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The critically endangered flapper skate (*Dipturus intermedius*): Recommendations from the first flapper skate working group meeting

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INTRODUCTION

Species in the ‘common skate’ species complex (*Dipturus batis*) display characteristics that make them highly vulnerable to local extirpation, including low fecundity, strong site fidelity, and vulnerability to being captured as bycatch [1, 2, 3]. The ‘common skate’ complex, hereafter referred to as ‘common skate’ is composed of two species; the flapper *Dipturus intermedius* and the blue skate *Dipturus batis* (previously referred to as *Dipturus cf flossada*), respectively [4, 5, 6]. These two species differ in size and general distribution, with the flapper skate being considerably larger and with a more coastal affinity [4, 6].

Once considered abundant (i.e., ‘common’ skate), the species complex is now listed by the IUCN Red List of Threatened Species as Critically Endangered, with numbers decreasing [7, 8]. In 1999, ‘common skate’ was listed on the Biodiversity Action Plan (BAP) in the UK [9], a Priority Marine Feature (PMF) in Scotland and Northern Ireland (NI) [10, 11], and has more recently become a focal point for conservation in the Republic of Ireland. Additionally, in 2006, many fisheries in the UK adopted a voluntary measure refraining from landing ‘common skate’ (A. Hood, March 2020, personal communications). As of 2009 the landing of ‘common skate’ by commercial fishing vessels has been prohibited in accordance with EU fisheries legislation [12, updated annually]. However, catch and release recreational angling continues in some regions, which can complement research activities. From 2011 onwards, ‘common skate’ were included in the Wildlife (Northern Ireland) Order (1985 (as amended) through the Wildlife and Natural Environment Act (Northern Ireland) 2011), followed by protection in Scotland in 2012 (Sharks, Skates and Rays (Prohibition of Fishing, Transshipment and Landing) (Scotland) Order 2012). The latter offers strengthened conservation of flapper skate by preventing the recreational sector from landing elasmobranchs listed as Prohibited to commercial sector. Continued research efforts from the Centre for Environment Fisheries and Aquaculture Science

(CEFAS) since 2010 has helped improve our understanding of ‘common skate’ through fisheries bycatch monitoring [e.g., 13], with specific reference to the Celtic Sea [14].

This report focuses on the flapper skate *D. intermedius* species within the ‘common skate’ complex. This coastal species is a popular target for recreational sport-fishing and appears to have a more restricted distribution compared to *D. batis* (i.e., with a current distribution throughout the western and northern territorial waters of Scotland and Ireland and occasionally in the Celtic Sea, and appears to have disappeared from much of its former geographical range, including all European waters [4].

The first stage in developing a coherent regional approach to flapper skate conservation is to reach a consensus across stakeholders in terms of conservation priorities and objectives. To this end, the Flapper Skate Working Group (SWG) was established as a forum where governmental, sports-fishing, non-governmental conservation bodies and scientists from across the three jurisdictions covering most of the current species’ range (the UK, Ireland, and experts from the Netherlands) could discuss, share knowledge and plan future collaborative conservation and research programmes. An overview of the contributions by SWG’s invited speakers are detailed in Appendix A.

CONSERVATION PRIORITIES

The SWG recognised that effective flapper skate conservation requires both inputs and coordinated efforts from several key stakeholder sectors. Essentially, the group is based on a circular process whereby focussed research informs advocacy and policy, which is supported by public opinion and shapes outreach direction, leading back to directed scientific research

(Fig 1). The SWG further acknowledged that for effective flapper skate conservation, the connectivity between each component of this conservation ‘triangle’ (Fig 1) needs to be consistent and prioritised equally. However, without scientific evidence, it is difficult for governments to respond with directed actions or provision of resources.

Pragmatically, the SWG accepted that conservation efforts to date were at different stages on a regional level, with some areas suggesting limited public awareness of the species (H. McIlvenny, November 2019, personal communications). Despite continued efforts from various outreach initiatives (e.g. The Shark Trust, SeaDeep and CEFAS work with commercial fishermen on handling and identification), flapper skate are yet to pique widescale public interest or concern in the same way as other, perhaps more charismatic, local megafauna (e.g. white-tailed sea eagles, otters, grey seals etc.) [e.g. 15].

Arguably, the public profile of the flapper skate is hindered by the vernacular name – the Critically Endangered ‘common’ skate seems somewhat contradictory. Such nuances in nomenclature are compounded by the disappearance of the species from much of its native range. Vernacular names can hinder comparisons between historical and contemporary ranges, and can prove difficult in light of shifting baselines [*sensu* 16, 17]. Additionally, the once commonly known species is no longer a commercial fisheries target, leading it to potentially fade from the collective cultural memory in all but a few fishing communities (H. McIlvenny, November 2019, personal communications). Within this overall context, the SWG highlighted the following conservation priorities for flapper skate without implied priority.

CONSERVATION PRIORITY 1: POOR TAXONOMIC RESOLUTION

As with fundamental research and public awareness, there remains some gaps within policy. All legislative documents pre-dating the species separation [6] relate to the ‘common skate’ or refer to the species as *Dipturus batis* or *Raja batis* [e.g., 12, 18, 7- IUCN] which generates additional confusion. Both of these names are now obsolete synonyms and reflect the early taxonomic efforts of Clark [19] to group together the somewhat similar species of *D. intermedius* and *D. batis*. Subsequent genetic and morphological analyses [6] confirmed that the ‘common skate’ is no longer valid and consists of two species. However, legislation and management still refer to ‘common skate’ (e.g., Wildlife and Natural Environment Act (Northern Ireland), 2011 and Loch Sunart to the Sound of Jura Nature Conservation Marine Protected Area Order 2014). Yet, on a broader political scale some efforts have been made to differentiate the two species (e.g., the usage of separate codes (DRJ [*D. intermedius*] and RJB [*D. batis*] by the Food and Agricultural Organization of the United Nations (FAO, 2010-2020)). Thus, support for ongoing efforts to standardise adoption of current nomenclature within legislative frameworks emerged as a clear recommendation from the SWG.

The SWG also acknowledged that all large batoids in NE Atlantic waters are likely to have data gaps and share similar vulnerabilities to over-exploitation [20]. Under this scenario, the umbrella approach of using one species to confer protection for other similar species [21] might be an appropriate way forward. The SWG recommended that the IUCN status of each species within the ‘common skate’ complex should be reassessed as separate species. Although this separation would not increase species numbers, it would highlight the circumstances of each species and may reveal an even more unfavourable situation which would substantiate the urgent need for further work.

CONSERVATION PRIORITY 2: LACK OF DATA ON LIFE HISTORY

Apart from site specific studies in the Loch Sunart to the Sound of Jura Marine Protected Area (MPA) in Scotland and CEFAS surveys and monitoring in the Celtic Sea, the SWG recognised that conservation of the species is hampered by a lack of data across much of its range [3, 13, 14, 22, 23]. The group acknowledged the value of previous studies but conceded that site-specific findings may not be representative across the entire species' range. Within this context, a number of knowledge gaps emerged (listed without implied priority): longevity, reproduction rates, ontogenetic shifts in habitat use, ontogenetic shifts in diet, sexual space partitioning, territoriality and site fidelity.

CONSERVATION PRIORITY 3: LACK OF REGIONAL APPROACH TO CONSERVATION

The current recognised distribution of *D. intermedius* ranges from Shetland, in a westward coastal arc, to southern Ireland (West Co. Cork) [6, 24]. Records outside this area are in existence [6, 8, 13], but further interrogation of these records is required (S. P. Iglésias, 2020, personal communications, January). Recent efforts in Scotland were heralded as a success, with flapper skate being the only elasmobranch in Europe with a dedicated MPA designation (Loch Sunart to the Sound of Jura MPA in Scotland). However, as a motile species, further protective measures are required on a regional scale. This goal will require regional standardisation in statutory data collection and steps towards a coherent, ecologically relevant MPA network across the species' range.

CONSERVATION PRIORITY 4: ACCOUNTING FOR BROADER ECOLOGICAL SHIFTS IN SKATE CONSERVATION

1
2 The SWG recognised that the species is unlikely to re-occupy its ‘pre-collapse’ range naturally
3 in the foreseeable future, given the current established fisheries regulations pertaining to the
4 species. Establishing the bounds of historical distribution represents a challenge in itself given
5 that historical landings were recorded under ‘common skate’. While additional mechanisms
6 can be employed to establish historical presence and absence of a species, the historical use of
7 the vernacular name remains an obstacle. The principal driver of extirpation, industrialised
8 fishing, still presents an ongoing threat from incidental catch of both juveniles and adults
9 despite prohibition on targeted fishing [20, 25, 26], but there is scope for improved mitigation.
10 For example, ‘excluders’ built into fishing nets have been shown to reduce bycatch markedly
11 (e.g. sea turtles [27]), with potential to reduce unwanted capture of large ray species [28]. The
12 SWG recommended research into such technical innovations which may reduce skate bycatch
13 [14] including the removal of “tickler” chains on bottom trawlers. This approach could reduce
14 the bycatch of batoids without reductions in the capture of target species [29], but it has not yet
15 been adopted widely.

16
17 More broadly, the ecological state of the NE European shelf has changed dramatically since
18 the species was last considered common (a century ago), owing to fisheries-induced trophic
19 shifts [e.g., 30, 31] habitat degradation [32] and climate change [33, 34]. Encompassing such
20 stressors within overall conservation strategies is not easy, but it is essential if genuine
21 restoration is to be achieved.

22 23 **SWG GENERAL RECOMMENDATIONS** 24

1 The SWG developed a series of research and conservation actions for those working on flapper
2 skate conservation, to focus efforts across the species known range. The resulting framework
3 for decision-making is inclusive of stakeholders, scientists, NGOs and government;
4 transparent, collaborative and co-operative. We advocate three distinct yet interacting
5 conservation ‘nodes’ feeding into policy (research, outreach advocacy and policy; Fig 1). This
6 structure will enable effective conservation through appropriate policy, underpinned by robust
7 science and targeted advocacy, that is communicable through a solid outreach platform. It will
8 also expedite research efforts through the sharing of good practice and advice from more
9 developed conservation programmes. Thus, many of the actions listed are already in place
10 within some jurisdictions but are included as a benchmark to standardise efforts on a regional
11 scale. More specifically, the SWG aspires to mirror recent successes at a national level on a
12 geographical scale that is representative of the species overall range (i.e., the conservation of
13 common natural heritage). Lastly, while a regional approach will be required for flapper skate
14 conservation across its’ remaining range, we acknowledge the need for site-specific
15 management objectives that are not listed here (i.e., what may be suitable for one site may not
16 be transferable to all prospective populations of *D. intermedius*).

- 19 ● File a petition for change in nomenclature used, to relevant authorities (e.g., IUCN and
20 government bodies), relating to large batoid stock management/conservation.
21 Common/vernacular names should be avoided for scientific and policy documentation
22 as the Linnean system should suffice, with common names such as flapper skate
23 reserved for communication with the general public. For grey areas, when species-
24 specific resolution is uncertain, the use of taxonomic surrogacy to genus level (i.e.,

Dipturus spp. rather than the vernacular ‘common skate’ is recommended and supports a precautionary approach [*sensu* 35].

- Identify ontogenetic shifts in distribution and critical habitats used by the species. Subsequently, the SWG recommends limitations on / or modifications to trawling within these areas, should evidence dictate, and that they are managed through national legislation where appropriate (e.g. Fisheries Act (Northern Ireland) [36], Marine (Scotland) Act 2010). The group noted that funding is required and should be sought for research into and implementation of ‘skate excluders’ on commercial fishing vessels/nets.
- The development of a coherent and ecologically relevant network of marine protected areas would be highly valuable to link fragmented habitats, ensure genetic diversity and support species recovery across differing life stages. Quantifying connectivity between hotspots is vital for the conservation of species with transnational ranges, evidenced by ongoing genetics and tracking programmes.
- Develop shared educational resources to avoid duplication of effort and provide a unified conservation message (e.g., resources developed by Shark Trust, SeaDeep, and CEFAS). Continued engagement with anglers/commercial fishers is encouraged to support co-development of identification and reporting protocols (e.g., to remove ambiguity surrounding *D. intermedius* morphology at different life history stages). This approach would encourage the documented release of incidentally caught individuals; or the retention (where permitted) of deceased skate to support research [e.g., 37].

- Foster communication and coordination between all points of the ‘conservation triangle’ (Fig 1) to raise the profile of the species, especially through the sharing of media. The main objective will be the development of a sense of public ownership of the species (mirroring successes amongst other species such as the otter, golden eagle, salmon etc.). Annual SWG workshops will serve as catalysts for collaboration, but mechanisms for routine communication between partners requires further development.
- Produce a collective guidance document aimed at conservation managers, politicians and legal practitioners etc. This is actionable science to support the development of an evidence base for policy implementation in Northern Ireland and the Republic of Ireland in particular. Furthermore, science would support reviews of existing protective measures in Northern Ireland and Scotland.
- Agree upon a standardised approach for statutory data collection where appropriate, such as a standardised method for logging bycatch/angling records or collecting morphological data. The SWG agreed that methods developed within the skate tagging programme in the Loch Sunart to the Sound of Jura MPA in Scotland, could serve as a template across the species range. This applies particularly to genetic sampling, animal handling, and recreational fishing best practice. This approach will enable future researchers to pool data across the region when required or deemed appropriate. Additionally, the SWG advocated for increased coordination and data-sharing to both promote and enhance conservation efforts. This applies to all links within the conservation triangle (Fig 1), with particular emphasis on collaborations between outreach programmes.

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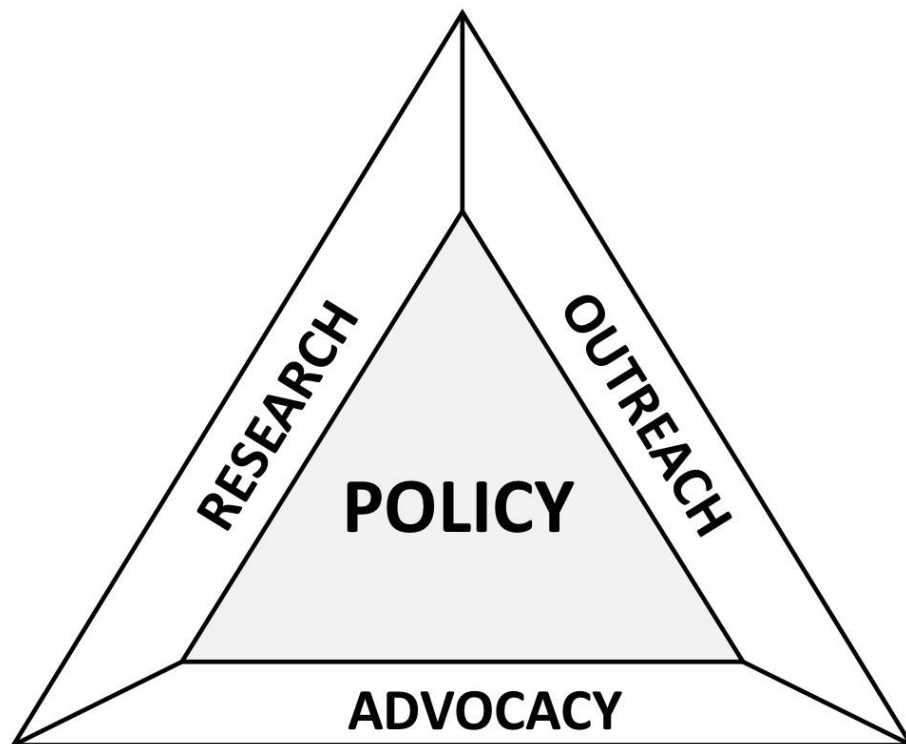
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1 **Figures**

2



3

4 **Fig 1. The Conservation Triangle** - this triangle denotes the essential components required
5 for effective conservation. 1) Research, 2) Outreach, 3) Advocacy & 4) Policy. All four
6 elements are the foundation of conservation efforts. The sides of the outer triangle are equally
7 important and need to work in unison for proactive conservation, feeding into policy for
8 effective implementation.