Chapter 4

# Competing and Coexisting with Cormorants

***Ambiguity and Change in European Wetlands***

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## Introduction

This chapter explores issues surrounding environmental change or, more precisely, local peoples' experiences and perceptions of environmental change, in relation to a particularly virulent conflict that exists across European wetlands between commercial and recreational fishermen[1], the fish-eating bird, the Great Cormorant, and those responsible for wildlife conservation and management. This conflict is embedded in two important global environmental challenges: the conservation of biodiversity and the sustainable management of natural resources. However, as with most human-wildlife conflicts, cormorant-fisheries conflicts are acted out at the local level (Anderson and Berglund 2004; Croll and Parkin 1992).

Wetland environments are historically recognised as "shifting landscapes", large sectors being either temporarily or permanently under water creating conditions where inhabitants must adapt to the natural fluctuations of their watery worlds. However, there is evidence that many groups of people are finding it increasingly difficult to negotiate the rapid environmental changes that are occurring across many European wetlands (Bell 2004; Tonder 2005). On the surface, local assessments of environmental change are usually articulated in a relatively straightforward manner, for example, people claim that more and more cormorants are feeding on declining fish stocks in direct competition with fishermen. The simple explanation that assumes a direct causal relation-

ship between increased numbers of cormorants and reduced amounts of commercial species of fish is attractive but flawed. As we shall show, prolonged conversations even with those most predisposed to espouse this view often reveal significant ambiguities. Such underlying uncertainties point to the presence of much wider social, economic and environmental concerns, particularly in relation to hydrological factors and top down approaches to natural resource management. Nevertheless, with their highly visible fish capture techniques, their distinctive pose when drying their wings and their clustering together in roosting and breeding colonies, cormorants are a highly conspicuous feature of wetland landscapes. So, if fishing and keep nets are empty, or full of the 'wrong' species and the reasons are too complex and difficult to change, cormorants are easy to blame.

Experiences of economic hardship and people's consequent anxieties about the security of the natural resource base are commonly reported as major influences on people's perceptions of and attitudes to the natural environment (Lewicki et al. 2003).Where livelihoods are not at issue and the fishery is a focus for recreational angling feelings also run deep. Anglers are also prone to blaming cormorants for fish losses (particularly of fish stocked artificially for subsequent recapture) despite poor statistics on yields and stocking (Adamek et al. 1997). So, while studies have shown that cormorants are increasing in numbers and do eat a lot of fish, the intense conflict over 'the cormorant problem' often masks more complex concerns over changes in the ecological and social environment (cf. Rotmans et al. 2000).

This chapter thus explores the multidimensional perspectives of cormorant-fisheries conflicts, incorporating the material dimensions of wildlife predation as well as the social and cultural dimensions (Knight 2000). Previous attempts to resolve cormorant-fisheries conflicts have relied largely on the work of biologists and biological understanding is obviously important, especially because the ambition of most wildlife management plans is to incorporate the best scientific evidence. However a purely biological approach is usually inadequate to the task of trying to address why human-wildlife conflicts occur and why they can remain contentious for decades (cf. Lewicki et al. 2003). Knight (2000: 20) suggests that many apparent human-wildlife conflicts actually have more to do with 'tensions, divisions and antagonisms' between humans.

Here we will draw upon four specific case studies from the U.K., Greece, Lithuania and Romania to emphasize the need to broaden the focus beyond biology to examine the wider context within which cormorant-fisheries conflicts are set. Although these places have different social, political and economic histories, all are facing problems with cormorants. While it is recognised that the 'cormorant problem' is occurring on a pan European scale, attempts to manage conflicts may be most effective at the local level. For example, examinations of how local people assess environmental change demonstrates how fishermen tend

to localise the cause of problems, partly because they consider themselves more capable of assessing what can be done to remedy problems closest to home (Bell 2004). To add weight to the view that interdisciplinary approaches to human-wildlife conflicts require cultural contextualisation, we therefore focus on tensions surrounding cormorant-fisheries interactions at the local level. Socio-cultural issues help to fuel conflicts and need to be carefully unravelled before they can be tackled. Thus, we have a situation where science is moving away from the premise that it can deliver a 'solution', to more collaborative endeavours involving information exchange and greater involvement of local people in decision-making and planning: relationships, collaborations and dialogues are intensifying between the research community, practitioners, and policy makers as science moves closer to applications (Marzano et al. 2006: 186). Furthermore, by drawing attention to local people's fears and concerns over environmental changes, encapsulated in their attitudes towards the cormorant, we also help to clarify how environmental managers and policy makers might embark on more sensitive, informed and inclusive interventions.

## Background

This chapter brings together findings and explorations from two EU-funded Fifth Framework Programme projects, REDCAFE [2] and IMEW [3], both of which considered cormorant-fisheries conflict in four countries (Figure 1). The REDCAFE project (taking a natural science perspective) was designed to complement and develop previous biological work by addressing several of the main uncertainties highlighted during the development of an *Action Plan for the Management of the Great Cormorant in the African-Eurasian Region* (see van Dam and Asbirk 1997 and also below). The project synthesised available cormorant-fisheries information, identified methods of reducing the current Europe-wide conflict between cormorants and fisheries interests, and collated expert evaluations of their practical use. REDCAFE took a novel approach (in relation to cormorant-fisheries issues at least) by, for the first time, bringing together avian, fisheries and social scientists and many relevant 'stakeholders' [4] to discuss and report on these issues. The project also included a cormorant-fishery conflict management case study focussing on the Lea Valley in southeast England. This case study formed the first phase of the development of a local Fisheries Action Plan, a government agency-led initiative to address and prioritise local social as well as biological issues affecting inland fisheries at a catchment scale. Some of the workshop outputs are presented here.

The IMEW project (taking a primarily social science perspective) set out to understand the role of people in relation to biodiversity conservation and focused on four sensitive European wetland regions, three of which (Kerkini Lake, Greece; Nemanus Delta, Lithuania; Danube Delta Romania) are included

here. IMEW's research focused on (1) perceptions of nature among adults and children, (2) the informal and formal social institutions that mediate between people and natural resource use, (3) how aspects of local people's livelihoods relate to, and impact upon, natural resource use, and (4) the development of responsible tourism. Interviewees were not asked specifically about cormorants at the start of this research but, if they mentioned these birds, we then explored their feelings and concerns over them in more depth. Finally, ecologically based work also attempted to quantify natural fish predation and collate fisheries statistics.

Despite their different disciplinary perspectives, both projects considered the 'cormorant problem' as experienced by local people, uncovering how fishermen are reacting to the rapid transformation of their social and natural environments, which has coincided with the increase in cormorant numbers.

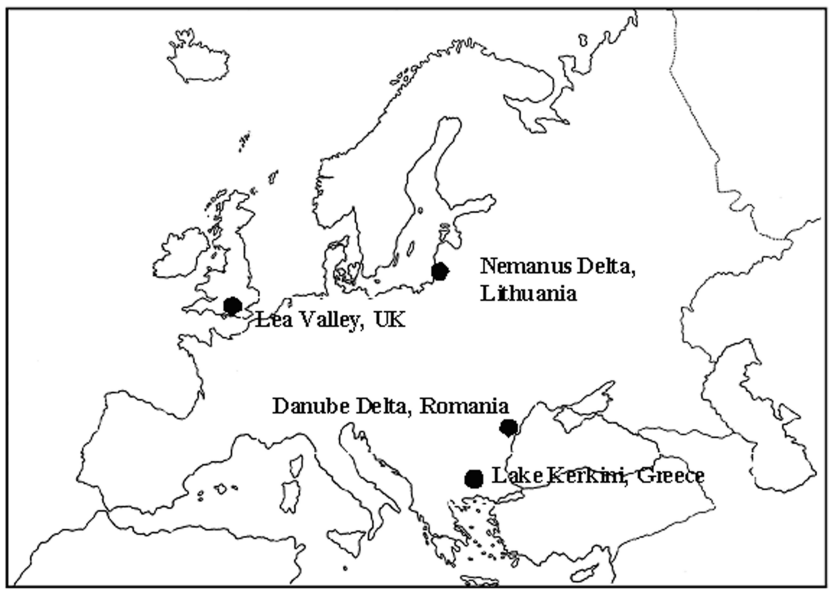


***Figure 4.1:*** *A map of Europe showing the four study sites*

## The Expansion of European Cormorant Populations

Two subspecies of Great Cormorant (hereafter 'cormorant') occur in Europe: the 'Atlantic' subspecies *Phalacrocorax carbo carbo* and the 'Continental' subspecies *P. c. sinensis*. Latest (1995) breeding estimates for *P.c. carbo* are of 40,000 pairs, mostly on the coasts of Norway, U.K., Ireland and northern France, representing over 80 percent of the world population of the *P.c. carbo* race (Debout et al. 1995).

Although there are no estimates for *P.c. sinensis* populations during the nineteenth century or the first half of the twentieth, it is likely that numbers in the remainder of Europe had declined to an unprecedented level of around 800 breeding pairs in the Netherlands in the early 1960s. Thereafter, numbers increased dramatically to over 150,000 pairs throughout the region in 1995 (van Eerden and Gregersen 1995) and it is likely that the species is now more numerous than ever before. The geographical range of these populations has expanded with cormorants returning to some areas after a long absence whilst also moving into areas previously never occupied. Moreover, birds spread all over Europe outside the breeding season, breeding birds from one country may spend the winter in others and *vice versa*. For example, a Mediterranean country may have a cormorant problem in winter caused by birds that breed in Scandinavia during the summer.

The reasons for such expansion are unclear but possible causal factors include a 'non-limiting food supply' (i.e. populations are not limited by a lack of food), protection of breeding sites and reduction in persecution throughout Europe (van Eerden and Gregersen 1995, Bregnballe and Gregersen 1997). Undoubtedly, protective legislation, particularly the EEC Directive 79/409 on the Conservation of Wild Birds (but also others), [5] has also been an extremely important factor in the increase of cormorant populations throughout the region (van Eerden et al. 1995) and is seen by many as a conservation success story. However, as we shall argue in this chapter, the expansion of the European cormorant population must also be considered in the context of environmental and social changes unprecedented during the late twentieth century.

## The 'Cormorant Problem'

Cormorants are 'generalist' fish-eating predators, taking a wide variety of species in shallow coastal seas, freshwater fisheries (natural and stocked artificially) in lakes and rivers, and both traditional/extensive and intensive aquaculture systems (Cramp and Simmons 1977). In many wetland regions across Europe, fish stocks, particularly of commercially valuable species, have become depleted. In almost all countries where cormorants occur, their increasing numbers and geographical spread has led to a growing number of conflicts with commercial fisheries and recreational angling interests (e.g. Bildsøe et al. 1998 and Suter 1995, respectively). The main argument for the conflict is that cormorants impact on fisheries through direct consumption of commercial or rare fish species. Best scientific estimates for the daily food requirement of cormorants range between 400g and 800g per bird per day [6], depending on subspecies and reproductive status (for instance in the breeding season birds will also be foraging to provision their chicks) (Wilson et al. 2003). Cormorant predation is also thought to result in indirect effects such as injury to fish and the spread of diseases and/or parasites that increase fish mortality and reduce their market value.

Quantifying the impact of cormorant predation on fish stocks and catches is notoriously difficult to do in a rigorous scientific manner (see endnote 6 and Wires et al. 2003 for review). Nevertheless, there are clear cases of cormorant damage to fishing gear and ensnared fish, as well as documented cases of considerable stock depletion at fish farms and small lakes and ponds (cf. van Dam and Asbirk 1997). However, demonstrating any ecological impact of cormorants on fish stocks or catches in large rivers, lakes and coasts is difficult because of ecological complexities. Similarly, demonstrating an economic impact is also difficult often because of a lack of information (Carss 2003: 153-154). Despite the difficulties in quantifying the biological or economic impact of cormorants in most situations, and because, like all wild birds in Europe, the cormorant is subject to protection, there have been attempts to minimise the conflict between fisheries interests and cormorants at the continental scale through legislation.

## International Legislation, Conservation and Management Plans

In order to understand why cormorant-fisheries conflicts are still prevalent and to show why it is so difficult to manage the problem across Europe, we present a brief review of the current legislation and management. Under a derogation of the EU Birds Directive it is possible to kill a small number of cormorants under certain circumstances at a specific fishery as a 'crop protection measure'. Although this, or a national equivalent, have been applied on a local scale, the calls for further measures to reduce the population size of cormorants made by some fisheries interests, particularly those in regions where cormorants overwinter, increased during the 1990s. After a lengthy political process (see van Dam and Asbirk 1997), and mindful of calls to take effective action to restore depleted fish stocks and ensure that the Common Fisheries Policy maintains fish at levels that can support both human fisheries and natural predators, an *Action Plan for the Management of the Great Cormorant in the African-Eurasian Region* was drawn up in 1998 (Bonn Convention document Jnr.SN1996-885/29-0001). This document included population models which were used to estimate the numbers of cormorants that would have to be killed in order to reduce the then current cormorant population. With important reservations (see van Dam and Asbirk 1997: 75-78), estimates suggested that several tens of thousands of cormorants would have to be killed across Europe every year in order to begin to reduce the cormorant population. The Action Plan aimed to minimise the conflict between fisheries interests and the cormorant by "*ensuring that best practice is followed in mitigating, preventing and reducing their reported impacts on fisheries, while maintaining a favourable conservation status for the species.*" The Action Plan also stated that Range States should try to achieve this, in the fol-

lowing order of preference, through (a) appropriate site-specific fisheries management, (b) local management and control of cormorants, and (c) co-ordinated management and control of cormorants between Range States.

The Action Plan was sent to all European Range States with a request to implement the recommendations included therein. Any response to the Action Plan was left to the discretion of individual Range States who appeared to continue with their own regional or national cormorant mitigation policies based on their interpretations of national and international legislation. Countries did not integrate their mitigation policies and there was little evidence of advice on the implementation of the Action Plan being made available to Range States nor was there facilitation or funding to co-ordinate its implementation at the international level. Perhaps most importantly, many local people (e.g. commercial fishermen, recreational anglers, fish farmers) felt excluded from the process, suggesting that it did not address their concerns over cormorant numbers and cormorants' impact on fisheries (Carss 2003: 132-133). Thus, for many fishermen and anglers most affected by the 'cormorant problem', the Action Plan appears to be ineffectual, fuelling the perception at the local level, that nothing is being done to help them protect the fish but much is being done to protect the cormorant. The case study examples presented here also show the growing frustrations fishermen feel as their livelihoods or leisure pursuits are increasingly constrained by forces of change which are out of their control.

## Local Perceptions of Environmental Change

In each of the four study wetlands, local people's views that fish stocks and quarry species from both commercial and recreational fisheries have declined considerably are commonplace and widely expressed, most often by comparing the present against times within living memory (see also Minnegal et al. 2003). Local people also considered that cormorant numbers had increased in these four wetlands, since the early 1990s or before, and this is corroborated by biological counts. Cormorants are cited by many as the culprits for these fish declines but the association between increased numbers of cormorants and reduced fish catches does not necessarily mean that there is a cause-and-effect relationship (van Dam and Asbirk 1997) and deeper discussions in our study areas reveal widespread concerns over other environmental, socio-political and economic changes. Here we offer a brief summary of local perceptions of these changes in relation to fish catches (and cormorant impacts) for each wetland.

### *Lea Valley, England*

The extensively managed River Lea (sometimes spelled 'Lee') runs some ninety kilometres roughly north to south, from rural Bedfordshire to the River Thames in east London. Much of the upper river is natural or semi-natural, the lower

catchment is a mosaic of countryside areas, urban green spaces and completely urban areas. Some 3 million people live within thirty minutes drive of the Lea Valley. Cormorant predation on rivers is often perceived to be a major issue. As one local angling representative wrote:

> 'If one asks those anglers who have stopped fishing the Lee "why?" – they will say catch rates and cormorants. In their eyes they see hundreds of these birds in the sky over the Lee Valley every day and they are surviving. Therefore they must still be feeding on fish. They have personally witnessed fish of all sizes taken or killed and to the anglers' perception there are no fish left and it is a waste of time trying. The Lee Bridge Road area, which produced many 20lb. plus bags [of fish] every winter weekend, was wiped out by cormorants in just two winters. Cormorants are in the Lee Valley twelve months of the year.'

However, the workshop revealed that cormorant predation is only one of several problems facing the Lea Valley, though for those involved it remains the most conspicuous. Other biological issues were cited by local stakeholders, including changes in water quality and levels and the threat of the invasive, alien signal crayfish (*Pacifastacus leniusculus*). Moreover, further problems cited stem from social issues including poaching of carp (*Cyprinus carpio*) for the table, the influence of private angling enterprises (that provide stocked fish in man-made water bodies), the loss of angling 'hotspots' as a result of poor planning (e.g. development encroaching on river banks), and several access and safety issues.

Indeed, during the workshop, a number of key issues affecting the Lea Valley emerged from our discussions with local people. For example, many believe that the main problem facing the Lea Valley is an economic one. Economic measures of angling 'effort' (i.e. day and season ticket sales and angling club membership) have all fallen considerably in the last decade: people have either stopped fishing or now fish elsewhere. This has had a knock-on effect on the local economy such as the closure of tackle shops.

Local people consider that these economic problems are the result of too few anglers catching too few fish in the Lea Valley. Several lines of evidence suggest that many fish stocks and/or catches there have declined dramatically (see Lea Valley draft consultation document, Environment Agency). The perception is that most small fish – both small individuals and small species – have declined whilst there may still be fisheries containing large individuals (i.e. 'specimen' fish) of some species such as barbel (*Barbus barbus*) and carp. However, even for these latter species, the concern is that once these larger individuals die, the capacity for the species to breed successfully and sustain viable populations will be greatly reduced. In some cases, such perceptions have been confirmed by fish surveys (Environment Agency, pers. comm.). There is also some evidence that the distribution of fish has changed within the Lea Valley (Environment Agency, pers. comm.). Anglers often choose to fish

adjacent to bridges in the belief that these structures are now the only places were fish aggregate in any numbers.

According to local people, the lack of fish, and the related economic decline, have both local ecological and social implications. There are concerns at the species and genetic levels in relation to the stocking of non-indigenous fish. Some anglers are also concerned that other fish-eating birds will suffer as a result of the lack of small fish or due to the 'aggression' of cormorants. As the fishery declines, it becomes uneconomical to pay bailiffs to maintain riverbanks, with resulting declines in littoral growth and associated fauna and increases in litter and pollution.

There is also a wider social impact. Local angling clubs are considered critical social partners with the National Federation of Anglers (NFA), the Environment Agency (EA) and central government. The NFA operates a coaching scheme that teaches coaches to train young people in all aspects of angling and associated environmental issues, whilst the EA and central government operate an Angling Participation Scheme. This scheme aims to re-establish derelict urban fisheries and develop properly trained, motivated young people. Such 'stewardship' schemes, and the recreational opportunities associated with them (as well as things like local employment and transport demand) all decline as the number of local angling clubs, and anglers, declines.

Finally, local people also told us of planning and policy implications resulting from the economic decline. With the demise of local angling clubs, organised citizens groups lose key players with their associated conservation and financial benefits. Moreover, falling motivation levels as a result of declining angling clubs mean that other Government initiatives suffer (e.g. angling/environmental awareness schemes) and vital community links may be lost. The Lea Valley case thus raises a number of important social issues in relation to young people, community livelihoods and traditions. The problem is related both to institutions and their survival.

*Lake Kerkini, Greece*

Lake Kerkini is an artificial lake created in 1932 after the construction of a dam across the Strymon River. The lake was intended as a source of irrigation, a means of flood control, and to promote fisheries and biodiversity. However, this multiplicity of purposes turned into sources of conflict (Bell et al. in press). In 1982 a bigger dam was constructed in order to increase the carrying capacity for irrigation and the water levels now fluctuate seasonally by around 7 metres. By 2001 a population of 26,000 people lived in the twenty-three villages around the lake. Hydrological work has led to increased water levels and shrinkage of shallow water areas important for fish spawning, and reduced grazing areas for cattle and water buffalo (Crivelli et al. 1995a). There are also associated changes in the fish composition of the lake in favour of species with low economic value,

particularly the gibel carp (*Carassius auratus*). Fish species valued by local people as a food source and mainstay of the commercial fishery (such as carp, wells *Silurus glanis* and eel *Anguilla anguilla*) are in serious decline (Crivelli et al. 1995b). Reed bed habitats have also declined through a combination of increased grazing pressure in riparian areas and alterations in water level. Furthermore, changing water levels have altered the structure and distribution of aquatic vegetation, whilst riparian forests to the north of the lake now suffer prolonged inundation.

Lake Kerkini is an important site for many waterbirds although rising water levels have had a serious impact on many of the 300 local bird species (Crivelli et al. 1995b). By contrast, numbers of (breeding) cormorants have increased from 500 pairs in 1990 to reach 3,500 pairs in 2002 (Carss and Marzano 2005: 154). Both amateur and commercial fishermen appear unanimous in fierce denunciation of cormorants. As an official from a local fisher association stated: 'Cormorants on the other hand are the lake's black sheep. They wipe out everything in their way.' His colleague explained: 'I like birds but I don't like cormorants. Dirty birds, birds of Satan they call them. Wherever they go, the place stinks. Fish don't go near. How could I like birds like these?'

Generally, cormorants were acknowledged as having a rightful place in the natural world, though they were categorised as pests. Knight (2000: 8) believes that the discourse of wildlife pestilence is often subjective with claims that are 'inaccurate, exaggerated or ill-founded'. He also suggests that many wildlife pests may serve as the 'scapegoats of human society'. The majority of fishermen interviewed described cormorants as particularly harmful and around 40 percent claimed that their numbers should be reduced. Fishermen were certain that the cormorant population had increased over the past few years and this, together with the bird's perceived preference for carp fry, had resulted in economic decline of the fishery creating social ills. One fisherman said that without cormorants 'there would be carp and I would have a better life….Another 500 families could make a living from the lake. Young people would stay here rather than look for ways to go away.' Many fishermen and other locals said hopelessly that they just wanted cormorants to 'go away' because, in combination with problems caused by fluctuating water levels, the odds became too greatly stacked against the fishery.

Although local people are passionately attached to this wetland ecosystem, they are disappointed over recent environmental change which they blame on the authorities. A 70-year-old retired fisherman told us: 'The lake has become a sea. Fish used to hide among the reed beds and the forest. This all perished since the dam was built. There is nothing left. Since then the lake has been left bare and we have lost what we had in the past'. A currently active fisherman expressed a similar view: 'Within four years the reed beds were lost and only water lilies were left. Ten years later water lilies were lost too.' Fishermen at Kerkini value

fishing as part of their identity and a means of relating to nature but many describe it now as a 'useless' job because of its poor economic return. Fishermen also feel powerless and neglected by the authorities that control water levels as one highlighted: 'The first thing to do would be to keep the water level stable during April and May until the fish spawn. This is impossible though because thousands of fields in the Serres Plain depend on this water…The result of all this is we have no power to speak. Their voice is stronger.'

*Nemanus Delta, Lithuania*

The inhabitants of the Nemanus Delta have similar concerns to those around Lake Kerkini in relation to hydrological change but they also face the uncertainty associated with the socio-political and economic transition confronting Eastern Europe [7]. The Delta, a dense network of waterways formed at the mouth of the Nemanus River, is located on the eastern shore of the Curonian Lagoon, a shallow freshwater body with some influx of brackish water from the adjacent Baltic Sea. The area contains twenty-five villages and a population of around 4,000 people. Informants from the Nemanus Delta viewed fish-eating birds as significant predators threatening fish stocks. The cormorant figured prominently as the most voracious of all. The following exchange, in a focus group with staff at a local fish-breeding institute, is typical: 'A: Cormorants are worse than anglers, B: Worse than poachers, A: The quarry of an angler is 12 tonnes per year. The quarry of a cormorant is 120 tonnes, C: They don't pay taxes!'

In the above quote, the latter figure for annual cormorant consumption of fish (120 tonnes) is over 410 times the maximum scientific estimate for the food requirements of the species and is thus biologically nonsensical. However, the main point of interest here is that a cormorant is claimed to take ten times the amount of fish annually that an angler would catch. Having said that, the value given for an angler's annual catch is also a gross overestimate – requiring the angler to catch almost 33kg of fish every day of the year.

A commonly aired view of cormorants is that they should be killed. Furthermore, cormorants were seen as originating from 'outside' the area and representing a new threat to local fisheries. For local people, this 'new' threat is associated with other uncertainties ushered in since the end of the Soviet period, their alien status rendering them fair game for vilification. Hampshire et al. (2004) note that privatisation of the marketing system in Lithuania (and Romania) has led to the expansion of black market trading and to over-fishing of certain species. For example, the opening up of free-markets in the fish farm sector has also caused conflicts between fisheries and cormorants in both Poland and the Czech Republic (Carss 2003), whilst associations between open markets, changes in livelihood strategies, over-fishing and cormorants have also been made in Estonia [8]. The dislike of cormorants seems to go beyond direct competition for fish and often appears to be linked to the consequences of major international

changes in market economies operating on local fisheries embodying, perhaps, local people's frustrations concerning lack of prosperity more generally.

Water management is a major concern of villagers in the Nemanus Delta. They maintain that the rivers are silting because of reduced dredging during the post-Soviet period. People fear this impedes the movement of fish. There is also a widespread opinion that the Curonian Lagoon is becoming more saline due to the impact of engineering works at its northern end. These works have opened the lagoon to intake of brackish water from the Baltic Sea and people hold them partly responsible for perceived decreases in fish stocks. As one local fisherman said: 'The situation is changing rapidly, especially because of the recent deepening of the Curonian Lagoon. Before that it took two to three days for the wind to blow from the west to get sea water over here and now it takes one day. This pushes all the [freshwater] fish away from here.' Fishermen also connect the decline of available fish stocks to the imposition of a national boundary across the lagoon between Kalingrad (Russian Federation) and Lithuania. They argue that a combination of currents, winds, and fish-feeding habits mean that desirable species are present in greater numbers on the Russian side of the Lagoon. These waters, once valuable fishing grounds, are now lost within Russian territory; a fact that contributes to the general belief that there are fewer fish for capture. The perception that fish stocks are decreasing is widely expressed, though the extent, its cause, and future prognosis of the depletion are typically a matter of conjecture and uncertainty. This situation breeds an air of pessimism and insecurity about the future and is encapsulated in comments from commercial fishermen: 'We expect nothing. We are afraid about the future of our children. Fish will not remain for them.'; 'The situation is worsening.'; 'The only aim is to survive.'

As in the Lea Valley and Lake Kerkini, the mounting presence of cormorants, in addition to the aforementioned changes facing fishermen, leads to increasing conflict. However, while cormorants are ostensibly to blame for fish decline, local understanding of environmental change also implicates other, human adversaries. Here we have a vivid example of the assertion that in some cases, conflicts are effectively projected onto wildlife which becomes a symbolic vehicle 'for the expression of a social conflict' between people or between people and the state (Knight 2000: 21). The Danube Delta case provides further evidence of this people-state conflict.

### *Danube Delta, Romania*

In the Romanian Danube Delta local inhabitants feel powerless against powerful institutions such as the Danube Delta Biosphere Reserve, accusing them of misunderstanding the natural environment while imposing restrictions, in the name of wildlife conservation, on how the inhabitants can live and work.

The Danube Delta comprises three major channels, 400 lakes and a network of interconnected waterways. It is Europe's largest delta and has a unique

pattern of closely interconnected habitats and ecosystems. There are twenty-six human settlements within the Delta and a population of around 14,000 people. The activities of cormorants and pelicans are seen as particularly damaging when set beside the hydrological and ecological changes affecting the Romanian Danube Delta. Informants judged these birds to be feeding less frequently in lakes, the birds' once favoured foraging grounds, because these water bodies are shrinking and forcing fish to retreat into channels, where they are followed by the birds. These environmental observations by local people heighten the sense of competition between fish-eating birds and fishermen especially because fishermen's licences usually permit fishing in lakes rather than channels. There is also widespread opinion that the currently low water levels make it easier for these birds to catch fish. The majority of informants consider that cormorants consume 'too much fish.'

Nevertheless, like the inhabitants of the Nemunas Delta, Danube Delta inhabitants' perceptions of the natural environment are heavily coloured by economic hardship and anxieties about the security of the natural resource base. As in all the case study wetlands presented, they are also worried about what they consider to be the most elementary aspect of the Delta's ecosystem – water volume, flow regime, and water quality. There is a solid consensus that water levels are dropping, marshes and channels drying out, silting up or becoming clogged with vegetation: 'Now around Caraorman it is like the Sahara desert…the balta [local term for the Delta's marshes and swamps] is drying up. Nature is suffering.'; 'Alluvia has come and covered the lakes with mud.'; 'The level of the water is decreasing and fish are dying.'

Although some informants mention lack of rain (two explicitly mention climate change) as being the cause of these changes, by far the majority blame what they see to be incompetent hydrological management. This relates to a common source of cormorant-fisheries conflict which stems from feelings of exclusion among local people, to which poor communications and simplistic understandings of information transfer needs have contributed. For example, feelings towards the Danube Delta Biosphere Reserve Authority (concerned with conservation and management of the Delta) are largely negative. There is acknowledgement that the Danube Delta must be managed and agreement that species and habitats require protection, especially against poachers and outsiders who seek to exploit the Delta's resources. In addition to suffering economic deprivation, isolation and lack of basic facilities such as piped drinking water and sewage facilities, local people feel that the authorities also blame them for failing to care for nature. Yet local people regard themselves as the most worthy champions of the natural world which is their daily reality. Historical and chronic lack of trust is a serious obstacle to the close collaboration between Delta inhabitants and members of the DDBRA essential for sustainable management of this wetland.

In discussing their intrinsic suspicion of the DDBRA, inhabitants point to the hydrological changes they believe to be pertinent to the decline of the Delta's fishery, the size and composition of the fish stock being affected by 'reduced water levels', 'the clogging of channels', 'the silting up of lakes', and 'the growth of weeds and algae'. One species has increased to the point of becoming what people describe as 'dominant' – the gibel carp. This is a non-native species and an escapee from the now abandoned Soviet-era fish farms in the Delta but the fish makes inferior eating and is of low economic value. Poor water quality is also considered to have affected fish stocks more adversely than fish-eating birds. As a retired helmsman remarked: 'It is said that the pelicans and cormorants eat more fish, but when there were large numbers of fish there was enough food for local people and birds too. The birds are not the principle cause for diminishing fish.'

Indeed, a fisherman from the village of Mila 23 cites poor water quality to explain the lack of carp: 'The common carp has died because he rests in winter, just like bears. His gills filled with mud. He couldn't breathe and when it got warmer he still had mud in his gills, so he didn't make it.' While a younger fisherman says: 'It would be better if they opened the channels to bring fresh water. Because of dirty water the fish die.' Traditionally, reeds were burned in winter to allow for more rigorous new growth in spring, which was cut and dried to provide animal fodder for winter. This practice is now severely restricted by local authorities (see Bell 2004: 62) but local people claim that important ecological benefits once came of it. As one fisherman said: 'Prior to 1989, the water was clean and the channels were clean. In winter and early spring people burned the reed from the bank and the floating reed islets. When fish spawned the water ways were clear…This is a most important thing not only for fish but for vegetation too.' Another stated: 'When the reed is burned it regenerates the fish and birds and everything else. Otherwise during the summer the water becomes foul.'

The Danube Delta case adds another perspective to why conflicts occur. There is a disparity in opinion between the DDBRA, representing nature conservation interests and those involved in the fisheries. Indeed, fishing is always potentially in conflict with conservation. In ecological terms, humans who fish are predators, albeit ones who respond to and reflect upon their role as predators, whilst conservation is a set of ideas and measures intended to ensure the maintenance, and possible enhancement, of populations of fauna and flora within their natural habitats. In the Danube Delta, local villagers feel that the fishing economy has taken second place to conservation efforts to preserve wildlife (including cormorants). Part of the problem is how different species are valued by the different stakeholders, especially fish-eating species such as cormorants (Bell et al. 2001). For example, cormorants are commonly held in contempt by fishermen across Europe but are considered important by others (such

as scientists, conservationists and many lay people) as the top predators in many aquatic systems (Bell et al. 2001).

## Fisheries Management Is More Than Managing Fish

Like anglers in the Lea Valley, the case studies from wetlands in Greece, Lithuania and Romania illustrate the changing circumstances fishermen find themselves in, where the increased abundance of cormorants becomes the object of dissatisfaction with degraded environments (and decreasing fish stocks), political and social change as well as the pressures of top-down management of the natural resources. It is clear that when attempting to better understand the nature of cormorant-fishery conflicts it is also useful to consider other, more wide-ranging issues that lead to conflicts over fisheries resources. These issues, both ecological and social, are often closely linked (Daniels and Walker 2001) and thus are perhaps best approached through an integrated framework that includes people's lived experiences within these dynamic environments. In this chapter we have highlighted how local people described their fears and concerns in relation to their fishing businesses or recreational angling pursuits as well as voicing their specific worries over fish-eating birds, particularly the numbers of cormorants and how much fish they are eating. In all study locations, perceptions of environmental change were similar and involved large-scale anthropogenic habitat and hydrological modification with concomitant changes in water levels, water quality, the distribution of aquatic vegetation, and the abundance and structure of fish communities. Moreover as fish stocks become more obviously affected by these changes, ultimately manifesting themselves in lower fish catches, two things often happen as a consequence: fish become more 'valuable' to local people, and fish-eating birds – especially cormorants – are increasingly seen as competitors for these fish.

One overlying issue affecting all fisheries, and certainly our local informants, is the long-held concern over increasing pressure on limited aquatic resources, particularly within the current climate of calls for sustainable management of natural resources. Symes (1996) notes that overfishing has been acknowledged by fishermen, administrators and scientists for over a hundred years and that by the mid-1990s the Food and Agriculture Organisation had estimated that some 70 percent of the world's fish stocks were overfished. Fishing takes place in uncertain and diverse environments, including both the biological and the social setting in which these activities are undertaken (Acheson 1981). This not only relates to commercial fisheries but also to aquaculture, another income producing fisheries activity (see Noakes et al. 2003), and to recreational angling. Thus, attempts to create 'sustainable' fisheries must extend to all aspects of the fishery system, from the fish stocks and ecological considerations to the social, cultural and economic structure of fishing groups and manage-

ment institutions (Symes 1996, Charles 2001). Furthermore, as Rotmans et al. point out 'the increasing complexity of European society means that sustainable development cannot be addressed from one perspective, one country or one scientific discipline' (2000: 810).

However, another concern voiced by local people is the fact that they often have little control over how legislation is interpreted by national and regional authorities or how the wetlands in which they live are managed. Until recently, academic contributions to fisheries management have usually been dominated by biologists and economists, whose understanding is influenced by their own discipline (Couper and Smith 1997). Now scientists and policy-makers are also paying attention to the human element in fisheries management by including an appreciation of fishermen's perspectives.

Many commercial fish stocks are now no longer plentiful and fisheries management must take into account the 'uncertainty factor' resulting from the behaviour of fishermen (individually and collectively through organisations), which is increasingly influenced by growing insecurity surrounding their livelihoods base (Symes 2001). In many societies around the world, fishing rights are controlled. Acheson (1981: 281) believes such rights-based systems operate to reduce uncertainty: 'if fishermen cannot control the fish, at least they can control who will be allowed to fish for them and how they will do so'. Seen in this context, local fishermen view cormorants as another 'fisherman' in the system, albeit one whose access to the fishery they currently have no, or very little, control over. Moreover, as in all the field sites discussed here, many fishermen feel that cormorants are given unduly high conservation status or legal protection, and that current legislation works against them (see also Marquiss and Carss 1997). Thus, as a consequence, local people often feel that other 'stakeholders' (e.g. nature conservationists, biologists, policy-makers) have too much control over rights of access to their fisheries and over the fisheries management decision-making process. Cormorants become a symbol of environmental but also social and political 'realities' facing local fishermen. Tensions are inevitable.

In this chapter we have shown how local people speak perceptively of the environmental changes affecting their wetland and fisheries and the resulting frustration they feel, indicating that despite the inclination to scapegoat the cormorant, they do understand the multiple factors involved in their complaints. Similarly, Pinkerton (1989) considers several major fisheries conflict issues that also emerged through our discussions with local people, identifying three relevant factors congruent with our own research. First, there is often a lack of faith in the ability of governments to solve management problems. Second, fishermen want a voice in the decision-making process to ensure more appropriate and equitable management. Both suggest the necessity for collaborations between the research community, practitioners and policy-makers. Third, there is an evident lack of trust: fishermen do not feel that they can depend on the reliability

of scientific data, or that governments (or the scientists they commission) have adequate data. Most field biologists would agree: often their data are incomplete, provisional, and have a considerable level of uncertainty. For their part, local and national governments can regard fishermen as unrelenting predators who, in many cases, have overfished through inadequate understanding of fish biology (cf. Jentoft et al. 1998, Hardin 1968, Clover 2004). This strongly suggests the need for greater collaboration between local people and scientists. The sharing of local knowledge and scientific information and the inclusion of local knowledge (in the form of perspectives, concerns and experiences) in decision-making and planning are both essential if fisheries management strategies are to be successful and sustainable.

## Integrating Local Knowledge into Fisheries and Cormorant Management

There has long been a growing movement towards the development and implementation of effective, 'holistic' fisheries management programmes which include local knowledge (cf. Mackinson and Nøttestad, 1998). In order to avoid inadequate fisheries policies and management systems that tend to treat the symptoms (in this case, the observation of increasing cormorants and the perception that there are too many) rather than address underlying problems (widespread anthropogenic changes in wetland hydrology and ecology), broader environmental and institutional factors should be taken into account and fundamental socio-cultural conditions must also be given high consideration (Symes 1996). Rettig et al. (1989) suggest that participatory co-management in fisheries, where fishermen and managers co-operate in drafting policy, may facilitate successful management and reduce conflicts (see also Jentoft et al. 1998; Pitcher and Hollingworth 2002).

One particular benefit of co-management relates specifically to the formation of relationships. Pinkerton (1989: 8) states: 'Once the relationship among actors is changed by establishing an area of co-operation, enlarging co-operation to other management functions becomes easier.' In relation to incorporating the knowledge and experience of local people into some form of co-ordinated assessment and management of the European 'cormorant problem', the process of 'establishing an area of cooperation' is proving difficult (Carss and Marzano 2005). The REDCAFE and IMEW projects gave local people some opportunity to describe their concerns over environmental change, and specifically cormorants, and also allowed natural scientists to consider social, cultural, political and economic perspectives to what were once considered 'biological issues'. They have also given both fishermen and natural scientists the opportunity of framing the cormorant-fisheries conflict in a wider context of complex 'social'

issues and wide-scale environmental change. However, these two projects also revealed the current disparity between many local people's felt needs of fewer cormorants and the current 'reality' of scientific understanding of both the impact of cormorant predation on fish populations, stocks and catches, and of the ecological systems within which the birds exist.

Given the difficulties in managing many of the other biological and social issues affecting fisheries, many people believe they could have some control over cormorant numbers. For many, the 'cormorant problem' could be addressed by a reduction in bird numbers through a widespread cull across Europe. However, as mentioned earlier, because population reduction on such a scale would require the killing of tens of thousands of cormorants each year (van Dam and Asbirk 1997: 86-88), there would undoubtedly be logistical, political, and perhaps ethical, issues to address. Moreover, biologists point out that:

> 'A best professional judgement suggests that a substantial reduction in population size does not necessarily lead to a substantial reduction in the number of cormorants foraging in so-called problem areas. Furthermore, economic losses would not necessarily decline proportionately with a decline in the number of cormorants foraging in a problem area' (van Dam and Asbirk 1997: 89).

This situation is causing continued, if not heightened, friction between fisheries interests, scientists and policy makers and it is still proving difficult to incorporate local people and their knowledge into cormorant management processes and strategies.

Indeed, the involvement of local people in fisheries planning and decision-making can be fraught with difficulties as there is rarely a single 'public discourse' and, in the majority of situations, there is likely to be a range of contested views and values in relation to natural resources (Hampshire et al. 2004, Minnegal et al. 2003). The present synthesis has shown a range of contested views and values specifically in relation to cormorant-fishery conflicts, just one area of concern for fisheries management. We have shown how concerns over the sustainability of the natural resource influences how local people perceive and experience the environment but research into human-wildlife conflicts must also include an examination of the role of power (for example: who has control over decision-making) in fuelling conflicts.

As well as a contextualising frame, which links the local with the national and global, environmental problems are repeatedly identified as presenting the most urgent need for the benefits conferred by interdisciplinary research (Kinzig 2001, Brewer 1999, Turner and Carpenter 1999, Stewart and Strathern 2003). We think that the examples discussed above, though not perfect in their interdisciplinary balance, demonstrate the truth of this assertion. Certainly the interpenetration of researchers across the two projects, REDCAFE and IMEW,

created new understandings about the cormorant issue and about obstacles to interdisciplinary research (Marzano et al. 2006). In addition there have been strong calls for the involvement in environmental management issues of a full range of stakeholders, particularly local participants (cf. Chambers 1997, Pound et al. 2003, Sillitoe 2004). Either one of these approaches requires people to break down barriers and is difficult enough to achieve in its own right, but we would add that neither will succeed alone. In the case of cormorant-fisheries conflicts, it is plain that a diverse range of solutions are the only ones likely to begin to remedy a wildlife conflict afflicting so many European countries, and which others are preparing for.

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## Notes

1. Here we use the word 'fishermen' to describe men and women who catch or farm fish for commercial gain, use commercial fishing gear to catch fish as a hobby, and angle for fish with rod-and-line as a recreational pursuit.
2. REDCAFE (Reducing the conflicts between cormorants and fisheries on a pan-European scale), EU Framework 5 Concerted Action Q5CA-2000-31387. Synthesised current understandings of cormorant conflicts with fisheries, cormorant ecology, potential management tools and organised a conflict-resolution case study workshop involving researchers and other stakeholders.
3. IMEW (Integrated Management of European Wetlands) EU Framework 5 Research Project EVK2-CT-2000-00081. Conducted comparative natural and social science research in four European wetlands. http://www.dur.ac.uk/imew.ecproject/.
4. The word 'stakeholders' was used in the REDCAFE project and is a difficult one: it means different things to different people and it is not easily translated into some languages. In the context of this chapter the term 'stakeholders' is taken to mean (a) people who are affected (either positively or negatively) by a particular problem or activity or (b) people who can influence (either positively or negatively) the outcome or end result of a particular process. For further details see Ramírez (1999).
5. Other important protective legislation in the EU includes the Bern Convention on the Conservation of European Wildlife and Natural Habitats and the Bonn Convention on the

Conservation of Migratory Species of Wild Animals and, in the EU and elsewhere, the Ramsar Convention on Wetlands of International Importance especially as waterfowl habitat.

6. It is difficult to put this daily food requirement into context for several reasons. First, during its daily foraging a cormorant may eat one or two large fish or several dozen small ones, thus without knowledge of the size of predated fish it is impossible to estimate the numbers of them being eaten per day. Second, the numbers of cormorants visiting foraging sites can vary from a single bird to flocks of several thousand (depending on the size of the water body involved). Even at a specific feeding site a mere count of the numbers of birds present is not a rigorous quantification of the numbers feeding there as it takes no account of the turnover of birds arriving to fish and leaving again throughout the day. Third, without an adequate estimate of the numbers of fish within a particular fishery, it is not possible to speculate on the likely consequences of the removal of those lost to cormorants. Adequate estimates of fish numbers are exceptionally difficult to make with current technology for all but the smallest and simplest fishery systems. Finally, such considerations assume some relatively simple relationship between the ultimate size of a fish 'population', the 'stock' of fish in a particular sector of a water body, and the actual 'catch' of fish by people from that same sector – the simplistic assumption being that a fish lost to a cormorant is one lost to the fish catch. There are numerous reasons why this might not be the case. Similarly there is some evidence that predators will select 'unhealthy' fish that are likely to die 'naturally' anyway and thus be unavailable to the fishery, and that at least some of the fish that are not predated 'compensate' for reduction in competitors with higher growth rates (and possibly ultimate survival).
7. Our research was carried out before Lithuania joined the European Union on 1 May 2004.
8. Vetemaa et al. (2000) detail how, during the Soviet period, all Estonian water bodies were state owned and commercial fishing was carried out by collectives mostly serving the markets of socialist countries. Following independence there was a high demand for fish and a rapid increase in exports so that fish prices rose dramatically. Most fishermen formally connected to collectives were given the chance to privatise fishing boats and gear at low cost, whilst the abandonment of an oppressive border regime allowed fishermen free access to the sea. Fishing quickly became an important livelihood strategy and resulted in unsustainable pressure on fish stocks. Profitability has declined in recent years, exacerbated by increasing costs and declining stocks. Within the troubled fishing industry, the debate over cormorant predation has highlighted potential conflict and, in certain regions, many commercial fishermen now believe that cormorants are to blame for declining catches (Eschbaum et al. 2003).

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