA e-Atlas.

Q. *How do you know where to place IMMA boundaries on a map?*
A. Boundary identification can be difficult. Experts for the relevant species and region are called upon to help identify boundaries based on distribution, genetics, acoustics and other lines of evidence. In some cases, oceanographic features and other hydrographic data can be used to help define a boundary. National or other legal designations are not considered when selecting IMMA boundaries.

Q. *What is the difference between 'preliminary Areas of Interest' (pAoI), 'candidate IMMAs' and IMMAs proper?*
A. Anyone can propose an area as a preliminary Area of Interest (pAoI). Sometimes existing MPAs, EBSAs, KBAs, BIAs or other spatial designations known to host marine mammals are also proposed as pAoI. All the pAoI then are assessed at the formal expert workshop for consideration where they may become candidate IMMAs (cIMMAs). Some will not proceed to be cIMMAs and may remain as AoI. cIMMAs will then go to an independent review panel that will either accept the cIMMA to become an IMMA, ask for major or minor revisions, or turn it down.

Q. *What is the difference between a pAoI and an AoI?*
A. The preliminary Areas of Interest, or pAoI, are proposed prior to a regional workshop for consideration as potential areas for candidate IMMAs. The pAoI that are able to satisfy one or more IMMA criteria, will become cIMMAs that then go to independent review after the workshop. A few pAoI that have little supporting scientific information may, by the decision of the workshop participants, remain as AoI and do not go for review. If a cIMMA is rejected by the reviewers due to insufficient information, it also may become an AoI, and along with those generated at the workshop will be shown on the e-Atlas. The hope is that by retaining these areas on the atlas it will spur more research so that they can resubmitted in the future.

Q. Can IMMAs be valid for a season only?
A. No. IMMAs are meant to identify the presence of marine mammal habitats, not necessarily the presence of marine mammals per se. If a marine mammal species is migratory, and leaves the area on a particular season, the area remains important because the habitat it delimits remains important.

Q. *Are IMMAs peer-reviewed?*
A. Yes. Candidate IMMAs (cIMMAs) proposed at a workshop are reviewed by an independent panel formed of species experts in the relevant IUCN specialist groups. The review panel assesses whether the cIMMAs have sufficient supporting evidence to satisfy the criteria.

Q. *What data are used to identify IMMAs?*
A. All available data on marine mammal distribution, behaviour, movements and habitat use are central to IMMA identification. Oceanographic and hydrographic data are also helpful in delineating suitable boundaries.

Q. *Once IMMAs are identified and published online, can they be changed?*
A. Yes. It is envisaged that IMMA identification will be an iterative process, e.g., it would be advantageous to revisit each region on a roughly decadal basis to review and evaluate each IMMA, adjust boundaries as needed as well as to add potential new IMMAs.

Q. *Why are some IMMAs small and others large?*
A. Some marine mammal populations are very localized while others are spread over great distances.

Q. *Can IMMAs be identified in the high seas?*
A. Yes. Marine mammals ignore human political boundaries, and many populations live in the high seas. Indeed, it is very important to be able to attract the decision-makers' attention to the presence of important marine mammal habitat in areas beyond national jurisdiction, particularly in

view of the agreement for the protection of high seas biodiversity currently negotiated within the United Nations framework.

Q. *How can new information on existing IMMAs be considered for inclusion and added to the database?*
A. New scientific information for existing IMMAs will be considered can be added only during a regional review. New IMMA information might lead to boundary changes or other changes in species and criteria and these can only be considered at formal regional workshops, and added to the database after approval by the independent Panel.

Q. *If data for a region is poor, how can we proceed with identifying IMMAs?*
A. In data poor regions, the assembled experts for that region will need to take difficult decisions on how and where to identify IMMAs. 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. The qualitative nature of the IMMA criteria allow for the identification of IMMAs even without extensive amounts of data, recognising that for marine mammals' extensive data is seldom available.

Q. *When will it be possible to adjust the borders of individual IMMAs based on new or additional data?*
A. Decisions on the adjustment of borders for individual IMMAs can be made only during the review process, although in situations with certain critically endangered species, a special review may be made, as determined the IUCN Marine Mammal Protected Areas Task Force.

Q. *I'm a marine mammal biologist with data. Can I nominate an IMMA in my study area? How can I help?*
A. Anyone can identify preliminary Areas of Interest (pAoI) to be submitted to the IMMA Secretariat of the Task Force and examined during a regional workshop, but only the regional workshops can identify cIMMAs on the basis of pAoI. Only after having been reviewed by the Panel can cIMMAs be considered IMMAs. The intention is to run regional workshops approximately every ten years.

Q. *I'm a student; how can I get involved in the Task Force and the IMMA work?*
A. As noted above, anyone can identify preliminary Areas of Interest (pAoI) to be submitted to a regional workshop. The success of your submission will depend on how well supported it is by the scientific data. To get involved in Task Force work, please contact the Task Force chairs.

USING THE IMMA KNOWLEDGE PRODUCT

Q. Do IMMAs have any legal standing?
A. No. An IMMA does not have legal standing per se. It only has legal standing if it is part of an MPA or other legal designation for that area.

Q. *How can information on individual IMMAs be accessed?*
A. The Task Force website marinemammalhabitat.org will hold the directory of existing IMMAs, along with maps that will be made public.

Q. *Is every IMMA a proposal for an MPA?*
A. No. Some IMMAs are already part of MPAs. Other IMMAs will never become MPAs. In some cases the IMMA designation will help support the creation of new MPAs.

Q. *How can IMMAs be used to inform the description of EBSAs under the CBD?*
A. IMMAs can support the CBD EBSA process as it contributes peer-reviewed spatial information on marine mammals relevant to the identification of EBSAs.

Q. *Can IMMAs become KBAs (IUCN's Key Biodiversity Areas)?*

A. Yes. IMMAs that can be identified based on quantitative criteria (thresholds) consistent with KBAs' criteria can also become KBAs.

Q*. Can IMMAs be used to inform bycatch management?*
A. Yes. IMMAs can highlight areas where certain marine mammal species are found, and this can be compared to data showing the location and extent of bycatch. The presence of an IMMA can shine a spotlight on the importance of the area therefore prioritising it for bycatch assessment or mitigation efforts.

Q*. How can IMMAs inform fisheries management?*
A. IMMAs include spatial data on where certain marine mammal species are found and this can be compared to data showing the location and extent of fishing operations, including catch data.

Q*. Should IMMAs become no-take zones for fisheries?*
A. No, not necessarily, but in some cases IMMAs may help to provide further evidence of areas that would benefit from no-take. It would be necessary to look not only at IMMAs but at other data sets to make a no-take zone proposal.

Q*. What is the ultimate goal for IMMAs over the next decade? In ideal world, how do you see them* developing and functioning in global marine conservation?
A. We hope that IMMAs, through the regional workshop process, will be able to serve as tools for conservation and monitoring (see for examples Agardy et al., 2019). This will happen through the existing channels of CBD EBSAs, IUCN KBAs, as well as various national and international (high seas) MPA processes. IMMAs will be valuable for marine spatial planning (MSP) which is used by many countries. IMMAs will also be valuable for monitoring the health of marine mammal populations in the face of ocean acidification, overfishing and climate change. We hope that national agencies will use the tool not only for the conservation of marine mammal species, but for the habitats for which they serve as umbrella species. Thus, IMMAs will be essential tools to help conserve biodiversity. With the current UN deliberations on the high seas, we hope that IMMAs will be able to step into a much wider role throughout the world ocean.

9. Concluding Remarks and Recommendations

IMMA classifications, and the information layers concerning an area's importance to marine mammals, are made available for use by various stakeholders engaged in marine mammal conservation as well for marine planning generally. Maps and descriptions of IMMAs and cIMMAs are circulated to national governments, regional agreements, policy makers and conservation management agencies, for their consideration in developing management measures. The ultimate goal, therefore, is to popularize the IMMA process and its outcomes and products (e.g., various information layers, the selection criteria, and resulting guidance documentation) and to integrate them, to the extent possible, into relevant global, regional and national planning processes.

IMMA classifications and their supporting evidence are also communicated publicly via an accessible and dedicated IMMA e-Atlas (www.marinemammalhabitat.org) whose purpose is consistent with the IBA global e-Atlas created by BirdLife International, the IUCN- WCPA Protected Planet web-viewer, and CBD EBSA online data-repository. IMMAs will be further supported by and contribute towards the global effort to identify KBAs, the results of which will be communicated through the alignment of IUCN knowledge products. Thus, IMMA information, as it is made available, can be used to assist with the: screening of potential operations; developing action plans to manage for biodiversity impacts; assessing risks associated with particular activities; and fulfilling duties on the reporting of state-level and corporate biodiversity performance.

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Annex 1: Alignment with other conservation prioritisation tools

As summarised in the background section of this document there are a number of conservation planning and prioritisation tools, both in use and being developed, which support and are supported by the IMMA classification. This Annex details where alignment of criteria occurs between the IMMA and the EBSA, BIA, CCH and KBA classifications.

Birdlife International Important Bird and Biodiversity Areas (IBAs)

Originally started in the 1980s, the IBA programme began a process of identifying and conserving a relatively modest network of sites (BirdLife International, 2010). This initiative allowed enhanced conservation measures to be implemented at these sites in a cost-effective way intended to ensure the survival of a large number of species. BirdLife partners have, to date, identified and documented around 12,000 sites in over 200 countries and territories worldwide, using data gathered locally and applying internationally and regionally agreed selection criteria consistently (BirdLife International, 2013). These IBAs provide the BirdLife Partnership with a focus for conservation action, planning, and advocacy. IBAs are intended to be large enough to safeguard a viable population of a species, group of species, or entire avian community during at least part of its life cycle, but small enough to be conserved in its entirety (BirdLife International, 2010). Until the IMMA was developed, no equivalent global initiative of site identification existed for marine mammals, although there were efforts through the International Committee on Marine Mammal Protected Areas (ICMMPA) to enhance knowledge and promote best practices with regard to spatial protection (Hoyt, 2015).

The Convention on Biological Diversity (CBD) Ecologically or Biologically Significant Areas (EBSAs)

The recommendations from the 14th meeting of the Subsidiary Body on Scientific and Technical and Technological Advice (SBSTTA) to the 10th CBD Conference of Parties requested an outline of a process for developing an inventory of EBSAs in the open oceans and deep seas (Ardron et al., 2009; Dunn et al., 2014). The identification of EBSAs in the open oceans and deep seas has followed a transparent process, leading to regional agreement on the proposed sites. EBSA descriptions can originate from a wide range of participants, and therefore repeatable procedures are necessary that can be implemented widely and are trusted by all relevant stakeholders (CBD, 2014a; CBD, 2014b). The EBSA process is iterative and dynamic, allowing for revision and improvement of proposals and proposed sites as new information becomes available. In areas of high-quality data and significant baseline research, the supporting documentation for a candidate EBSA may be well defined early in the process (Ardron et al., 2009; Dunn et al., 2014). In areas where baseline data are insufficient, further analyses may be required to define the ecological quality, geographic boundary and status of a proposed site. EBSAs may be proposed because they are considered valuable due to their contribution to one or more than one of the seven EBSA selection criteria. In the case where more than one criterion is relevant, multi-criterion assessment tools and methods will need to be used to evaluate these sites (Ardron et al., 2009). Also, while EBSAs may be described first at a national level, they must be evaluated within a regional context. These regional analyses necessarily require an assessment of the role of the EBSAs within the broader context of management networks, usually with several objectives and constraints (CBD, 2014a; CBD, 2014b).

International Union for the Conservation of Nature (IUCN) Standard for the identification of Key Biodiversity Areas (KBAs)

The Key Biodiversity Areas (KBA) concept extends the successful IBA approach to all taxonomic groups of living macro-organisms and aims to identify sites that contribute significantly to the global persistence of biodiversity in terrestrial, freshwater and marine environments. Over the past several years, the IUCN SSC-WCPA Joint Task Force on Biodiversity and Protected Areas has led the development of an IUCN standard for the identification of Key Biodiversity Areas, in response to a resolution passed by IUCN Members (WCC 3.013). The criteria in this standard were developed through a series of expert workshops in 2013 and 2014, and wider public online consultation (IUCN, 2016). The KBA criteria standard, unlike the EBSA process, use numerically driven thresholds to determine whether the features assessed within a site meet those determined as appropriate by experts across the range of marine and terrestrial taxa.

NOAA Biologically Important Areas (BIAs)

In the USA, the BIAs are a component of the NOAA CetMap programme that supplements the collation of quantitative information on cetacean density, distribution, and occurrence (Ferguson et al., 2015). This involved (1) identifying areas where cetacean species or populations are known to concentrate for specific categories (or types) of behaviour, or are range-limited, but for which the available data are insufficient for their importance to be reflected in the quantitative mapping effort; and (2) providing additional context within which to examine potential interactions between cetaceans and human activities. Such information can assist resource managers with planning, analyses, and decisions regarding how to reduce adverse impacts of human activities on cetaceans. Specifically, with regard to anthropogenic sound, there is compelling evidence that contextual factors, including behavioural state, can help determine the probability, nature, and extent of a marine mammal's response to anthropogenic noise (Ferguson et al., 2015). BIAs are intended to identify some of this contextual information on cetaceans and thus enable the augmentation of impact assessments that have previously been based solely on received sound levels. For the BIA programme of work, regional experts were asked to compile the best available information from scientific literature (including books, peer-reviewed articles, and government or contract reports), unpublished data (sighting, acoustic, tagging, genetic, photo identification), and expert knowledge to create written summaries and maps highlighting areas within the U.S. EEZ that are biologically important to cetacean species (or populations), either seasonally or year-round (Ferguson et al., 2015). Further information on the development and application of the BIA classification can be found in the BIA Special Issue of Aquatic Mammals by Van Parijs and colleagues (2015).

ACCOBAMS Cetacean Critical Habitat (CCH)

The ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area) is a cooperative tool for the conservation of marine biodiversity in the Mediterranean and Black Seas. Its purpose is to reduce threats to cetaceans in Mediterranean and Black Sea waters and improve our knowledge of these animals. ACCOBAMS is the first Agreement binding the countries in these two sub-regions and enabling them to work together on a matter of general interest. To assist in the meeting of ACCOBAMS objectives Resolution 3 (now 3.22) was passed on the need for criteria for the selection of protected areas in the region.

Underpinning this resolution on protected areas was the concept of Cetacean Critical Habitat (CCH). 'Critical habitat' is commonly referred to in the context of MPAs and refers to breeding areas, feeding areas, migratory corridors, etc. However, in the context of cetacean conservation and management in the Mediterranean it is important to incorporate the concept of actual and/or potential threats at the population level into consideration of 'critical'. Thus, the definition of what comprises 'critical habitat' and suitable candidates for MPAs is addressed on a case-by-case basis in the light of the available scientific knowledge. Spatial modelling approach is a powerful tool in this regard.

Criteria to identify sites containing ACCOBAMS CCH may include:

- Areas used by cetaceans for feeding, breeding, calving, nursing and social behaviour;
- Migration routes and corridors and related resting areas;
- Areas where there are seasonal concentrations of cetacean species;
- Areas of importance to cetacean prey; natural processes that support continued productivity of cetacean foraging species (upwellings, fronts, etc.);

• Topographic structures favourable for enhancing foraging opportunities for cetacean species (canyons, seamounts).

These criteria can be applied for the identification of sites containing cetacean critical habitats, in need of protection due to the occurrence of significant interactions between cetaceans and human activities, where:

- Conflicts between cetaceans and fishing activities have been reported;
- Significant or frequent bycatch of cetaceans is reported;
- Intensive whale watching or other marine tourism activities occur;
- Navigation presents a potential threat to cetaceans;
- Pollution runoff, outflow or other marine dumping occur;
- Military exercises are known to routinely occur.

In every one of the above cases ACCOBAMS advises careful consideration of whether the threat can be the focus of regulatory action that is generic, or whether MPA creation taken as the next appropriate step from CCH classification would provide necessary added conservation value.

Convention on Wetland Areas of International Importance (Ramsar)

The IMMA selection criteria have also been compared against the Convention on Wetlands (Ramsar) criteria for the identification of Ramsar Sites for the conservation of wetlands of international importance (http://www.ramsar.org). Existing Ramsar sites, listed species, habitats and conditions that potentially meet the IMMA selection criteria have been explored. There is an apparent alignment (in both purpose and utility) between the IMMA and Ramsar Site selection criteria. Species occurring within inland 'non-marine' (often freshwater-dominated) systems are likely to be considered separately within a parallel expert-based process, within the Task Force's programme of work, possibly in conjunction or alignment with the Ramsar Sites and/or KBA processes.

For additional information on the comparison of the IMMA and Ramsar identification criteria please see the results of the expert led IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force Important Marine Mammal Areas (IMMAs) in Freshwater Environments Workshop Summary Report (IUCN Marine Mammal Protected Areas Task Force, 2017) which is available for download from the Task Force website at www.marinemammalhabitat.org/download/important-marine-mammal-areas- immas-freshwater-environments

Alignment of IMMA criteria to other conservation tools is examined below, on a criterion-by-criterion basis.

Criterion A: Species or Population Vulnerability

Comparable to EBSA Criterion III on 'Importance for threatened, endangered or declining species and/or habitats' (CBD, 2008). EBSA Criterion III includes any area containing habitat for the survival and recovery of endangered, threatened or declining species and areas with significant assemblages of such species. This criterion also aligns with KBA sub-criterion A1: Threatened Taxa (IUCN, 2016). However, there are differences in eligible trigger species. Taxa that are proposed to trigger KBA sub-criterion A1 encompass species assessed as globally Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) on The IUCN Red List of Threatened Species, or species assessed as regionally/nationally threatened using the Guidelines for Application of IUCN Red List Criteria at Regional and National Levels that both (a) have not been assessed globally and (b) are endemic to the region/country in question.

Sub-criterion B1: Small and Resident Populations

Corresponding to EBSA Criteria IV on 'Vulnerability, Fragility, Sensitivity, or Slow Recovery' and I on 'Uniqueness or rarity' (CBD, 2008) and NOAA BIA Criterion IV on 'Small and Resident Populations' (Ferguson et al., 2015). EBSA Criterion IV includes areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile or would be slow to recover (CBD, 2008). EBSA Criterion I is defined as: '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' (CBD, 2008). NOAA BIA Criterion IV includes areas and months within which small and resident populations occupy a limited geographical extent. This sub-criterion further aligns with the KBA sub-criterion B1: Individual Geographically Restricted Species (IUCN, 2016).

Sub-criterion B2: Aggregations

Comparable to EBSA Criteria II and V (CBD, 2008). EBSA Criterion II, special importance for life-history stages of species, includes, 'Areas that are required for a population to survive and thrive' (ibid.). Criterion V, 'Biological productivity', includes any area containing species, populations or communities with comparatively higher natural biological productivity. This sub-criterion also aligns with KBA sub-criterion D1: Demographic aggregations (IUCN, 2016).

Sub-criterion C1: Reproductive Areas

Comparable to EBSA Criterion II on Special importance for life-history stages of species (CBD, 2008) and NOAA BIA Criterion I on Reproductive Areas (Ferguson et al., 2015). EBSA Criterion II includes areas that are required for a population to survive and thrive. NOAA BIA Criterion I includes areas and months within which a particular species or population mates, gives birth, or is found with neonates or other sensitive age classes. This sub-criterion also aligns with KBA sub-criterion D1: Demographic Aggregations (IUCN, 2016).

Sub-criterion C2: Feeding Areas

Comparable to EBSA Criterion II on Special importance for life-history stages of species (CBD, 2008) and NOAA BIA Criterion I on Feeding Areas (Ferguson et al., 2015). EBSA Criterion II includes any areas that are required for a population to survive and thrive. NOAA BIA Criterion I includes those areas and months within which a particular species or population selectively feeds. These may be either found consistently in space and time, or associated with ephemeral features that are not entirely predictable but can be delineated and are generally located within a larger identifiable area. This sub-criterion also aligns with KBA sub-criterion D1: Demographic Aggregations (IUCN, 2016).

Sub-criterion C3: Migration Routes

Comparable to EBSA Criterion II on Special Importance for life-history stages of species (CBD, 2008) and NOAA BIA Criterion I on Migration Corridors (Ferguson et al., 2015), and help to add further consideration to specific areas of heightened importance to marine mammals not covered by these other parallel classifications. EBSA Criterion II includes any areas that are required for a population to survive and thrive. NOAA BIA Criterion I includes areas and months within which a substantial portion of a species or population is known to migrate; the corridor is typically delimited on one or both sides by land or ice. This sub-criterion also aligns with KBA sub- criterion D1: Demographic Aggregations except in the instances where migration corridors may be of a large size, such as that of the scale of a seascape (IUCN, 2016).

Sub-criterion D1: Distinctiveness

Comparable to EBSA Criterion I on Uniqueness or Rarity (CBD, 2008), and help to add further consideration to specific areas of heightened importance to marine mammals not covered already by this parallel EBSA criterion. As noted above, EBSA Criterion I include an area that 'contains either (i) unique ('the only one of its kind'), rare (occurs only in a 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' (CBD, 2008). Although there is no direct analogue for this sub-criterion in the emerging IUCN KBA Standard, sites holding genetically distinct populations of a non-threatened species may qualify under KBA sub-criterion B1: Individual Geographically Restricted Species (IUCN, 2016).

Sub-criterion D2: Diversity

Comparable to EBSA Criterion VI on Biological Diversity (CBD, 2008). EBSA Criterion VI includes any area which contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity. There is no criterion for species diversity in the KBA Standard. There is some degree of alignment with KBA sub-criterion B3: Geographically restricted assemblages (IUCN, 2016). Sites holding intact species assemblages may qualify under KBA criterion C: Ecological Integrity (IUCN, 2016). These are sites that maintain their full complement of species in their natural abundances or biomass, support the ability of populations to engage in natural movements, and allow for the unimpeded functioning of ecological processes.

Table A1.1. IMMA criteria alignment to parallel conservation criteria from the CBD EBSAs, NOAA BIAs, the IUCN Standard for KBAs, and ACCOBAMS CCH.

IMMA Criteria	EBSA Criteria	BIA Criteria	KBA Criteria	CCH Criteria
A: Species or Population Vulnerability *Areas containing habitat important for the survival and recovery of threatened and declining species or population.*	**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.*		**Sub-criterion A1: Threatened Taxa** *Site regularly holds ≥95% of the global population of a globally Critically Endangered (CR) or an Endangered (EN) taxon; OR ≥0.5% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon; OR ≥1% of the global population AND ≥10 functional reproductive units of a globally Vulnerable (VU) taxon; OR ≥0.1% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of sub-criteria A1, A2, or A4; OR ≥0.2% of the global population AND ≥10 functional reproductive units of a globally VU taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of sub- criteria A1, A2, or A4.*	
B: Distribution and Abundance **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.*	**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 slow recovery degradation or depletion by human activity or by natural events) or with slow recovery.* **Uniqueness or Rarity** *Area contains either unique, or endemic species, populations or communities, and/or unique, rare or distinct, habitats or ecosystems;…*	**Small and Resident Population** *Areas and months within which small and resident populations occupying a limited geographic extent exist.*	**Sub-criterion B1: Individual geographically restricted species** *Site regularly holds ≥10% of the global population and ≥10 functional reproductive units of a species.*	

	… and/or unique or unusual geomorphological or oceanographic features.			
Sub-criterion B2: Aggregations *Areas with underlying qualities that support important concentrations of a species or population.*	**Biological Productivity** *Area containing species, populations or communities with comparatively higher natural biological productivity.* **Special importance for life-history stages of species** *Areas that are required for a population to survive and thrive.*		**Sub-criterion D1: Demographic Aggregations** *Site predictably holds an aggregation representing ≥1% of the global population of a species during one or more, but not all, key stages of its life cycle.*	**Criterion C:** *Areas where there are seasonal concentrations of cetacean species.*
C: Key Life Cycle Activities **Sub-criterion C1: Reproductive Areas** *Reproductive areas and conditions that are important for a species or population to mate, give birth, and/or care for young until weaning.*	**Special importance for life-history stages of species** *Areas that are required for a population to survive and thrive.*	**Reproductive Areas** *Areas and months within which a particular species or population selectively mates, gives birth, or is found with neonates or other sensitive age classes.*	**Sub-criterion D1: Demographic Aggregations** *Site predictably holds an aggregation representing ≥1% of the global population of a species during one or more, but not all, key stages of its life cycle.*	**Criterion A:** *Areas used by cetaceans for feeding, breeding, calving, nursing and social behavior.*
Sub-criterion C2: Feeding Areas *Areas and conditions that provide an important nutritional base on which a species or population depends.*	**Special importance for life-history stages of species** *Areas that are required for a population to survive and thrive.*	**Feeding Areas** *Areas and months within which a particular species or population selectively feeds.* *These may either be found consistently in space and time, or may be associated with ephemeral features that are less predictable but can be delineated and are generally located within a larger identifiable area.*	**Sub-criterion D1: Demographic Aggregations** *Site predictably holds an aggregation representing ≥1% of the global population of a species during one or more, but not all, key stages of its life cycle.*	**Criterion A:** *Areas used by cetaceans for feeding, breeding, calving, nursing and social behaviour.* **Criterion D:** *Areas of importance to cetacean prey.* **Criterion E:** *Natural processes that support continued productivity of cetacean foraging species (upwelling, fronts, etc.).*

				Criterion F: *Topographic structures favourable for enhancing foraging opportunities for cetacean species (canyons, seamounts).*
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.*	**Special importance for life-history stages of species** *Areas that are required for a population to survive and thrive.*	**Migration Corridors** *Areas and months within which a substantial portion of a species or population is known to migrate; the corridor is typically delimited on one or both sides by land or ice.*	**Sub-criterion D1: Demographic Aggregations** *Site predictably holds an aggregation representing ≥1% of the global population of a species during one or more, but not all, key stages of its life cycle.*	**Criterion B:** *Migration routes and corridors and related resting areas;*
D: Special Attributes **Sub-criterion D1: Distinctiveness** *Areas which sustain populations with important genetic, behavioural or ecologically distinctive characteristics.*	**Uniqueness or Rarity** *Area contains either unique, or endemic species, populations or communities, and/or unique, rare or distinct, habitats or ecosystems; and/or unique or unusual geomorphological or oceanographic features.*		**Sub-criterion B1: Individual geographically restricted species** *Site regularly holds ≥10% of the global population and ≥10 functional reproductive units of a species.*	
Sub-criterion D2: Diversity *Areas containing habitat that supports an important diversity of species.*	**Biological Diversity** *Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.*		**Sub-criterion B3: Geographically restricted assemblages** *Site regularly holds globally the most important 5% of occupied habitat for each of ≥5 species within a taxonomic group; OR ≥0.5% of the global population of each of a number of species in a taxonomic group restricted to an ecoregion, determined as either ≥5 species or 10% of the species restricted to the ecoregion, whichever is larger; OR ≥5 biome-restricted species…*	

			… or 30% of the biome-restricted species known from the country, whichever is larger. **C. Ecological Integrity** *Site is one of ≤2 per ecoregion characterized by wholly intact species assemblages, comprising the composition and abundance of native species and their interactions.*	

Annex 2: IMMA Criteria and Guiding Examples

The following information describes the list of IMMA Criteria and the original likely qualifying scenarios (with key examples from the literature) which can guide those preparing future candidate IMMA submissions (see **Table A2.1**). Since 2016 seven successful regional expert identification workshops have been held and the results of these made available on the IMMA e-Atlas (www.marinemammalhabitat.org/imma-eatlas/) – however for convenience the Task Force has presented four IMMA Case Studies in this Annex for a range of qualifying species and criteria used to achieve IMMA status within the global IMMA repository.

Table A2.1. Summarising the IMMA criteria, likely qualifying scenarios and key examples that could meet the criteria statements of requirement.

IMMA Criterion	Qualifying Scenarios	IMMA Examples
A: Species or Population Vulnerability *Areas containing habitat important for the survival and recovery of threatened and declining species or population.*	*(1) Species or populations listed internationally as CR/EN/VU status under the IUCN Red List.* *(2) Nationally or regionally listed species or populations under non-Red List authorities.*	• Bazaruto Archipelago to Inhambane Bay IMMA, Southern Shelf Waters and Reef Edge of Palau IMMA, and the Mersing Archipelago IMMA: habitat for the dugong VU on the Red List. • Akamas and Chrysochou Bay IMMA, Akrotiri IMMA and Chios and Turkish coast IMMAs that provide caves for EN Mediterranean monk seals. • Caspian Seal Breeding Area IMMA and Caspian Seal Transitory Migration and Feeding Area IMMA for the EN Caspian seal. • Important habitat for coastal dolphins/porpoises listed as threatened on the IUCN Red List e.g. Indus estuary and creeks IMMA (habitat for Indian Ocean humpback dolphin listed as EN, and finless porpoise listed as VU), Chilika Lagoon IMMA (habitat for Irrawaddy dolphins listed as EN), Moreton Bay IMMA (habitat for Australian humpback dolphin and dugong VU on the Red List). • Samoan Archipelago IMMA and Society Archipelago IMMAs both include important seasonal habitat for the Oceania subpopulation of humpback whales listed as EN on the IUCN Red List. • the submerged Dogger Bank for North Sea harbour porpoises (OSPAR, 2009); deep-water canyons for the Scotian Shelf northern bottlenose whales listed as Endangered (DFO, 2009).
B1: Small and Resident Populations *Areas supporting at least one resident population, containing an important proportion of that species or population, that are occupied consistently*	*(1) An entire species or subspecies inhabiting a discrete area.* *(2) One of the very few sites globally where the species or subspecies occurs.* *(3) Discrete areas occupied year-round by a large proportion of a species.* *(4) Instances where a population is so small that a single event in a part of its distribution could jeopardize the population's survival.*	• Heard Island, Kerguelen and surrounding waters IMMA for Kerguelen Islands Commerson's dolphins (*Cephalorhynchus commersonii kerguelenensis*); • Central West Coast, North Island, IMMA for Māui dolphins (*Cephalorhynchus hectori maui*); • Madeira and Desertas Islands IMMA with caves for Mediterranean monk seals • Main Hawaiian Archipelago IMMA with resident populations of many cetacean species. • Southern Egyptian Red Sea Bays, Offshore Reefs and Islands IMMA with resident Risso's dolphin, spinner dolphin and Indo-Pacific bottlenose dolphins. • Ionian Archipelago IMMA and Gulf of Ambracia IMMA both with small resident and declining populations of Mediterranean common dolphins. • Other potential applications: various 'transient' killer whale populations (de Bruyn et al., 2013), vaquitas in the Gulf of California (Rojas-Bracho and Reeves, 2013); Galápagos fur seals and sea lions (Wolf et al., 2008); Juan Fernández and Guadalupe fur seals (Acuña and Francis, 1995); Saimaa and Ladoga seals (Trukanova, 2013).
B2: Aggregations *Areas with underlying qualities that support important concentrations of a species or population.*	*(1) An important proportion of the individuals of a species or population regularly congregate in a specific area during a portion of the year.* *(2) Individuals of one or more species or populations occur in the same area in observed densities of potential global importance.* *(3) Aggregations observed in multiple years, either consecutively or episodically due to climatic or oceanic 'anomalies'. Marine mammals occur regularly and are concentrated to an extent that a single large-scale event could significantly alter the long-term survival of a species or population.*	• Aggregations of southern right whales in waters off Tasmania in the Southeastern Australian and Tasmanian Shelf waters IMMA • Alboran Deep IMMA with important aggregations of Cuvier's beaked whales, Risso's dolphins and Pilot whales and the Western Ligurian Sea and Genoa Canyon IMMA important for Cuvier's beaked whales. • Western Antarctic Peninsula IMMA with important aggregations of humpback whales, fin whales, killer whales, Antarctic fur seal, leopard seal, crabeater seal and Weddell seal. • Irrawaddy dolphin and Australian humpback dolphin aggregations in the Kikori Delta IMMA. • Savu sea and surrounding areas IMMA and the Dhofar IMMA where seasonal upwelling provides important habitat for aggregating sperm whales and pygmy blue whales (*Balaenoptera musculus brevicauda*), *and* Arabian sea humpback whales, respectively. • Common dolphins in the Gulf of Corinth IMMA

		• Caspian seals in the Caspian Seal Moulting and Haul-Out Areas IMMA. • Other examples of species that may satisfy this criteria include: right whales in Cape Cod Bay (Nichols et al., 2008), gray whales off north- eastern Sakhalin Island, Russia (Bradford et al., 2008) and North Atlantic right whales in Massachusetts Bay and eastern Cape Cod Bay (Nichols et al., 2008).
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.*	*(1) Haul-out sites used by one or more pinniped populations for giving birth, nursing young and/or mating.* *(2) Specific sites or systems with favourable conditions for giving birth and caring for young immediately after birth.*	• Cabo Blanco IMMA for breeding Mediterranean monk seals. • South Australian Gulfs and Adjacent Waters IMMA for breeding Australia sea lions. • Gough Island and Adjacent Waters IMMA for breeding Subantarctic fur seal and southern elephant seals. • Central and Western Torres Strait IMMA an important breeding area for dugongs. • Geographe Bay to Eucla Shelf and Coastal Waters IMMA and Cape Coastal Waters IMMA both important calving grounds for southern right whales. • Mozambique Coastal Breeding Grounds IMMA and Southern Great Barrier Reef Lagoon and Coast IMMA important calving grounds for humpback whales. • Muscat Coastal Waters and Offshore Canyons IMMA important habitat for breeding spinner dolphins, common bottlenose dolphins, and Long-beaked common dolphins (*Delphinus delphis capensis*)
C2: Feeding Areas *Areas and conditions that provide an important nutritional base on which a species or population depends.*	*(1) Oceanic features that drive processes supporting important biological productivity.* *(2) Bathymetric features and the hydrodynamic processes around them which often act to concentrate prey for marine mammals.* *(3) River mouths and larger estuarine habitats promoting the stable presence of prey aggregations.* *(4) Where seal colonies are located and animals feed in the oceans surrounding the central colony*	• Macquarie Island and Ridge IMMA where large populations of seals and sea lions provide a source of food annually for killer whales. • Gulf of Masirah and Offshore Waters IMMA, where seasonal upwelling provides food for humpback whales. • Feeding grounds for sperm whales in the complex bathymetry of the Wakatobi and Adjacent Waters IMMA and the Albany Canyon IMMA. • Southwest to Eastern Sri Lanka IMMA which has steep bathymetry and productive waters that are feeding grounds for sperm whales and blue whales. • Berau and East Kutai District IMMA – feeding grounds throughout the year in an estuary used by Indo-Pacific humpback dolphins. • Kikori Delta IMMA – feeding grounds throughout the year in an estuary used by Australian humpback dolphins and snubfin dolphins. • Aldabra Atoll IMMA, Moreton Bay IMMA, and Farasan Archipelago IMMA – all feeding grounds for dugong with large sea grass beds. • New Zealand Subantarctic Islands IMMA where New Zealand sea lion and New Zealand fur seals forage. • Other examples include: Upwellings in Humboldt Current System off Chile and Peru (Molina-Schiller et al., 2005); in the Gulf of St. Lawrence near the mouth of Saguenay Fiord, Canada (Lavoie et al., 2000); Mexico's Gulf of California (Barlow and Forney, 2007); frontal systems such as the Sub-tropical Convergence off southern Africa (Best and Shell, 1996) and the Sub- Antarctic Front and the Antarctic Polar Front (Bost et al., 2009); shelf breaks around the Grand Banks of Newfoundland (Fuller and Myers, 2004); Hanna Shoal Seamount Alaska (Jay et al., 2012); Coral atolls and submerged banks such as the Saya de Malha in the southwest Indian Ocean (Hilbertz et al., 2002;; warm water plumes (Kudela et al., 2010); glacial meltwater (Goetz et al., 2012; Lydersen et al., 2014).

C3: Migration Routes *Areas used for important migration or other movements, often connecting distinct reproductive and feeding areas or connecting different parts of the year-round range of a non-migratory population.*	*(1) Areas used for (annual) migrations of marine mammals which may be associated with fixed submarine features.* *(2) Coastal movement zones and corridors.* *(3) Straits which often act as major thoroughfares for marine mammals.* *(4) Passages through archipelagos which are critical to the movements of long-distance migrations and for non-migratory species that must undertake more local movements.*	Places that are used for (annual) migrations of marine mammals. Such areas may be associated with fixed submarine features such as mid-ocean rises, ridges or shelf edges, for example those used by migrating fin (Silva et al., 2013), sei (Prieto et al., 2014) and common minke whales (Víkingsson and Heide-Jørgensen, 2015) in the North Atlantic. • Mascarene Islands and Associated Ocean Features IMMA – migratory route and sea mounts used by humpback whales and sperm whales Places where coastal corridors are used, for example, by grey whales in North America and Russia (Mate et al., 2015), and North Atlantic right whales along the eastern United States (Gowan and Ortega-Ortiz, 2014); • Western Australian Humpback Whale Migration Route IMMA, Eastern Indian Ocean Blue Whale Migratory Route IMMA and Southeast African Coastal Migration Corridor IMMA. Places where straits, act as major thoroughfares for marine mammals, for example, such as the Bering Strait for bowhead whales and many other Arctic and increasingly sub- Arctic/temperate region marine mammals (Citta et al., 2012; Clarke et al., 2013). • Tanon Strait IMMA used by spinner dolphins moving between feeding and resting areas • Savu Sea and Surrounding Areas IMMA where blue whales move between north-west Australia and Banda-Seram Seas. • Alborán Straits IMMA migratory corridor connecting fin whales and sperm whales in the northern Alborán Sea and Strait of Gibraltar. Places where islands/archipelagos act as resting spots or stopovers for marine mammal populations undertaking long migrations over open ocean, such as the Aleutian Islands in the North Pacific (Zerbini et al., 2006) which are critical to the movements of long-distance migrating species such as humpback whales (Kennedy et al., 2014) and gray whales (Mate et al., 2015). • E.g. Cook Islands Southern Group IMMA stopover for migrating humpback whales in the Pacific.
D1: Distinctiveness *Areas which sustain populations with important genetic, behavioural or ecologically distinctive characteristics.*	*(1) Populations are genetically and demographically isolated from other populations of the species but have not been described or recognized as sub-species.* *(2) Populations exhibit behaviour (social, foraging, resting, etc.) or other features suggestive of local adaptation.*	• Sea of Azov IMMA with morphologically distinct Black sea harbour porpoises. • Karadag and Opus IMMA where Black sea bottlenose dolphins show distinct piebald colouring. • Hellenic Trench IMMA with genetically and culturally distinct fin whales and Cuvier's beaked whales. • South Georgia IMMA the only known place that Weddell seals breed on land • Marquesas Archipelago IMMA unusual coastal distribution of the usually pelagic melon-headed whale • Other potential examples include: Killer whale eco-types (de Bruyn et al., 2013); common bottlenose dolphins in South Carolina and Georgia, USA (Duffy-Echevarria et al., 2008), killer whale populations in Patagonia, Argentina (Vila et al., 2008) or rub on rocky beaches in British Columbia, Canada (Williams et al., 2006).

D2: Diversity *Areas containing habitat that supports an important diversity of species.*	*(1) The species present represent the full richness of marine mammal species diversity in the wider region.* *(2) Where certain physical structures are observed to attract important diversities of marine mammals in high seas environments.*	Places where a large number of species are regularly present, including where certain physical structures are observed to attract important diversities of marine mammals e.g., seamounts in the Southeast Pacific (Kaschner, 2007; Kaschner et al., 2009), or steep bathymetry and high currents around Pemba Island in Tanzania (Braulik et al. 2017). The follow are examples of IMMAs where this criterion is used. • Hikurangi Trench IMMA (22 species), • Berau and East Kutai District IMMA (25 species), • Cook Islands Southern Group IMMA (15 species), and • Greater Pemba Channel IMMA (13 species).

Example IMMA Brochure Entry

[Kikori Delta IMMA](#)

Kikori Delta IMMA

Area Size

2,032 km²

Qualifying Species and Criteria

Australian snubfin dolphin – *Orcaella heinsohni*

Criteria A, B1, B2, C1, C2

Australian humpback dolphin – *Sousa sahulensis*

Criteria A, B1, B2, C1, C2

Marine Mammal Diversity

Tursiops aduncus, Dugong dugon, Orcaella heinsohni, Sousa sahulensis

Summary

The Kikori Delta IMMA is located in the Gulf Province of Southern Papua New Guinea. It is recognised as one of the most important areas of forest and wetland/riverine biodiversity in the Asia/Pacific region and has been nominated as a UNESCO World Heritage Site because of its cultural and biodiversity value. There are small, resident populations of two inshore dolphin species (Australian snubfin and Australian humpback dolphins) within the IMMA. The boundary selection of the Kikori Delta IMMA is based on the core area of resident dolphin sightings obtained during four comprehensive surveys in the region since 1999. Surveys also recorded the Indo-Pacific bottlenose dolphin and the dugong in the Delta region.

Description

The Kikori Delta is located in Gulf Province, Southern Papua New Guinea. The region is renowned for its biodiversity and ecological significance, with extensive mangrove, forest, wetland and delta habitats (WWF, 2015). Marine mammal species known to inhabit the Kikori Delta are the Near Threatened Australian snubfin dolphin, *Orcaella heinsohni* and Australian humpback dolphin, *Sousa sahulensis* (hereafter referred to as snubfin and humpback dolphins, respectively), Near Threatened Indo-pacific bottlenose dolphin, *Tursiops aduncus*, and Vulnerable dugong, *Dugong dugon*. Additional marine megafauna species known to regularly inhabit the Kikori Delta are the Vulnerable riverine pig-nosed turtle, *Carettochelys insculpta*, Endangered speartooth shark, *Glyphis glyphis* and Critically Endangered largetooth sawfish, *Pristis pristis* (Kyne et al., 2013; Compagno et al., 2009; Asian Turtle Trade Working Group, 2000).

The Kikori Delta holds the northern-most snubfin dolphin population. There have been no other confirmed reports of humpback or snubfin dolphins from any other locations in Papua New Guinea, the Pacific Islands, or adjacent waters of Torres Strait in Northern Australia (Beasley et al., 2016; Department of Environment, 2013). Snubfin and humpback dolphins are known to occur throughout northern Australia, from the Fitzroy River on the East coast to Roebuck Bay on the West coast (Department of Environment, 2013). Humpback dolphins are known to occur in some areas along the Indonesian Provinces of Papua and West Papua (western New Guinea), although distribution and abundance remains unknown (Beasley et al., 2016).

Criterion A: Species or Population Vulnerability

Australian snubfin (Fig. 1) and humpback dolphins (Fig. 3) are listed as Vulnerable on the IUCN Red List. Snubfin and humpback dolphins in the Kikori Delta are thought to be declining due to bycatch in

Figure 1: Australian snubfin dolphins surfacing in the IMMA. Photo: Isabel Beasley

subsistence fisheries, and possibly due to increasing levels of direct catch. There are strong indications based on interview surveys that inshore dolphin extent of occurrence in the Kikori Delta has declined. Many respondents to standardised interviews reported that prior to gillnets being introduced to the delta (in the 1960s), inshore 'dolphins' (species unknown) could be sighted swimming in front of Kikori Township (approx. 50km upstream from the coastal headlands) (Beasley et al., 2011). No dolphins are now sighted in front of Kikori Township, and the maximum distance dolphins are now reported upstream is 30 km from coastal headlands.

Bycatch in subsistence fisheries appears to be a problem for inshore dolphins in the Kikori Delta. Data is admittedly limited, yet it appears that mortality levels may be unsustainable. As an example, during nine days of surveys during 2015, one humpback dolphin and four snubfin dolphin carcasses were recovered that had recently (i.e. within 1-10 days) been bycaught in fishing gear (Beasley et al., 2015). One large-mesh sized gillnet set around a headland at Gaorabari Island had three snubfin dolphins caught at the same time (two adults and one calf). There were also interview reports of local fishers beginning to eat dolphin carcasses after dolphins had been accidentally bycaught in nets (Beasley et al., 2015).

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

Based on surveys conducted in 2013 and 2015, humpback and snubfin dolphins were found to occur in the Kikori Delta in small populations (i.e. estimated to be <100 humpback dolphins and <200 snubfin dolphins) (Fig. 2) (Beasley et al., 2013; 2015).

The populations of both species are assumed to be isolated and resident in the Delta based on the complete lack of species occurrence records within at least 500km from the Kikori Delta (Beasley et al., 2016).

Criterion B: Distribution and Abundance Sub-criterion B2: Aggregations

The Kikori Delta is a large, dynamic, estuarine ecosystem, recognised as one of the most important areas of forest and wetland/riverine biodiversity in the Asia/Pacific region (WWF 2015). Both inshore dolphin species aggregate in the outer Kikori Delta region. The core area of occurrence for both species is Banana Island/Paia Inlet east to Era/Baimuru Rivers (Bonoccorso et al., 2000; Beasley et al., 2011; 2013; 2015).

Figure 2: Australian snubfin dolphin distribution and sample location within the IMMA. From Beasley et al., in review.

Criterion C: Key Life Cycle Activities Sub-criterion C1: Reproductive Areas

Neonates and calves, as well as mating behaviour, have been observed for both humpback and snubfin dolphins within the IMMA (Beasley et al 2013; 2015). Therefore, the Kikori Delta region provides important habitat for reproduction of both inshore dolphin species.

Criterion C: Key Life Cycle Activities
Sub-criterion C2: Feeding Areas

The Kikori Delta has been identified as an important area for feeding for both inshore dolphin species. The snubfin dolphin appears to utilise specific areas within the Delta where prey aggregations occur. Humpback dolphins have often been sighted foraging in the Paia Inlet region and around the Verabari Headland of Banana Island.

Supporting Information

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Figure 5: Australian humpback dolphins surfacing in the Kikori Delta IMMA. Photo: Isabel Beasley

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Annex 3: Advisory threshold benchmarks for candidate IMMA identification

To ensure adequate alignment of the IMMA with the other main IUCN supported conservation prioritisation tool, the new IUCN standard for the identification of KBA (IUCN, 2016), numerically- driven thresholds are recommended as a benchmark by which candidate IMMAs should be initially assessed, if the numbers exist. Candidate IMMA rationales which meet the KBA criteria selection thresholds are considered primary candidates by the IMMA Secretariat for cIMMA nomination. However, in many instances, where such numerically-driven criteria may not exist, cIMMAs can be considered without meeting thresholds for IMMA status, as long as the rationales and supporting evidence presented meet the IMMA criterion statement of requirement. This must be determined at regional IMMA expert workshops, with further consideration during global review for maintaining the integrity of the IMMA scheme and network.

Criterion A: Species or Population Vulnerability

KBA sub-criterion A1: Threatened Taxa proposes that the following numerically-driven thresholds are used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for A: Species or Population Vulnerability.

Area regularly holds one or more of the following:

- Effectively the entire global population size of a Critically Endangered (CR) or an Endangered (EN) taxon;
- ≥0.5% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon;
- ≥1% of the global population AND ≥10 functional reproductive units of a globally Vulnerable (VU) taxon;
- ≥0.1% of the global population AND ≥5 functional reproductive units of a globally CR or EN taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of sub-criteria A1, A2, or A4;
- ≥0.2% of the global population AND ≥10 functional reproductive units of a globally VU taxon qualifying only under Criterion A of the IUCN Red List Categories and Criteria, in any of sub- criteria A1, A2, or A4.

Criterion B: Distribution and Abundance

Sub-criterion B1: Small and Resident Populations

KBA sub-criterion B1: Individual Geographically Restricted Species proposes that the following numerically-driven threshold be used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for B1: Small and Resident Populations.

Area regularly holds the following:

- ≥10% of the global population and ≥10 functional reproductive units of a species.

Sub-criterion B2: Aggregations

KBA sub-criterion D1: Demographic Aggregations proposes that the following numerically-driven threshold be used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for B2: Aggregations.

Area predictably holds the following:

- a number of mature individuals that ranks the site among the largest 10 aggregations known for the species.
- aggregation representing ≥1% of the global population a species.

Criterion C: Key Life Cycle Activities

Sub-criterion C1: Reproductive Areas

KBA criterion D1: Demographic Aggregations proposes that the following numerically-driven threshold is used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for C1: Reproductive Areas.

Area predictably holds the following:

- aggregation of reproductively active individuals representing ≥1% of a species or population over a season engaging in this part of the life-cycle.

Sub-criterion C2: Feeding Areas

KBA criterion D1: Demographic Aggregations proposes that the following numerically-driven threshold is used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for C2: Feeding Areas.

Area regularly holds the following:

- aggregation of actively foraging individuals representing ≥1% of a species or population over a season engaging in this part of the life-cycle.

Sub-criterion C3: Migration Routes

KBA criterion D1: Demographic Aggregations proposes that the following numerically-driven threshold is used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for C3: Migration Areas.

Area regularly holds the following:

- aggregation of progressively transiting individuals representing ≥1% of a species or population over a season engaging in this part of the life-cycle.

Criterion D: Special Attributes

Sub-criterion D1: Distinctiveness

KBA sub-criterion B1: Individual Geographically Restricted Species proposes the following numerically-driven threshold to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for Di: Distinctiveness.

Area regularly holds the following:

- ≥10% of a genetically, behaviourally or ecologically distinct population of a species with ≥10 functional reproductive units of that population.

Sub-criterion D2: Diversity

KBA criterion C: Ecological Integrity and KBA sub-criterion B3: Geographically restricted assemblages propose that the following numerically-driven thresholds be used to determine whether supporting evidence in the cIMMA rationale can meet the IMMA criterion requirement for D: Diversity.

Area predictably holds one or more of the following:

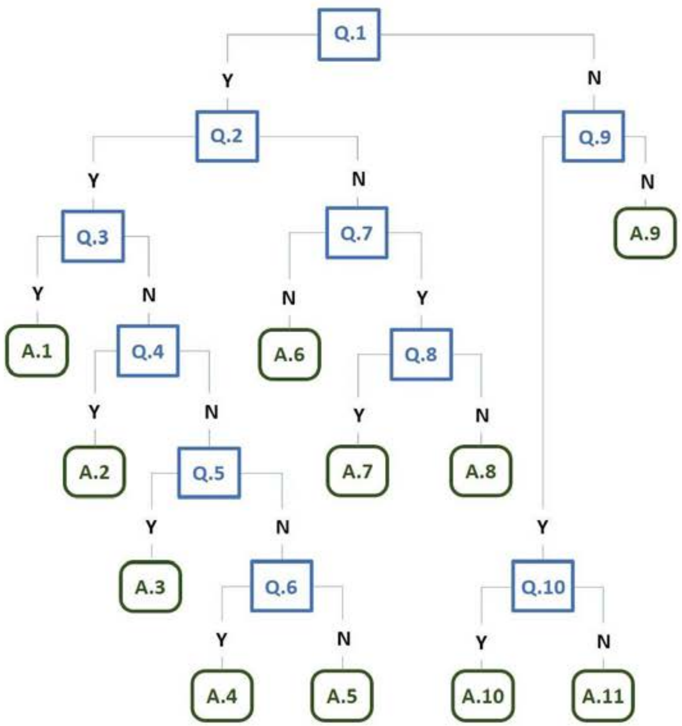
- wholly intact species assemblage for the ecoregion and is determined by being either one of ≤2 per ecoregion characterized by, comprising the composition and abundance of native species and their interactions OR equals ≥2 times the mean number of species expected to occur within the ecoregion, whichever is larger;

- ≥0.5% of the global population of each of a number of species in a taxonomic group restricted to an ecoregion, determined as either ≥5 species OR 10% of the species restricted to the ecoregion, whichever is larger;

- globally the most important 5% of occupied habitat for each of ≥5 species within a taxonomic group;

- ≥5 ecoregion restricted species OR 30% of the restricted species known from the ecoregion, whichever is larger.

Annex 4: Decision-making chart used to decide whether to merge spatially overlapping cIMMA submissions.



Q.1. Do the cIMMA boundaries overlap?; **Q.2.** Are any of the IMMA criteria proposed to qualify for IMMA Status the same between the overlapping cIMMA?; **Q.3.** Do the cIMMA boundaries overlap by more than 70% in each of their respective areas?; **Q.4.** Are any of the overlapping cIMMAs proposed using Criterion A – Species or Population Vulnerability and the boundaries overlap by more than 50% in each of their respective areas?; **Q.5.** Are the habitat or other underlying conditions the same within the area of the cIMMA boundaries, overlapping by more than 50% in each of their respective areas, and considered important for meeting the same criteria proposed for each cIMMA?; **Q.6.** Are there more than two cIMMAs overlapping in the same area which overlap by more than 50% in each of their respective areas?; **Q.7.** Are the habitat or other underlying conditions the same within the area of all overlapping cIMMA boundaries, and are these considered important for the meeting of differing criteria or species proposed for each cIMMA?; **Q.8.** Are there more than two cIMMAs overlapping and do these overlap by more than 70% in each of their respective areas?; **Q.9.** Do individuals within the same Threatened OR Small and Resident Population utilise the non-overlapping cIMMAs?; **Q.10.** Are the IMMA criteria proposed to qualify for IMMA status the same as the non-overlapping cIMMA?

A.1. Yes - please consider merging the overlapping cIMMA boundaries to create one cIMMA submission; **A.2.** Yes - please consider merging the overlapping cIMMA boundaries to create one cIMMA submission. Please also make it clear that the cIMMA qualifies under Criterion A and is a combination of previous closely overlapping cIMMA boundaries of potentially differing species; **A.3.** Yes - please consider merging the overlapping cIMMA boundaries to create one cIMMA submission. Please make it clear that the cIMMA qualifies under the same criteria but for potentially differing species, which share or are a result of habitat or underlying conditions within the area, and that the current boundary results from previously overlapping cIMMA boundaries; **A.4.** Yes - please consider merging the overlapping cIMMA boundaries to create one cIMMA submission. Please make it clear that the IMMA qualifies under shared criteria but of potentially differing species, which do not share or are a result of habitat or underlying conditions within the area, and that the current boundary results from more than two previously overlapping cIMMA boundaries; **A.5.** No - please reconsider merging the overlapping cIMMA boundaries to keep the cIMMA submissions separate; **A.6.** No - please reconsider merging the overlapping cIMMA boundaries to keep the cIMMA submissions separate; **A.7.** Yes - please consider merging the overlapping cIMMA boundaries to create one cIMMA submission. Please make it clear that the IMMA qualifies under differing criteria, and potentially differing species, but may share or be a result of habitat or underlying conditions within the area, and that the current boundary results from more than two previously but closely overlapping cIMMA boundaries.; **A.8.** No - please reconsider merging the overlapping cIMMA boundaries to keep the cIMMA submissions separate; **A.9.** No - please reconsider merging the non-overlapping cIMMA boundaries to keep the cIMMA submissions separate; **A.10.** Yes - please reconsider merging the non-overlapping cIMMA boundaries. In this case you may consider either creating multiple cIMMA submissions OR creating one cIMMA submission for a network of non-adjoining areas which qualify under the same set of Criteria for the same Population of a species which is either Small and Resident OR Threatened; **A.11.** No - please reconsider merging the non-overlapping cIMMA boundaries to keep the cIMMA submissions separate.

Example of a decision-making chart which could be used for informing the choice over whether or not to merge spatially overlapping cIMMA submissions into one or more combined submissions. Such charts may be developed to assist with a range of IMMA-related decision-making processes. However, such tools for assisting with decision-making are considered purely as advisory mechanisms that ultimately rely on the expert knowledge of those who prepare any cIMMA submissions as part of the IMMA identification process.

Annex 5: Guidance on the suitability of data types for use in the assessment of the IMMA selection criteria.

There is a large variety of different data types on marine mammals. The tables below provide some examples of the different types of data that might be used to provide evidence for the IMMA criteria.

Table A4.1. How species distribution modelling (visual) can inform the individual IMMA criteria.

IMMA Criterion	Analysis Metric	Methodology	Analytical Tools
A) Species or Population Vulnerability	Population Abundance	Distance sampling Colony counts Remote Sensing Photo-ID	Mathematical models (i.e., Distance, General Additive Models (GAM), General Liner Models (GLM)), Mark-recapture models.
	Density	Line-transect survey Distance sampling Other effort-based surveys Tracking telemetry	Relative Abundance (e.g., Encounter rate) Spatial Models (e.g., Kernel Density Estimates (KDE)) Mathematical models (e.g., General Additive Models (GAM))
B) Distribution and abundance	Range	Line-transect survey Distance sampling Other effort-based surveys Casual survey effort Opportunistic sightings Standings data Tracking telemetry Photo-ID	Convex-hull (e.g., Bounding Polygon) Alpha-hull (e.g., Area of Occupancy (AOO)) Gridded presence (e.g., Extent of Occurrence (EEO))
	Probability of occurrence	Line-transect survey Distance sampling Other effort-based surveys Casual survey effort Opportunistic sightings Tracking telemetry	Presence-absence mathematical models (e.g., General Additive Model (GAM), General Liner Model (GLM), classification trees (CART)) Habitat suitability models (e.g., Principal Component Analysis (PCA), Ecological Niche Factor Analysis (ENFA), Maximum Entropy Models (MaxEnt),

		Remote sensing	Bioclimatic Envelops (BioClim), Relative Environmental Suitability Analysis (RES))
	Population Abundance	Line-transect survey Distance sampling Colony counts Photo-Id / mark-recapture	Mathematical models (i.e., Distance, General Additive Models (GAM))
	Density	Line-transect survey Distance sampling Other effort-based surveys Tracking telemetry	Relative Abundance (e.g., Encounter rate) Spatial models (e.g., Kernel Density Estimates (KDE)) Mathematical models (e.g., General Additive Models (GAM))
C) Key life cycle activities	Abundance	Colony counts	Mathematical models (i.e., Distance, General Additive Models (GAM))
	Density	Line-transect survey Distance sampling Other effort-based surveys Tracking telemetry	Relative Abundance (e.g., Encounter rate) Spatial models (e.g., Kernel Density Estimates (KDE)) Mathematical models (e.g., General Additive Models (GAM))
	Habitat Suitability	Line-transect survey Distance sampling Other effort-based surveys Casual survey effort Opportunistic sightings Tracking telemetry Remote Sensing	Habitat suitability models (e.g., Principal Components Analysis (PCA), Ecological Niche Factor Analysis (ENFA), Maximum Entropy Models (MaxEnt), Bioclimatic Envelops (BioClim), Relative Environmental Suitability Analysis (RES))
	Behavioural state	Tracking telemetry	State-based models (e.g., hidden Markov model, maximum likelihood, Agent-based model)
D) Special Attributes	Range	Line-transect survey Distance sampling Other effort-based surveys	Convex-hull (e.g., Bounding Polygon) Alpha-hull (e.g., Area of Occurrence

		Casual survey effort Opportunistic sightings Strandings data Tracking telemetry	Occupancy (AOO)) Gridded presence (e.g., Extent of Occurrence (EEO))
	Behavioural state	Tracking telemetry	State-based models (e.g., hidden Markov model, maximum likelihood, Agent-based model)

* It is advised that there is no single model to produce 'the best' distribution estimate. It will always depend on the question to be answered, the data available, the focus species and other factors already discussed. In the specific case of the marine mammals it may be wise to highlight the importance of taking into consideration the marine environment variability and the species dynamism.

Table A4.2. How genetic analyses can inform the individual IMMA criteria.

IMMA Criterion	Genetic tool(s)	Marker Type(s)	Data format
A) Species or Population Vulnerability	Identification of species	Nuclear gene sequences (species) Nuclear introns Mitochondrial sequences Genome-wide markers*	Phylogenetic trees Diagnostic characters (barcodes)
	Identification of stocks and populations	Mitochondrial sequences Microsatellites Single nucleotide polymorphisms (SNPs) Genome-wide markers	Genetic differentiation indices (e.g., F_{ST}, ϕ_{ST}) Clustering algorithms Assignment probabilities PCA-based analyses
	Changes in abundance through time	DNA sequences Microsatellites Genome-wide markers (inc. historic samples; ancient or 'aDNA')	Allele frequency distribution Time since bottleneck Changes in population size over time
	Effective population size (Ne)	DNA sequences Microsatellites Genome-wide markers	Continuous metric of effective population size (Ne)
	Population diversity	Mitochondrial sequences Microsatellites Single nucleotide polymorphisms (SNPs) Genome-wide markers	Diversity indices (continuous metric) Inbreeding detection

	Species diversity	Nuclear gene sequences Nuclear introns Mitochondrial sequences Genome-wide markers	Phylogenetic trees Clustering algorithms Species diversity metrics
B) Distribution and abundance *(sub-criterion B1) small and resident populations)*	Number and distribution of populations	Mitochondrial sequences Microsatellites Single nucleotide polymorphisms (SNPs) Genome-wide markers	Genetic differentiation indices (e.g., F_{ST}, ϕ_{ST}) Clustering algorithms Assignment probabilities PCA-based analyses
	Effective population size (ne)	DNA sequences Microsatellites Genome-wide markers	Continuous metric of effective population size (Ne)
	Changes in abundance through time	DNA sequences Microsatellites Genome-wide markers (inc. historic samples; ancient or 'aDNA')	Allele frequency distribution Time since bottleneck Changes in population size over time
	Site fidelity	Microsatellites Genome-wide markers (if microsatellite power is limited)	Genotypic matches Relatedness analyses
C) Key life cycle activities	Connectivity between different areas (e.g., breeding and feeding areas)	Mitochondrial sequences Microsatellites	Sex-biased population structure and dispersal Genotypic matches
	Site fidelity	Microsatellites Genome-wide markers (if microsatellite power is limited)	Genotypic matches Relatedness analyses
	Sex-specific differences	Mitochondrial sequences Microsatellites Genome-wide markers (if microsatellite power is limited)	Sex-biased population structure and dispersal Genotypic matches Relatedness analyses
	Mixing on migratory routes	Microsatellites	Mixed stock analysis Genotypic matches
D) Special Attributes	Evolutionary distinctive species	Nuclear gene sequences (species)	Phylogenetic trees Diagnostic characters

	(sub-criterion D1) Distinctiveness)	Nuclear introns Mitochondrial sequences Genome-wide markers	(barcodes)
	Highly isolated populations within a species *(sub-criterion D1) Distinctiveness)*	Mitochondrial sequences Microsatellites Single nucleotide polymorphisms Genome-wide markers	Phylogenetic trees Diagnostic characters (barcodes) Genetic differentiation indices (e.g., F_{ST}, ϕ_{ST}) Clustering algorithms Assignment probabilities PCA-based analyses
	Species diversity *(sub-criterion D2) Diversity)*	Nuclear gene sequences Nuclear introns Mitochondrial sequences Genome-wide markers	Phylogenetic trees Clustering algorithms Species diversity metrics

*While genomic tools are being increasingly applied to conservation, protection and spatial planning questions, this is still an emerging area of research and immediate application of genomic tools to inform the IMMA criteria will likely be limited.

Those approaches that are able to quantify the number of animals, which are likely to occur within a given cIMMA, can be considered to have the highest rank of efficacy for potential IMMA end-users. These measures of area-specific abundance or density can be used to effectively consider their more immediate importance alongside wider assessments of a species or sub-population size. In some instances, this may be possible by direct observations of animals through systematic surveys or remote monitoring (i.e., tagging). However, these approaches may not be possible due to a paucity of data for a specific region or taxa group. In those instances, it is recommended that other surrogates utilising area, habitat or range estimates against known population estimates (global or regional) could be used to determine surrogate metrics for the likely proportion of a species or population that are supported by the cIMMA. Area-specific metrics are further considered very useful in ensemble with other direct observations for use in the justification of a cIMMA's rationale (and boundary) when submitted for consideration by the IMMA Secretariat and independent IMMA review panel. Such important supportive information, used alongside or for assessing specific criteria, include those which further understand the contextual importance of a site (purpose of breeding, foraging or migration) or how the site may support the wider population as sinks or sources of other important characteristics (unique genetic or behavioural assets, or species diversity). Some examples of these have been assessed in more detail by the IMMA Secretariat and associated experts, and are summarised below.

Species Distribution Modelling for the assessment of IMMA selection

Distribution estimates of species are often an essential component of environmental management, which can be used to ensure their protection. One popular method to meet these requirements is Species Distribution Modelling (SDM), which has experienced tremendous growth in recent years. According to Peterson et al. (2011), the term 'distribution' can be defined as a set of grid elements in which, within a given sampling time period, the probability of recording an individual of that species exceeds some given threshold. Moreover, when modelling the marine environment, especially for highly mobile species, such as cetaceans, there are still many questions to be answered.

SDM procedures can be divided into 4 different steps: (1) variable selection, (2) data preparation (filtering and processing), (3) algorithm choice, and (4) model/results evaluation. Regarding variable selection, the two main concerns are data quality and origin. Issues with data quality are common, particularly as many environmental layers can be highly interpolated in order to obtain continuous layers with useful information for modelling processes. Conversely, when products are not interpolated, large data gaps can be found (especially on satellite-derived variables) which might have serious influence on the results. To overcome these problems several alternatives are available. Multi-scale measurements (e.g., MUR-SST) blend satellite data from many different sources, using different resolutions, producing robust results in trials, and being able to detect relatively small features (Vazquez-Cuervo et al., 2013). Recent studies also showed good performance when using modelled oceanographic layers (e.g., ROMS), producing better estimates that the studies using satellite derived layers (Becker et al., 2016).

SDMs are the primary means of developing estimates of abundance, determining extent of habitat use, and for assessing probabilities of occurrence, each of which form the basis of the IMMA criteria. Specific intersections between these models and the individual IMMA criteria, the types of data, and environmental covariates that are required, are summarized in Annex 4 of this document (in Table A4.1).

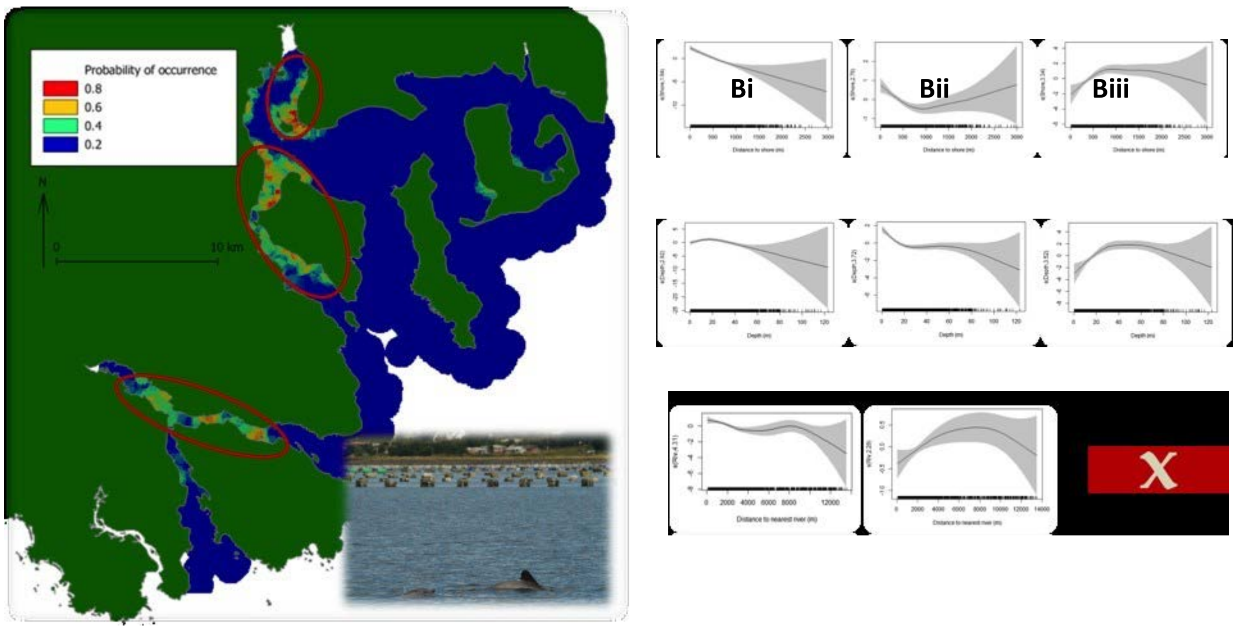


Figure 1. The habitat utilization of three small cetacean species, in relation to environmental and anthropogenic variables. A. Map of probability of occurrence of Chilean dolphins, based on binomial General Additive Models using presence/absence data, indicating three core areas of use. B. Occurrence of Chilean dolphins (Bi), Peale's dolphins (Bii) and Burmeister's porpoises (Biii) as a smooth function of various covariates. Zero on the vertical axis correspond to no effect of the covariate on species occurrence.

Shaded areas represent 95% confidence intervals. Data points are represented as rug plots on the horizontal axis. The results show that the three species display fine- scale habitat partitioning. The study indicates that with appropriate sampling, fine-scale modelling allows insight into fine-scale habitat differences among species, as well as for informing conservation measures. Source: Genov, 2012.

Visualisation of IMMA species distribution associated with identifying IMMAs

Predictive models of species distribution and habitat use are increasingly being used in research and conservation of marine mammals. Given their mobility, marine mammal habitat use modelling is often most appropriate over large spatial scales. However, many functionally important behaviours occur over small spatial scales, and fine-scale modelling may provide finer detail of spatial patterns, particularly for small cetaceans that often have restricted ranges. Two case studies were assessed against the principles of the IMMA selection criteria. These included the habitat use of Chilean dolphins, Peale's dolphins and Burmeister's porpoises in relation to environmental and anthropogenic variables (Genov, 2012; Figure 1); and habitat use and abundance estimation of humpback whale in the Brazilian coast (Bortolotto et al., 2017; Figure 2).

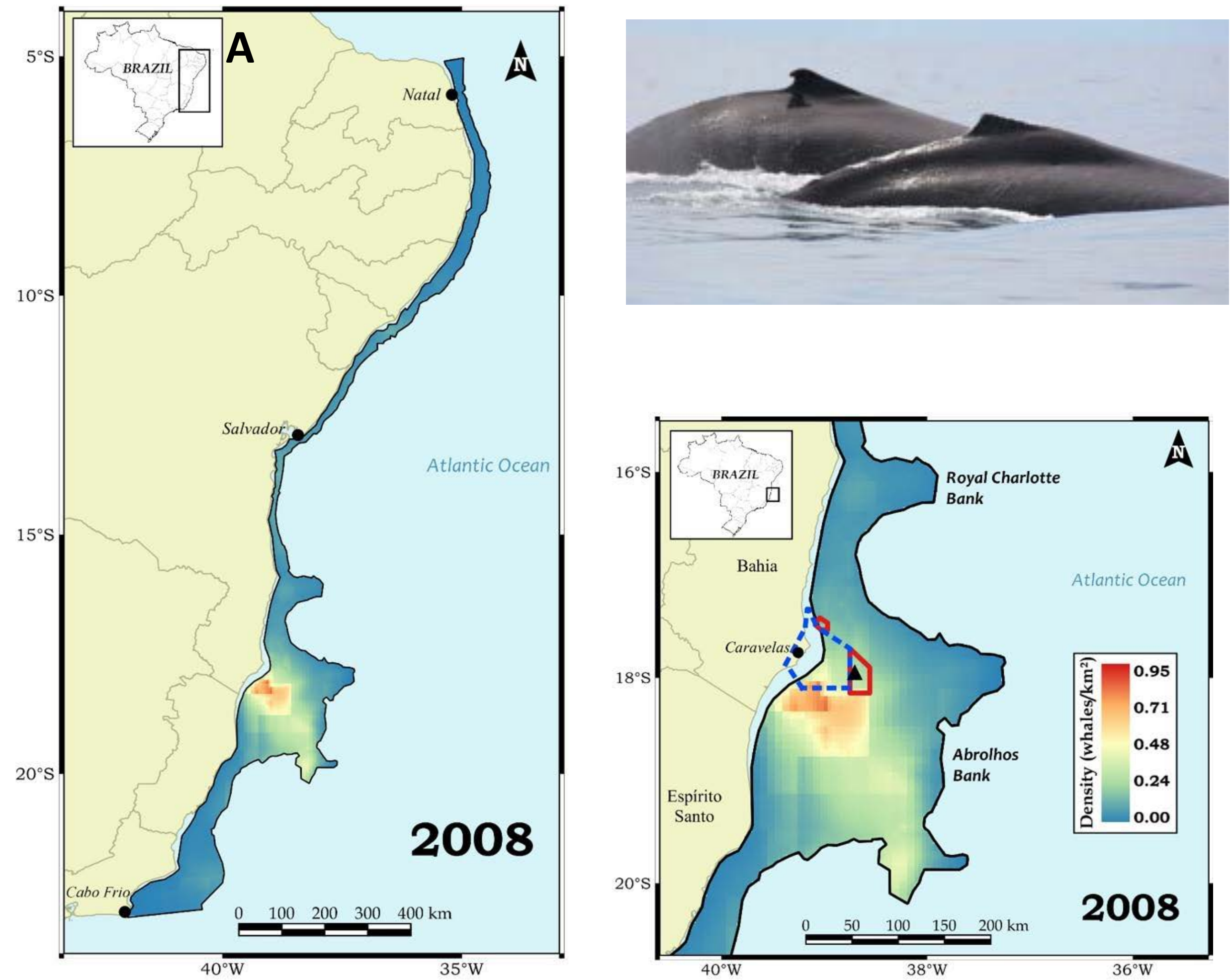


Figure 2. Distribution of humpback whales in the coast of Brazil in 2008 (Bortolotto et al., 2017), predicted using a density surface model (Miller et al., 2013). Line-transects (surveyed by ship) were divided in 8 km segments, totalling 2,337 km of effort. GAMs were fitted to investigate the relationship between the number of whales per segment (corrected for imperfect detection) and some spatial covariates. Easting/northing (i.e., geographic position), distance to shelf-break, distance to coast, current speed and 'shelter' (a combination of wind speed and SST categories) were selected according to the REML (restricted maximum likelihood) score. Model-based abundance estimated was computed at 14,264 (CV =

0.084). Abundance estimated through conventional distance sampling (Buckland et al., 2001) resulted in 16,410 (CV = 0.228) whales in the survey area (Bortolotto et al., 2016). The higher precision from the modelling approach occurred because the spatial covariates explained well the variation in the number of whales per segment. Map on the left: entire survey area in the Brazilian coast; Map on the bottom-right: Abrolhos Bank region, where animals from this population are known to concentrate. The red and blue-dashed polygons indicate the Abrolhos Marine National Park the Ponta da Baleia marine protected areas, respectively. The black triangle indicates the Abrolhos Archipelago. Maps were adapted from Bortolotto et al. (2017).

Most of the SDM studies rely on one basic modelling technique to produce distribution estimates, but recent studies have shown the importance of testing different algorithms to obtain more accurate estimates (Qiao et al., 2015). There is no perfect model, either for any given species of study area and an ensemble of models (e.g., GLMs, GAMs, GBMs, Maxent, ENFA, RES) should be tested where possible in each case. The process of evaluating model predictions is essential. However, experts should be aware if the techniques used are providing a metric of the model performance or evaluating the predictions accuracy. Ideally an independent dataset should be used for model validation, however generally this data is not available (Peterson et al., 2011). There are a series of techniques that can be used to easily produce evaluation estimates; nevertheless, some of them should be used carefully (e.g., AUC). Some over-fitted models can produce misleading AUCs with artificially high measures (Lobo et al., 2008). As in the case of algorithm selection, a good approach would be the use of a variety of different evaluation techniques. Moreover, some techniques such as a k-fold geographical cross-validation (Radosavljevic and Anderson, 2014) may be very useful in the case of marine mammals.

Genetic Analyses for the Identification of IMMAs

The persistence of biodiversity requires the protection of evolutionary processes at the scale of ecosystems, species, and populations. The maintenance of genetic diversity is becoming increasingly important to promote resilience to environmental disruption, such as habitat loss and climate change. The genetic toolbox can be used to address questions at multiple scales: between individuals (e.g., parentage-analysis), within and between populations (e.g., population 'units', effective population size, genetic connectivity, and genetic diversity), and species (e.g., taxonomic units, cryptic species, and adaptive potential). Genetic tools can therefore provide unique information for marine mammal protection, management, and spatial planning, including the identification of individual IMMAs and IMMA networks.

Genetic tools are one of the primary means of delineating population units and are useful for developing estimates of abundance, both of which form the basis of the IMMA criteria. Specific intersections between genetic tools and the individual IMMA criteria, the types of genetic markers, and format of the data that would be employed, are summarized in Annex 4 of this document (in Table A4.2).

Visualization of genetic data to identify IMMAs

Lack of access to and understanding of genetic data has previously been identified as key reasons why genetics is often overlooked in marine spatial planning processes. Existing and emerging techniques to develop geospatial data layers, which can be viewed and mapped alongside other kinds of data (e.g., habitat models, satellite telemetry, survey data), enable genetic data to more easily and fully support the identification of IMMAs (Kershaw et al., 2021).

Prototype case studies demonstrating the geospatial mapping of genetic data to support the identification of IMMAs have been developed (Figure 3) using the marine spatial planning tool, SeaSketch (www.seasketch.org). Case studies have been developed for the humpback whale – a migratory baleen species (humpbacks.seasketch.org), and the spinner dolphin – a coastal small cetacean species (spinners.seasketch.org), to demonstrate how genetic data may need to be mapped and interpreted differently for species with varied life histories and habitat preferences.

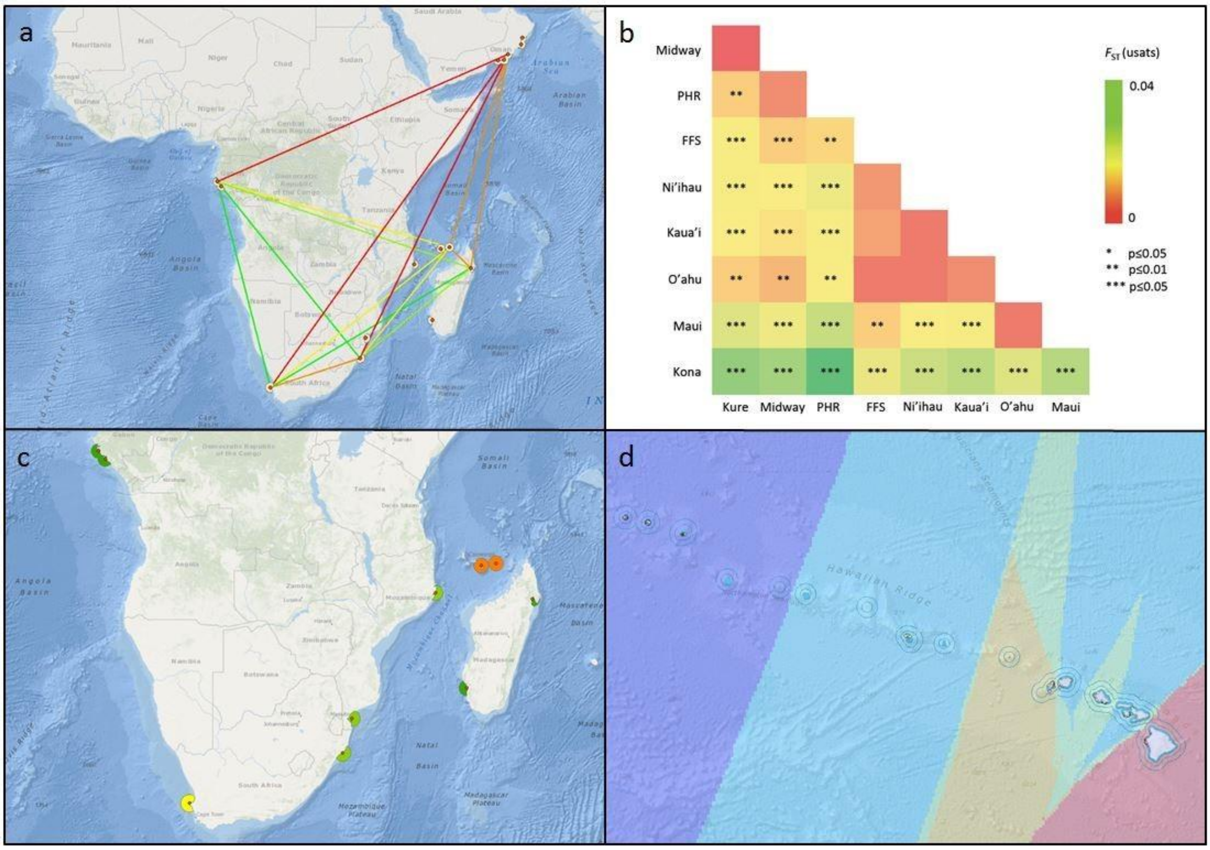


Figure 3. Four examples of geospatial genetic data layers and graphical analytics from the case studies in SeaSketch: a) Magnitude of east to west genetic connectivity based on 9 nuclear microsatellite markers for humpback whales between six major sampling sites in the south Atlantic and western Indian Ocean (green: high connectivity; red: low connectivity); b) Pairwise population differentiation (FST) for spinner dolphins between Hawaiian Islands based on 10 nuclear microsatellites; c) Genetic diversity (number of haplotypes) for humpback whales across ten sampling sites based on a 484bp sequence of the mitochondrial control region (Kershaw et al., 2017); d) Interpolated local FST (population differentiation) for spinner dolphins across the Hawaiian Archipelago based on a 474 bp sequence of the mitochondrial control region (Andrews et al., 2010). See also Kershaw et al. (2021).

Considerations and opportunities for using genetic data to identify IMMAs

As with any type of data, there are a range of caveats and uncertainties that require consideration when using genetic data and analyses for the identification of IMMAs. The most pertinent include those related to spatial and temporal sampling, the extent and resolution of the data, the properties of the genetic marker used, and the definition of thresholds of 'difference'. In addition, every aspect of genetic analysis carries some component of uncertainty, and it is essential that within the context of the IMMA process, planners have these uncertainties clearly presented to them so that they can be considered in parallel with the genetic data and information. The IMMA process offers opportunities to develop new methods to communicate uncertainty to planners, and the wider marine spatial planning community, in a standardized and accessible way. It is essential that expert synthesis of the genetic information, and the related caveats and uncertainties, be undertaken in a standardized and accessible format prior to its use for the identification of IMMAs. The results generated and conclusions drawn from any genetic analyses are highly sensitive to the sampling scheme adopted. How individuals are sampled spatially and temporally has direct influence on the determination of populations/management units, inferences regarding the dynamism of those units through time, and estimates of genetic diversity. These issues are particularly pertinent for highly mobile or migratory species, where a genetic study may only capture a snapshot of the patterns existing at that particular stage of the migration or life cycle. In light of the fact that comprehensive spatial and temporal sampling is not possible for marine mammals, it is very important that details of the sampling scheme and associated levels of uncertainty are available to inform the IMMA process in a clear and understandable way.

Related to the issue of sampling is that of extent and resolution of the data used. Inferences regarding the delineation of management units and the connectivity between those units in a study region with an extent of 10 km^2 may significantly differ if an extent of 100 km^2 was considered, for example. Similarly, a coarse analytical resolution may overlook management units that have boundaries at a finer resolution. In lieu of a robust methodology to account for these scaling issues, the process of identifying IMMAs should employ, when possible, an exploration of the sensitivity of the results to the scale of analysis.

Different types of genetic markers have different properties that directly affect their interpretation. For example, mitochondrial sequences are maternally-inherited and provide insights into female-mediated population units and gene flow. Bi-parentally inherited markers, such as nuclear microsatellites or male chromosomal markers, are required if an understanding of sex-specific differences in gene flow, such as male-biased dispersal, is required. The mutation rate of a genetic marker also influences the temporal scale of the inference that can be made. Rapidly mutating microsatellites provide insights into contemporary (e.g., genotypic matches) or more recent evolutionary processes (e.g., emerging population units), whereas moderately evolving mitochondrial sequences provide a more historic perspective (e.g., established population differentiation), and slowly evolving nuclear coding genes provide insights into the distant past (e.g., speciation events). These properties, and a number of others not detailed here, need to be fully understood in the context of the IMMA process when using the genetic tools for the identification of IMMAs.

Prioritization efforts often require information regarding thresholds of 'difference'. For example, are management units different or not? Are they adequately connected or not? Are they genetically diverse or not? As genetic data and information is generally continuous, there is a need to incorporate the ability to explore different thresholds into the IMMA identification process, so that users can make inferences based on thresholds defined by the IMMA criteria, or to explore how genetic inferences change across a range of thresholds. Importantly, genetic metrics (e.g., diversity, differentiation, etc.) result from the evolutionary history of the species and are, generally, species specific. There is, therefore, no 'one size fits all' genetic metric that can be applied across all species. In addition, thresholds may differ in relation to specific management goals. Threshold values should therefore be defined in relation to current knowledge of the species in question, and should be explicitly incorporated into criteria testing process.