Food and Agriculture Organization of the United Nations

Framework for a European Management Plan for the Great Cormorant

Version July 2025

EIFAAC EUROPE

European Inland Fisheries and Aquaculture Advisory Commission

Co-funded by the European Union

Preparation of this document

The preparation of this Framework for a European Management Plan for the Great Cormorant received financial support from the European Maritime, Fisheries and Aquaculture Fund (EMFAF) within its work programme for 2024–2025, under the FAO-European Commission Trust Fund project on 'Developing Europe-wide management advice to protect vulnerable and endangered fish species from unsustainable predation by cormorants" (GCP/RER/069/EC).

The membership of the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) and the European Parliament requested the preparation of a European management plan for the great cormorant various times since 2008.

This document has been written by Ian G. Cowx (University of Hull, United Kingdom), Niels Jepsen (Danish Technical University, Denmark) and Raymon Van Anrooy (EIFAAC secretary).

The preparation of the document involved hundreds of stakeholders, representing governments, research and management institutions, intergovernmental organizations, non-governmental organizations (NGOs) and Civil society organizations (CSOs) active in bird conservation, fish and biodiversity conservation, water management, fisheries and aquaculture. Draft versions of this document were shared by the EIFAAC Secretariat with all key stakeholders in April and May 2025 for comments and suggestions.

Contributions, information and comments were received from Government officials from ministries responsible for environment and fisheries of nearly all 37 EIFAAC member countries.

The European Commission Directorate General for Maritime Affairs and Fisheries (DG MARE) and European Commission Directorate General for the Environment (DG ENV), and various Members of the European Parliament participated in the stakeholder meetings and contributed to the draft framework management plan, as well as scientists on bird- and fish conservation, fisheries and aquaculture from more than 30 European universities.

Organizations which participated in and contributed to the development of this framework management plan included, amongst others: Angling Trust (United Kingdom), Alienor, Aquaculture Advisory Council (AAC), Association of Marine Aquaculture Companies of Andalusia (ASEMA, Spain), Association Française des Professionnels de la Pisciculture d'Etangs (France), Asociatia Nationala a Producatorilor din Pescarie (ROMFISH, Romania), Baltic Sea Advisory Council (BSAC), Birdlife Europe, Centro Tecnológico de la Acuicultura (CTAQUA, Spain), Brancheorganisationen Dansk Lystfiskeri (Denmark), Danmarks Sportsfiskerforbund (Denmark), Deutscher Fischerei Verband e. V.(Germany), Deutscher Angelfischerverband e.V. (Germany), Eurogroup for Animals, European Anglers Alliance (EAA), European Federation for Hunting and Conservation (FACE), Federation of European Aquaculture Producers (FEAP), Fédération Française d'Aquaculture (France), Fishprotection contra Cormorant re. association (FPcC, Germany), Lystfisker Danmark (Denmark), Maison Wallonne de la Pêche (Belgium), Natural Resources Institute Finland (LUKE), North Sea Advisory Council (NSAC), Organizacja Producentów Polski Karp (Poland), Polskie Towarzystwo Rybackie (Poland), Polski Związek Wędkarski (Poland), Seas at Risk, Sportvisserij Nederland (Netherlands), Svenska Jägareforbündet (Sweden), Wetlands International, and Związek Producentów Ryb (Poland).

The preparatory process included a range of regional workshops, meetings and consultations in 2024 and 2025, such as:

- An EIFAAC workshop on management advice for reducing the impact of cormorant predation on fish and fisheries, Pula/online, Croatia, 8 October 2024. (78 participants from 24 countries)
- A Baltic Sea Advisory Council Workshop on predators in the Baltic (seals, cormorants), second edition, Helsinki/online, Finland, 30 October 2024 (71 participants)
- A North Sea Advisory Council/BSAC Workshop on predators (seals & cormorants), Lulea, Sweden, 20 March 2025 (41 participants)
- An EIFAAC Stakeholder consultation on the draft European Cormorant Management Plan, Rome/online, 25 April 2025 (114 participants from 27 countries)
- A Polish Presidency to the Council of the EU/EIFAAC Conference on management advice to reduce cormorant predation impacts, Brussels/online, Belgium, 3 June 2025 (230 participants from 27 countries).

Citation: EIFAAC. 2025. Framework for a European Management Plan for the Great Cormorant. Version July 2025. European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC). Rome.

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Executive summary

Cormorants are protected in the European Union under the Birds Directive (2009/147/EC), which has contributed to a dramatic increase in their populations since the 1980s. This conservation success has brought cormorants into conflict with inland and coastal fisheries and aquaculture in Europe. The increasing population size and expanding range of the great cormorant in Europe have contributed to threats to aquatic biodiversity, declining fish stocks and loss of aquaculture production in both fresh and coastal waters, leading to economic losses for commercial and recreational fisheries and aquaculture enterprises.

To address the problems caused by the increasing European great cormorant population size, numerous mitigation measures have been undertaken at the national level. However, great cormorant population numbers and their distribution range across Europe continue to increase and mitigation measures have been largely unsuccessful. The limited success of ongoing national management interventions has highlighted the need for a pan-European management plan, as previously requested by the European Parliament.

This document provides a framework for a European Management Plan for the great cormorant (CMP framework) to manage the adverse impacts of an expanding great cormorant population on inland and coastal fish, fisheries and aquaculture across its European distribution range. It provides a balanced, science-based, and inclusive roadmap for managing the complex interactions between cormorants, fisheries, aquaculture and fish conservation in Europe. It is designed to compensate, mitigate and, where possible, reconcile cormorant-fish conflicts. It focusses on maintaining the great cormorant's good conservation status, but also recognises the social and economic dimensions, especially related to fish and fisheries and aquaculture, along with consequences of cormorant-fish-human interactions.

The CMP framework contains a review of the biology and development of great cormorants in Europe, a section on impact on fish resources and associated socio-economic impacts, a section on legislative, policy and management issues of relevance and provides a structured framework for its implementation and evaluation.

The CMP framework involves a series of steps: 1) assessment of the system of cormorant fish interactions, related economics, and the underpinning policy drivers, objectives and target end points; 2) formulating management measures; 3) choosing a course of action; 4) implementing management actions, monitoring changes in cormorant, fish, aquaculture and ecosystem characteristics, region-wide cooperation, and compensation for damages to fisheries and aquaculture; and 5) re-evaluation and adjustment of the endpoints and objectives of the plan into the future.

The CMP framework provides a process for stakeholder engagement and enables structured decision-making and adaptive management through the Evaluate-Adjust-Adapt processes. The outcomes of the CMP target a significant decrease in cormorant-related conflicts in Europe, maintenance of the favourable conservation status of the great cormorant across its European distribution range, improvement of the conservation status of vulnerable fish species, and, in part, address reasons for failure to achieve good ecological status in rivers, lakes and transitional waters under the EU Water Framework Directive. It will also contribute towards sustainable freshwater aquaculture and inland fisheries business development and food security for Europe.

Contents

1. The need for a European Cormorant Management Plan

Recovery of the great cormorant (*Phalacrocorax carbo carbo* and *Phalacrocorax carbo sinensis*) in Europe symbolises a highly successful conservation story. From very low abundance in the 1950s due to persecution and toxic pollution, its population has grown and expanded its range across Europe (van Eerden and Gregersen, 1995; Bregnballe, 1996; Bregnballe et al., 2011a; Bregnballe et al., 2014). This has brought the great cormorant into direct conflict with fisheries, and has been the subject of intense debate since the 1990s regarding its impact on inland and coastal fisheries in Europe. This is reflected by the various interventions by the European Parliament (EP) over the past three decades (see section 2.5.3 and Annex 2), including calls for a European Management Plan and a call for support for various projects to address the conflict. Support has also been given by the European Commission (EC) to projects to attempt to address the problem (REDCAFE[1], INTERCAFE[2], CORMAN[3] and FRAP[4] projects). The increasing population size and expanding range of the great cormorant have contributed to low levels of fish stocks and problems with their recovery, and loss of aquaculture production in both inland and coastal waters. This has led to economic losses for commercial and recreational fisheries and aquaculture enterprises (Section 2.3).

This perspective is countered by arguments that the current poor status of fish stocks is the result of commercial and recreational overfishing, including considerable bycatch, and general environmental degradation (Klenke et al., 2013). It is suggested that fish stocks should be helped in their recovery by managing fishing pressure and strategically removing the barriers to fish migration and restoring their habitats, thus meeting the EU´s nature restoration goal to restore 25 000 km free flowing rivers by 2030. Whilst considerable attention has been paid to these measures through the Common Fisheries Policy (updated in 2013[5]), including measures introduced in 2023 to improve the sustainability and resilience of the EU fisheries and aquaculture sectors, and under the Water Framework Directive (WFD)[6] (including estuarine (transitional) and coastal waters) and the Marine Strategy Framework Directive (MSFD)[7], fish populations continue to decline. Freshwater fish are amongst those with the highest proportion of species in poor conservation status of any biota (EEA, 2020). Within Europe, 37% of the 531 native freshwater fishes assessed for the IUCN European Red List are threatened (Freyhof and Brooks, 2011).

One factor that has persisted throughout this period, since first raised in the 1990s and including removal of *P. c. sinensis* from Annex 1 of the Birds Directive in 1997[8], is predation

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[1] https://www.ceh.ac.uk/our-science/projects/intercafe-information#:~:text=REDCAFE,European%20Union's%20Framework%20Five%20Programme

[2] https://www.ceh.ac.uk/our-science/projects/intercafe#:~:text=The%20main%20objective%20of%20INTERCAFE,Europe%20and%20to%20deliver%20a

[3] EU Project: Sustainable Management of Cormorant Populations: https://tinyurl.com/y7vpcy6p; http://cormorants.freehostia.com/

[4] https://www.ufz.de/index.php?en=36309

[5] Common fisheries policy (CFP) - European Commission

[6] Water Framework Directive - European Commission[7] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0056

[7] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0056

[8] https://ec.europa.eu/commission/presscorner/detail/ro/ip_97_718

and damage by cormorants. This is not only directly affecting fish populations themselves but also constraining recovery of threatened species and depleted stocks after environmental conditions have been improved.

To date it has not been possible to reconcile the increased pressure from cormorants in rivers, lakes and coastal waters or on aquaculture facilities using traditional mitigation measures (restoration, barrier removal, stocking, reducing fishing pressure and shifting capture methods), and alternative strategies are required. This includes managing the cormorant population size proportionate to the damage caused, and recognising localised actions have failed to resolve ongoing conflicts because the problem is pan-European (Kindermann, 2008; Cowx, 2013).

A precedent for such a multi-country approach has been successfully adopted for other problem bird species, e.g. the barnacle goose (Jensen et al., 2018), greylag goose (Powolny et al., 2018) and the Svalbard pink-footed goose, where a management plan has been put in place to control its feeding on field crops (Madsen et al., 2012), which was evaluated in 2017 (Madsen et al., 2017).

While cormorants may constitute a vital component of biodiversity, fisheries managers, fisheries organizations, fish farming organizations and fish farmers, and those engaged in management and rehabilitation of endangered fish species have raised concerns about critical declines in fish conservation status and fish farming. In the case of fish farming, pond-based aquaculture is becoming economically unviable in various places because of predation losses and damage (FAO, 2024b, 2025a; FDAAPPMA, 2024; Parlier, 2024). Pond farm closures could also have considerable indirect impact on conservation of aquatic biota as they act as critical habitat for many threatened aquatic biota.

Although much attention has to be paid to the impact of fishing on the status of fish stocks, this predominantly refers to marine waters and diadromous species such as salmon, shad, lamprey and eel. Fishing for eel is now heavily regulated to protect the species (Council Regulation (EC) No 1100/2007). Inland waters in Europe are rarely impacted by fishing, because it is mostly recreational catch and release fishing (Cowx, 2015).Especially in rivers where the stocks are notably in decline, predation by cormorants is often a major contributor to the decline or failure to recover (e.g. Conrad et al., 2002; Guthörl, 2006; Jepsen et al., 2018; Jepsen and Rasmussen, 2023; Kallö et al., 2020; Kallö et al., 2023; Kennedy & Greer, 1988; Steffens, 2010), but see Suter (1995) who found no effect of cormorants.

Fish populations in many water bodies are now in poor condition and many stocks are threatened, including fish species of high conservation value (e.g. IUCN, 2015, 2019; Pradhl, 1996; Sayer et al., 2025). A high proportion of freshwater and marine fish species are currently in poor or bad conservation status (around 80%) based on Habitats Directive assessments, a proportion that is higher than any other species group. Loss of large freshwater fish that are top predators of smaller fish may result in higher biomass of small fish, lower biomass of invertebrates and therefore more algae, impacting the ecological status of water bodies (European Environment Agency, 2024).

To address issues arising from increasing abundance and range of cormorant populations in Europe, numerous national and European collaborative projects have been undertaken to manage and mitigate the conflict between cormorants and fisheries and aquaculture, including the EU REDCAFE, INTERCAFE, CORMAN and FRAP projects and the development of

a cormorant management toolbox (Russell et al., 2013), There has, however, been no discernible reduction in cormorant population numbers across Europe or mitigation of the problems encountered by their increasing presence. More projects have been initiated, including the Horizon 2020 ProtectFish[9] and national management plans were developed in some countries to address the problem (Gerdaux, 2005; Cowx, 2013). These actions, however, do not address one of the fundamental issues - lack of a coherent regional management plan for this migratory bird species, despite numerous calls for such a plan from the European Parliament, EIFAAC, fisheries and aquaculture agencies and NGOs such as the European Anglers Alliance and Aquaculture Advisory Council (see Annex 2). Consequently, fish populations continue to deteriorate, with many fish stocks and associate businesses threatened in their survival. Further, many aquaculture businesses have become unviable and gone out of business as a result of unsustainable cormorant predation (e.g. Musil, 2002; Kortan et. al., 2008; Donati et al., 1997; Adamek and Kaigrova, 2022; FAO, 2025a).

The aim of this document is to:

- outline the nature of the conflict arising from the recovery and expansion of great cormorant in Europe, the ways they have been addressed, and the effectiveness of adopted measures;
- review the main economic effects of the conflict, and attempts to define the major problems preventing resolution;
- review the legislative and policy framework relevant to the cormorant-fish conflict; and
- present a framework for a European management plan to reduce damages caused by great cormorants to fish biodiversity, fisheries and aquaculture.

[9] Homepage - Protectfish

2. Cormorant-fish conflict

2.1 Description of the cormorant population

Two subspecies of great cormorant occur across Europe, the smaller *Phalacrocorax carbo sinensis* inhabits coastal as well as inland waters, whereas the other subspecies, the larger *Phalacrocorax carbo carbo* is mainly found around the open coast of Norway, Ireland, British Isles and Iceland (Nelson, 2005; Bregnballe et al., 2014). The subspecies *P. c. sinensis* has increased strongly in both numbers and geographical range and causes many conflicts throughout Europe. The subspecies *P. c. carbo* has maintained a stable population and distribution in recent decades (although declining in Norway), and, as such, does not cause as many conflicts. Thus, when the term cormorant is used in this document, it refers mainly to *P. c. sinensis* in mainland Europe and *P. c. carbo* in north-western Atlantic coastal countries.

2.1.1 Breeding biology

Cormorants are colonial waterbirds that breed in relatively large colonies. They are flexible with regards to where they establish colonies. Cormorants build their nests in trees, shrubs and/or on the ground. They breed directly on the ground on small islands if these are safe against predators (primarily foxes). However, if there are trees and shrubs on the island where they settle, they usually choose to build the nests in them. When cormorants breed by lakes, the nests are often found in trees next to the lakeshore. Colonies can occur in diverse locations, including shipwrecks, electrical transmission towers (decommissioned) and even old light houses. The breeding season extends from March to July. The eggs are white to slightly blue. Cormorants start breeding from ages 2 - 6 years and will usually lay 2 – 5 eggs each year. The reproductive time of most cormorants starts from an age of 3 years (Frederiksen and Bregnballe, 2001). Nesting success increases with age and experience (Bregnballe, 2006). The cormorants are rather long-lived and can reach ages of 15-20 years (Frederiksen and Bregnballe, 2000; Fransson and Pettersson, 2001) and adult cormorants are estimated to have a mean annual survival rate of 88 percent. The mortality rate can range between 5% and 26%, depending on factors like winter severity and population size (Frederiksen and Bregnballe, 2000). The egg incubation period is approximately 30 days. About 7 weeks after hatching, the young are ready to fly. Breeding success depends primarily on food availability and amount of disturbance during the breeding season. In favourable years, ≈2.5 young can be produced per nest, but in years with little food as few as 0.5 young are produced per nest. Some studies from Germany and Czechia reported the number of young per breeding pair was 2.1 - 3.8 per nest (Zimmerman and Rutschke, 1991). The young will typically leave the nests between late June and the end of July, depending on latitude.

2.1.2 Foraging and diet

Cormorants live almost exclusively on fish. The cormorant's individual food intake fluctuates throughout the season from 200 to 700 g/day, with a mean of 500 g/day (Grémillet et al., 1996; Keller & Visser, 1999; Ridgway, 2010). The need is greatest in May-June, when cormorants have young. The cormorant is an efficient underwater hunter that forages in virtually all water bodies, even the smallest fresh waters (running and still), shallow coasts and brackish habitats in depths up to 50 m, but normally only down to 20 m (Bregnballe, 2009) Cormorants usually seek food alone, but also forage in groups of up to several hundreds in fjords, lakes, rivers and in shallow marine areas. During the breeding period, they will normally utilise water bodies in a radius of about 30 km from the colonies, but foraging trips of up to

50 km are known. Cormorants are good at locating areas with many fish that are relatively easy to catch, such as in ponds and small open lakes (van Eerden et al., 2012). Cormorants also forage in very small water bodies like garden-ponds, small streams of 1-2 m width and even in underground concrete channels. Cormorants can survive on shrimps, sticklebacks and tiny sand goby if other prey is absent, but they can also eat fish of up to 2 kg (±50 cm in length) (Klenke et al., 2013; Kallö et al., 2023).

2.1.3 Migration and overwintering

Cormorants have established breeding colonies in most European countries, but most of the breeding takes place in northern Europe, especially around the Baltic Sea (van Eerden et al., 2012). From late summer to autumn, there is a shift in the distribution of cormorants away from the Baltic/Nordic fjords and freshwater areas and out to the more open coasts and remote small islands. Around September-October they begin their autumn migration. Some migrate along the Atlantic coast and others migrate over land, usually along rivers (Figure 1) (Frederiksen, et al., 2018). Important wintering areas include The Netherlands, France, Spain, southern Germany, Switzerland and northern Italy (Bregnballe and Rasmussen, 2000). Some cormorants choose to stay in northern areas, including the British Isles and the Baltic Sea region in winter, and do well in mild winters. The number of cormorants that overwinter in the north has increased as winters have become milder, linked to increasing air temperatures and less ice-cover.

Figure 1. Example of recoveries of ringed cormorants from The Eurasian African Bird Migration Atlas (https://migrationatlas.org/node/1773#section1)

The population of cormorants in Southern European countries like Italy, Croatia, Spain and Portugal has continued to increase in recent decades (Regione del Veneto, 2024; Opacak et al., 2004; Junta de Andalucia, 2025), as well as in Central and Eastern Europe (Bregnballe et al., 2014). Cormorants in Central and Eastern Europe tend to stay year-round, so they are moving from obligatory migratory birds towards more diverse strategies (including resident birds).

2.1.4 Development in Europe

In Europe, standardized comprehensive cormorant surveys have only been conducted a few times. The last comprehensive survey was in 2013 (van Eerden 2021), thus the numbers given below are estimates. The European Breeding Birds Atlas[10] shows trends in distribution and abundance of cormorants and their breeding status up to and including 2017 (Figure 2), and it is widely recognised that the distribution range and abundance have increased further in recent years (T. Bregnballe, unpublished data).

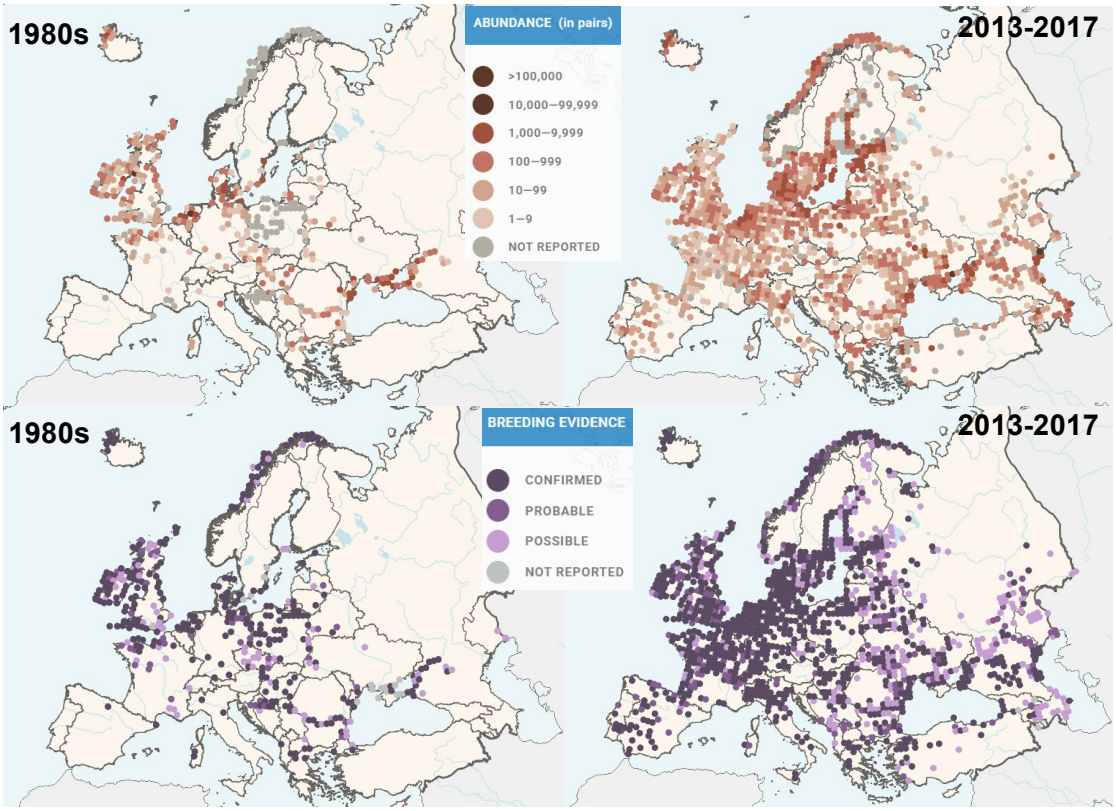

Figure 2. Abundance (upper panels) and distribution of breeding cormorants in the Western Palearctic in 2012 presented in 50 x 50 km grid cells between the 1980s and 2013-2017. (source: European Breeding Birds Atlas 2 - https://ebba2.info/maps/species/Phalacrocorax-carbo/ebba2/abundance/)

In the first half of the 20th Century, the great cormorant was close to extinction in Europe. In the early 1960s, the northwest European population numbered about 5 000 breeding pairs. In the 1970s, the population began to grow in The Netherlands, Denmark and Sweden, and numbers increased to ≈13 500 pairs in 1981. The increase in numbers reflects that the abundance of cormorants was negatively impacted in the past by human activities or side

[10] https://ebba2.info/maps/species/Phalacrocorax-carbo/ebba2/abundance/

effects of societal development (e.g. persecution, toxic pollution such as DDT and PCBs) (Dirksen et al., 1995; van Eerden and Gregersen, 1995). Adoption of the EU Birds Directive in 1979 resulted in markedly increased protection of cormorants, and cormorant population abundance and their distribution increased greatly (van Eerden and Gregersen, 1995). The implementation of the Birds Directive was not followed by plans for management of the species, and the population of *P. c. sinensis* grew rapidly and spread over Europe (van Eerden and Gregersen, 1995; Lindell et al., 1995; Keller and Muller, 2015; Bregnballe, 1996; Bregnballe et al., 2011; Bregnballe et al., 2014).

Other reasons for the successful expansion of the great cormorant are increased nutrient input into lakes and coastal waters leading to eutrophication, boosting fish populations and thereby providing more abundant food sources for cormorants (de Nie, 1995; van Eerden and Gregersen, 1995; Suter, 1997). The growth of fish farming in various European countries, particularly in areas frequented during cormorant migration, provide additional foraging opportunities, especially in fishponds (Moerbeek et al., 1987).

The global population in 2014 was estimated to number ≈1 400 000-2 100 000 individuals (Wetlands International, 2015). The European population was estimated at 401 000-512 000 breeding pairs, which equates to 828 000-1 030 000 mature individuals (Birdlife International 2015; 2018). The total number of breeding pairs in Europe is estimated to have increased since 2014, but has not been counted recently. This recent, substantial, increase in numbers has coincided with an extension in geographical range, with cormorants moving north, especially along the Baltic coasts of Sweden and Finland, resulting in a build-up of breeding colonies as far north as the Bothnian Bay (Figure 1). However, there have also been marked increases in numbers of (smaller) breeding colonies on the European mainland and British Isles. Knowledge of the size of the cormorant population in Europe prior to modern times, is limited, but it has been concluded, based on archaeological finds and ancient literature dating back a thousand years that the cormorant was never very abundant in Europe (Beike et al., 2013), thus "*the current distribution and abundance of the cormorant cannot be seen as a recovery of the species to historically existing conditions*".

Even the best counts (2006, 2012/13) carry some uncertainty, both because some colonies may have been overlooked and because some nests inside some of the colonies are likely to have been missed (Bregnballe et al., 2013).

The dynamic nature of the cormorant population, as well as variation in the counting effort from country to country, makes robust estimates of total population size in Europe challenging. The conversion from counted nests/pairs to total number of individuals is not trivial and will vary with population age-structure. This has given rise to much discussion regarding the "true" size of the population, but overall, it is often assumed that each counted nest equates to 4.5 birds in the autumn (Bregnballe, 2009; Wetlands International, 2025), although another study used as a simplified method for population estimation a conversion factor as low as 3 birds for waterbirds in general (Meininger et al., 1995). Based on the nest counts and the conversion factor of 4.5 it is valid to approximate that there are currently more than 2 million cormorants spending all or most of their time in European waters. The future development of the cormorant population will primarily be determined by: a) the food supply; b) opportunities for cormorants to establish new colonies; c) regulatory measures, especially culling of juveniles and adults; and d) expansion of the population of white-tailed sea eagles and other predators like foxes and racoons, and weather conditions (Hermann et al., 2021).

2.2 Impact of cormorants on aquatic resources

Discussions regarding cormorant predation on wild fish, and thus commercial fishing, recreational fishing, fisheries and fish conservation, have been intense for decades and continue to date (e.g. Kindermann, 2008; Cowx, 2013; Carss, 2022; Saarikoski et al. 2025). Impacts from cormorant predation on wild fish populations are, however, difficult to measure. Consequently, most information is gained from single site assessments carried out as part of targeted studies (see Kindermann, 2008; Seiche et al., 2012; Cowx, 2013; EU Cormorant Platform[11]). These are supplemented by information in various national and regional cormorant management plans (e.g. Sweden, Denmark, Finland, Veneto region in Italy; see Gerdaux, 2005 and Cowx, 2013 for overviews) and information being compiled as part of the ProtectFish project. These studies provide clear and compelling evidence for predation impact on fish species and populations in specific areas. There are many common recurrent results from different places that show the impact of cormorant predation of fish stocks, especially salmon and sea trout [smolts] and grayling in rivers, pike in lakes, and cod and juvenile flatfishes in coastal waters, but not all results can be readily used or seen as valid for other areas or species. Consequently, the transferability of scientific results is central to providing evidence for the conflict. The impact on farmed fish, on the other hand, is relatively easier to evaluate, as the input (fry/fingerlings, feed), growth and mortality rates, and output (expected harvest without predation) are known. In this section, definitive evidence of impact is described, whereas it is acknowledged that evidence of no- or low impact can also be found in the scientific literature. A more thorough discussion of this dichotomy can be found in Cowx (2013) and Marzano et al. (2013).

Nevertheless, ample evidence shows that predation from cormorants can have substantial adverse impacts on aquaculture and inland and coastal fishing, and on aquatic biodiversity in general. Considering a total population of 2 million cormorants in Europe (Geographic Europe, not EU) and the fact that they each must consume a mean of 500 g of fish/day (Grémillet et al., 1996, Keller and Visser, 1999, Ridgway, 2010), equates to ≈ 365 000 tonnes of fish consumed each year, assuming they all forage within European waters the whole year. If this number is compared with high sea commercial fishing landings, it is only a fraction, but if compared with coastal and freshwater fish harvest, it is a very high proportion. So, the impact from cormorant predation is very dependent on the foraging habitat. In the open sea it represents less direct impact. In coastal areas and fjords the predation impact will only be a major when fish stocks are low, but in rivers and lakes with a naturally lower fish biomass the impact can be very high.

Rivers

In rivers and streams, even rare visits by cormorants have serious consequences for wild river fish populations, like salmon, marble trout, brown trout, grayling, barbel and nase (e.g. Harris, et al., 2008; Jepsen et al., 2018, 2018b; Kennedy and Greer, 1998; Kohl, 2005; Steffens, 2010; Kainz, 1994; NASCO, 2025). Trout and salmon smolts are particularly vulnerable to cormorant predation, especially stocked hatchery reared trout and other commonly stocked species (Boström et al., 2009; Boström et al., 2012; Cech and Vejrik, 2011; Jepsen et al, 2019, Källo et al., 2023; Säterberg et al., 2023). Some studies argue that cormorant predation may pose an

[11]https://circabc.europa.eu/ui/group/e21159fc-a026-4045-a47f-9ff1a319e1c5/library/b592c4bf-acd4-41e4-aba1-e6d3d5d9a0b0/details

extinction risk to some fish populations (Koed et al., 2006; Jepsen et al., 2010; Steffens, 2010). Cyprinid fishes (e.g. roach, bleak and bream), European pike and perch-like fish (pike-perch, perch and gizzard shad) are also at great risk of being adversely affected by cormorants (Evrard, et al., 2005; Ovegård et al., 2021; Delmastro et al., 2015; FDAAPPMA 47, 2024).

Lakes

Depletion of fish stocks in lakes as a result of predation by cormorants has been documented in Sweden, Germany, Denmark and the United Kingdom of Great Britain and Northern Ireland (e.g. Britton et al., 2002, 2003; Boel, 2012; Boström et al., 2012; Carpenter et al., 2005; Dirksen, et al. 1995; Ovegaard, et al., 2017; Rudstam et al., 2004; Skov et al., 2014; Winfield, et al., 2007; Wright, 2003), but see Engström, (2001) for no impact. These impacts are particularly severe in small shallow lakes (e.g. Britton et al., 2002, 2003; Wright, 2003).

Marine

In coastal (and fjord) waters, there is considerable evidence that cormorants can consume a high proportion of the fish stocks (Birt et al., 1987; Bax, 1998; Dehngard, et al., 2021; Dieperink, 1995; Vetemaa et al., 2010): and for some species in the Baltic Sea cormorants eat more fish than are caught by commercial fisheries (Hansson et al., 2017), although the results of this modelling study have been disputed (Heikinheimo et al., 2018). Nevertheless, predation impacts on cod, eel, flounder and perch in the Baltic Sea area are now well-documented:

- perch (e.g. Vetemaa et al., 2010; Östman et al., 2012, 2013; Gagnon et al., 2015, Veneranta et al.,2020; Arlinghaus et al., 2021; Bergström et al., 2022);
- pikeperch (e.g. Eschbaum et al., ,2003; Mustamäki et al., 2014; Heikinheimo et al., 2016; Salmi et al., 2015);
- pike (e.g. Östman et al., 2013; Hansson et al., 2017; Bergström et al., ,2022);
- flounder (e.g. Florin et al., 2013; Östman et al., 2013; Jepsen et al., 2010; Nielsen et al., 2008; Jepsen et al., in prep);
- eel (e.g. Jepsen et al., 2010; Dauster, 1987);
- cod (Jepsen et al., in prep).

However, there are also studies that did not find severe impacts of cormorant predation on marine fish stocks (e.g. Lehikoinen et al., 2017; Heikinheimo et al., 2018; Heikinheimo et al., 2022).

Information on cormorant predation of threatened eel populations—once the foundation of historically important fisheries—is scattered (Carpentier et al., 2009). However, research indicates that cormorants can consume 40–44% of small eels in a single summer in coastal areas (Jepsen et al., 2010; Danish Eel MP, 2008). Estimates suggest that cormorants are the leading cause of eel mortality, exerting a far greater impact than both fishing and hydropower/water pumping stations combined.

Fishing

Inland (freshwater) capture fisheries production in the European area has declined from 192 000 tonnes in 1980 to 110 000 tonnes in 2023, a reduction of 43 % (FAO, 2025c). The increase in predation by cormorants cannot be solely blamed for this reduction in freshwater fish production, but has certainly contributed to the decline. Increased predation from cormorants also constrains depleted fish populations from recovering, despite measures being taken to address other influencing factors, as has been observed in Denmark (Jepsen et

al., 2018). The reduced stocks of freshwater fish have caused most EU Member States to introduce catch and release practices (Arlinghaus et al., 2002; 2015; Ferter et al., 2013; Arthur, 2025) and resort to intensive stocking of fish in inland waters for recreational fisheries (Cowx, 2025). For comparison, non-EU, eastern European countries that have lower prevalence of cormorants, have exhibited an increase in inland fisheries production over the same period, although production has been relatively stable in recent years (FAO, 2025c). These countries have generally less problems with cormorant predation on fish, as the cormorant population is smaller, not protected, actively managed and hunted (FAO, 2025a, forthcoming).

Fish farming

Despite considerable emphasis on promoting aquaculture production in the EU (EC, 2020b, 2021, 2022), freshwater aquaculture production has declined in the European area between 1990 and 2023 from 340 000 tonnes to 300 000 tonnes - a reduction of 14% (FAO, 2025d). Pond aquaculture in France, Germany, Czechia and Romania saw declines in production, where an increase would have been expected based on improved aquaculture techniques and management (FAO, 2025d). Whilst economic and marketing factors may contribute this decline, the reduction in production is partly attributable to the increase in cormorant numbers and related predation on freshwater fishponds (Opacak et al., 2004; Seiche et al., 2012; Volponi, 1997; Halasi-Kovács et al., 2023). Most freshwater fish aquaculture production in Europe takes place in ponds, and cormorants have caused farm closures and reduced profitability in many countries (FAO, 2025a forthcoming).

General decline in fish and fisheries

Against the backdrop of increasing cormorant population abundance and range, is the recognition that fish stocks and fisheries are in decline because of other factors, including fishing pressure, predation pressure from other piscivores, climate change, habitat degradation and environmental change. These other factors do, of course, play a role, but there are many studies where other causes for declining fish can be ruled out, leaving only cormorant predation (e.g. Koed at al. 2006; Jepsen et al., 2010, 2018, 2019; Klenke et al., 2012). Arguments that fisheries themselves are largely responsible are unsubstantiated for most areas, because fishing activities have declined drastically in freshwater and coastal areas, and fish stocks had responded positively until cormorant numbers increased (e.g. Anon, 2022; Boel, 2012; Jepsen et al., 2014; Jepsen et al., 2018; Jepsen and Rasmussen, 2023). Fishing, as a single factor, is not accountable for the poor state of many fish stocks in inland and coastal waters (whereas fishing is often responsible for open seas fisheries). However, in some southern Member States, there is still some commercial inland fishing, which may have a significant impact on populations. Fishing pressure in coastal waters has reduced tremendously in the last decades (Pascual-Fernandez et al., 2020; Guyader et al., 2013), but fisheries are still in decline. As an example, the traditional coastal cod fishing in the western Baltic has almost ceased to exist (Figure 3), while tagging studies show that cormorants are now eating 70% of the tagged cod in just one season (Jepsen et al. unpublished). With such predation pressure, rebuilding of the stock is unlikely, despite closure of the fisheries.

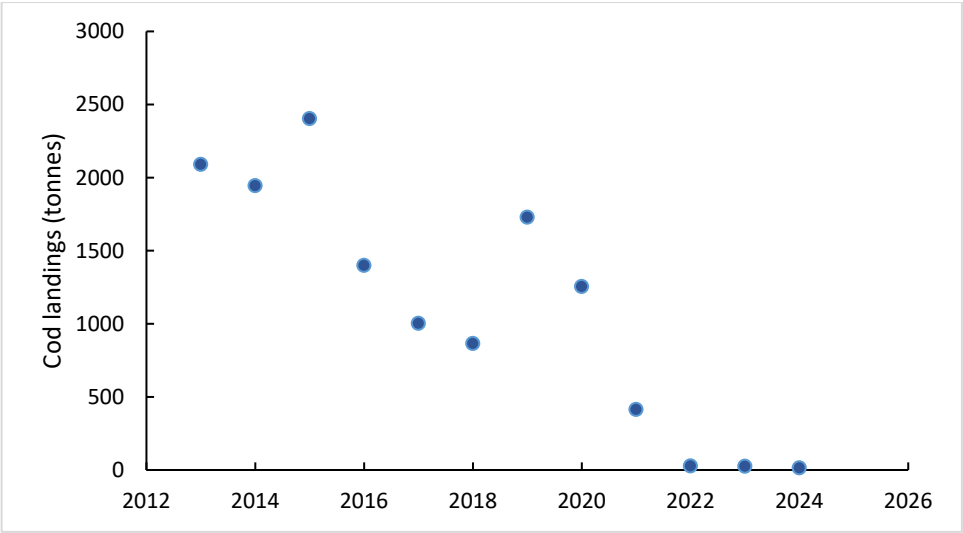

Figure 3. Danish landings of cod in the Western Baltic (source: subdivision 22, Fiskeristatistik.dk)

In inland waters, catch and release is widely practiced by recreational fishers (Arthur, 2025; EAA, pers. comm.) so has little impact of stock status. In addition, populations of many freshwater fish species that are not subjected to any fisheries exploitation, and where habitat quality has improved, because of considerable investment in removing barriers to reconnect rivers (see European Centre for River Restoration[12]), river habitat and water quality improvement activities, still have not recovered. Tagging studies document the direct impact of cormorants on several freshwater fish populations (e.g. Jepsen and Rasmussen, 2023; Skov et al., 2014). Cormorants appear to be a common denominator in the failure to meet recovery benchmark targets of Good Ecological Status or Potential for fish under the EU Water Framework Directive (e.g. Steffens 2010; Görner, 2019; Jepsen et al., 2014), but bird predation, not being formally recognised as a pressure, inadvertently overlooks this problem. The failure to meet good ecological status affects not only fish but also apex predators like otters and other fish-eating birds (e.g. herons, mergansers, ospreys, kingfishers), the prey base of which has become unstable.

While predation remains the primary impact of cormorants on fish populations, there are additional concerns regarding the effects of wounding and disturbance on fish stocks. Studies (e.g. Gremillet et al., 2003, 2006) revealed that although cormorants are considered highly efficient predators, they abandon nearly half of their hunting attempts due to prey escaping their grasp or being too large to swallow. Many of these escaped fish sustain injuries, which can lead to infections and increased mortality rates (Adamek et al., 2007).

In natural fisheries, the proportion of fish injured by cormorants is generally low (less than 5%). However, in aquaculture settings, such as farm ponds, injury rates can be higher—up to 18% (Kortan and Adamek, 2011). Further, Kortan et al., (2008) found that as many as 47% of two-year-old mirror carp (*Cyprinus carpio*) measuring 200–300 mm in total length and weighing 200–300 g showed signs of injury. Such additional damage can result in considerable economic losses in both stillwater and commercial fisheries, rendering fish unmarketable or undesirable for harvest (Callaghan et al., 1998; Engstrom 1998).

[12] https://www.ecrr.org/

Additionally, cormorants can cause fish to seek refuge in inaccessible habitats, such as small streams, in reed, or under complex overhanging structures. This displacement makes the fish unavailable to fisheries (Feltham et al., 1999). In some cases, fish become so densely packed in these refuge areas that they face the risk of oxygen depletion, which can lead to further mortality.

Dietary studies consistently show that cormorants forage on a broad spectrum of fish species. However, Doucette et al. (2011) suggested that cormorants may, in fact, exhibit specific and relatively narrow dietary niche preferences. These preferences can influence food web dynamics, particularly in ecosystems with low prey diversity. In diverse systems with abundant prey, cormorants are less likely to exert significant pressure. Conversely, in ecosystems with limited prey options, their predation has more pronounced ecological or economic impacts. Therefore, it is important not to assume universally negative effects of cormorants on fisheries, but instead to evaluate impacts in the context of local food web structure and the niches occupied by both cormorants and ecologically and economically valuable fish species.

Because cormorants are able to feed on a wide range of fish species and are highly mobile, simple predator prey relationships are unlikely to regulate population grow naturally making concerted action necessary. It seems to have become a classic “predator-pit” situation for many fish stocks. A predator pit occurs when two alternative equilibria (Holling 1973; May 1977) exist and prey is held at a low density equilibrium, unable to pass a critical threshold (‘the pit’) needed to reach the higher density equilibrium (Messier 1994; Sinclair and Pech 1996).

Habitat effects

An often-overlooked aspect of cormorant ecology is the dramatic transformation of forest ecosystems associated with dense breeding colonies (Goc et al., 2005). The accumulation of guano in these areas can lead to canopy loss of up to 90% in riparian forests, triggering cascading effects on other organisms, including amphibians. Additionally, nutrient enrichment of adjacent water bodies from guano runoff can disrupt ecological processes, resulting in reduced biodiversity and biomass of aquatic invertebrates and plants.

The growing numbers of cormorants, particularly large nesting and overwintering colonies have further amplified their ecological footprint. For example, in forested areas, cormorants can inflict substantial damage. In extreme cases, such as the Kąty Rybackie colony in Poland, which spans approximately 100 ha of pine forest, entire forest stands have been killed, leading to conflicts with forest managers (Goc et al., 2005). In the Swedish archipelago, losses in value of summerhouses have been reported and discussed in the public media, due to the establishment of cormorant colonies on small islands (e.g. Svenska Dagbladet, 2021).

Cormorant colonies also alter soil chemistry. Eggshell fragments and pellet contents can neutralize soil acidity, while high concentrations of faecal matter enrich the soil with nitrogen and phosphorus. This process can exceed the soil’s phosphate absorption capacity (Breuning-Madsen et al., 2008), increasing the risk of nutrient leaching into nearby watercourses and potentially triggering eutrophication. Such nutrient loading has implications for water quality and may affect the classification of water bodies under the Water Framework Directive.

The physical presence of carcasses from dead chicks and adults attracts scavengers and predators further alters the local ecological community. Overall, the establishment of a cormorant colony induces widespread habitat changes, initiates succession processes, and

contributes to a substantial transfer of energy and nutrients from aquatic to terrestrial systems. By shortening food chains and accelerating biogeochemical cycles, cormorants can alter both aquatic and terrestrial environments. Indeed, by predating on larger piscivorous fish, cormorants modify the food chain leaving small pelagic species to proliferate (Olin et al., 2022) and deplete the larger zooplankton that regulate algal growth (Gerke et al., 2021). Ultimately this can accelerate eutrophication processes (Donadi et al., 2017; Eklöf et al., 2020), with algal blooms causing oxygen depletion, and negatively impacting on water quality and aquatic biodiversity (Alves Amorim and Do Nascimento Moura, 2021). The consequences of this indirect impact of cormorant predation on fish on the ecological status of water bodies under the EU WFD can be significant (Ovegård et al., 2021).

2.3 Socio-economic impact of cormorant predation of fish

The social and economic impact of cormorant predation on recreational fishing and aquaculture facilities is substantial. A study by EIFAAC, the Federation of European Aquaculture Producers (FEAP) and European Angling Alliance (EAA) estimated that the costs of cormorant predation to aquaculture and fisheries in Europe were more than 350 million euros per year in 2023 and 2024 (FAO, 2025a forthcoming). Government research institutions and ministries from 25 countries contributed to the study. More than 250 angling clubs and 160 fish farmers submitted information on cormorant counts, preventive actions taken and damage and losses due to predation by cormorants[13].

There are approximately 7 000 freshwater (pond and raceway) aquaculture farms in the EU, with a total annual turnover of around 1 billion euros (EC, 2023). The total freshwater aquaculture pond area in the EU is nearly 360 000 hectares. The freshwater fish output from pond production in the EU was around 100 000 tonnes per year in recent years, plus some tens of thousands of tonnes of trout that are mainly produced in raceways (FAO, 2025a; Cai et al., 2024).

Box 1: Losses to aquaculture farms. A total of 118 aquaculture farmers from seven EU countries, which produce on average 11 000 tonnes of trout, carp, pikeperch and tench per year, reported for 2023 a combined loss of more than 10 million euros due to fish predation by cormorants. Reported losses per farm ranged from 500 euros to more than one million euros per farm, with a median figure of 30 000 euros per farm. Losses reported by pond farmers ranged from 100 euro/ha to 662 euro/ha. Annual losses of trout in raceways to cormorant predation were around 2%, increasing to 40% of the stock in large-sized pond production systems. The average annual fish stock loss due to cormorant predation in carp and tench ponds was 19%, ranging between 3% and 70% of the stock.

National level aquaculture studies, strategies and plans of European countries, such as in France, Germany and Poland, frequently refer to the economic losses and impact of cormorant predation on aquaculture farm production and incomes (e.g. Ministère de la Transition écologique, 2025; MAPA, 2014; AG NASTAQ, 2020) Annual losses from fish predation by cormorants to pond aquaculture farmers throughout Europe are estimated to be higher than 250 million euros . Recreational fishing clubs reported losses of stocked fish in the order of 100 million euros annually due to cormorant predation. In comparison, heron

[13] Detailed information will be published in FAO 2025a (forthcoming).

predation losses to aquaculture and recreational fisheries were estimated at 48 million euros annually (FAO, 2025a forthcoming).

Reported income losses in pond aquaculture due to predation by cormorants are often the difference between a profitable and loss-making business (Halasi-Kovács et al., 2023; FAO, 2024a, b; FAO, 2025a forthcoming; Engle et al., 2021). Tens of aquaculture farms have closed due to cormorant predation, as farms were no longer economically viable. Moreover, many pond aquaculture farmers, and some cage culture farmers, indicated they were disinvesting in aquaculture, shifting towards more extensive production practices, as the risks from predation by great cormorants and other protected species (e.g. herons, pygmy cormorants and otters) become too large (FAO, 2025a forthcoming).

This generally happened after fish farmers tried a wide variety of measures to reduce predation on their fish stocks. It is estimated that employment in freshwater aquaculture in Europe has declined by 20 % in the last 20 years (FAO, 2025b), partly due to increasing cormorant predation and lack of compensation for lost fish. New investments in freshwater pond aquaculture have stalled as they are considered not viable (Parlier, 2024; Ministère de la Transition écologique, 2025; FAO, 2025a forthcoming), causing a further reduction in rural employment opportunities. The European Commission's campaign to promote aquaculture across the region through the "Aquaculture in the EU: We work for you with passion[14]", which aims to bring aquaculture closer to citizens across the continent, with a strong focus on sustainability, food security, and regional development, cannot succeed without addressing the cormorant issue.

Recreational fishing organizations are widely acknowledged as providing stewardship to the nature resources under their management (Shephard et al., 2023). Many of these organizations reported that river restoration to maintain and rehabilitate aquatic biodiversity is failing because of predation of fish by cormorants. To reintroduce endangered species such as Atlantic salmon and North Sea houting, to support declining stocks of species such as grayling and to sustain angling, many lakes and rivers need restocking, a labour-intensive and expensive process. The level of predation by cormorants has reached the point where fishing organizations can no longer bear the costs of river restoration and re-stocking. Reduced catches by recreational fishers lead to less participation and reduced income for angling clubs and rural communities, and consequently less expenses and effort towards stewardship of the inland aquatic resources. Loss of members, loss of tourists, reduction in license fee income for recreational and commercial fishing are negative effects associated with the high level of cormorant predation. Some commercial fisheries are also reporting reduced profitability and losses due to conflicts with cormorants, such as in Greece (Katselis et al., 2023) and the Baltic Sea (Svels et al., 2019).

The costs for aquaculture businesses and angling clubs to try to reduce predation and mitigate the effects of predation on their fish stocks are high. Costs include scaring and hunting/culling cormorants, costs of covering ponds/water by nets, restocking costs, and volunteer hours for guarding the ponds and rivers, adding millions of euros annually (FAO, 2025a forthcoming; Ministère de la Transition écologique, 2025). Moreover, stressed fish and fish that are seeking shelter from predation do not eat well, causing suppressed growth rates and reduced income for farmers (FAO, 2024b).

[14] https://eu-aquaculture.campaign.europa.eu/index_en

Fish farmers reported stress, depression and health problems due to the need to continuously guard their ponds against cormorants and not being allowed to take timely action.

The loss of fish production due to cormorant predation also has an impact on the availability of food that provides high quality protein and micronutrients (EIFAC, 1988; Engle et al., 2021; Golden et al., 2021) in Europe. A substantial part of the estimated 365 000 tonnes of fish consumed annually by the great cormorant population in Europe could have been high quality nutritious food for people (FEAP, 2022; FAO, 2025a forthcoming). Given that the average fish and seafood consumption per capita in Europe is some 22 kg per year, the cormorant population in Europe consumes as much fish as 16 million people. The total value of fish consumed by the cormorant population in Europe is estimated at more than 1 billion euro per year (FAO, 2025a forthcoming).

The import of fish and seafood continues to increase in the EU and was around 5.9 million tonnes in 2023 (EC, 2024a): and the EU trade balance on these products is negative (approximately 23 billion euro/year). Food sovereignty of Europe is on the political agenda, to reduce dependence on food imports and improve food systems and the fisheries and aquaculture sectors have an important role to play, according to the European Ocean Pact (EC, 2025). The large cormorant population presents a barrier to increasing aquatic food systems (aquaculture and fisheries) production in freshwater and coastal environments throughout Europe.

Ecosystem services are negatively affected by the growing cormorant population, as aquatic biodiversity and natural recruitment of fish are compromised. The services provided by aquatic and wetlands ecosystems (including 360 000 ha of man-made fishpond ecosystems) have been attributable high values. Pond farms contribute greatly to preserving biodiversity of numerous wetland-related plant and animal species, most of them with NATURA 2000 importance. Operating fishponds contributes to climate resilience through carbon sequestration, and retention of water as well as assisting in a circular approach of water management. The loss of pond aquaculture causes a reduction in natural values and biodiversity and excludes a measure to attain climate goals (FAO, 2024a). The monetary damage done by cormorants to aquatic ecosystems has not been investigated sufficiently for making an estimate here.

2.4 Measures to prevent and avoid serious harm

Numerous reviews have been undertaken of measures to prevent and avoid serious harm by fish-eating birds to inland fisheries and aquaculture enterprises, most of which have been synthesised under the EU REDCAFE and INTERCAFE projects, and specifically in the Cormorant Toolbox (Russell et al., 2012). The main measures can be broken down as follows:

- Non-lethal
  - Scaring cormorants away from fishery or aquaculture unit;
  - Exclusion techniques;
  - Habitat modification techniques to reduce availability of fish to cormorants.
  - Fish stock management techniques to reduce availability of fish to cormorants;
- Lethal measures
  - Lethal measures to reduce cormorant number directly;
  - Reducing reproductive success through egg destruction;

The various measures are deployed in different European countries to different extents, and with varying degrees of success (Russel et al., 1996, 2003, 2008; Russell and Carss, 2022). The choice of measures depends on the scale of the cormorant-fisheries conflict, the type of water body or fishery operation impacted, and the potential economic losses incurred.

2.4.1 Non-lethal control measures

Scaring is a well-established method that is applied across Europe with varying degrees of success. Scaring devices cover a range of visual and auditory tools from shooting, gas cannons, fireworks, green lasers, reflectors, bells and the presence of people during daylight hours. To be effective scaring methods need to be continuous, varied, and require considerable manpower and coordinated effort. Scaring, however, moves the predation problem from one fishery or fish farm to another, increasing the food requirement of birds, so is unlikely to be regionally effective. Novel technologies like automated optical recognition combined with artificial intelligence for detection of foraging cormorants, drones to scare or to oil eggs, shotguns and rifles with silencers, subsonic ammunition, and thermal aiming devices, are being tested by stakeholders and may contribute to the available toolbox.

Scaring methods can, and often are, coupled with other exclusion and habitat modification methods that control access of cormorants to the fish and fisheries. These include wires and netting that prevent cormorants from landing on the water and foraging, or habitat modifications and increasing habitat complexity that may act as refugia for fish from cormorants. Such measures are only relevant for artificial settings like aquaculture ponds and raceways, stocked ponds, and around fixed fishing gears. Whilst they may be effective at the local level in small water bodies or small fish farm ponds, they are largely impractical for large water bodies, especially where they are utilized for angling, navigation or other conservation species, including birds.

These exclusion actions can be supported by modification to the fish stocking protocols, such that larger fish, outside the normal foraging size of cormorants, are stocked and at times when cormorant numbers are lowest.

2.4.2 Lethal actions against cormorants in Europe

As with most wild bird species, their deliberate capture and killing, disturbance, destruction of its nest or taking of its eggs can only be allowed by EU Member States in accordance with the derogation system of the EU Birds Directive (Article 9). Large scale shooting of cormorants, under Article 9 derogation of the Birds Directive, takes place in the France, Hungary, Sweden, Denmark and parts of Germany, as well as non-EU countries such as Norway and the United Kingdom, (Figure 4). The effectiveness of these measures appear to be limited, both locally (conflicts continue) (FAO, 2024b) and at a pan-EU level (population increasing). Similarly, oiling and egg pricking are used in several countries with limited effect on controlling cormorant numbers at a European scale. This is in part because some countries, such as the Netherlands, do not apply the derogation and lethal control is not permitted. Other countries apply the derogation options but insufficiently to make a difference. As a consequence, these countries potentially act as a source for replenishment of birds in countries where lethal control measures are carried out.

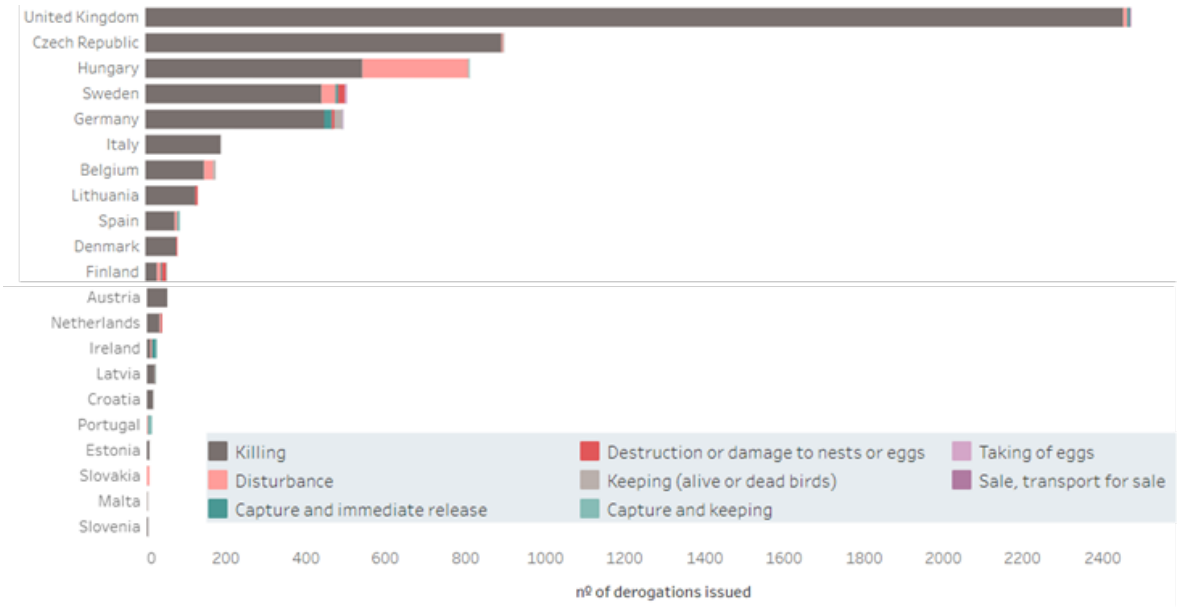

Figure 4 Number of derogations issued under Article 9 of the Birds Directive to control cormorants in Europe: 2015-2023 (Source: https://www.eea.europa.eu/en/analysis/maps-and-charts/overview-of-derogations-and-exceptions-dashboards)[15]. Note: Poland and France do not report here.

Eastern European countries outside of the EU, where cormorants are not protected, and actively managed and hunted, generally experience less problems with cormorant predation and some fish stocks and inland fisheries populations have even improved in recent years (FAO, 2025a forthcoming).

These results suggest, that to be effective, lethal control measures need to be applied in a coordinated, well planned and executed manner and include most European countries.

It should be recognised that some management organizations and stakeholders do not endorse culling cormorants under Article 9. BirdLife International and FACE produced a joint statement in 2008 on the derogation under Article 9 opposing any proposal of listing the cormorant as huntable species in Annex II of the Birds Directive[16]. It is argued that there is no legal possibility under the Birds Directive for a binding EU-wide framework obliging Member States to reduce cormorant populations. BirdLife International and FACE stress that it is the right of each EU Member State to decide on the application of derogations of Article 9, and suggest management efforts should focus on following up and promotion of the work undertaken by the REDCAFE and INTERCAFE projects. However, as already shown, these measures are ineffective at the pan-European scale.

2.4.3 Compensation

Many national authorities take the view that the cost of managing cormorant conflicts should be borne by the stakeholder. Nevertheless, some countries or regions apply or have applied

[15] This figure does not include France, as the country did not report on its derogations to the EU. Information on the national system of derogations can be found here: https://www.isere.gouv.fr/Actions-de-l-Etat/Animaux/Faune-sauvage/Les-especes-protegees/Le-Grand-Cormoran

[16] Joint Statement of BirdLife International and FACE on Cormorants *June 2008:* https://circabc.europa.eu/ui/group/3f466d71-92a7-49eb-9c63-6cb0fadf29dc/library/df4389c7-8e4b-44cf-87e9-dba40a27e1ec?p=1&n=10&sort=modified_DESC

compensation schemes to offset the consequences of cormorant predation for certain stakeholders. These include Czechia, Finland, Lithuania, Romania, Saxony (Germany), Slovakia, and Wallonia (Belgium). Such measures are largely, but not exclusively, restricted to fish farms and hatcheries, with losses of fish consumed covered (though not always fully) by compensatory payments. The calculation of compensation payments is seldom rigorous and often simply an approximation related to the farm system and visualization of cormorant presence. In some countries it is also possible to apply for financial aid for the construction of netting enclosures or scaring programmes. It should also be recognised that compensation payments are not necessarily related to financial losses but more to encourage fish farmers to maintain the heritage value of cultural landscapes.

2.4.4 Management plans

Management plans to address the cormorant-fisheries conflict exist in a number of European countries (including, Austria, Denmark, France, Germany, Ireland, Italy, Slovakia and Sweden within the EU, and Norway, Switzerland and parts of the United Kingdom outside the European Union) (Gerdeaux, 2005; Cowx, 2015), but these are not coordinated between countries. The plans are generally related to control of bird depredation on open water bodies, and in Switzerland and Austria the management plans target control (mostly scaring with culling as a last option) of birds exploiting river fisheries. This lack of coordinated planning coupled with inconsistency over culling populations between countries has implications for managing the cormorant fisheries conflict. Although transnational cormorant management plans are generally lacking in Europe, the feasibility of such an approach to address the conflict is possible, as can be seen from implementation of cormorant management in North America on lakes Huron and Ontario (U.S. Fish and Wildlife Service, 2003; Fielder, 2008, 2010). Here multi-faceted large-scale plans have proven successful to reduce the predation pressure from cormorants. The plans are often structured with alternatives, which are introduced progressively and only implemented if the previous stage remained unsuccessful: 1) no intervention; 2) scaring birds (without shooting); 3) limiting local damage at commercial fish ponds; 4) strictly monitored reduction of resources; 5) reduction of regional populations; and 6) opening up lethal control as a last alternative.

2.4.5 Conclusions

The main conclusion is that no single management intervention is effective at mitigating the problems created by great cormorants. Shooting (on a large scale) does not appear to be a viable option unless the numbers are reduced across the European distribution range. Continuous dispersal and turnover of birds is a result of incoherent action from countries that do not adopt intervention measures. Controlling local bird population density by destroying nesting areas and oiling eggs is again only likely to have a limited and short-term effect, if not carried out in a coordinated at a regional scale, especially targeting the main breeding colonies in northern Europe. Similarly, scaring methods (human disturbance, laser guns, and sound and taste aversion) do not appear to be effective because they must be carried out on a continuous basis, birds become accustomed to the methods employed, and the problem is potentially dissipated to other fisheries. Exclusion devices are only viable on some aquaculture facilities, and are not feasible in open fisheries because they restrict or prohibit fishing activities. Some success has been achieved with fish refuge devices (McKay *et al.,* 1999; Russell *et al.,* 2003, 2008; Orpwood *et al.,* 2010), but again only at a local scale. These features included artificial reefs or underwater fenced off zones that constrain access to fish-eating birds, but are not suitable for rivers where they can cause localised flooding problems.

The solution to the problem of bird depredation is thus complex and multi-facetted. It is unlikely that legislation to protect birds will be changed in the short term and scientific evidence/advice seems unable to provide easy solutions. Furthermore, irrespective of the physical measures necessary to reduce the problems, the conflicts that now exist are deep-rooted, societal issues and will not be resolved unless all stakeholders are involved in the debate and solution.

2.5 Policies and legislation relevant for management

There is a range of international and regional instruments, EU directives, EU policies and national legislation that affect the management and conservation of the great cormorant and the most important of these are discussed below.

2.5.1 International instruments

The **Convention on the Conservation of Migratory Species of Wild Animals (CMS)** of 1979 entered into force in 1983. The CMS (also called Bonn Convention) contains appendices for endangered migratory species (Appendix 1) and migratory species conserved through Agreements (Appendix 2). The great cormorant does not appear in these appendixes.

Nevertheless, the Fourth Conference of the parties (1994) issued Recommendation 4.1 on "Conservation and management of cormorants in the African Eurasian region", which recognized the strong increase in the great cormorant population and requested to maintain a favourable conservation status for this species. The same recommendation requested the members to carry out research on the assessment of damage caused by cormorants to fishers' interests, and on the effectiveness of scaring techniques and the development of other techniques to protect fisheries. However, implementation was limited to some projects. At the 12th Conference of the parties (2017) it was proposed to develop an Action Plan for the Great Cormorant in the African-Eurasian Region, but the parties did not agree to this proposal.

The **Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA,** 1995) entered into force in 1999. Most European countries have ratified this Agreement. The great cormorant (*P. c. carbo*) is included in the list of waterbird species to which the Agreement applies. In development of action and/or management plans under AEWA, species that get priority are listed in Appendix I of the CMS, as threatened species according to the IUCN Red List, and with populations of less than 10 000 individuals. The large population sizes of great cormorant would not justify an AEWA action plan, as plans are made for population recovery purposes.

Under the AEWA the great cormorant (*P. c. carbo* and *P. c. sinensis*) has three populations listed with distribution in Europe. Currently all three have the status: Populations numbering more than around 100 000 individuals which could benefit from international cooperation. The AEWA has provisions to address the management of overabundant and-conflict raising species. This has been applied with the implementation of International Single Species Management Plans for the Svalbard pink-footed goose, greylag goose, and barnacle goose. The first two are huntable under the EU Birds Directive, while the last one is not. AEWA has not been given mandate by the parties to the Agreement to work on the great cormorant.

Nevertheless, this cormorant management plan framework largely complies with the AEWA international single and multi-species management plans format and guidelines[17].

2.5.2 European and EU legal and policy instruments

The **Convention on the Conservation of European Wildlife and Natural Habitats** (Bern Convention, 1979), of the Council of Europe, entered into force in 1982. All members of the Council of Europe have ratified the Bern Convention. It governs the conservation of fauna in Europe, including the great cormorant. Article 2 of the Convention text states: "The Contracting Parties shall take requisite to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements and the needs of sub-species, varieties or forms at risk locally."

Phalacrocorax carbo carbo and *P. c. sinensis* are not included in Appendix II of the Bern Convention concerning special protection of the wild fauna species specified. The species is covered under the Convention's Appendix III protection regime. This implies that:

> Article 7.1. Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III.
>
> Article 7.2. Any exploitation of wild fauna specified in Appendix III shall be regulated in order to keep the populations out of danger, taking into account the requirements of Article 2.

The EU Directive on the Conservation of Wild Birds (Birds Directive, 2009) relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the EU Member States. It covers the protection, management and control of these species, and lays down rules for their exploitation. The Directive covers birds, their eggs, nests and habitats. The current Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds, is an amendment of the 1979 Directive 79/409/EEC.

Like the Bern Convention, the Birds Directive requires EU Member States take measures to maintain the population of the species at a level that corresponds to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level (Article 2).

Species listed in Annex I of the Birds Directive are subject to special conservation measures concerning their habitat to ensure their survival and reproduction in their area of distribution (Art. 4: Birds Directive). *Phalacrocorax carbo carbo* and *P. c. sinensis* have not been listed in Annex I to the Birds Directive since 1997[18]. This means the obligation to classify special protection areas does not apply to these species; however, they do fall under the general protection regime provided by the Birds Directive.

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[17] https://egmp.aewa.info/sites/default/files/download/population_status_reports/aewa_mop8_24_species_management_plan_format.pdf

[18] See https://ec.europa.eu/commission/presscorner/detail/en/ip_97_718 and https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:91997E003084

This general protection regime can be found in Article 5 (without prejudice to Articles 7 and 9) setting out the required measures to be taken by the Member States:

Article 5: Without prejudice to Articles 7 and 9, Member States shall take the requisite measures to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular:

a) deliberate killing or capture by any method;
b) deliberate destruction of, or damage to, their nests and eggs or removal of their nests;
c) taking their eggs in the wild and keeping these eggs even if empty;
d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive;
e) keeping birds of species for which the hunting and capture of which is prohibited.

Article 7 applies to species listed under Annex II to the Directive (species that may be hunted under national legislation). Paragraphs 2 and 3 under Article 7 state that "The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies" and "The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated." Neither of the two parts under Annex II currently list *P. c. carbo* and *P. c. sinensis* and therefore this annex does not apply for this species.

Article 9 allows Member States to derogate (in other words, *to suspend under certain circumstances*) from the basic prohibitions in Articles 5-8 as follows:

1. Member States **may derogate** from the provisions of Articles 5 to 8, where there is **no other satisfactory solution**, for the following reasons:
   a) in the interests of public health and safety, — in the interests of air safety — **to prevent serious damage to crops, livestock, forests, fisheries and water** — for the protection of flora and fauna;
   b) for the purposes of research and teaching, of re-population, of re-introduction and for the breeding necessary for these purposes;
   c) to permit, under strictly supervised conditions and on a selective basis, the capture, keeping or other judicious use of certain birds in small numbers.
2. The derogations referred to in paragraph 1 **must specify:**
   a) the species which are subject to the derogations;
   b) the means, arrangements or methods authorised for capture or killing;
   c) the conditions of risk and the circumstances of time and place under which such derogations may be granted;
   d) the authority empowered to declare that the required conditions obtain and to decide what means, arrangements or methods may be used, within what limits and by whom;
   e) the controls which will be carried out.
3. Each year the Member States shall send a **report to the Commission** on the implementation of paragraphs 1 and 2.
4. On the basis of the information available to it, and in particular the information communicated to it pursuant to paragraph 3, the Commission shall at all times ensure that the consequences of the derogations referred to in paragraph 1 are not incompatible with this Directive. It shall take appropriate steps to this end.

Over the period 2015 – 2023, the great cormorant was the species with the second highest number of derogations under Article 9, after the house sparrow (*Passer domesticus*). In terms

of the type of derogations, *P. carbo* (both subspecies included) is the species for which most derogations for deliberate killing were made; 86% of the total number of derogations related to the great cormorant (Figure 4). Moreover, 22 EU Member States (23 including the United Kingdom) made derogations for killing cormorants, largely with the purpose of preventing serious damage. The nearly 10 000 derogations made for great cormorants over the period 2015 – 2023 (Figure 4) indicate the considerable problems caused by the species.

The European Commission has repeatedly stated that the tools made available by the current interpretation of Article 9, as laid out in a guidance report from 2013 (EC, 2013b), are sufficient to manage the cormorant population and mitigate the local conflicts. Nevertheless, many of the requests by fisheries and aquaculture sector stakeholders for permissions for killing, egg oiling or nest destruction of great cormorants do not obtain approval from national environment agencies as their internal policies aim to limit derogations, or approvals are only given after large scale damage has been done. The very different way the Article 9 is used in the different countries gives rise to additional conflicts and cases regarding permission to regulate cormorants often end in national courtrooms.

The **EU Directive on the conservation of natural habitats and of wild fauna and flora (Habitats Directive, 1992)** aims to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States (Council Directive 92/43/EEC). Article 12 [protection of species] of this directive is similar as Article 5 of the Birds Directive.

Article 16 of the Habitats Directive provides the possibility to derogate if "there is no satisfactory alternative, and the derogation is not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range":

a) in the interest of protecting wild fauna and flora and conserving natural habitats;
b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property;
c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences;

Great cormorants are not mentioned in the Habitats Directive. Derogations under Article 9 of the Birds Directive should be used when cormorant predation is impacting "natural habitat areas" (Annex I), "species requiring special areas of conservation" (Annex II) and "Strictly protected species" (Annex IV). There are 65 fish species listed under the annexes of the Habitats Directive. A number of these, such as Atlantic salmon, Danube salmon, houting, marble trout, grayling, barbel and nase, are negatively impacted by predation from cormorants (see Section 2.2).

The **EU framework for community action in the field of water policy (Water Framework Directive, 2000)** (Directive 2000/60/EC) is also a relevant piece of legislation in relation to the problems caused by great cormorants. The Water Framework Directive requires EU Member States to protect and, where necessary, restore water bodies to reach good status, and to prevent deterioration. Good status means both good chemical and good ecological status. Native fish are foundational to aquatic food web stability. Predation by cormorants can have significantly impact on the fish fauna, species composition, fish population abundance and

changes the age structure in fish communities, as well as the reproductive capacities of protected fish species throughout Europe. Impacts like predation by cormorants must be (but is not presently) considered when assessing the WFD-waterbody status based on the biological quality element "Fish fauna".

The cormorant – fish, fisheries and aquaculture conflict also has an impact on the implementation and outcomes of a range of other elements of EU policy and legal frameworks, such as:

- The **European Green Deal** (EC, 2019), which states that "European farmers and fishermen are key to managing the transition", and that it "is essential to preserve and restore biodiversity in lakes, rivers, wetlands and estuaries, and to prevent and limit damage from floods." Fishers and fish farmers have thus a key role to play.
- **EU Biodiversity Strategy for 2030: Bringing nature back into our lives** (EC, 2020a), regarding restoring the good environmental status of marine ecosystems and restoration of freshwater ecosystems.
- **EU Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system** (EC, 2020b), aims (among others), to "ensure food security in the face of climate change and biodiversity loss", and gives emphasis to economic return creation and a shift to sustainable fish and seafood production which must be accelerated.
- **Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030** (EC, 2021), which recognizes that "For freshwater aquaculture in particular, predators and drought pose also a challenge in terms of profitability." The strategy also states that *"the* environmental performance of the EU aquaculture sector can be further improved by the management of predators*".*
- **Common Fisheries Policy** (EC, 2013a) which aims to "ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies".
- The Communication of the Commission on **Safeguarding food security and reinforcing the resilience of food systems** (EC, 2022) recognizes the importance of long-term availability of affordable food (including fish) for the European population, sustainable management of fish stocks and reducing the dependence on imports.
- **Nature Restoration Regulation** (EC, 2024b), which aims to contribute to "(a) the long-term and sustained recovery of biodiverse and resilient ecosystems across the Member States' land and sea areas through the restoration of degraded ecosystems; (b) achieving the Union's overarching objectives concerning climate change mitigation, climate change adaptation and land degradation neutrality; (c) enhancing food security; and (d) meeting the Union's international commitments.

2.5.3 European Parliament and international resolutions

The **European Parliament resolution** of 4 December 2008 on the adoption of a **European Cormorant Management Plan** [aims] to minimise the increasing impact of cormorants on fish stocks, fishing and aquaculture (2008/2177(INI)). In this resolution the European Parliament called (amongst others) on the European Commission to submit a cormorant population management plan in several stages, coordinated at the European level and seeking to integrate cormorant populations into the environment as developed and cultivated by man in

the long term, without jeopardising the objectives of the EU Birds Directive or Natura 2000 with regards fish species and marine and freshwater ecosystems (paragraph 7).

The **European Parliament resolution** of 12 June 2018 **towards a sustainable and competitive European aquaculture sector: current status and future challenges** (2017/2118(INI)), reiterated "the views it has already expressed in its resolution on the adoption of a European Cormorant Management Plan, and points out that reducing the harm caused by cormorants and other birds of prey to aquaculture farms is a major factor in production costs, and thus for their survival and competitiveness; calls on the Member States to apply the current exceptions in the case of herons and cormorants and to the Commission to review the state of conservation of the otter"(paragraph 90).

The **European Parliament resolution** of 4 October 2022 on **striving for a sustainable and competitive EU aquaculture: the way forward** (2021/2189(INI)) acknowledged that the population of cormorants has seen a massive increase, and that this increase is causing serious damage to many marine sectors, including aquaculture. The resolution "Calls on the Commission to prepare a proposal for an EU great cormorant management plan that could properly and definitively address the problem the aquaculture sector has been facing for many years, based on the best available scientific advice and experiences and practices already tested in Member States; urges that the plan be designed for the effective mitigation and control of their effect on aquaculture farms, with a view to reducing their economic, environmental and social impact on production and biodiversity; highlights that the plan should include a list of eligible measures on preventive coexistence solutions and adequate compensation for losses and measures, financed with EU or national funds; insists that financial support for tailor-made research aimed at finding and testing preventive measures is key, but also for allowing proper monitoring, including recording and analysing the effects of the measures undertaken; calls on the Member States to implement those measures on a local case-by-case basis and report to the Commission every year on the implementation of the plan, including the effectiveness of the measures chosen; calls on the Commission to evaluate the EU great cormorant management plan every five years and report to Parliament; urges the Commission to prepare, as an immediate action, a guidance document on how to apply derogations provided for in Article 9 of the Birds Directive, and to assess the need to modify the current legislation where preventive measures have proven insufficient and the financial and social impact does not allow for coexistence solutions, according to the best scientific advice"(paragraph 56).

The **IUCN/Wetlands International Cormorant Research Group** responded in an Open letter to the Members of European Parliament about the initiative report (2021/2189(INI)), and in particular its paragraph 56 on cormorant management[19]. IUCN/Wetlands International asked to promote the implementation of existing solutions and to ensure follow up of scientific research to solve conflicts. The **European Inland Fisheries and Aquaculture Advisory Commission** (EIFAAC), through an advisory note[20], welcomed the European Parliament resolution of 4 October 2022 on striving for a sustainable and competitive EU aquaculture: the

[19] https://www.birdlife.org/wp-content/uploads/2022/09/Open_Letter_MEP_Cormorant_Research_Group.pdf

[20] https://www.fao.org/fishery/services/storage/fs/fishery/images/organization/EIFAAC_advisorynotes.pdf

way forward (2021/2189(INI)) and offered its expertise to coordinate the development of a European-wide great cormorant management plan to harmonize measures and regulations aiming to reduce the population of cormorants in Europe to a sustainable and manageable level.

In 2022, EIFAAC also issued a Resolution on measures to support the protection of vulnerable and endangered fish species from unsustainable predation from cormorants (EIFAAC/31/2022/3), which *inter alia* called for the preparation of a European-wide cormorant management plan to harmonize measures and regulations aiming to reduce the damage to fish stocks in Europe.

In addition to the above mentioned international and regional instruments, various European countries have adopted national level measures to reduce the impact of cormorant predation on fish, fisheries and aquaculture (including also the establishment of damage reporting and compensation schemes). These national measures have not been as successful as hoped, due to the migratory nature of the cormorants, where super abundance of the predators, results in a "sink-situation" with new birds coming in as an area becomes "vacant" due to local restrictive regulations in controlling great cormorants in adjacent areas.

2.5.4 Predation risk management

To prevent cormorant predation on fish and mitigate the consequences of predation, various European countries have applied a range of measures, with limited success (see Section 2.4).

Preventive measures include UV-resistant netting of hatchery/nursery tanks, raceways and small ponds in aquaculture, as well as netting of small stretches of rivers. Other farms, where ponds are too large to cover with nets, have installed fishing lines across these ponds, with limited success. Many angling clubs have increased their pond depth, introduced more water plants (to reduce sighting and accessibility of fish by cormorants), floating covers, or "fish forests", which provide shelter against predation. Others have introduced fenced areas in their waters, also covered by nets, with mesh sizes that are too small for cormorants, but large enough for small fish.

Bird scaring devices with predator decoys, sudden noises, kites, balloons, aluminium strips, moving objects and laser lights are used by fish farmers and angling clubs. These are short-term solutions, as birds seem to get used to them. Watch-keeping and chasing cormorants away from ponds and angling areas and stocking are now common practices, but require lots of time from fish farmers and volunteers.

Preventive measures applied under Article 9 (derogations) of the EU Birds Directive, include culling (shooting), destruction of nests, oiling of eggs and disturbance of nests during breeding season. Due to the application and review processes involved, approvals for such measures often come too late, when the damage is done. There is apparently a high degree of variation in the way each Member State reads Article §9, from strict "no implementation" to easy and fast provision of permissions to regulate.

Frequently applied risk mitigation strategies include an increase in stocking of fry and fingerlings, stocking with larger fish, stocking in spring instead of autumn, or just stop stocking and maintain a fish density that is very low, making a water area less attractive for cormorants.

Aquaculture crop insurance, including cover of damage caused by predators, is available in most European countries. Many marine cage culture operations are also insured. However,

the insurance premiums are often too high for freshwater pond farmers (van Anrooy et al., 2022). Aquaculture crop insurance premium subsidies are not provided by European governments.

Financial compensation for damage caused by cormorants to fish stocks in aquaculture exists in a few European countries, such as Belgium, Czechia, Latvia, Slovakia, and some regions in Germany. However, the compensation paid is partial and some countries that paid compensation in the past no longer do so. There is no financial compensation for angling clubs for lost fish due to predation by cormorants. In a few countries, some limited compensation was paid in the past to commercial (inland) fisheries, but this seems to have stopped. A few angling clubs involved in aquatic biodiversity protection have received financial support for preventive measures such as netting and construction of fish forests/shelters. The existing financial compensation and prevention systems for predation of fish by cormorants are few, inadequate in scope and insufficient in terms of funds available.

2.6 Management issues

Interactions between birds and fish/fisheries have long been prevalent within both marine and freshwater ecosystems (see Annex 2). In recent years, however, there has been increasing concern and accountability of the impact of expanding populations of fish-eating birds on wild fish populations and aquaculture enterprises. This has led to growing concerns about, on the one hand conservation of birds and on the other hand sustainability of fisheries resources for both commercial and recreational exploitation and aquaculture development, alongside protection of native aquatic biodiversity.

Conflicts involving cormorants have been studied in detail in Europe through the EU REDCAFE/INTERCAFE COST Action projects[21] and FRAP[22], but also at a national level, where multiple scientific projects have sought to resolve or mitigate the conflicts (see Sections 2.2 and 2.4). The conflicts primarily arise from competition for the same resources, but the conservation of fish populations has become increasingly important, especially as many fish stocks have declined, and, critically, non-fished species have become vulnerable. The effects of predation are amplified in areas where fish stocks are already under pressure from deteriorating habitats. Summaries of these conflicts and actions are highlighted below.

Coastal and lake fisheries: Cormorants are directly catching fish in nets, removing valuable catch, damaging other (large) fish and nets. Solutions have been to use of cover-nets in pound net fisheries and regulating/killing cormorants in proximity of the nets. Cover nets have, however, been of limited effect because cormorants learn to swim under the nets (the same way as fish enter), plus the nets are expensive and laborious to use.

Aquaculture: Modern, recirculation aquaculture systems (RAS) and raceway systems can be protected by nets, strings or by moving indoors, but traditional pond-aquaculture remains open to cormorants and the problem cannot be solved by covering ponds with nets as cormorants learn to walk in under the nets. The same is true for the many put and take lakes/ponds, where cormorants can cause great damage to the stocked fish by eating the smaller fish and injuring the large fish. Aquaculture producers that use cages in coastal areas,

[21] http://cormorants.freehostia.com/

[22] Behrens et al 2008; Managing international 'problem' species: why pan-European cormorant management is so difficult. Environmental Conservation 35, 55-63.

lakes and reservoirs, have often covered their cages with nets against fish escapes and predation by cormorants. However, at maintenance and harvest times many cage fish farmers encounter predation by groups of cormorants.

Recreational fishing: When cormorants forage in rivers, the main target fish species are often eaten in very high numbers, leaving rivers with very little fish to catch. Grayling and salmonid (trout and salmon) populations can be diminished, even when only relatively few birds have been hunting. In many rivers, the total biomass of fish has dropped from around 500 - 150 kg/ha to 10-15 kg/ha (Jepsen et al., 2018; Görlach and Müller, 2005; Görner, 2006; Steffens, 2010). This means that fishing in such "fish-empty" rivers is no longer attractive and feels ethically wrong. Even a few cormorants can eat a substantial part of the total fish stock. Management measures include to stock more and larger fish and to organize "hunting/scaring patrols" along rivers. In larger lakes, the situation is less pronounced, but cormorants have been shown to remove a high proportion of large perch, mid-sized pike, trout and zander in lakes in Denmark, France, the Netherlands and Sweden, making recreational fishing less attractive.

Conservation: Some fish species that used to be very abundant, like the grayling, salmon and eel, are now in a very bad conservation status, with generally negative trends, and some populations are locally extinct. When investigating the causes, cormorant predation remains a key contributory factor that precludes the capacity for some fish populations to recover when other stressors are addressed. Thus, species of freshwater fish protected under the Habitats Directive and listed as vulnerable or threatened in the IUCN Red List are under increasing pressure from cormorant predation and, to date, management responses have been very limited. Further, many species are now vulnerable and contribute towards many water bodies failing good ecological status or potential under the EU Water Framework Directive. It is clear that many local or generic factors other than predation can cause fish populations to decline. Most of these factors are described by the IUCN/SSC specialist freshwater fish group (https://freshwaterfish.org/), but with little documentation about the size of impact and cormorant predation is largely overlooked.

Although the most frequently reported problems with cormorants are related to fisheries, guano (faeces) produced by birds at breeding and roosting sites is known to eventually kill trees — which, when alive, may have commercial or amenity value. Guano production can also alter the local fauna and flora communities, which can have conservation consequences for some rare or localised plant and animal species, especially amphibians and other bird species dependent of fish for their food. In some places the presence of relatively large aggregations of cormorants in colonies or roosts, and the associated noise and smell are degrading the local land/waterscapes.

The conflicts involving fish protection and cormorants have been intense in most member states and across the rest of Europe for decades and remain that way despite many protective and responsive measures, including culling (according to EU Birds Directive's Article 9-derogation). There are only a few well-documented examples of successful attempts to reduce avian predation pressure (e.g. Lake Neuchâtel in Switzerland [Vogel et al., 2010]; Lake Ontario, USA; [Johnson et al., 2001]). Since completion of the EU-funded REDCAFE and INTERCAFE COST-Action projects (2008), conflicts have further escalated and numerous new reports of damage to wild fish populations have been published (see Sections 2.2 and 2.3), thereby changing the nature of the conflicts, at least partly from commercial and recreational fisheries perspectives, to species conservation, i.e. balancing the need of how best to meet

conservation requirements for species regarded as being in conflict. The existing tools to mitigate conflicts (i.e. INTERCAFE TOOLBOX [Russell et al., 2012]) have not proved effective under current application to reduce the ongoing levels of conflicts.

A recent EIFAAC survey (FAO, 2024a), with responses from 26 European countries, revealed a continued high level of conflict between cormorants and biodiversity conservation, recreational fisheries, commercial fisheries and aquaculture. The number of conflicts between cormorants and recreational fisheries and biodiversity conservation have increased rapidly. Seventy percent of the respondents agreed that a European-wide cormorant management plan is needed to control the increasing cormorant population.

3. Plan principles, overall goal and specific objectives

3.1 Nature of the conflict

In the past 30 years the number of breeding and overwintering great cormorants has increased dramatically across Europe, creating conflict between bird conservation and fisheries and aquaculture. In many European countries, great cormorant populations negatively impact fish stocks and reduce catches, putting pressure on fisheries and aquaculture activities and thus creating socioeconomic conflicts. Although the great cormorant is protected under Directive 2009/147/EC (Birds Directive), there is an urgent need to resolve the cormorant-fish conflict in a manner proportionate to the damage caused, recognising localised actions have failed to resolve the ongoing conflict and the problem is pan-European.

3.2 Overall goal

The overall goal of the *European Management Plan for the Great Cormorant* is:

> ***To achieve a fair balance between pan-European conservation of the great cormorant, with the sustainable use and protection of aquatic biodiversity, fish populations, fisheries and aquaculture interests, including the socio-economic well-being of communities dependent on fisheries and aquaculture***.

3.3 Guiding principles

The management plan is guided by the following principles.

Sustainability	Ensure the long-term coexistence of cormorants, fish populations, and human livelihoods by maintaining both an ecological balance and economic viability of fisheries and aquaculture.
Evidence-based management	Where possible, decisions will be based on robust scientific data, including population dynamics, migration patterns, ecological and socio-economic data and information.
Recognising alternative issues	Due consideration is given for all environmental, social and economic pressures constraining fish and fisheries recovery.
Adaptive management	Use flexible and dynamic approaches to address evolving challenges, incorporating regular monitoring and stakeholder feedback.
Collaboration and coordination	Promote cooperation and continuous dialogue among European countries, bird, fisheries, conservation and animal welfare organizations and other stakeholders.
Compliance with policies and legal frameworks	Align management actions with EU directives (e.g. Birds Directive, Habitats Directive, Water Framework Directive), international treaties (e.g. Bern Convention) and national legislation and policies of European countries.
Minimization of conflicts	Balance the needs of fisheries, aquaculture, biodiversity conservation, including fish and birds, and societal interests to reduce conflicts between stakeholders.
Ethical considerations	Apply management measures with lowest adverse animal welfare impacts.

Precautionary approach	Address potential risks proactively, ensuring that management measures do not cause unintended ecological or economic harm.
Environmental stewardship	Conduct management interventions in a responsible manner with care for the environment and in accordance with key stakeholder interests.

3.4 Objectives

This pan-European management planning framework aims to mitigate, compensate and, where possible, reconcile cormorant-fish conflicts. It focusses on the biological dimension of maintaining the great cormorant's conservation status[23], while recognising the social and economic consequences of cormorant-fish interactions. The plan is also expected to contribute to the long-term viability of inland and coastal recreational and commercial fisheries and aquaculture enterprises in Europe, and the implementation of European and national food security and rural development policies and strategies.

The objectives of the framework plan, based on consultation with national authorities and key stakeholders in 2024 and 2025, are to:

1. Maintain up-to-date status and trend data on distribution and abundance of great cormorants (breeding and overwintering), and inland and coastal fish populations and aquaculture, and understand reasons for changes in population abundance of both cormorants and fish stocks.
2. Improve understanding, documentation and quantification of ecological, economic and social impacts of cormorants on inland and coastal waters and their associated aquatic biodiversity, and fisheries and aquaculture.
3. Provide a plan of action to protect vulnerable fish species against predation by great cormorants, contributing to achievement of EU Water Framework Directive, Habitats Directive, and the European biodiversity targets.
4. Adapt, update and provide a framework to implement preventative measures to reduce and mitigate impact of cormorant predation on fisheries and aquaculture, and harmonise compensation schemes.
5. Provide a framework to facilitate the use of derogations to authorise controlled culling of great cormorants, whilst maintaining the good population status of great cormorants across its distribution range in Europe.
6. Promote cross-border collaboration and harmonisation of monitoring, management and policy frameworks.
7. Provide a central, open-access, fully moderated platform for engagement with all key stakeholders.

[23] AEWA and the EU Habitats Directive apply the term "Favourable Conservation Status", while the EU Birds Directive uses "Good Population Status". The Bern Convention under its Article 7 makes reference to restoring 'satisfactory population levels'.

4. European Management Planning framework for the Great Cormorant

4.1 Management planning framework

The European Management Planning framework for the Great Cormorant (CMP) adopts an adaptive approach and involves a series of steps: 1) assessment of the status of cormorant-fish interactions, related economics, and the underpinning policy drivers, objectives and target end points; 2) formulating management measures; 3) choosing a course of action; 4) implementing management actions, monitoring changes in cormorant, fish, aquaculture and ecosystem characteristics, region-wide cooperation, and compensation for damages to fisheries and aquaculture; and 5) evaluation and adjustment of endpoints and goals of the plan into the future (Figure 5). Explicit specifications and documentation are required at each step, supported by stakeholder participation and consultation.

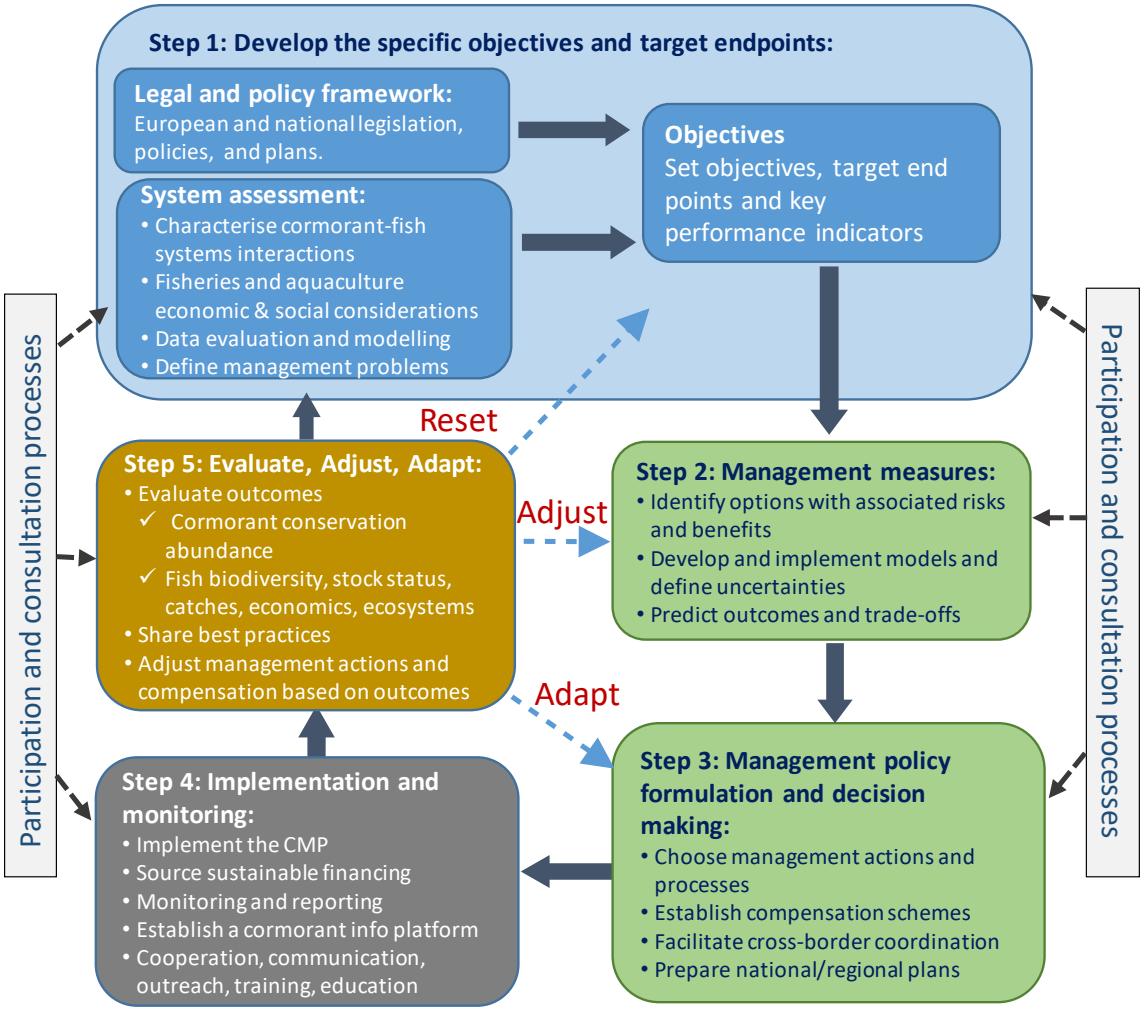

Figure 5. Framework for the European Management Plan for the Great Cormorant

The framework for the CMP provides a process to quantify the problems, stakeholder motives and desires, goals and objectives, and enables structured decision-making and adaptive management through the Evaluate-Adjust-Adapt-processes.

4.2 Step 1: Develop the specific objectives and target endpoints of the management plan

4.2.1 Characterise cormorant, fisheries and aquaculture systems

The first step is to formally characterise cormorant-fish systems interactions and define the management problems and conflicts. Sufficient information exists to define and quantify these problems (see Section 2), and develop an appropriate action plan, but the information should be continuously updated and used accordingly to revise any proposed actions. Data collection methods, data evaluation and modelling processes should be agreed on by key stakeholders and, where necessary, approved by the proposed Cormorant Management Advisory Group (see Section 4.5.2 and Annex 4).

The following actions are needed to reinforce the information and account for changing conditions as the CMP is enacted.

- Establish and operate an open-access, **pan-European system for monitoring** and updating cormorant population trends in distribution and abundance, breeding sites, and migration routes, and factors contributing to their range expansion.
- **Build on and standardise data collection and monitoring protocols** for cormorants and fish and fisheries across European countries and agencies for consistency and comparability. (This action would build on the ongoing ProtectFish project)
- **Review the status and trends in fish populations across Europe** related to achieving WFD and HD objectives in the face of cormorant predation. (This action would expand the ProtectFish work to more European countries)
- **Establish scientifically informed favourable reference value and range for defining good population status of great cormorant across its European range, and thresholds** that trigger implementation of non-lethal deterrents and lethal control measures (in compliance with the Birds Directive and national legal protections).
- Continue data collection and **monitoring of ecological, economic and social impact**s of cormorant predation and other pressures on fish stocks in inland and coastal waters and fish farms, and provide evaluation against other threats to fish biodiversity and population status.
- **Establish a central database** of cormorant abundance, breeding colonies, population dynamics, migratory patterns and predation impacts. This input should engage with existing databases that hold appropriate data such as the European Breeding Birds Atlas. The cormorant data will be complemented by national fish monitoring data collated under the WFD and HD or other non-EU national monitoring requirements.

4.2.2 Setting objectives

The objectives for the plan, as defined in Section 3.4, should be aligned to quantitative targeted end points for the size of the European great cormorant population. There is a need to **establish scientifically derived reference and end points for the abundance and distribution of the European cormorant population** that maintain good population status for the species, but also aligns with attaining favourable conservation status of fish species across Europe where cormorant predation is a known pressure, thus improving the status of fish populations and viable fish farming enterprises (see Section 4.3). These end points will be developed and agreed upon by the Cormorant Management Advisory Group in collaboration

with key stakeholders, and reviewed and endorsed by competent authorities in European countries and at the regional level (as needed).

4.2.3 Legal and policy framework

The distribution and abundance of great cormorants in Europe are largely regulated under the EU Birds Directive and national wildlife protection legislation (see Section 2.5). Where conflicts arise, people can request to control population size through lethal measures, generally targeting the adult birds or eggs (oiling). These requests are evaluated, approved or denied, by environment ministries or competent authorities. In EU Member States, environment ministries, as the competent authorities, submit annual reports to the European Commission on derogations granted under Article 9 of the Birds Directive and this will continue, but it is recommended that the actual numbers of birds culled, not just the numbers approved, should be reported.

Local control measures have so far proved inadequate to reduce the impact of cormorant depredation at a European level. There is a clear need to assess the population status of cormorants in each European country and align national and regional policies and management measures within Europe to ensure consistency and effectiveness of control measures. Such an-assessment should occur as a priority during implementation of the CMP. Where countries abstain for control, due account should be made of the contribution of these countries to replenishment of the overall European great cormorant population abundance.

Management options for consideration are:

- Clarify requirements and the procedure to apply derogations under Article 9 and introduce a standardized, fast-track, stream-lined protocol to apply for derogation for common use by stakeholders and competent authorities in all countries;
- Consider a change in the protection status of the great cormorant under the Bern Convention from a non-named species in Appendix III to a species listed as an exception (similar to the house sparrow, jackdaw, rook and great black-backed gull);
- Consider development of legislation that establishes spatial (zonal) management plans with zones where great cormorant abundance is actively managed to protect fish populations (e.g. around aquaculture farms and fish populations in both coastal and inland waters), i.e. where lethal measures are granted and documented, and matched with “exclusive protection zones” for cormorants.
- Depending on the mid-term evaluation, and progress made towards resolving the cormorant-fish conflict, consider preparation of a definitive great cormorant International Single Species Action Plan under the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), applicable to countries in its European distribution range.

4.3 Step 2: Determine management measures

An array of management tools has already been developed to address the cormorant fish conflict. These are described in detail in the INTERCAFE Toolbox (Russell et al., 2012). They cover both non-lethal and lethal control measures (see Section 2.4). The main non-lethal measures include use of visual and acoustic deterrents, barriers, and habitat modification; promoting fish refuges (e.g. submerged structures) to shelter vulnerable species, and support for stocking programmes for at-risk fish populations, where ecologically appropriate.

In high-conflict areas, lethal control of the cormorant population is carried out following a licensing/permit system according to Article 9 derogation criteria underpinned by strict ecological justification and in line with local management plans. As such, lethal control tends to be a local or national measure and there has been a lack of coordinated control to manage the population of cormorant at a European scale.

To meet the desired objectives to reduce cormorant depredation to sustainable levels across its European range, this step identifies innovative and sustainable methods, with associated risks and benefits, for managing long-term sustainability of the great cormorant population whilst minimizing the negative impacts of cormorants on fish stocks, aquaculture, aquatic biodiversity and ecosystem health proportionate to the scale of the impact.

The following options, which are not mutually exclusive, should be considered:

- **Status quo/do nothing:** This option will lead to continued impacts on the viability of fisheries and aquaculture throughout Europe, as seen by a continued history of conflict since the protection of great cormorant (Annex 2), and further jeopardising conservation of fish. If the population continues to expand the likelihood is that the cormorant population will eventually become food limited as is already the case in some areas where numbers are in decline (e.g. in Denmark). There is a greater risk that the great cormorant population in Europe will continue to grow and further expand its distribution range, which will increase pressure on fish stocks, fisheries and aquaculture.
- Develop **national and/or region-specific strategies** that recognise varying levels of cormorant population density, habitat type, and human interventions across Europe and implement adaptive interventions that allow for adjustments based on new data, research findings, and evolving cormorant and fish population status and dynamics.
- Develop, test and promote **non-lethal deterrent methods** to prevent or reduce predation rates. This should build on the **INTERCAFE Toolbox** where existing and novel measures are tested, updated, including in combination, and advice made available to all stakeholders**.** Nevertheless, it should be recognised that many of the non-lethal methods have inherent problems with application (see Annex 3), and do not address the underlying problem of reducing predation pressure across the European landscape. Support for **stocking programmes** for at-risk fish populations should also be considered where ecologically appropriate (Cowx et al., 2025).
- Targeted **lethal control,** when justified under Article 9 of the Birds Directive and without compromising the favourable conservation status of the great cormorant, to manage the cormorant population size proportionate to damage caused. The justification will be to protect, and conserve threatened and endangered fish populations and improve population status of impacted fish populations. This will require coordinated culling and egg oiling across the great cormorant European distribution range, especially in primary breeding areas, and will require engagement with countries that currently do not control cormorant numbers and are acting as reservoirs for replenishing cormorant numbers. The culling needed and rate of intervention will level off as the population reaches a manageable level, and thus make spatial management a more viable and effective option.
- **Establish spatial management** to reduce cormorant predation impact on fish, by assigning zones where cormorant abundance is actively managed to protect fish populations and aquaculture and “no-regulation protection-zones” for cormorants. As such, there will be a need to develop **zonal management plans** where lethal control is

tied to documented impact of predation on fish populations, especially in high-conflict areas.

Throughout the formulation of management options, attention is paid to ensure compliance with the EU Directives and national laws and regulations.

4.4 Step 3: Management policy formulation and decision making

4.4.1 Choose management actions and processes, including monitoring and evaluation plans

The following actions are recommended to achieve a balance between pan-European conservation of cormorants, and the sustainable use and protection of fish populations, fisheries and aquaculture interests.

- Review information on cormorant-fish systems interactions and define the management problems and conflicts. This should also include identifying issues that constrain reaching consensus of the status of both great cormorant and fish population status.
- Develop and use models to predict outcomes and trade-offs, and define uncertainties, with proposed actions.
- Carry out regular assessments of the conservation status of aquatic biodiversity, including fish populations, and of habitat quality affected by cormorant presence and management.
- Develop models on the target population size of breeding pairs of cormorants within the European distribution range based on information collected in Step 1 and modelling carried out as part of the management decision-making process. This will build on a reference value for favourable conservation status for cormorant established in Step 1 and scale of impact determined in Step 2.
- Propose an appropriate mix of short and long-term management measures to reach the defined goal - i.e.:
  - Immediate and continuous: support non-lethal measures, including deterrents, barriers, habitat modifications and fish stocking, where measurable impact is achieved.
  - Short term: coordinated culling where impact of cormorant predation is established and until regionally agreed targets of breeding pairs are reached, based on triennial monitoring and adaptive management procedures (see Step 5). This will build on the existing country-specific actions but coordinated across regions and the great cormorant European distribution rage to enable cross-border management of cormorant depredation.
  - Long term: oiling of eggs in a defined percentage of nests annually based on triennial monitoring and adaptive management procedures (see Step 5). The practice of egg oiling has been used for cormorants for many years and is widely applied for managing seagull colonies.

Recovery of inland and coastal fish populations and aquatic biodiversity proven to be impacted by cormorant depredation (e.g. grayling, trout, salmon, chub, nase, eel) to good ecological status or potential, as well as a reduction in losses at aquaculture ponds should be attained. If not, the regional target should be adjusted following review of cormorant abundance and

status of fish populations and impacts on aquaculture and fisheries, after an initial interim period of three years and every three years thereafter.

The measures will be applied in accordance with legal requirements of Article 9, where and when damage is predicted or preventive measures have been implemented and proven ineffective. The application for derogations needs to be standardised, including appropriate justification for each case, and coordinated across the European distribution range, enabling actions to be taken immediately to avoid further damages.

Linked to this, is the need to establish an effective system for damage reporting, assessment and applying for compensation for fisheries and aquaculture facilities affected by great cormorant predation. The procedure for determining compensation payments, including damage reporting, criteria for payment and payment for damages, needs to be equitable and standardised across all European countries.

Each European country needs to prepare and submit a 6-year national plan of management measures and monitoring to the CMAG, which will enable the preparation of a regional overview of actions that will be used to formulate actions for the next implementation period.

4.4.2 Facilitate cross-border coordination and decision making

One of the barriers to effective management of the migratory and expanding cormorant population is the limited cross-border coordination of management interventions. Each country operates its own management activities. Some countries, however, choose not to use Article 9 derogations to reduce the cormorant population size, compromising measures by other countries to effectively address depredation from this transboundary, highly migratory, shared population of birds. Consequently, it appears that much of the effort by individual countries or regions is ineffective at the pan-European level, as it is not addressing the cause - the ever-expanding cormorant population.

To overcome this issue of lack of coordination between countries and authorities the following mechanisms are proposed:

- **Review and adoption of the European management plan for the great cormorant** by the competent authorities and relevant stakeholders within its European distribution range, the European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) and possibly by AEWA. It is important to ensure coordination and joint implementation of the CMP with non-EU countries in Europe.
- Review and **endorsement of the European management plan for the great cormorant** by the European Parliament through a dedicated resolution.
- **Preparation and adoption of one or more regional plans,** e.g. one each for the Baltic Sea and North Sea areas, Eastern Europe and Southern Europe.
- **Facilitate coordination between countries** to share responsibility for data collection, monitoring, management, control and evaluation. This will require a structure in which the CMAG and a secretariat have major roles to play (see also Section 4.5.5 and Annex 4).

4.5 Step 4: Implementation and monitoring

4.5.1 Implementation of the framework for European Management Plan for the Great Cormorant

The proposed framework for the CMP should act as a catalyst towards implementation, and requires a roadmap of interventions. A tentative timeline for action towards implementation is as follows:

Year	***Key milestones***
October 2025	Formal submission of the 3rd draft framework CMP to the European Parliament, EIFAAC and European Commission.
Year 1	Formal review of the draft framework CMP by EIFAAC, the European Parliament and possibly the European Commission, through Expert Group on the Nature Directives (NADEG), and national governments to discuss the CMP framework.
Year 1	CMP forerunners: Regional working groups established by some countries.
Year 2	Establish the Cormorant Management Advisory Group (CMAG) with representatives from the European countries and key stakeholders, including scientists, bird, fisheries, aquaculture, fish conservation and animal welfare NGOs.
Year 2	Determine and agree European cormorant population abundance thresholds and management targets through multi-stakeholder fora.
Year 2	Prepare and submit a single species management plan, based on the CMP, for review and adoption by AEWA.
Year 2	European Inland Fisheries and Aquaculture Advisory Commission (EIFAAC) adopts the CMP, increasing its application to non-EU countries in Europe.
Year 2-3	Set-up of the Secretariat and a Compliance Committee, composed of country representatives, with clear terms of reference (using Annex 4 as basis).
Year 3	Implementation of the CMP, and development of regional and national level management plans (as required).
Year 3-8	Annual reporting by countries to the Secretariat and CMAG.
Year 8	Mid-term review, evaluation and adaptation of CMP

Following start-up, the outcomes of new research findings and ecological shifts (e.g. climate change effects on fish migration and bird distribution) will be evaluated and the actions adapted every 3 years.

4.5.2 CMP management structure

Implementation of a European Management Plan for the Great Cormorant (CMP) will require an organizational structure. The following structure, which is largely similar to the structure used by most Regional Fisheries Management Organizations (RFMOs), is proposed:

a) Cormorant Management Advisory Group – supporting assessment/research and data collection.
b) Compliance Committee – monitoring compliance with the implementation of the Plan.
c) Secretariat – coordinating, facilitating and reporting on the implementation of activities in support of the Plan.

Further details on the management structure are provided in Annex 4, including draft Terms of Reference for each entity.

As part of the organization, each European country should report activities and outcomes to the Secretariat annually. The Secretariat will compile the reports and provide a regional

overview for the countries, European Parliament, European Commission and EIFAAC and other appropriate stakeholders, after review by the Compliance Committee.

The proposed structure for CMP implementation, monitoring and reporting is presented in Figure 6.

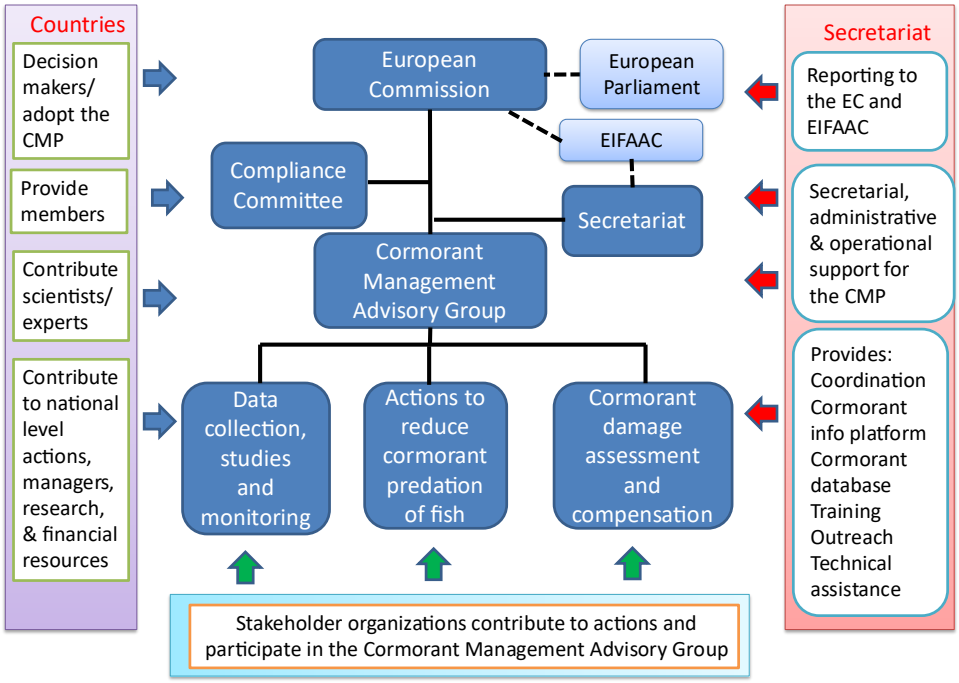

Figure 6: Framework for CMP implementation

4.5.3 *Financing the implementation of the CMP*

Sustainable financing is fundamental to successful endorsement and implementation of the management plan. Without funding from national budgets, the European Maritime, Fisheries and Aquaculture Fund (EMFAF), and possibly the EU LIFE Programme or Horizon Europe, for establishing the key elements of the plan, such as data collection and collation, model development and supporting initial stakeholder collaboration, any plan will be difficult to implement.

The funds will be required to:

- Develop, promote and implement conflict prevention and mitigation measures, including **non-lethal deterrents**, **predation thresholds** and **fish stock resilience**;
- Establish and operationalize damage/loss reporting systems, damage assessment and **compensation schemes** for affected fisheries and aquaculture entrepreneurs;
- Establish and operate **joint data collection and monitoring initiatives**, reporting and dissemination;
- Establish and maintain a Secretariat that will support a **Cormorant Management Platform,** including a data hub, coordinate actions between countries, support awareness raising and capacity building, and reporting to the competent bodies and regional bodies;
- Facilitate meetings of the **Cormorant Management Advisory Group** (CMAG) and **Compliance Committee** (CC);

- Provide technical support to European countries for developing national plans, capacity building, awareness raising, and legislation review and amendment (as required).
- Support scientific studies leading to documentation of impact or not, where a consensus has not been reached.

Co-financing from individual European countries is required to implement local measures for mitigating and compensating damages caused by great cormorants along with central financing from the EMFAF and LIFE Programmes.

The running costs for the secretariat (salaries and running costs) and meetings of the CMAG, CC and secretariat will need to be covered centrally from EU and national resources. The more substantial costs for the field measures (shooting and oiling), populations monitoring (cormorants and fish) and compensation payment for damages caused by cormorants should be largely covered nationally, but include EMFAF and LIFE programme assistance.

Shooting of adult cormorants already takes place in most countries and is mainly carried out by volunteers, so the extra costs will mainly be on monitoring and egg-oiling. However, where needed, consideration should be given to reimburse the costs for non-lethal and lethal control measures from national and EMFAF sources. For instance, the ammunition costs could be claimed and reimbursed, as is done in some countries for pest control measures (e.g. for rodents). Fish monitoring in rivers and lakes is taking place under the Water Framework and Habitats Directives, usually on a six-year cycle, although routine monitoring of fish populations occurs in most countries on a more regular basis. Efforts must be made to adjust monitoring needs to help contributing to reporting for the CMP, including establishing ***index rivers*** and assigning vulnerable fish populations for more intensive annual (indicator) monitoring. This would need changes in monitoring programmes to become operational, but if infrastructure and expertise are present and available, this should not result in significantly higher costs. The oiling of eggs will be quite labour intensive for short periods every spring; the main effort will likely be greater for countries around the Baltic, with most nests to oil. Nevertheless, these countries are also the ones likely to benefit the most from a reduction in cormorant predation.

4.5.4 Monitoring and data hub

An open-access, pan-European system for storage of cormorant population monitoring data and evaluation of trends, breeding sites, and migration routes is required to support the implementation of the CMP. This needs to be coupled with fisheries and aquaculture data. This data storage and associated platform will need to be maintained by the proposed Secretariat but should fully engage with the European Bird Census Council and other bird and fish conservation NGOs to benefit from going actions. This information can be used to develop scientifically informed population thresholds to prevent overpopulation, mitigate negative impacts and implement effective population control methods, such as habitat modification, non-lethal deterrents, or regulated culling. Such a data hub will also allow transparency of information and establishment of management targets. It is recognised, however, that data sharing is a complex undertaking because of ownership and intellectual property rights issues, but the hub will provide links to all open access data to support this action.

Each year national reports will be submitted to the CMAG to prepare a European overview of numbers of birds culled and eggs oiled against the status of fisheries and aquaculture and impacts of cormorant predation.

4.5.5 Cooperation and participation

It is recognised that the great cormorant is a highly mobile species, therefore management requires collaboration between European countries to address the migratory nature of cormorants and their shared impacts. Therefore a participatory stakeholder approach similar to the ecosystem approach to fisheries management will be applied. Actions to redress the balance of cormorant and fish population needs, must involve all countries and key stakeholders working in harmony to attain the same desired end points. To achieve this, the establishment of a Cormorant Management Advisory Committee (CMAG) is needed. The CMAG will include representatives of competent authorities, natural resource managers, scientists, and other key stakeholders (e.g. representatives of bird conservation, aquaculture, recreational fisheries, commercial fisheries, biodiversity conservation and other organizations). The involvement of these stakeholder organizations and institutions in the data collection and monitoring, management actions, and damage assessments is critical to the success of the CMP.

To oversee compliance with the plan and implementation of the agreed actions, a Compliance Committee (CC) will be required, comprising representatives of the European countries and key stakeholders. The structure and terms of reference of the committees are described in Annex 4. The CC will work in close collaboration with the European Commission concerning the Birds Directive and possibly with the AEWA Secretariat.

Embedded within this international cooperation is the need to develop mechanisms for sharing successful strategies and lessons learned among European countries. This can be achieved by establishing a **Cormorant Information Platform** (including cormorants' info as was presented by the IUCN Wetlands International Cormorant Research Group platform[24], but also containing data and information on fish, fisheries and aquaculture), which will be actively maintained and updated by the secretariat. The platform will be used to share up-to-date information on cormorant distribution and abundance, fish population monitoring results, discussions and decisions on policies/legislation, and appropriate training materials.

4.5.6 Public awareness, communication and education

Informing the public about interactions between fisheries and cormorant ecology, cormorants and fishes roles in the ecosystem and delivery of ecosystem services, preventive measures and the need to foster coexistence, are essential. Local community involvement in decision-making processes to foster ownership and compliance with the plan is key. A communication strategy will be developed, and **public information campaigns will be carried out on a regular basis** to improve awareness of the complexity of the conflict.

Legitimate and inclusive stakeholder engagement is fundamental to the plan and must consider the motives and drivers of the main stakeholder groups. Whilst conservation of biodiversity, in line with European biodiversity targets, is central to the plan, due consideration must also be given to wider environmental and biodiversity protection, economic development, food security and livelihoods objectives.

[24] http://cormorants.freehostia.com/

Stakeholders will become literate in all aspects of the cormorant fish conflicts, issues and potential solutions in the CMP through training and communication. Information will be balanced and clear to ensure consensus and avoid misrepresentation and misinterpretation.

4.6 Step 5: Evaluate, Adjust, Adapt

Continuous monitoring and data collection on the status and distribution of the great cormorant population and its impacts, and keeping track of management actions and results will allow evaluation of the CMP. Information on fish biodiversity, fish stock status, catches, economics, ecosystems and fish farming enterprises is also essential for the evaluation and adaptation of the CMP. It is essential that environmental changes and non-target effects are tracked. Information should include feedback from stakeholders and field operators.

Information collated during the first 6-year period will be analysed against a reference year established at the onset of the implementation period when the threshold levels for good conservation status are established and agreed to:

- Evaluate whether the management actions are achieving desired outcomes;
- Assess outcomes of different management actions;
- Integrate new scientific research, technologies and or policy updates;
- Identify unintended consequences, including ecosystem changes and proliferation of pest species;
- Redefine management objectives and targets based on the updated information.

Where necessary, management actions will be adjusted in the following ways:

- ***Modify control techniques:*** if a method (scaring, exclusion, culling and egg oiling) is ineffective or causing unintended harm, switch to alternative methods.
- ***Optimize resource allocation***: redirect efforts to the most affected areas or most effective actions.
- ***Increase or decrease intervention intensity:*** if the cormorant population abundance falls below the threshold that threatens their conservation status, any actions should be suspended until the numbers have recovered; conversely where cormorant numbers are increasing and found to have adverse impacts, efforts should be intensified.
- ***Introduce new technologies***: use innovations, such as drones, to increase capacity to count birds and nests, to oil eggs in remote nests and in tree-based colonies, or use drones to scare birds. Where such methods are implemented on Natura 2000 sites, permissions from the competent authorities should be obtained.
- ***Compensation:*** Adjust compensation levels based on CMP outcomes, preventive measures taken, and social and economic performance of the affected aquaculture and fisheries enterprises and angling clubs. Re-allocate void compensation money to support the CMP.

The adjustment of actions may require an update of the objectives and key performance indicators (KPIs), including:

- Revising goals if needed - e.g. shift from long-term suppression to targeted control to maintain equitable balance of bird and fish populations;
- Define new success metrics based on updated knowledge;
- Adjust timelines and expectations based on outcomes.

It is also necessary to communicate new findings to policymakers, managers, and the public. There may also be a need to adapt engagement strategies to increase compliance and participation.

There is also a need to incorporate lessons learned and plan for future adaptation by documenting successes, failures and best practices, and develop contingency plans for unforeseen challenges (e.g. climate change impacts, other piscivorous species). Maintaining flexibility in decision-making to adapt quickly to emerging threats is fundamental to this requirement.

5. Logical framework approach

The European Great Cormorant Management Plan needs clear priority actions and a timeframe for implementation of these actions. Table 1 gives an overview of actions that should be targeted in the short to medium term to manage the adverse impacts of an expanding great cormorant population on inland and coastal fish, fisheries and aquaculture across its European distribution range. It should be noted Table 1 is not a definitive logical project framework because the current document is a framework for a management plan an quantifiable goals have not been determined, thus indicators cannot be defined. It does, however, follow the structure of an AEWA single species action plan and can easily be adapted for comprehensive cormorant management plan.

Implementation of the actions will largely depend on availability of funding.

The CMP is deliberately not a blue-print plan, but guides coordinated action throughout Europe. It is designed to enable change in policies, legislation and cormorant management approaches in line with achieving the joint objectives. The outcomes of actions will be reviewed every 6 years and adaptation of the CMP and associated management measures is foreseen.

The budget required for implementation of the CMP will be prepared at a later stage in the drafting process, based on agreed structure and actions. Key elements to ensure successful implementation of the CMP will be:

- Allocation of adequate financial resources from the EU, country environmental budgets and other internal and external sources.
- Availability and motivation of personnel, including support from bird, environmental, fisheries and aquaculture agencies, NGOs and CSOs.
- Necessary logistical resources and equipment available to apply management measures and fund appropriate compensation.

Table 1. Implementation activities, priorities and timeframe for delivery of the cormorant management plan

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
Step 1: Develop the specific objectives and target endpoints of the management plan					
Characterise cormorant, fisheries and aquaculture systems					
1) Establish and operate a standardised pan-European **system for monitoring cormorant population trends** and breeding sites.	1, 2, 4	Triennial	• Triennial monitoring of breeding and overwintering cormorant population abundance and distribution in European countries. • Monitoring of cormorant breeding success at nesting sites in protected areas. • Regular assessment of conservation status of aquatic biodiversity, including fish populations, and habitat quality affected by cormorant presence and management. • Protocol for stomach analysis of culled cormorants applied. • Access and update European Fisheries Data Framework information. • Empirical information on economic impacts of cormorants on fisheries and other ecosystems services in freshwater and coastal water bodies taking into account also other pressures on fish and fisheries. • Updated studies on the impact of cormorants on the economic viability of fish farms.	• Regular updates of status and trends in cormorant population distribution and abundance, including breeding and overwintering population sizes. • Open access European monitoring information system updated on biennial basis. • Review of the cormorant population distribution and abundance in Europe. • Regular updates of conservation status of aquatic biodiversity, including fish populations, and habitat quality affected by cormorant presence and management. • Updated information on economic impacts of cormorants on fisheries, aquaculture and other ecosystems services in freshwater and coastal water bodies.	• National bird monitoring organizations, CSOs, NGOs and volunteers. • EIFAAC. • National and regional fisheries and environment agencies and fisheries and aquaculture organizations in each country.
2) **Establish standardise data collection and monitoring protocols** for assessing status of fish populations cross European countries in line with HD and WFD needs.	1, 2, 6	Triennial. Minimum compliance with HD and WFD reporting			
3) Conduct, in a coordinated and standardised manner, studies and report on **ecological and economic impacts of cormorant predation** on fish populations, freshwater and coastal ecosystems, and fish farms, whilst accounting for other pressures on fish and fisheries.	1, 2, 6	Initially to establish reference state and periodically to assess impact of measures			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
Setting objectives					
4) Agree on the **objectives for the Cormorant Management Plan**.	3, 4, 5	Year 1-2	• Objectives prepared and disseminated. • Predictive modelling tools developed, maintained and results communicated. • Evaluation of actions on cormorant distribution and population size through coordinated monitoring and modelling. • Established regional population abundance thresholds to maintain cormorant conservation status across its distribution range.	• Objectives and KPIs of the CMP agreed. • Local, national and regional cormorant population thresholds established and agreed by key stakeholders.	• National and regional competent authorities. • CMAG, Compliance Committee.
5) Develop scientifically informed cormorant favourable reference value for good population status and thresholds that trigger implementation of non-lethal, deterrents, such as scaring, exclusion devices or habitat modification, or targeted humane population control methods.	1, 2, 3, 4, 5, 6	Year 2			
6) Establish **key performance indicators (KPIs)** to measure the success of management actions, such as changes in cormorant populations and fish stock recovery.	3, 4, 5, 6	Year 1-2			
Legal and policy framework					
7) **Introduce standardized, stream-lined procedures to apply for derogations under Article 9, including universal or regional justifications,** for common use by stakeholders and competent authorities in all countries	4, 5	Years 1-2	• Standardised, fast-track systems developed and applied by most European countries. • Report of legal review published.	• Annual country reports indicate the average time between application and approval. • An increase in the number of article 9 derogations commensurate with scale of cormorant impact.	• National and regional competent authorities. • CMAG • Stakeholder organizations.

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
8) **Legal review** of the options for re-evaluating the status of the great cormorant under the Bern Convention.	3, 5, 6	Year 1-2		• Legal advice shared online.	• Bern Convention Secretariat. • AEWA. • EIFAAC.
Step 2: Determine management measures					
9) **Mitigation measures**: Explore innovative and sustainable methods for managing cormorant populations and mitigating their impacts.	3, 4, 5	Years 1-5	• Updated studies on the ecological damage to wild fish stocks, including virtual population analysis and fish population modelling, and assessment of well-being of fish species of conservation importance. • Empirical information on economic impacts of cormorants on fisheries and other ecosystems services in freshwater and coastal water bodies. • Updated studies on economic and livelihoods impact of predation by cormorants at aquaculture enterprises. • Update and promote the INTERCAFE Toolbox for non-lethal deterrents to reduce depredation by cormorants on wild fish stocks and at aquaculture facilities, with indicators of likely success and options, including use of multiple deterrents, to improve likelihood of success.	• Scientific monitoring programme in place to determine and agree on acceptable levels of cormorant depredation. • Ecological and impact data updated and made available online. • Population monitoring data published, and data incorporated into predictive models. • Updated INTERCAFE cormorant mitigation and population management toolbox published online. • Zonal management plans available online.	• Relevant monitoring and research organizations. • CMAG and Compliance Committee. • EIFAAC. • Relevant national and regional competent authorities. • Stakeholder organizations.
10) **Non-lethal deterrents to protect fish and fisheries**: Determine non-lethal deterrent methods, such as nets, acoustic devices and visual deterrents, to safeguard fish stocks and keep cormorants away from sensitive areas.	3, 4,5, 6	Year 1-2			
11) **Non-lethal deterrents to protect aquaculture**: Determine non-lethal deterrent methods, such as nets and acoustic devices, to reduce economic losses in fish farms.	3,4, 5, 6	Year 1-2			
12) **Systematic lethal control measures:** Establish clear regionally agreed criteria to justify for when and where lethal	2, 3, 4, 5, 6	Years 1-5			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
control (such as culling) can be used.			• Thresholds of cormorant population abundance at local and region scales established, where lethal control becomes a justifiable option to manage population abundance where serious damage has been established. • High conflict areas selected where zonal management could be applied. • Zonal management plans developed.		
13) **Spatial management**: Establish spatial management, including zonal management plans where appropriate, to increase effectiveness of management actions in high-conflict areas.	3, 4, 5, 6	Years 3-5			
Step 3: Management policy formulation and decision making					
14) European management plan for the great cormorant: Finalize and agree on the actions and KPIs of the plan.	all	Year 1-2	• Pan-European adaptive management plan for cormorants agreed along with its goal, objectives and key actions and KPIs. • National plans developed and 'Best practice' guidelines for organization of coordinated control of cormorant numbers at regional and national levels established. • Clear criteria established for when and where lethal control (such as culling) can be employed, under what conditions permits can be granted, and how this aligns with EU and national legislation. • Guidelines to facilitate Article 9 derogations under the Birds Directive	• Management Plan agreed by all parties and published. • Thresholds for lethal control established and agreed. • Population target confirmed and communicated to relevant national authorities. • Number of derogations submitted. • National / regional management plans published and shared. • National/local management plans produced including development of activities benefitting local communities. • Funds made available for research and monitoring	• Relevant monitoring and research organizations. • National environment agencies. • CMAG and Compliance Committee. • Relevant national and regional competent authorities, CSOs, NGOs in dealing with
15) **National plans:** Develop national or region-specific plans that recognise varying levels of cormorant population density, habitat type, and human interventions across Europe.	3, 4, 5, 6, 7	Years 1-2			
16) Evaluate efficacy of non-lethal (e.g. scaring, habitat modification netting) and lethal **control measures** such as oiling eggs or regulated culling (in compliance with legal protections).	3, 4, 5	Years 1-5			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
17) **Derogations:** Use the derogations system under the Birds Directive to report on controlled culling in areas where cormorants cause serious damage to aid decision making on appropriate measures.	4, 5, 6	Continuous	available and linked to requirements to control cormorant depredation pressures. • Damage assessment method developed and agreed. • Damage compensation system established, based on best practices and lessons learnt from other bird damage compensation systems used for agriculture. • Relevant authorities (national or regional) responsible for implementation and enforcement engaged. • Existing structures/capacity or new structures in place. • Appropriate funding secured and dispersed to appropriate research and monitoring programmes. • Platform for communication and feedback established and operational under guidance of CMAG and the Secretariat.	programmes and for damage compensation. • Compensation system for cormorant damage to aquaculture and fisheries enterprises established in most countries. • Communication and data platform established.	wildlife and cormorant issues. • EIFAAC. • Secretariat.
18) **Compensation system:** Establish an effective system for damage reporting, assessment and compensation for predation by cormorants.	3,4, 5 6	Years 1-2			
19) **Assign responsibilities** to authorities and organizations at national level for implementation of management plan and support targeted activities.	5, 6, 7	Years 1-2			
20) **Funding:** Ensure financial resources available to implement CMP, including funding from national, EMFAF and LIFE programme sources.	all	Continuous			
21) **Promote dialogue:** Create platforms for dialogue among fishers, aquaculture farmers , conservationists, and policymakers to build trust and consensus.	5, 6, 7	Years 1-3 Continuous			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
Step 4: Implementation and monitoring					
22) **Protect fish and fisheries using non-lethal deterrents**: Implement non-lethal deterrent methods, such as nets, acoustic devices and visual deterrents, to safeguard fish stocks and aquaculture facilities and keep cormorants away from sensitive areas.	3, 4, 5, 6		• Cormorant depredation rates reduced to socially, ecologically, economically and environmentally acceptable levels by regulated intervention mechanisms. • Population monitoring to ensure population size remains within established threshold for several consecutive years, and the CMAG agrees to take necessary action where appropriate. • Coordination to ensure cormorant management does not compromise protection of key biodiversity areas and protects conservation species, including fish. • Countries support and actively facilitate rehabilitation of key habitats for fish. • Dispersion of damage compensation funds to offset economic losses to fisheries and aquaculture enterprises, and possibly angling organizations.	• Population monitoring data published, and data incorporated in predictive models. • Annual reporting and publication of data. • Review the status of the great cormorant under the Birds Directive and Bern Convention. • Countries support and actively facilitate the rehabilitation of fish habitats. • Annual report on damages and dispersal of compensation funds.	• Monitoring and research organizations. • CMAG and Compliance Committee. • EIFAAC. • Secretariat • Relevant national and regional competent authorities.
23) **Habitat modification**: Implement habitat modifications where necessary to reduce conflicts with fisheries and aquaculture.	3, 4, 5, 6	Years 3-10			
24) **Restore habitats:** Rehabilitate ecosystems affected by cormorant colonies, such as areas of deforestation or degraded soils.	3, 4, 5, 6	Years 3-10			
25) **Control measures:** Implement targeted population control methods where necessary, such as oiling eggs or culling.	3, 4, 5, 6	Continuous			
26) **Compensation mechanisms:** Implement equitable damage compensation schemes for	3, 4, 5, 6	Years 1-3			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
fisheries and aquaculture enterprises affected by cormorant predation across countries.					
Cooperation and participation					
27) **Cross-border coordination:** Facilitate collaboration between European countries to address the migratory nature of cormorants and their shared impacts.	4, 5, 6, 7	Years 2-5	• A Cormorant Management Advisory Group (CMAG) and Compliance Committee (CC) established, along with review and feedback system at the regional level. • European countries and stakeholder representatives participate actively in research and monitoring activities. • Authorities (national or regional) responsible for CMP implementation and enforcement within each country share data and information at regional level with the CMAG, CC and secretariat. • Reporting of annual culling and egg-oiling statistics by countries to the Secretariat. • Wise use and 'best practices' for the control of cormorants at national and local levels promoted.	• European Cormorant Management Advisory Group and Compliance Committee formally established. • Annual meeting reports of the CMAG and CC. • Monitoring data published and reported to relevant authorities and organizations. • Publication of Article 9 derogation statistics, with the number of culled cormorants. • Best practices shared and dialogue between stakeholders active.	• CMAG and Compliance Committee. • Monitoring and research organizations. • Relevant national and regional competent authorities, CSOs, and NGOs. • EIFAAC. • Secretariat.
28) **Cormorant Information Platform:** Establish a centralized database to share cormorant population data, fishery impact reports, and best management practices between European countries, agencies and other stakeholders.	4, 5, 6, 7	Years 2, continuous.			
29) **Share best practices**: Develop mechanisms for sharing successful strategies and lessons learned among European countries.	3, 4, 5, 6, 7	Years 3-6, continuous.			
Public awareness, communication and education					
30) **Awareness campaigns:** Conduct awareness campaigns to inform	4, 5, 6, 7	Years 2-6 - ongoing	• A communication strategy on the CMP developed and implemented.	• CMP communication strategy available online.	• CMAG. • EIFAAC.

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
the public about cormorant conservation, cormorant impact on biodiversity, and the costs to fisheries and aquaculture.			• Awareness raising campaigns and knowledge systems implemented and freely available. • Stakeholders and communities actively engaged in CMP development, implementation and evaluation. • Educational programmes designed and presented periodically in European countries and online.	• Statistics on stakeholder engagement in the CMP development and implementation compiled by the CMAG. • Publication of guidelines, training programmes and local codes of conduct. • Education programmes available nationally and online in various languages.	• Secretariat. • Monitoring and research organizations. • Relevant national and regional competent authorities, CSOs, and NGOs.
31) **Stakeholder involvement:** Engage stakeholders, including fisheries and aquaculture organizations, conservation organizations, managers and policymakers, in the development and implementation of management measures.	4, 5, 6, 7	Ongoing			
32) **Educational programmes:** Enhance understanding and education about cormorants, fish and their role in the environment, economy and food security to gain broader public support for management actions.	6, 7	Years 2-6 - ongoing			
Step 5: Evaluate, Adjust, Adapt					
33) **Evaluate & Adjust:** review outcomes of measures and adjust CMP actions based on new data, research findings, and evolving cormorant-fish population dynamics.	all	Year 6-8	• European countries and key stakeholders participate in the CMP evaluation. • CMP evaluated along with its goal, objectives, key actions and KPIs. • CMP adaptations or adjustments proposed based on the evaluation recommendations, new data,	• Reports of the compliance committee. • Annual reports compiled by Secretariat. • CMP evaluation report published. • Proposals for adjustment and adaptation of the CMP submitted	• CMAG and Compliance Committee. • Relevant national and regional competent authorities.
34) **Evaluate breeding sites:** Key cormorant breeding colonies in	1, 2, 3, 5	Year 6-8			

Goal / Action	Objectives addressed	Timeframe	Outputs	Indicators	Responsibility
Nature 200 sites are protected and control measures managed in other main breeding colonies to maintain population status.			research findings, and evolving cormorant and fish population dynamics. • Status of cormorant breeding sites, aquatic biodiversity and fish habitat outcomes evaluated. • CMP adapted to changes in the European policy and legislative framework. • European countries evaluate the outcomes of the CMP at national level and adjust their national plans and management actions.	to relevant national and regional competent authorities. • CMP amendments take in consideration relevant changes in the European policy and legislative environment. • Reports of national level evaluations of national and regional cormorant management plans and damage compensation schemes.	• Secretariat.
35) **Evaluate biodiversity and habitat outcomes**: Ensure cormorant management measures have positive biodiversity and habitat outcomes.	1, 2, 5	Year 6-8			
36) **Adapt to changes in the management environment**: Coordinate with EU Natura 2000 sites, WFD and HD programmes and other relevant policies and programmes to ensure that cormorant management contributes to the protection of biodiversity.	all	Year 6-8			
37) **Harmonize policies and legislation:** Align the CMP with other regional policies and legislative changes within Europe (such as the Bern Convention, AEWA, Birds Directive, HD, and WFD) and national policies to ensure consistent and effective management measures.	4, 6, 7	Year 6-8			

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Annex 1: Acronyms and abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
CC	Compliance Committee
CMP	Cormorant Management Plan
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CMAG	Cormorant Management Advisory Group
CORMAN	EU Project: Sustainable Management of Cormorant Populations https://tinyurl.com/y7vpcy6p http://cormorants.freehostia.com/
CSO	Civil Society Organization
EAA	European Angling Alliance
EBBA	European Breeding Birds Atlas
EC	European Commission
EIFAAC	European Inland Fisheries and Aquaculture Advisory Commission
EMFAF	European Maritime, Fisheries and Aquaculture Fund
EP	European Parliament
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEAP	Federation of European Aquaculture Producers
FRAP	Development of a procedural framework for action plans to reconcile the conflict between large vertebrate conservation and the use of biological resources: fisheries and fish-eating vertebrates as a model case. https://www.ufz.de/index.php?en=36309
HD	Habitats Directive (EU Directive on the conservation of natural habitats and of wild fauna and flora)
INTERCAFE	EU COST Action Project: Interdisciplinary Initiative to Reduce pan-European Cormorant-Fisheries Conflicts. https://www.ceh.ac.uk/our-science/projects/intercafe#:~:text=The%20main%20objective%20of%20INTERCAFE,Europe%20and%20to%20deliver%20a (http://cormorants.freehostia.com/)
INTERCAFE TOOLBOX	Russell, I., Broughton, B., Keller, T. and Carss, D.N. (2012). The INTERCAFE Cormorant Management Toolbox: methods for reducing cormorant problems at European fisheries. INTERCAFE COST Action 635 Final Report III (ISBN 978-1-906698-09-6).
IUCN	International Union for Nature Conservation
MS	Member State
NGO	Non-Government Organization
REDCAFE	EU FP5 Concerted Action Project: Reducing the conflict between cormorants and fisheries on a pan-European scale https://www.ceh.ac.uk/our-science/projects/intercafe-information#:~:text=REDCAFE,European%20Union's%20Framework%20Five%20Programme.
WFD	Water Framework Directive (EU framework for community action in the field of water policy)

Annex 2: Timeline of interventions on the cormorant-fish conflict

Year	Event	Responsible / Reference
1979	Birds Directive	European Commission
1994	Development of an Action Plan for the Great Cormorant in the African-Eurasian Region. Recommendation 04.01. ADOPTED	UNEP/CMS https://www.cms.int/en/meeting/fourth-meeting-conference-parties-cms
1994/95	EU Directives on the protection of cormorants and herons ;MEP question & COM answer,	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C:1995:024:FULL
1996	Cormorants And Human Interests Workshop towards an International Conservation and Management Plan for the Great Cormorant (*Phalacrocorax carbo*)	van Dam C. and Asbirk S. (Eds.). 1997 - National Reference Centre for Nature Management, Wageningen, The Netherlands. 152 pp.
1996	Demonstration in Strasbourg 5-10,000 people. Le Monde « Les pêcheurs déclarent la guerre aux cormorans sur les bords du Rhin »	Fishing and aquaculture interests
1997	Development of an Action Plan for the Great Cormorant in the African-Eurasian Region. Denmark and the Netherlands declared they were willing to take the initiative for the preparation of an action plan for the great cormorant	UNEP/CMS https://www.cms.int/en/document/development-action-plan-great-cormorant-african-eurasian-region
1997	Opinion of the Committee of the Regions on 'The immediate measures which need to be taken to counter the damage caused by cormorants in the European regions'	Committee of the Regions https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:51997IR0028&from=FR
1997	Removal of cormorant from Annex I	EU-Commission https://ec.europa.eu/commission/presscorner/detail/ro/ip_97_718
2001	REDCAFE: EU FP5 Concerted Action Project: Reducing the conflict between cormorants and fisheries on a pan-European scale.	DG Environment https://www.ceh.ac.uk/our-science/projects/intercafe-information#:~:text=REDCAFE,European%20Union's%20Framework%20Five%20Programme
2001	International Symposium on Interaction between fish and birds: implications for management. (3 - 6 April 2001)	Organized by the Hull International Fisheries Institute, University of Hull, in collaboration with EIFAC. Cowx I.G. (2003) *Interactions between Birds and Fish: Implications for Management*. Oxford: Fishing News Books Blackwell Science, 374 pp.
2002	GRAND CORMORAN conference (12-13 March 2002)	France
2002	Cormorant event/meeting	Hunting Intergroup EU-Parliament
2003	A statement on cormorants	EU Council of Ministers (fisheries),

2003	INTERCAFE -project EU COST Action Project: Interdisciplinary Initiative to Reduce pan-European Cormorant-Fisheries Conflicts. INTERCAFE - Interdisciplinary Initiative to Reduce pan-European Cormorant-Fishery Conflicts, (2004-2008, 60 partners, 2012). European Science Foundation/EU RTD Framework Programme, COST Action (635).	https://www.ceh.ac.uk/our-science/projects/intercafe#:~:text=The%20main%20objective%20of%20INTERCAFE,Europe%20and%20to%20deliver%20a (http://cormorants.freehostia.com/
2003	FRAP project: Development of a Procedural Framework for Action Plans to Reconcile Conflicts between Large Vertebrate Conservation and the Use of Biological Resources: Fisheries and Fish-eating Vertebrates as a Model Case	DG-Research https://www.ufz.de/index.php?en=36309
2004	"Review of international policy and practice for the management of native species conflicts"	DG-Environment
2007	Cormorant event (23 May 2007)	Hunting Intergroup EU-Parliament
2007	EIFAC Workshop on a European Cormorant Management Plan. Bonn, Germany, (20-21 November, 2007	EIFAC Occasional Paper No. 41. https://www.fao.org/4/i0210e/i0210e00.htm
2008	European Parliament resolution of 4 December 2008 on the adoption of a European Cormorant Management Plan to minimise the increasing impact of cormorants on fish stocks, fishing and aquaculture (2008/2177(INI))	EU-Parliament: EUR-Lex - 52008IP0583 - EN - EUR-Lex
2008	Resolution on a Pan-European management plan for the control of cormorants – 2 July	Advisory Committee on Fisheries and Aquaculture (ACFA) https://maritime-forum.ec.europa.eu/document/download/f64d062c-1ed1-4f57-ab48-7ce8b2444f49_en?filename=Answ%20DG%20ENV%20187956.pdf
2008	Kindermann report adopted 4 December	Report on the adoption of a European Cormorant Management Plan to minimise increasing impact of cormorants on fish stocks, fishing and aquaculture (2008/2177(INI)) Committee on Fisheries, European Parliament (A6-0434/2008
2009	17-18 January Cormorant count	Wetlands Cormorant Research Group
2009	Follow-up to the European Parliament resolution on the adoption of a European Cormorant Management Plan to minimise the increasing impact of cormorants on fish stocks, fishing and aquaculture	EU-Commission
2009	Cormorant seminar – Commission and stakeholders, 31 March	EU-Commission

2009	Speech by Commissioner Joe Borg at the Fisheries Council, Luxembourg, 23 June	Commissioner Joe Borg
2009	EU-guide for use of §9-derogation (final version in 2010)	EU-Commission
2010	CORMAN: EU project "Sustainable Management of Cormorant Populations" (2011-2014)	Consortium Partnership Aarhus University – DCE Danish Centre for Environment and Energy with UK Centre for Ecology & Hydrology. https://tinyurl.com/y7vpcy6p
2011	France presented a note demanding that the Commission establish a management plan for cormorant populations	France http://register.consilium.europa.eu/pdf/en/11/st11/st11532.en11.pdf
2013	Between Fisheries and Bird Conservation: The Cormorant Conflict Report to European Parliament Directorate General for Internal Policies Policy Department B: Structural and Cohesion Policies, Fisheries	Cowx I.G. 2013 https://www.europarl.europa.eu/RegData/etudes/note/join/2013/495845/IPOL-PECH_NT(2013)495845_EN.pdf
2013	EU guide for applying great cormorant derogations under article 9 of the birds directive 2009/147/EC.	European Commission: Directorate-General for Environment and N2K Group EEIG, *Great cormorant – Applying derogations under article 9 of the birds directive 2009/147/EC*, Publications Office,2013, https://data.europa.eu/doi/10.2779/56719
2016	Answer on cormorant plan given by Mr Vella on behalf of the Commission:	EU-Commission https://www.europarl.europa.eu/doceo/document/E-8-2016-004736-ASW_EN.html
2018	European Parliament resolution of 12 June 2018 on towards a sustainable and competitive European aquaculture sector: current status and future challenges (2017/2118(INI))	EU-Parliament: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2020_028_R_0004
2021	Aquaculture Advisory Council: Recommendation on Freshwater Aquaculture and Wildlife	https://aac-europe.org/wp-content/uploads/2021/06/AAC_Recommendation_-_Ecosystem_Services_2021_08_revised2.pdf
2021	Commissioner Sinkevičius' answer on the European great cormorant population	EU-Commission https://www.europarl.europa.eu/doceo/document/E-9-2021-001534-ASW_EN.html
2022	European Parliament resolution of 4 October 2022 on striving for a sustainable and competitive EU aquaculture: the way forward (2021/2189(INI))	EU-Parliament: https://www.europarl.europa.eu/doceo/document/TA-9-2022-0334_EN.html
2022	**EU Council** approved Conclusions on aquaculture strategic guidelines state in Point 10 that "*cormorants…have become a considerable challenge*" and urge "*the*	https://data.consilium.europa.eu/doc/document/ST-11496-2022-INIT/en/pdf

	Commission to timely identify effective and efficient EU-wide management measures to prevent or reduce the damage caused by predators".	
2022	EIFAAC Resolution EIFAAC/31/2022/3 "On the protection of vulnerable and endangered fish species from unsustainable predation from cormorants" including the need for a CMP	FAO/EIFAAC https://openknowledge.fao.org/handle/20.500.14283/cd2886en
2022	Aquaculture Advisory Council: Recommendation on predation by birds in relation with shellfish farming.	https://aac-europe.org/wp-content/uploads/2022/03/10.AAC_Recommendation_-_Freshwater_aquaculture_and_wildlife_2022_10.pdf
2024	FAO-European Commission Trust Fund project on 'Developing Europe-wide management advice to protect vulnerable and endangered fish species from unsustainable predation by cormorants" (GCP/RER/069/EC).	DG Mare/EIFAAC European Maritime, Fisheries and Aquaculture Fund (EMFAF) financed within its work programme for 2024–2025. Projects - Ongoing projects | EIFAAC | FAO
2024	ProtectFish EU Horizon Project: Researching management solutions for fish, birds and people.	DG Research https://protectfish.eu/
2024	EIFAAC Workshop on management advice for reducing the impact of cormorant predation on fish and fisheries. Pula, Croatia, 8 October 2024	EIFAAC: https://www.fao.org/fishery/en/meeting/41469. Report available at: https://openknowledge.fao.org/items/9a7bd657-f7a4-4c86-a372-bfdf55f726ba
2024	BSAC Workshop on predators in the Baltic (seals, cormorants) second edition, Helsinki, Finland, 30 October 2024	BSAC: https://www.bsac.dk/wp-content/uploads/2024/06/BSACworkshoponpredators_Helsinki_30102024_final-report.pdf
2025	NSAC/BSAC Workshop on predators (seals & cormorants) – Lulea, Sweden, 20 March 2025	NSAC/BSAC: https://www.nsrac.org/projects/nsac-bsac-workshop-on-predators-seals-cormorants-20-march-2025-lulea-sweden/
2025	Stakeholder consultation on the draft European cormorant management plan, Rome, virtual, 25 April 2025	EIFAAC https://www.fao.org/fishery/en/meeting/41503
2025	Conference on management advice to reduce cormorant predation impacts, Brussels/virtual, 3 June 2025	Polish Presidency to the European Council & EIFAAC https://www.fao.org/fishery/en/meeting/41505
2025	Letter to the European Commission by Members of the European Parliament: Call for an EU-wide management strategy for the Great Cormorant while maintaining its favourable conservation status – a long overdue necessity. 3 July 2025	The letter is available at the EAA website: https://www.eaa-europe.org/news/18452/10-meps-call-in-open-letter-to-eu-commission-for-a-coordinated-eu-strategy-on-cormorant-predation-management.html

Annex 3: Overview of measures to reduce impact of cormorants on fisheries and aquaculture

Measure and objective	Efficacy and acceptability
Lethal measures to reduce cormorant numbers directly	
• Active removal of adult breeding birds or overwintering birds from the population. • Shooting at site-specific or local levels under Article 9 derogation. • Coordinated culling for population control at a national level at a national level.	• Response to localised culling short-lived and bird numbers recover to pre-treatment levels over a period of a few weeks. • Shooting adults also helps reduce cormorant predation pressure through harassment of remaining birds. • To be effective in the longer term, culling needs to be repeated at frequent intervals and coordinated across European distribution range. • Culling birds at roosts near aquaculture ponds or on the ponds is likely to create only short-term respite and push birds into other areas where they might become a problem. • Local reductions on the non-breeding grounds have marginal impact at a continental scale, and the problem will recur in the next season when new wintering birds appear.
Reducing reproductive success	
• Egg destruction, for example by oiling [*spraying eggs with inert mineral or vegetable oil*] and egg pricking.	• The benefits of egg oiling over destroying eggs are that cormorants continue to incubate the eggs and are less likely to attempt to re-nest. • Reduces the number of hatchlings. • Takes a minimum of two years before there is noticeable reduction in population numbers. • Expensive and time consuming to carry out and difficult to access many roosts, especially in trees. Drones can improve effectiveness.
• Destruction of nests and breeding habitat.	• Nests or trees used for nesting can be removed or physically broken up with the hope that adult birds will either leave the area, or fail to rebuild or re-nest successfully that season. • Nest destruction is labour intensive, although can be practical on smaller colony sites. • Requires more than one visit per colony as birds are known to re-nest and lay additional eggs if nests and eggs are destroyed (time consuming). • Constrained by factors such as adverse environmental or amenity impacts and influenced by the availability of alternative roosting sites.

Scaring cormorants away from fisheries or aquaculture units	
• Auditory deterrents: automatic exploders, pop-up scarecrows with exploders, pyrotechnics, alarm or distress calls. • Visual deterrents: laser guns, reflecting tapes, eyespot balloons, scarecrows, lights, water spray devices. • Aerial harassment with ultralight aircraft, radio-controlled model airplanes; ground harassment with vehicle patrols. • Chemical [conditioned taste aversion] deterrents.	• Can discourage cormorants from using specific sites. • For harassment to be effective, a variety of techniques should be used in combination, and the location and combination of devices should be changed frequently for best results. • Roost dispersal may move predating birds from the target area but pass on the problem to other fisheries and aquaculture units. • Measures only have an effective range up to 200 m so of little use on river systems or larger sites. • Cormorants learn quickly and these methods often do not deter the birds for extended periods of time. • Use of scaring devices may be constrained where there are risks of disturbing other wildlife or human habituation.
Exclusion techniques	
• Netting enclosures using nets, wires, floating plastic balls. • Facility design and construction.	• Nets provide a physical barrier and are effective if the edges of the nets extend to the ground surrounding the pond. • Difficult to implement over large pond areas and rivers. • Costs may be prohibitive for large ponds. • Overhead wire systems function by making it difficult for cormorants to land on, and take off from, ponds. Although these systems are effective at preventing large flocks from landing, individual birds often learn to fly between the lines, or land on levies and walk into the pond despite the wires. • Success of both wire systems and floating ropes depends on the availability of alternative foraging areas nearby. • Construction of pond margins and bottom profile, location of fingerling ponds, and feeding techniques may lessen damage marginally.
Habitat modification techniques to reduce availability of fish to cormorants	
• Elimination of resting or roosting places. • Elimination of nests. • Improving habitat quality for fish. • Construction of artificial fish refuges.	• Fish refuges can reduce fish losses, foraging efficiency of cormorants and incidence of damage to fish. • Practical constraints regarding the use of refuge structures in rivers and larger still-waters

	(especially those that are also used for water sports). • Causes obstructions and snagging to anglers but also increases flooding risk in large rivers.
Fish stock management techniques to reduce availability of fish to cormorants	
• Increase the size of individuals stocked, regulation of stocking density. • Alter stocking strategy [timing of stocking, frequency and location of stocking]. • Use of buffer species to divert cormorants from predating on valuable species.	• Reduces depredation on small-sized individuals but can increase scarring and wounding of larger individuals. • Not always feasible because of availability of stock. • Increases cost of stocking.
No control	
• Allows species abundance and interrelationships to become regulated based on predator prey interactions.	• Cormorant population will continue to expand and exacerbate conflict. • Outcry from stakeholders and businesses affected by cormorant predation. • May not be acceptable where survival of endangered fish and other aquatic species are at risk, especially from cormorant damage.

Source: table adapted from Cowx, 2013.

Annex 4: Cormorant management framework structure

Cormorant Management Advisory Group (CMAG)

1. The Cormorant Management Advisory group (CMAG) will be responsible for providing scientific, ecological, social and economic advice relating to the management of cormorants in Europe, as well as support the implementation of the adaptive (multiannual) European Management Plan for the Great Cormorant.

2. The CMAG Terms of Reference are to:

a) Develop standardized methods and guidelines to assist European countries in their data collection and reporting in relation to the implementation of the CMP;
b) Collect and assess information provided by European countries, relevant organizations, institutions or programmes on cormorant management efforts, and other data relevant to measuring the impact of the cormorants on aquatic biodiversity, fisheries and aquaculture;
c) Collate and assess information on the status and trends of the great cormorant population, ecosystems and fisheries-related human components, using the appropriate indicators and in relation to agreed management, biological, and/or conservation reference points;
d) Provide independent advice on a technical and scientific basis to facilitate the adoption and implementation of measures concerning the sustainable management of great cormorants and the assessment of biological, ecological, social and economic implications under different management scenarios;
e) Report annually, through the secretariat, to the European Commission and EIFAAC on recommendations concerning conservation, management and research on cormorants, including consensus, majority and minority views.

3. Composition of the CMAG

The CMAG will be composed of scientists officially nominated by the European countries, and observers from international and European stakeholder organizations.

Each European country shall have the right to appoint a representative and an alternate, if needed, both with suitable scientific qualifications, who may be accompanied by experts and advisers.

Members and the Secretariat may invite experts, in their individual capacity, to enhance and broaden the expertise of the CMAG.

The European countries and observers shall finance the participation of their representatives, alternates, experts and advisers to the CMAG meetings.

Compliance Committee

1. The Compliance Committee (CC) will be responsible for reviewing the individual compliance by European countries with the European Management Plan for the Great Cormorant, and its agreed management measures.

2. The Compliance Committee Terms of Reference are:

a) assess, based on all available information, compliance by European countries, and relevant institutions with the measures of the CMP;
b) request clarifications and express concern to European countries and relevant institutions in cases of non-compliance with the agreed measures in the CMP;
c) submit, through the secretariat, to the attention of the European Commission cases in which countries and relevant institutions are not compliant with the agreed measures of the plan, cases in which activities undermine the effectiveness of the CMP;
d) provide additional information, as it considers appropriate or as may be requested by the European Commission and EIFAAC, relating to the implementation and compliance with measures in the CMP;
e) monitor and evaluate the CMP, and formally propose adaptations to the CMP for consideration by the European Commission and EIFAAC;
f) provide independent institutional and legal advice and submit bi-annual reports to the Commission to facilitate the adoption of adaptations to the CMP.

3. Composition of the Compliance Committee

The Compliance Committee shall be composed of one representative and one alternate of each European country. Experts and stakeholder organizations can be invited as observers.

The European countries shall finance the participation of their representatives and/or alternates to the Compliance Committee meetings.

Secretariat

1. The Secretariat will be responsible for the official communications related to the implementation, review, evaluation and adaptation of the European Management Plan for the Great Cormorant, coordination with countries, international and regional stakeholders, and reporting to the European Parliament, European Commission and EIFAAC.

2. The Secretariat Terms of Reference are:
a) receive and transmit the official communications regarding the CMP;
b) maintain contacts with government officials, international and regional organizations concerned with the conservation and management of cormorants and fish and other aquatic species that are impacted by cormorant predations, to facilitate consultation and cooperation on all matters pertaining to the objectives of the CMP,
c) facilitate the preparation and implementation of the CMP, prepare budgets and ensure timely reporting to the European Commission, EP and EIFAAC;
d) participate in the formulation of proposals regarding the budget, the CMP and related activities;
e) stimulate interest among European countries and potential donors in the implementation of the CMP and in possible financing or in implementing cooperative projects and complementary activities;
f) promote, facilitate, and monitor the development and maintain the Cormorant Information Platform and regional databases on ecological, social

and economic information related to the population of cormorants and impacts on fish, fisheries and aquaculture;

g) coordinate and technically support the research, awareness raising and capacity building programmes in support of implementation of the CMP, when required;
h) organize meetings of the CMAG and Compliance Committee and other related ad hoc meetings;
i) prepare, or arrange for the preparation of, background documents and papers and report annually on the implementation of the CMP to the European Commission, EP and EIFAAC, and arrange for the subsequent publication of the annual reports;
j) perform any other function, as may be required by the European Commission, EP and/or EIFAAC.

3. The Secretariat shall be composed of:

1. An Executive Secretary – responsible for implementation of policies and activities related to the CMP and reporting to the European Commission, EP and EIFAAC.
2. A Research and Capacity building officer – responsible for database maintenance and management and facilitation of research, awareness raising and capacity building on the CMP.
3. An administrative assistant – responsible for administrative and operational support related to implementation of the CMP.