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“Beyond 2020: Shaping flyway conservation for the future”

**DRAFT GUIDE TO GUIDANCE TO REDUCE THE IMPACT OF FISHERIES
ON AEWA SEABIRD SPECIES**

(Compiled by BirdLife International and approved by the Technical Committee)

Background to this document

1. At the 1st Session of the Meeting of the Parties to AEWA in November 1999, a project entitled “Study of the potential impacts of marine fisheries on migratory seabirds” was listed amongst the AEWA International Implementation Priorities 2000-2004 (Resolution 1.4). Following the acquisition of funding, an initial review was completed in 2009, focused on the Atlantic Afro-tropical region (Cooper & Petersen, 2009¹).
2. When reviewed by the Technical Committee, a number of issues were identified for further consideration. In 2013 the UNEP/AEWA Secretariat secured funding to commission an updated version, expanded to cover a broader range of fisheries in the Afro-tropical region. This document was reviewed by the AEWA Technical Committee and the AEWA Standing Committee during their meetings in 2015, and submitted to MOP6 (Hagen & Wanless, 2015²).
3. In the same year, BirdLife International was also commissioned by the UNEP/AEWA Secretariat to produce a review of the status, threats and conservation action priorities for all AEWA seabird species (Tarzia et al. 2015³).
4. Discussion of these two documents at MOP6 resulted in the following task in the Technical Committee work plan 2016-2018:

4.4 Reducing the impact of fisheries

Compile existing – and where necessary complement – conservation guidelines and recommendations based on the priorities identified in paragraph 5 [of Resolution 6.9] and best available science and bring these to MOP7.

¹ Cooper, J. & Petersen, S.L. 2009. Potential Impacts of Marine Fisheries on Migratory Seabirds within the Afrotropical Region. Report to the African-Eurasian Waterbird Agreement. Rondebosch: Animal Demography Unit, University of Cape Town. 239 pp.

² Hagen, C. and Wanless, R.M. 2015. Potential impacts of marine fisheries on migratory seabirds within the Afrotropical region. Unpublished report to the African-Eurasian Waterbird Agreement

³ Tarzia, M., Hagan, C., Wanless, R.M. 2015. Review of the Status, Threats and Conservation Action Priorities for the Seabird Populations Covered by the Agreement. Unpublished report to the African-Eurasian Waterbird Agreement.

Where Paragraph 5 of Resolution 6.9 stated:

5. *Determines that in addressing seabird conservation issues, AEWA's priority should be those species, regions, or threats not already the subject of pre-existing international or conservation frameworks, for example - but not restricted to - tropical seabirds or those impacted by small or artisanal fisheries not regulated by RFMOs, and subject to the availability of financial resources, requests the Technical Committee to provide advice on most urgent priorities in this regard;*

Background to fisheries impacts on AEWA seabird species

5. The Hagen & Wanless 2015 and Tarzia et al. 2015 reviews presented to MOP6 identified that fisheries can impact on AEWA species through both direct and indirect means, where direct impact refers principally to being caught as bycatch in fisheries whereas indirect impact refers to the diminishing of foraging opportunities for seabirds due to competition with, or displacement by, fisheries. In addition, both reviews identified significant data gaps regarding seabird-fisheries interactions, with recommendations on the need to strengthen data collection.

Direct impacts – bycatch in fisheries

6. In the Northeast Atlantic, gillnet fisheries have been identified as impacting AEWA seabird species (including, but not limited to, Black Guillemot, Common Eider, Common Murre, Long-tailed Duck and Velvet Scoter), particularly in the Baltic and around Iceland and Norway (ICES 2013⁴, Zydalis et al 2013⁵, Tarzia et al 2015, Gascoigne et al, 2017⁶, Tarzia et al 2017⁷). Though there are few contemporary data, seabird bycatch is also understood to occur in longline fisheries, principally impacting fulmars (not an AEWA species), but also including Great Skua, Northern Gannet and Black-legged Kittiwake (Dunn and Steel 2001⁸).
7. In the Mediterranean and Lusitanian regions, bycatch of AEWA seabird species has been recorded in a range of fisheries, including demersal longlines, trawls, gillnets and potentially purse seine fisheries (ICES 2013, Tarzia et al. 2015).
8. Hagen & Wanless 2015 identified that bycatch was probably not the most problematic impact for AEWA-listed seabirds within the Afrotropical region, with the exception of Cape Gannet *Morus capensis* and possible exception of Northern Gannet *M. bassanus*. An important caveat was the unknown risk from gillnetting, conducted on a large scale in the Afro-tropical region but highly data-deficient (Zydalis et al 2013): cormorants and African Penguin have been recorded caught.
9. Neither the Hagen & Wanless 2015 review nor the Tarzia et al. 2017 review identified fisheries impacts on AEWA species arising from electrofishing, poisoning or explosives. For this reason, these issues are not included in the following guidance table.

⁴ ICES, 2013 Report of the Workshop to Review and Advise on Seabird Bycatch. WGBYCS Report 2013. ICES CM 2013 /ACOM: 77.

⁵ Zydalis, R., C. Small, and G. French. 2013. The incidental catch of seabirds in gillnet fisheries: A global review. *Biological Conservation* 162: 76–88.

⁶ Gascoigne, J., Danielsson, A., Jagielo, T., le Roux, L., Gudmundsdottir, L.O., 2017. Icelandic Gillnet Lumpfish Third Annual Surveillance Report. Marine Stewardship Council Sustainable Fisheries Assessment. Available at <https://fisheries.msc.org/en/fisheries/icelandic-gillnet-lumpfish/@assessments>.

⁷ Tarzia, M. (compiler), Arcos, P., Cama, A., Cortés, V., Crawford, R., Morkūnas, J., Opper, S., Raudonikas, L., Tobella, C., Yates, O., 2017. Seabird Task Force: 2014-2017. Technical report. Available at www.seabirdbycatch.com

⁸ Dunn, E. and Steel, C. 2001. The impact of longline fishing on seabirds in the north-east Atlantic: recommendations for reducing mortality, NOF Rapportserie Report no 5-2001, RSPB, The Norwegian Ornithological Society.

Indirect impacts – impact of fisheries on foraging

Temperate region

10. Tarzia et al 2015 identified that depletion of prey is a major threat for many of the seabird species within the Northern European Seas and that it includes multiple interacting factors such as over-fishing, climate change and habitat degradation.

Afro-tropical region

11. In West Africa, the scale of overexploited fisheries is a cause for concern regarding the indirect impact on seabirds either through a reduction in preferred prey or through changes in beneficial foraging associations with predatory fish competition. Indirect impacts of fishing on AEWA seabird species are poorly quantified in the Afro-tropical region but probably pervasive. Appreciable, directed research effort is required to remedy this data gap (Hagen & Wanless, 2015).
12. In Southern Africa, of significant concern to the conservation of seabirds in the region is the collapse of the Namibian sardine fishery and the eastward shift in distribution of sardine and anchovy stocks—important seabird prey in South Africa (Ludynia et al. 2010⁹, Coetzee et al. 2008¹⁰, both cited in Tarzia et al., 2015). Food scarcity was deemed the major driver of the collapse of African Penguins off western South Africa this century (Crawford et al., 2017¹¹) and a major contributor to this species, Cape Gannets and Cape Cormorants all now having an IUCN status of Endangered¹²¹³. These three species are endemic to the Benguela upwelling ecosystem and all subsist mainly on sardine and anchovy.

Other legal frameworks and organisations within the AEWA region

13. Within the AEWA region there are a number of legal frameworks and organisations that have provisions or duties for reducing the impact of fisheries on seabirds. As noted in Hagen & Wanless 2015 and Tarzia et al. 2017, these include (further details is given in Tarzia et al 2017 tables 8b, 13, 15, 17, 21, 23):
- a. Arctic Council (and its working groups including CAFF, Actions for Biodiversity, AMBI, CBIRD)
 - b. Convention on Migratory Species (CMS)
 - c. European Commission Common Fisheries Policy
 - d. European Commission, Birds Directive
 - e. European Commission, Marine Strategy Framework Directive
 - f. Fisheries Advisory Councils
 - g. Fishery Committee for the Eastern Central Atlantic (CECAF)
 - h. General Fisheries Commission for the Mediterranean (GFCM)
 - i. Helsinki Convention (HELCOM)

⁹ Ludynia K, Jones R, Kemper J, Garthe S, Underhill LG (2010). Foraging behaviour of bank cormorants in Namibia: implications for conservation. *Endangered Species Research* 12:31–40

¹⁰ Coetzee, J.C., van der Lingen, C.D., Hutchings, L., Fairweather, T.P., 2008. Has the fishery contributed to a major shift in the distribution of South African sardine? *ICES J. Mar. Sci.* 65, 1676–1688. <https://doi:10.1093/icesjms/fsn184>

¹¹ Crawford RJM, Makhado AB, Oosthuizen WH. 2017. Bottom-up and top-down control of the Benguela ecosystem's seabirds. *Journal of Marine Systems* <https://doi.org/10.1016/j.jmarsys.2017.04.004>

¹² Crawford RJM, Randall RM, Cook TR, Ryan PG, Dyer BM, Fox R, Geldenhuys D, Huisamen J, McGeorge C, Upfold L, Visagie J, Waller LJ, Whittington PA, Wilke CG, Makhado AB. 2016. Cape cormorants decrease, move east and adapt foraging strategies following eastward displacement of their main prey. *African Journal of Marine Science* 38: 373–383. <http://dx.doi.org/10.2989/1814232X.2016.1202861>, 11 pp.

¹³ BirdLife International. 2017. IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 20/12/2017.

- j. OSPAR Convention
- k. Indian Ocean Tuna Commission (IOTC)
- l. International Commission for the Conservation of Atlantic Tunas (ICCAT)
- m. International Council for the Exploration of the Sea (ICES)
- n. Nordic Council for Ministers
- o. North-East Atlantic Fisheries Commission (NEAFC)
- p. South Indian Ocean Fisheries Agreement (SIOFA)
- q. South Western Indian Ocean Fishery Commission (SWIOFC)
- r. Southeast Atlantic Fisheries Organisation (SEAFO)

Format of this document

14. This directory provides a guide to the technical and other guidances that have been produced in recent years related to reducing the impact of fisheries on seabirds, focusing on the impacts most relevant to AEWA seabird species.
15. The directory provides weblinks for publications that are accessible via the Internet and has attempted to categorise such guidance with respect to its intended audience. The current listing is dominated by publications in the English language. Contracting Parties and others are encouraged to submit further examples of good practice guidance to AEWA's Technical Committee so that this listing can be continually updated. This document concludes with a brief view on gaps in guidance.
16. In light of priorities identified in the Hagen & Wanless 2015 and Tarzia et al 2015 reviews, guidance documents are organized under the following topics and subtopics:
 - **Background guidance on impacts of fisheries on AEWA seabird species**
 - **Guidance to seabird bycatch mitigation**
 - Longline fisheries
 - Trawl fisheries
 - Gillnets fisheries
 - Artisanal fisheries
 - Guidance for developing a National Plan of Action
 - Guidance for data collection
 - Guidance for education and outreach
 - Guidance for addressing the seabird impacts of Illegal, Unregulated and Unreported Fishing
 - **Guidance for mitigating the indirect impacts of fishing**

Guide to guidance

A directory of guidance is given in Table 1.

Important note: The AEWA Technical Committee and the UNEP/AEWA Secretariat do not necessarily endorse any of the content of the external web links listed here. These are given solely in the context of their possible utility to Contracting Parties and others.

Table 1. Directory of guidance materials related to reducing impact of fisheries on AEWA seabird species (materials are in English only, except where indicated)

Guidance	Guidance topics	Audience
Background guidance on impacts of fisheries on AEWA seabird species		
Hagen, C. and Wanless, R.M. 2014. Potential impacts of marine fisheries on migratory seabirds within the Afrotropical region. Report to the African-Eurasian Waterbird Agreement (available in English and French) ¹⁴ .	Description of fisheries in Afrotropical region Seabird species affected	Policy-makers & scientists
Tarzia, M., Hagan, C., Wanless, R.M. 2015. Review of the Status, Threats and Conservation Action Priorities for the Seabird Populations Covered by the Agreement. Report to the African-Eurasian Waterbird Agreement (available in English and French) ¹⁵ .	Description of threats to AEWA seabird species by region, including bycatch and indirect fishery impacts	Policy-makers & scientists
Tasker, M. L., K. C. J. Camphuysen, J. Cooper, S. Garthe, W. A. Montevecchi, and S. J. M. Blaber. 2000. The impacts of fishing on marine birds. ICES Journal of Marine Science 57:531–547 ¹⁶ .	Global overview of impacts of fisheries on seabirds	Policy-makers & scientists
Global seabird tracking database ¹⁷	Seabird distribution	Policy-makers & scientists
BirdLife Marine Important Bird Area E-Atlas ¹⁸	Seabird distribution	Policy-makers & scientists
Guidance to seabird bycatch mitigation		
Longline fisheries		
ACAP Review and Best Practice Advice for Reducing the Impact of Demersal Longline Fisheries on Seabirds ¹⁹	Bycatch mitigation for longline fisheries - demersal	Policy-makers & fishing industry

¹⁴

<http://www.unep-aewa.org/en/document/review-potential-impacts-marine-fisheries-migratory-seabirds-within-afrotropical-region-1>

¹⁵ <http://www.unep-aewa.org/en/document/review-status-threats-and-conservation-action-priorities-seabird-populations-covered-1>

¹⁶ <https://academic.oup.com/icesjms/article/57/3/531/635929>

¹⁷ www.seabirdtracking.org

¹⁸ <https://maps.birdlife.org/marineIBAs/default.html>

¹⁹ <https://acap.aq/en/bycatch-mitigation/mitigation-advice>

Guidance	Guidance topics	Audience
ACAP Review and Best Practice Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds ⁶	Bycatch mitigation for longline fisheries - pelagic	Policy-makers & fishing industry
ACAP bycatch mitigation fact sheets: FS0-FS12 (especially FS1, FS2, FS5, FS7, FS8) (English, French, Spanish, Portuguese, Japanese, Korean, Simplified Chinese and Traditional Chinese) ²⁰	Bycatch mitigation for longline fisheries	Policy-makers & fishing industry
ACAP guidance on hook removal ²¹	Bycatch mitigation for longline fisheries	Policy-makers & fishing industry
Bull, L. S. 2007. Reducing seabird bycatch in longline, trawl and gillnet fisheries. <i>Fish and Fisheries</i> 8:31–56.	Bycatch mitigation for longline fisheries	Policy-makers & scientists
Lokkeborg, 2011. Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries—efficiency and practical applicability. <i>Mar Ecol Prog Ser. Vol. 435: 285–303</i>	Bycatch mitigation for longline fisheries	Policy-makers & scientists
Trawl fisheries		
ACAP Review and Best Practice Advice for Reducing the Impact of Pelagic and Demersal Trawl Fisheries on Seabirds ⁶	Bycatch mitigation for trawl fisheries	Policy-makers & fishing industry
ACAP bycatch mitigation fact sheets: FS13 Bird scaring lines and offal management to reduce warp strike (English, French, Spanish, Portuguese, Japanese, Korean, Simplified Chinese and Traditional Chinese) ⁷	Bycatch mitigation for trawl fisheries	Policy-makers & fishing industry
ACAP bycatch mitigation fact sheets: FS14 Net Entanglement (English, French, Spanish, Portuguese, Japanese, Korean, Simplified Chinese and Traditional Chinese) ⁷	Bycatch mitigation for trawl fisheries	Policy-makers & fishing industry
Maree B.A., R.M. Wanless, T.P. Fairweather, B.J. Sullivan, and O. Yates. 2014. Significant reductions in mortality of threatened seabirds in a South African trawl fishery. <i>Animal Conservation</i> 17: 520–529.	Bycatch mitigation for trawl fisheries	Policy-makers & fishing industry
Bull, L. S. 2007. Reducing seabird bycatch in longline, trawl and gillnet fisheries. <i>Fish and Fisheries</i> 8:31–56.	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists

²⁰ <https://acap.aq/en/bycatch-mitigation/bycatch-mitigation-fact-sheets>

²¹ <http://acap.aq/resources/acap-conservation-guidelines>

Guidance	Guidance topics	Audience
Lokkeborg, 2011. Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries—efficiency and practical applicability. Mar Ecol Prog Ser. Vol. 435: 285–303	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists
Gillnet fisheries		
Žydelis R., J. Bellebaum, H. Osterblom, M. Vetemaa, B. Schirmeister, A. Stipnice, D. Mindaugas, D., M. van Eerden, and S. Garthe (2009) Bycatch in gillnet fisheries – An overlooked threat to waterbird populations. Biol. Conserv. 142, 1269-1281 ²² .	Bycatch mitigation for gillnet fisheries	Policy makers & scientists
Almeida, A., Ameryk, A., Campos, B., Crawford, R., Krogulec, J., Linkowski, T., Mitchell, R., Mitchell, W., Oliveira, N., Opiel, S., Tarzia, M. Study on Mitigation Measures to Minimise Seabird Bycatch in Gillnet Fisheries . November – 2017. European Commission Service Contract EASME/EMFF/2015/1.3.2.1/SI2.719535 ²³	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists
Melvin, E., J. Parrish, and L. Conquest. 1999. Novel tools to reduce seabird bycatch in coastal gillnet fisheries. <i>Conservation Biology</i> 13:1386–1397.	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists
Bull, L. S. 2007. Reducing seabird bycatch in longline, trawl and gillnet fisheries. <i>Fish and Fisheries</i> 8:31–56.	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists
Lokkeborg, 2011. Best practices to mitigate seabird bycatch in longline, trawl and gillnet fisheries—efficiency and practical applicability. Mar Ecol Prog Ser. Vol. 435: 285–303	Bycatch mitigation for gillnet fisheries	Policy-makers & scientists
Jeffrey C. Mangel, Joanna Alfaro-Shigueto, Jorge Azocar & Igor Debski, 2017. ‘Toolbox’ template for mitigation advice in artisanal and small-scale fisheries. Paper submitted to the Eighth Meeting of the Seabird Bycatch Working Group, Wellington, New Zealand, 4 – 6 September 2017 (SBWG8 Doc 16) ²⁴	Bycatch mitigation for small-scale fisheries	Policy-makers & scientists

²² <https://www.sciencedirect.com/science/article/pii/S0006320709001001>

²³ <https://publications.europa.eu/en/publication-detail/-/publication/f426200b-1138-11e8-9253-01aa75ed71a1/language-en>

²⁴

<https://www.acap.aq/en/documents/working-groups/seabird-bycatch-working-group/seabird-bycatch-wg-meeting-8/sbwg8-meeting-documents>

Guidance	Guidance topics	Audience
Artisanal fisheries ²⁵		
Gillett, R. Bycatch in small-scale tuna fisheries: a global study. FAO Fisheries and Aquaculture Technical Paper. No. 560. Rome, FAO. 2011. 116p. ²⁶	Bycatch estimates	Policy-makers, scientists
FAO 2015. Voluntary guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication ²⁷	Fisheries management	Policy-makers
Guidance for developing a National Plan of Action		
International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries, FAO Fisheries and Aquaculture Department, 1999 ²⁸ .	Bycatch management planning	Policy-makers
Report of the Expert Consultation on Best Practice Technical Guidelines for IPOA/NPOA-Seabirds, Bergen, Norway, 2–5 September 2008, FAO Fisheries and Aquaculture Report. No. 880 ²⁹ .	Bycatch management planning	Policy-makers
International Guidelines on Bycatch Management and Reduction of Discards, FAO, Rome, 2011 ³⁰	Bycatch management planning	Policy-makers
South Africa National Plan of Action - Seabirds 2008 ³¹	Bycatch management planning	Policy-makers, fishing industry
EU Plan of Action Seabirds 2012 ³²	Bycatch management planning	Policy-makers, fishing industry
Implementation of the EU Plan of Action Seabirds, pp 58-101 in Report of the OSPAR/HELCOM/ICES Working Group on Marine Birds (JWGBIRD) 2016 ³³	Assessment of implementation of the EU Seabird Plan of Action	Policy-makers

²⁵ Many resources exist in relation to guidance on artisanal and small-scale fisheries, the following selection is indicative only

²⁶ <http://www.fao.org/docrep/014/i2175e/i2175e00.pdf>

²⁷ <http://www.fao.org/3/a-i4356en.pdf>

²⁸ <http://www.fao.org/fishery/ipoa-seabirds/en>

²⁹ <http://www.fao.org/docrep/014/i0459e/i0459e00.htm>

³⁰ <http://www.fao.org/docrep/015/ba0022t/ba0022t00.pdf>

³¹ <http://www.fao.org/fishery/docs/DOCUMENT/IPOAS/national/southafrica/NPOA-Seabirds.pdf>

³² <http://ec.europa.eu/transparency/regdoc/rep/1/2012/EN/1-2012-665-EN-F1-1.Pdf>

³³

http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2016/JWGBIRD/JWGBIRD_2016.pdf

Guidance	Guidance topics	Audience
Guidance for data collection		
ACAP 2016. The further development of ACAP seabird bycatch indicators, data needs, methodological approaches and reporting requirements data collection advice (SBWG7 Doc 5) ³⁴	Seabird bycatch data collection and reporting	Fishery managers & scientists
International Guidelines on Bycatch Management and Reduction of Discards, FAO, Rome, 2011 ³⁵	Principles of bycatch data collection and reporting	Policy-makers
Commission Implementing Decision (EU) 2016/1251 of 12 July 2016 adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019 (notified under document C(2016) 4329)	List of seabirds for which bycatch data need to be collected from EU fisheries	EU Member States
Commission Implementing Decision (EU) 2016/1701 of 19 August 2016 laying down rules on the format for the submission of work plans for data collection in the fisheries and aquaculture sectors (notified under document C(2016) 5304)	Seabird bycatch data reporting to European Commission	EU Member States
Indian Ocean Tuna Commission (IOTC) Regional Observer Program ³⁶	Seabird bycatch data collection and reporting	Policy-makers & scientists

³⁴

<https://acap.aq/en/working-groups/seabird-bycatch-working-group/seabird-bycatch-wg-meeting-7/sbwg7-meeting-documents>

³⁵ <http://www.fao.org/docrep/015/ba0022t/ba0022t00.pdf>

³⁶ <http://iotc.org/science/regional-observer-scheme-science>

Guidance	Guidance topics	Audience
Guidance for addressing the seabird impacts of Illegal, Unregulated and Unreported Fishing ³⁷		
FAO 2001. International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing ³⁸	Addressing IUU	Policy-makers
EU Rules to Combat Illegal Fishing ³⁹	Regulations to reduce IUU	Policy-makers, fishing industry
Agnew, D. J., J. Pearce, G. Pramod, T. Peatman, R. Watson, J. R. Beddington and T. J. Pitcher 2009. Estimating the worldwide extent of illegal fishing. PLoS One 4: e4570.	Estimating IUU	Policy-makers
MRAG 2005. IUU Fishing on the High Seas: Impacts on Ecosystems and Future Science Needs. ⁴⁰	Estimating impact of IUU on non-target species	Policy-makers, scientists
FAO 2015. Report of the Expert Workshop to Estimate the Magnitude of Illegal, Unreported and Unregulated Fishing Globally, Rome, 2–4 February 2015. FAO Fisheries and Aquaculture Report No. 1106. Rome. 53 pp. FIRO/R1106 (En) ⁴¹	Estimating IUU	Policy-makers, scientists
Guidance for mitigating the indirect impacts of fishing		
FAO 2003. Fisheries Management - 2. The Ecosystem Approach to Fisheries. FAO TECHNICAL GUIDELINES FOR RESPONSIBLE FISHERIES 4 Suppl. 2 ⁴²	Principles for implementing an Ecosystem Approach to Fisheries	Policy-makers, fishing industry
Garcia, S.M.; Zerbi, A.; Aliaume, C.; Do Chi, T.; Lasserre, G. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 2003. 71 p. ⁴³	Principles for implementing EAF	Policy-makers
FAO. Putting into practice the ecosystem approach to fisheries. Rome, FAO. 2005. 76p ⁴⁴	Principles for implementing EAF	Policy-makers
PICES 2012. A guide to implementing the ecosystem approach through the Marine Strategy Framework Directive ⁴⁵	Principles for implementing EAF	Policy-makers, fishing industry

³⁷ Many resources exist in relation to guidance to combating IUU fishing, the following selection is indicative only

³⁸ <http://www.fao.org/fishery/ipoa-iuu/en>

³⁹ https://ec.europa.eu/fisheries/cfp/illegal_fishing/info_en

⁴⁰ <http://thestevepergroup.com/marinemegafauna/wp-content/uploads/2013/02/IUU-Fishing.pdf>

⁴¹ <http://www.fao.org/3/a-i5028e.pdf>

⁴² <http://www.fao.org/docrep/005/Y4470E/Y4470E00.HTM>

⁴³ <http://www.fao.org/3/a-y4773e.pdf>

⁴⁴ <https://www.cbd.int/doc/meetings/mar/cbwsoi-seasi-01/other/cbwsoi-seasi-01-putting-into-practice-eaf-en.pdf>

⁴⁵ <http://www.projectpisces.eu/guide/index.html>

Guidance	Guidance topics	Audience
Petersen, S. L., D. C. Nel, and A. Omardien (eds). 2007. Towards an ecosystem approach to longline fisheries in the Benguela: An assessment of impacts on seabirds, sea turtles and sharks. WWF Report Series – 2007/Marine/001 ⁴⁶	Benguela Current EAF	Policy-makers & scientists
Frederiksen, M., Wanless, S., Harris, M.P., Rothery, P. and Wilson, L.J., (2004) The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. <i>J. Appl. Ecol.</i> 41, 1129-1139 ⁴⁷	Principles for implementing EAF	Policy-makers and scientists
Cook, A.S.P., D. Dadan, I. Mitchell, V.H. Ross-Smith, and R.A. Robinson (2014) Indicators of seabird reproductive performance demonstrate the impact of commercial fisheries on seabird populations in the North Sea. <i>Ecological Indicators</i> 38, 1-11.	Principles for implementing EAF	Policy makers and scientists
Sydeman WJ, Thompson SA, Anker-Nilssen T, Arimitsu M, Bennison A, Bertrand S, Boersch-Supan P, Boyd C, Bransome N, Crawford RJM, Daunt F, Furness R, Gianuca D, Gladics A, Koehn L, Lang J, Logerwell E, Morris T, Phillips EM, Provencher J, Punt A, Saraux C, Shannon L, Sherley R, Simeone A, Wanless R, Wanless S, Zador S. 2017. Best practices for assessing forage fish fisheries – seabird resource competition. <i>Fisheries Research</i> 194: 209–221.	Best practice for assessing fishery-seabird competition	Policy makers and scientists
<p>References proposing minimum biomass thresholds:</p> <ul style="list-style-type: none"> • CCAMLR 2018. Website https://www.ccamlr.org/en/fisheries/krill-fisheries accessed March 2018.⁴⁸ • MSC 2014. Fisheries Standard v2.0 • Pikitch, E., Boersma, P.D., Boyd, I.L., Conover, D.O., Cury, P., Essington, T., Heppell, S.S., Houde, E.D., Mangel, M., Pauly, D., Plagányi, É., Sainsbury, K., and Steneck, R.S. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC. 108 pp. • Smith, A. D., Brown, C. J., Bulman, C. M., Fulton, E. A., Johnson, P., Kaplan, I. C., Lozano-Montes, H., et al. 2011. Impacts of fishing low-trophic level species on marine ecosystems. <i>Science</i>, 333, 1147–1150. • Cury, P., Boyd, I.L., Bonhommeau, S., Anker-Nilssen, T., Crawford, R.J.M., Furness, R.W., Mills, J.A., Murphy, E.J., Österblom, H., Paleczny, M., Piatt, J.F., Roux, J-P, Shannon, L. and Sydeman, W.J., 2011. Global seabird 	Minimum biomass thresholds	Policy-makers & scientists

⁴⁶<http://www.wwf.eu/?99180/Towards-an-ecosystem-approach-to-longline-fisheries-in-the-Benguela-An-assessment-of-impacts-on-seabirds-sea-turtles-and-sharks>

⁴⁷ <https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/j.0021-8901.2004.00966.x>

⁴⁸https://www.msc.org/docs/default-source/default-document-library/for-business/program-documents/fisheries-program-documents/fisheries_standard_v2-0.pdf

Guidance	Guidance topics	Audience
response to forage fish depletion- One-third for the birds. Science 334:1703–1706.		
<p>References in relation to closed areas:</p> <ul style="list-style-type: none"> • Trathan, P. N., Garcia-Borboroglu, P., Boersma, D., Bost, C.A., Crawford, R.J.M., Crossin, G.T., Cuthbert, R.J., Dann, P., Davis, L.S., De La Puente, S., Ellenberg, U., Lynch, H.J., Mattern, T., Puetz, K., Seddon, P.J., Trivelpiece, W. and Wienecke, B., 2015. Pollution, habitat loss, fishing, and climate change as critical threats to penguins. <i>Conservation Biology</i> 29,31-41. • Daunt, F., Wanless, S., Greenstreet, S.P.R., Jensen, H., Hamer, K.C. and Harris, M.P., 2008. The impact of the sandeel fishery closure on seabird food consumption, distribution, and productivity in the northwestern North Sea. <i>Canadian Journal of Fisheries and Aquatic Sciences</i>, 65(3), 362–381. • Sherley RB, Botha P, Underhill LG, Ryan PG, van Zyl D, Cockcroft AC, Crawford RJM, Dyer BM, Cook TR. 2017. Defining ecologically-relevant scales for spatial protection using long-term data on an endangered seabird and local prey availability. <i>Conservation Biology</i>. DOI: 10.1111/cobi.12923. • Sherley, R. B. et al. 2018. Bayesian inference reveals positive but subtle effects of experimental fishery closures on marine predator demographics. <i>Proceedings of the Royal Society B: Biological Sciences</i> 285, 20172443. 	Spatial or seasonal closures	Policy-makers & scientists

Gaps in guidance

As the table above indicates, well-developed guidance exists for addressing bycatch of seabirds in longline and trawl fisheries worldwide. However, for AEWAs seabirds, gillnets, small-scale fisheries and indirect impacts of fishing are having the predominant fisheries-related impact. Guidance on reducing seabird bycatch in gillnet fisheries is hampered by the fact that technical solutions are not yet fully identified. There is also little specific guidance to quantifying or reducing bycatch in IUU fisheries, although substantial guidance on addressing IUU fishing in general (not the subject of this review). Guidance to quantify and address the indirect impact of fisheries on seabirds is an active research field, and it is anticipated that guidance in this area will continue to evolve at pace.