MEETING REPORT
INTERCAFE @ South Bohemia 11-13 April 2008

"Management practices in a complex habitat mosaic and at local, regional and national levels"

INTERCAFE meeting report, Jindřichův Hradec, South Bohemia, 11-13 April 2008

M. Marzano & D.N. Carss (Editors)

This edited report of the meeting is in four parts:

(1) Introduction
(2) Presentations – local experts
(3) Integrated working session: exploring the local situation with local experts
(4) Field trip report and subsequent interview

The agenda for the meeting is given in Appendix 1.

PART (1) Introduction

This, the ninth INTERCAFE meeting, was held at the Hotel Concertino in the town of **Jindřichův Hradec**, South Bohemia, 11-13 April 2008. South Bohemia is renowned as a region of rolling hills and large forests, it is still largely rural and has not suffered from much industrialisation. However the Třeboňsko region, with the towns of Třeboň and Jindřichův Hradec at its heart is characterised by bogs, flatlands and fish ponds. This **marshland** was moulded into an intricate system of over 6,000 ponds linked by canals as early as the fifteenth century. These **fish ponds** provided considerable wealth to the local nobles and the fish industry still dominates the region today. Larger ponds – such as the Rožmberg visited on the field trip – are harvested every second year and people from the surrounding district gather for several days to feast, sing and participate in what is a great local event. The area is rich in biodiversity and in 1977 **UNESCO** declared a large area, from Soběslav south to the Austrian border as a Nature Reserve. The fishponds in the Czech republic represent **unique managed ecostsyems**. Here,

water levels, fish stock, basic water chemistry and nutrient input are under the control of the fishery manager. However, the fishponds are not intensive, 'driven' systems like many other aquaculture facilities. The natural production processes (sunlight, phytoplankton, zooplankton) are the basic elements of fish-rearing in these fishpond ecosystems. The real challenge for fisheries managers (and for research) is to maintain the functioning of these natural ecosystems in the unique environment of the fishponds.

Before the 1980s, Cormorants were a **rare migrant** in the Czech Republic, although there was an increase in the occurrence of non-breeding birds in 1970s and 1980s. The main breeding area is now in the south of the country after Cormorants began breeding in South Moravia in 1982. Numbers of **breeding pairs** peaked in 1991, when 612 pairs bred on the Nové Mlýny reservoirs. Since then there has been a decrease in the numbers of breeding pairs following the removal of dead trees and as a result of shooting in pre-and post-breeding periods.

Records of **ringed birds** shot in the Czech Republic show that the country is clearly an important area for migrating Cormorants from a number of different countries. Many of the birds shot here in spring, autumn and (to a lesser extent) winter were hatched in colonies in Sweden, Finland and Hungary, whilst most shot in the summer breeding period or immediately after are from the Czech Republic itself. Similarly, the proportions of shot cormorants in the Czech Republic from different countries has changed: in the 1980s, most shot ringed birds were from Denmark and Sweden. Thereafter, Swedish and Polish birds increased and towards the end of the 1990s so too did those from Russia and Estonia. In more recent years, the number of birds ringed as nestlings in Estonia, Sweden and (latterly) Finland have also increased. Czech-hatched ringed Cormorants have been present in the country since 1988-90, albeit in fluctuating numbers. Such birds have also been found dead outside the country and, again, there are **seasonal patterns of recovery**. For instance most Czech birds found dead abroad during July-September are recovered on a north-west/south-east axis, those during the rest of the year tend to be distributed more widely, although there is a suggestion of a parallel n-w/s-e axis farther to the west, especially for birds dying in mid-winter.

Given the increasing numbers of both breeding and over-wintering Cormorants in the Czech Republic, the fact that they forage at commercial fishponds and regularly take fish species of commercial interest, **an Action Plan for the species** in the Czech Republic has been devised. The Cormorant is a protected species under Czech Environmental Law. Permission for **flushing** and **shooting** can be granted by the district government or by the Landscape Protected Area Administration. Such permission is usually granted for actions undertaken during the non-breeding season. In addition, the district government can pay **financial compensation** for damage caused by cormorants at any time throughout the year. As a result of such legislation, the numbers of shot cormorants began to increase in 1989, reaching around 2,000 per year during the 1990s. Thereafter, the numbers of cormorants shot annually increased to around 3,000 during 2000-2004 and have since (in 2005 and 2006) fallen back to around 2,250 birds per year.

In the late 1980s and early 1990s, wintering cormorants were only recorded on **standing water reservoirs** in the Czech Republic. By the mid-1990s the birds were also recorded on **rivers** (in increasing numbers) and thereafter birds have also occasionally been recorded on smaller standing waters (ponds and gravel and sand pit lakes, see Figure). Between 1993 and 2005, rivers have been the only freshwater habitat to show a consistent increase in cormorant numbers (from a few hundred individuals to around 5-6,000 over this time period). In more recent years,

cormorant wintering numbers in the Czech Republic have risen above 10,000 individuls according to International Waterbird Census figures.

Moreover, many of these birds occur along river systems throughout the Czech Republic. Thus, overwintering birds in the Czech republic have undergone a dramatic increase. As a result of both these changes in cormorant behaviour in recent years and the backdrop of a highly diverse wetland mosaic of extremely high biodiversity value, INTERCAFE was very interested to explore the managemnt of cormorants in such a complex system.

Although the basis for **cormorant-fishery conflict mitigation** in the Czech Republic is complex, it is no more so than elsewhere in Europe. As mitigation of the cormorant-fishery conflict is not only a biological problem, **cultural and social definitions of nature** should be taken into more account during the planning processes of management actions. **Financial compensation for damage** to fish stocks is viewed by many as a positive feature but nevertheless it depends on the goodwill of the Government to pay it from the State budget. As elsewhere in Europe, the regulation of cormorants (i.e. lethal control measures) is problematic due to the fact that birds are on **migration flyways** and there is often a high turnover of birds at sites. As elsewhere, the local, regional and national level of the problem, and its potential solutions, were another important reason for INTERCAFE's interest in this region.

A flavour of South Bohemia: habitat variety and history

We were privileged to work with many local experts during the meeting. These included local land/water owners and fishermen and ornithologists. We also heard from two highly influential NGOs, and representatives of both the Czech Ministries of the Environment and Agriculture. We also learned about the area's different perceptions of humans and Cormorants from a social

scientist based at the Department of General Anthropology of Charles University. We were guided on our field trip by several local experts who showed us much of the local landscape, culture and fish pond tradition. As in previous meetings, this collaboration allowed us to learn much about the biological and social diversity of the area.

It was against this complex background of ecological and cultural diversity - in a landscape dominated by managed water systems and history that INTERCAFE participants explored the topic of **management practices in a complex habitat mosaic and at local, regional and national levels.**

Thanks and acknowledgements: Some of the activities during this meeting were provided through financial support from Charles University, Prague – we are extremely greatful for this. Assistants at the meeting were university students and INTERCAFE would like to thank Martin, Lucie, Anna, and Jiří for all their help and hospitality. Thanks also to Jan Pokorný ENKI, Public Benefit Corporation for showing us some of the wonderful architecture and history of Jindřichův Hradec. Special thanks also to Štěpán Rusňák who presented his documentary film *"Cormorant – a protected enemy"* in the evening of Day One, acted as high-speed chauffeur between Jindřichův Hradec and Prague, offered accommodation to our Rapporteur and offered participants a magical cruise (with music, food and drink) on the Vltara River to see the sights of Prague after the meeting. Here, Štěpán offered us a never-to-be – forgotten evening on a Venice of Prague river canal boat trip (see www.prague-venice.cz). The field trip was guided by staff from Třeboňsko Landscape Protected Area and included discussions with local stakeholders from various fisheries companies – we thank them all for sharing their great wealth of experience with us and for answering so many questions. Special thanks to Ladislav Strecl, who kindly gave two hours of time to discuss a variety of issues with INTERCAFE at the Rybářství company office.

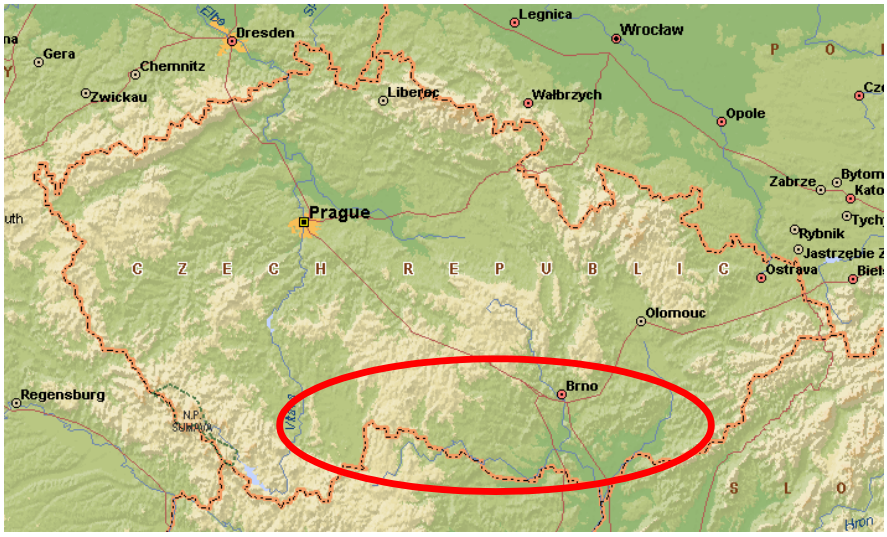
PART (2) Presentations – local experts

2.1 Cormorants on commercial fishponds in the Czech Republic: population development, migration, feeding ecology

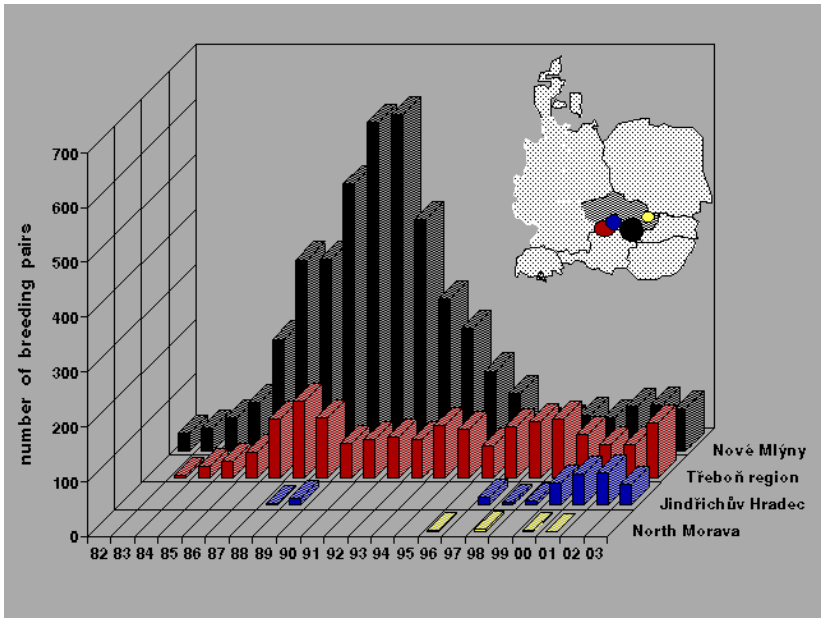
Petr Musil, Zuzana Musilová (Department of Zoology, Faculty of Sciences, Charles University, Vinicna 7, Praha 2, CZ-128 44, Czech Republic. Email: p.musil@post.cz and iwccz@post.cz, respectively).

Development of the breeding population

Before the 1980s, cormorants (*Phalacrocorax carbo sinensis*) were only a rare migrant in the Czech Republic. The birds made unsuccessful breeding attempts in South Moravia in the 1930s and 1950s and there was an increase in the occurrence of non-breeding birds in 1970s and 1980s. The main breeding area is in the south of the country (see map with breeding area circled). Cormorants began breeding in South Moravia in 1982 with the first breeding colony (32 pairs) on the Middle Reservoir of Nové Mlýny (indicated in yellow on map and Figure). The numbers of breeding pairs peaked in 1991, when 612 pairs bred on the Nové Mlýny reservoirs. There has since been a decrease in the numbers of breeding pairs following the removal of dead trees and as a result of shooting in pre-and post-breeding periods.

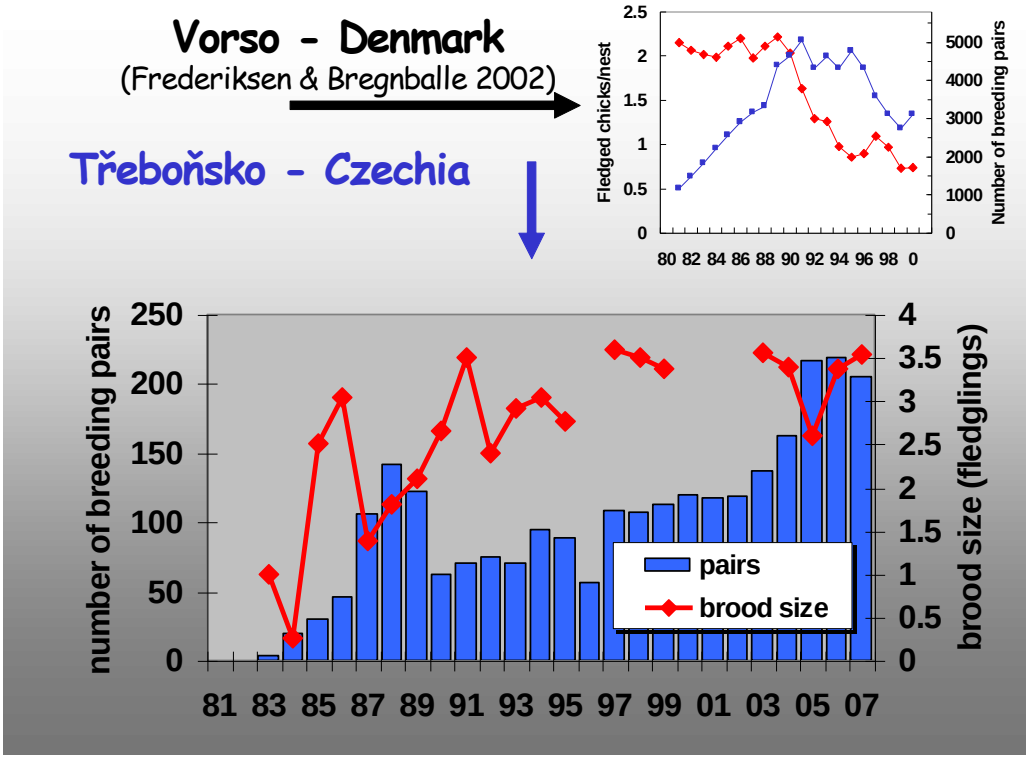


In the second half of the 1990s, a colony moved near to the reserve Křivé jezero, where the population has increased from 5 pairs in 1997 to 90 pairs in 2007. Overall, twenty cormorant breeding sites have been recorded in the Czech Republic between 1981-2007.



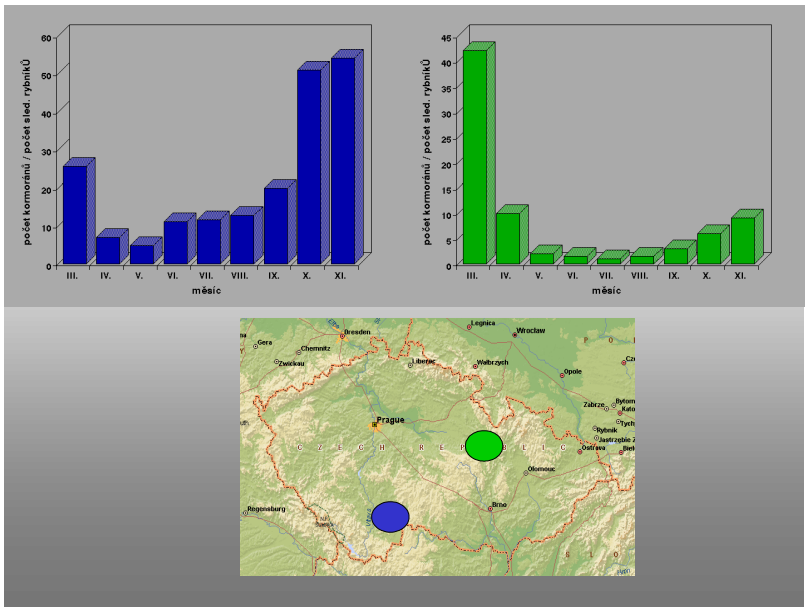
Breeding productivity (number of fledglings per nest) has also been recorded for breeding cormorants in South Bohemia between 1983-2005. It is interesting to note that although

'population' numbers are at least one order of magnitude lower than those at the Vørso colony in Denmark, breeding productivity in South Bohemia is (particularly in recent years) often at least 1 fledgling/nest higher than in the Danish colony (see Figure overleaf).



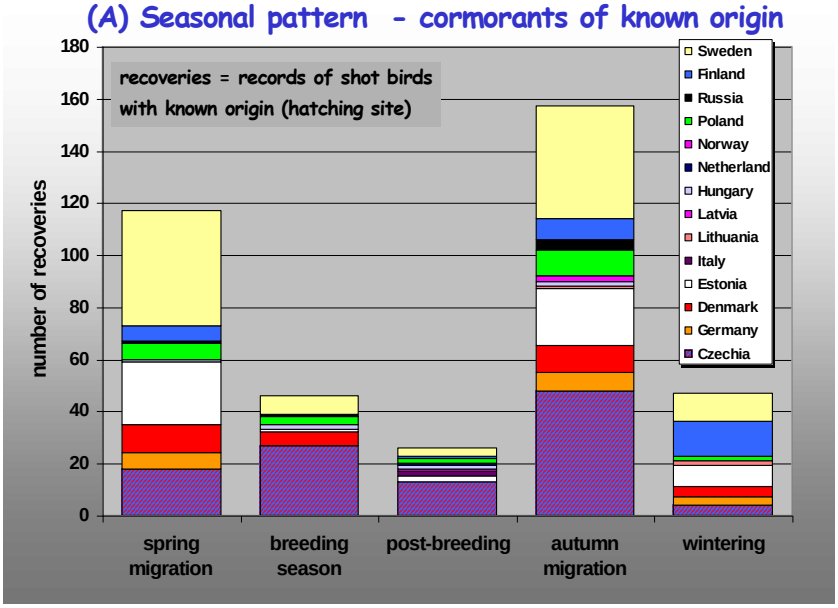
Breeding productivity – Czech Republic colony in comparison to Vørso, Denmark

Seasonal patterns, migration and movements: Cormorants are present in parts of the Czech Republic throughout the year – although often in low numbers. For example, in a region to the south west (blue) bird numbers peak during October-November, whilst to the north east (green) they tend to peak during Spring (March, see Figure below).

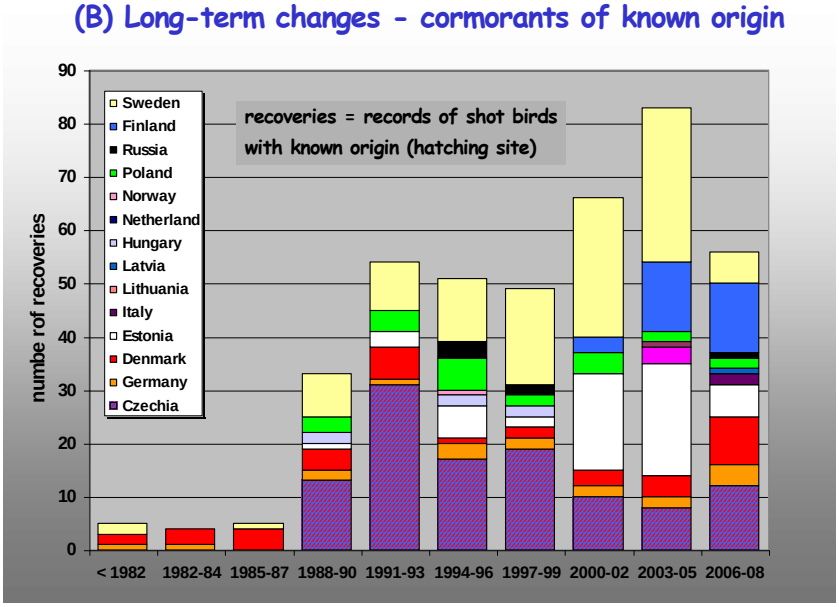


Seasonal patterns in cormorant numbers in two regions of the Czech Republic

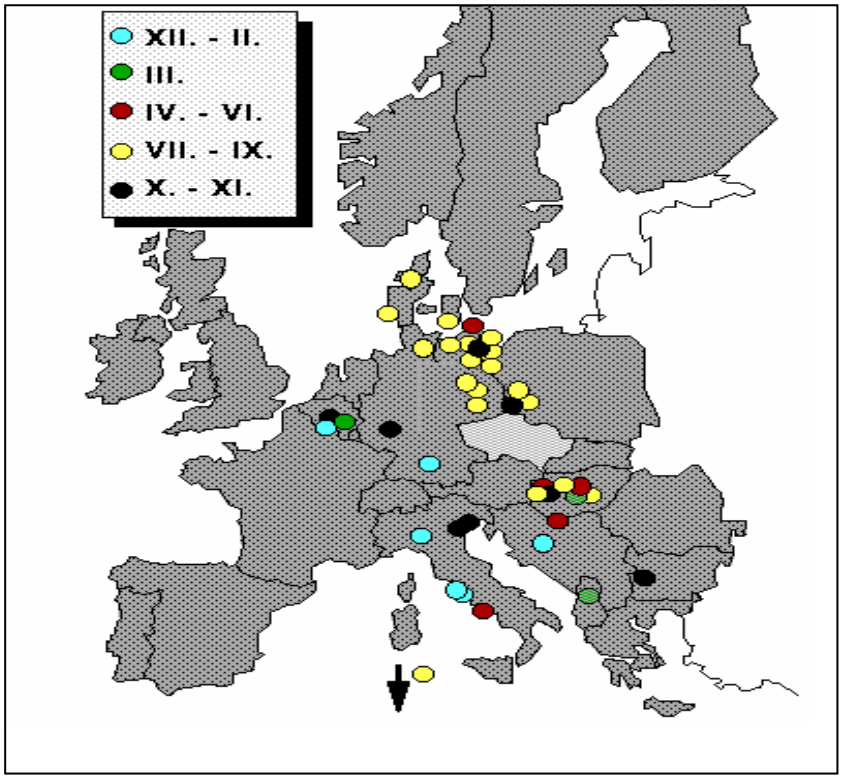
Records of ringed birds shot in the Czech Republic show that the country is clearly an important area for migrating cormorants from a number of different countries (see Figure A). Also that the proportions of birds (ringed as nestlings) from different countries also varies seasonally. As shown below, many of the birds shot here in spring, autumn and (to a lesser extent) winter were hatched in colonies in Sweden, Finland and Hungary, whilst most shot in the summer breeding period or immediately after were from the Czech Republic itself.



Similarly, the proportions of shot cormorants in the Czech Republic from different countries has changed over the years (see Figure B). During the 1980s, most shot ringed birds were from Denmark and Sweden. Thereafter, Swedish and Polish birds increased and towards the end of the 1990s so too did those from Russia and Estonia. In more recent years, the number of birds ringed as nestlings in Estonia, Sweden and (latterly) Finland have also increased.

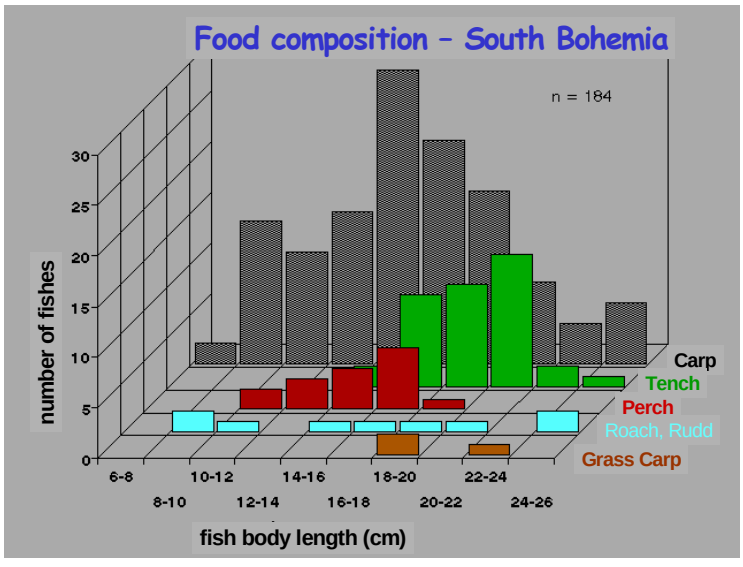


As can be seen in Figure (B), Czech-hatched ringed cormorants have been present in the country since 1988-90, albeit in fluctuating numbers. Such birds have also been found dead outside the country and, again, there are seasonal patterns of recovery. For instance most Czech birds found dead abroad during July-September (yellow, red dots) are recovered on a north-west/south-east axis, those during the rest of the year (black, green, blue dots) tend to be distributed more widely, although there is a suggestion of a parallel n-w/s-e axis farther to the west, especially for birds dying in December-February.



Feeding ecology of cormorants in fishpond areas

Although not restricted to these areas, considerable research has been undertaken into the diet of cormorants at fishponds in South Bohemia. Here, the most commonly consumed species are Carp (*Cyprinus carpio*), followed by Tench (*Tinca tinca*), Perch (*Perca fluviatilis*), Roach and Rudd (*Rutilus rutilus, Scardinius erythropthalmus*, respectively) and Grass Carp (*Ctenopharyngodon idella* – originally from China).



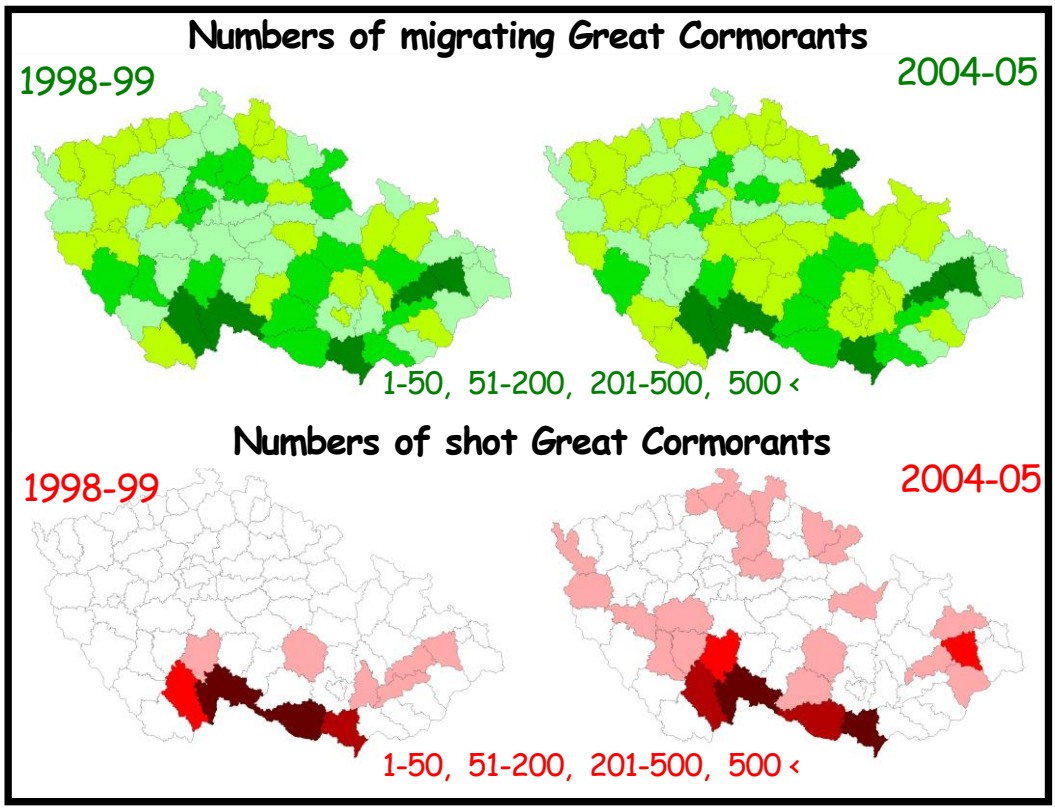
From the data (N = 184 fishes), most of the fish taken by cormorants at fishponds are 10-25cm long. Similarly, there is a suggestion – based on the number of cormorants per fishpond, the size-composition of that fishpond and the diet of birds there – that cormorants may select

those ponds holding the most appropriately-sized (ca. 10-20cm) fishes.

"Action Plan" for Great Cormorants in the Czech Republic

Given the increasing numbers of both breeding and over-wintering cormorants in the Czech Republic, the fact that they forage at commercial fishponds and regularly take fish species of commercial interest, an Action Plan for the species in the Czech Republic has been devised.

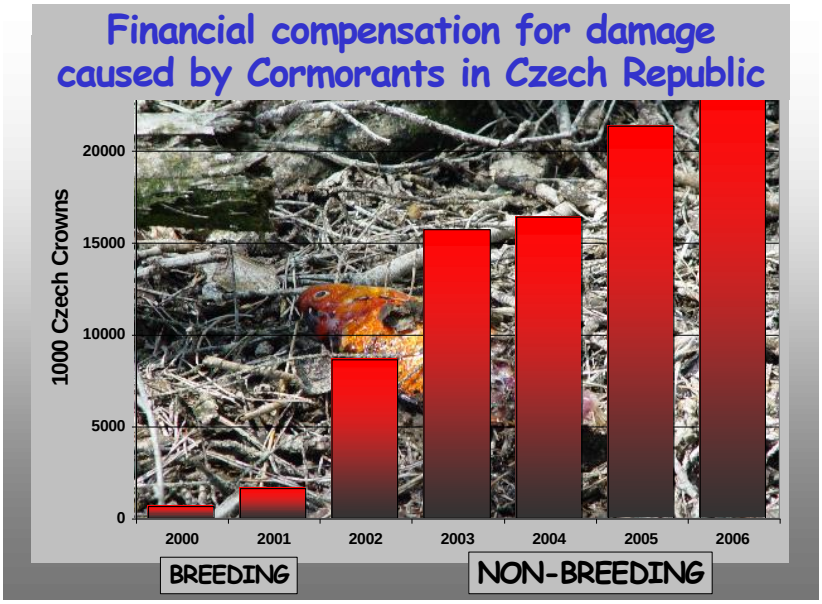
The cormorant is a protected species under Czech Environmental Law. Permission for flushing and shooting can be granted by the district government or by the Landscape Protected Area Administration. Such permission is usually granted for actions undertaken during the non-breeding season. In addition, the district government can pay financial compensation for damage caused by cormorants at any time throughout the year. As a result of such legislation, the numbers of shot cormorants began to increase in 1989, reaching around 2,000 per year during the 1990s. Thereafter, the numbers of cormorants shot annually increased to around 3,000 during 2000-2004 and have since (in 2005 and 2006) fallen back to around 2,250 birds per year.



In general, shooting intensity is linked to the numbers of birds recorded in different areas. The maps show both increasing numbers of cormorants and of shot birds (i.e. through increased density of colour: green and red, respectively). The maps also show temporal changes across the Czech Republic – both in terms of the numbers of migratory cormorants and the numbers of shot birds. Superficially, at least, it would appear that shooting intensity has spread further than might be expected – into regions where migratory cormorant 'density' is not high nor has it changed much (if at all) between 1998-99 and 2004-05.

Since 5 April 2000, financial compensation for cormorant damage to fish stocks has been available through Czech Act no. 115/2000. Although District Authorities can compensate for the damage caused by Cormorants throughout the year, it is only available in cases where fish

are stocked for economic purposes in fishponds, fish farms, fish hatcheries and so on. Any request for compensation must be addressed to the Department of Nature Conservation of the Regional Government or the Landscape Protected Area/Nature Park Authorities. Furthermore, claims must be submitted no later than 6 months after the start of proposed damage. Indirect damage (not only for those birds eaten by the birds) can also be compensated although all requests for compensation have to be confirmed through an "expert review" by biologists. Since this legislation came into force, the amount of financial compensation paid out has increased to over 20,000,000 CZ Crowns annually in 2005 and 2006. In the early years, compensation was restricted to damage within the breeding season. From 2002 onwards, compensation has also been paid for damage during the non-breeding season. Financial compensation could either be one or two pond farmers or everyone. Basically now everyone applies for compensation.



Acknowledgements: this study was supported by a grant form the Ministry of Education, Youth and Sport of the Czech Republic No. 1P05OC079.

2.2 The Role of Fishponds in the Landscape

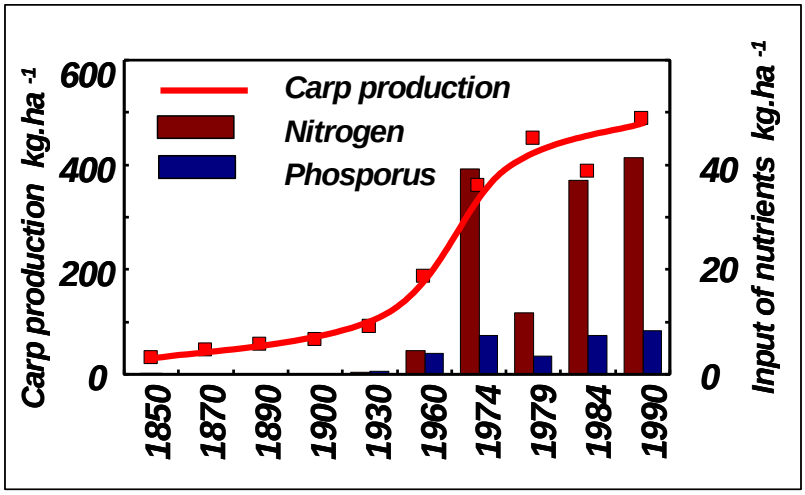
Jan Pokorný, Libor Pechar *et al*. (ENKI, Public Benefit Corporation, Dukelská 145, CZ-379 01, Třeboň and Institute of System Biology and Ecology, Academy of Sciences, Czech Republic. Email addresses: pokorny@enki.cz and lpechar@zf.jcu.cz, respectively)

The fishponds in the Czech republic represent unique managed ecostsyems. Here, water levels, fish stock, basic water chemistry and nutrient input are under the control of fishery manager. However, the fishponds are not intensive, 'driven' systems like many other aquaculture facilities. The natural production processes (sunlight, phytoplankton, zooplankton) are the basic elements of fish-rearing in these fishpond ecosystems. The real challenge for fisheries managers (and for research) is to maintain the functioning of these natural ecosystems in the hypertrophic

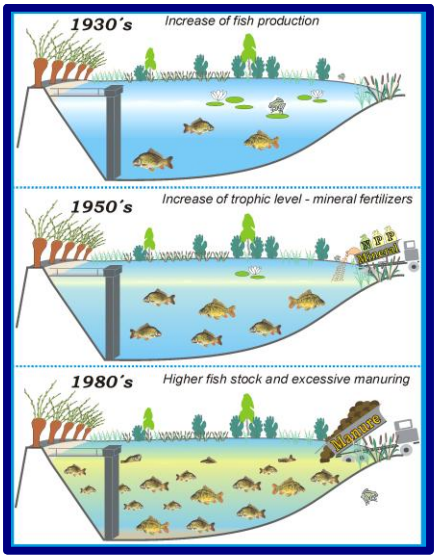
(excessively nutrient-rich) fishponds.

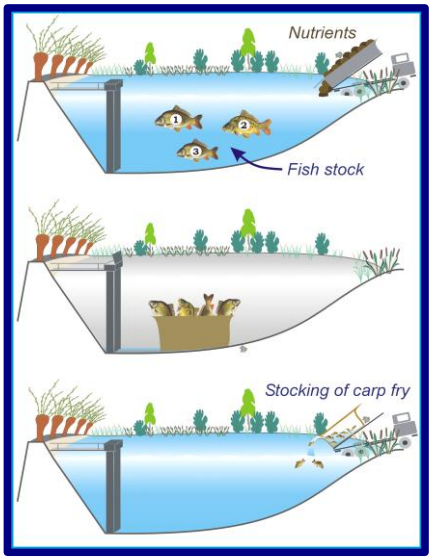
In general, fishponds are maintained by a dam usually of earth with stone rip-rap (protective stones laid to absorb and deflect the energy of waves before they reach the defended shore.) stabilised with trees. Ponds have an outlet of wood (in earlier times), concrete or steel and a spillway is used to maintian the water level. Fish are held in ponds for 2-3 year (summer season) gycles of growth before being harvested with nets. Ponds vary greatly in size from several to hundreds of hectares. The most commonly reared specis in fishpond is the Carp (88%, 17,000 tonnes/year), followed by Grass Carp and Silver Carp (*Hypophthalmichthys molitrix*) (4%), Tench (1%) and Pike (*Esox lucius*) and Zander (*Sander leucioperca*).

Josef Šusta (1835-1914) introduced modern scientific methods to the management of Czech fishponds – based on an understanding of the role of natural food chains. He also proposed liming and fertilistaion to enhance the productivity of ponds. Such changes in fishpond management greatly increased the productivity of Carp production but they also led to changes in the phytoplankton and zooplankton communities of ponds. Low fish biomass is associated with large-sized zooplankton, low nitrogen:phosphorous ratios and high water transparency (i.e. clear water) and an excess of inorganic nutrients. High fish biomass is asociated with very small-sized zooplankton, the dominance of some phytoplankton and excessive algal blooms, low water transparency and an overloading of organic matter.



In many instances, these changes have resulted in a change from ‘extensive‘ fish stocks (i.e. natural fish stocks at relatively low density), through a period of intensive nutrient input and associated declines in fish stocks, to a system where fish now have to be stocked as fry.



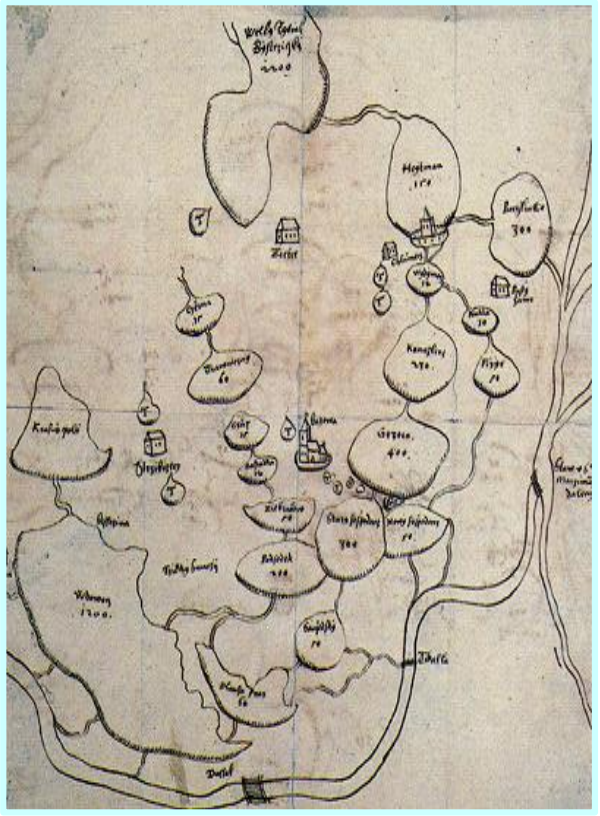


Thus, fishpond management management is crucial for the sustainable existence of fishponds. Lack of management can lead to terrestrialization and eventual extinction of a fishpond while fishpond management also affects the water quality. In the Czech Republic, the total water area of the fishponds is some 51, 000 ha. Historically, production has increased around ten times overall. The Trebon Basin and UNESCO Biosphere Reserve represent the most important fishpond region in the country, containing more than 2,000 fishponds which cover a total area about 7,500 hectares.

DEVELOPMENT OF FISHPOND MANAGEMENT

Period	Area *1000 ha*	Production *kg / ha*
12th cent.	unknown	unknown
14th cent.	75	40
16th cent.	180	40
18th cent.	79	30
1850	35	25
1924	44	81
1956	50	137
1965	50	210
1975	51	328
1985	52	393
1995	52	423

The first fishponds were developed in the Roman period, the first reservoirs in the 3rd centrury by the Celts. Pond construction in Bohemia began in the 10th century but the main fishpond systems in Bohemia were developedin the 16th century. However fishponds were periodically destroyed, for example in the 17th century (during the 30 years´ war) and in the 19th century when ponds were converted to sugar beet culture.



Historically, fish ponds had a number of functions such as:

- Accumulation – the drainage of land and water collection
- Storage – streaming of ores
- Fish culture – Rome, France, Germany, Bohemia
- Fortification – part of castle and town fortifications
- Energy – mills, mine pumps
- Retention – flood control

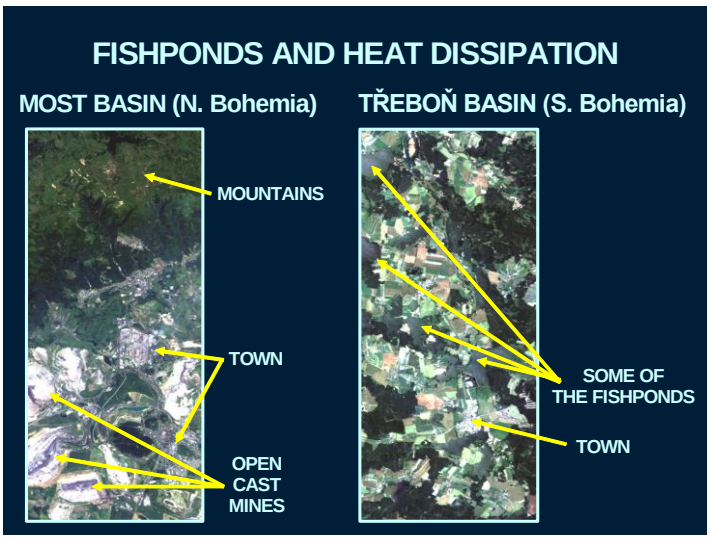
In modern times fishponds also function for a variety of important reasons:

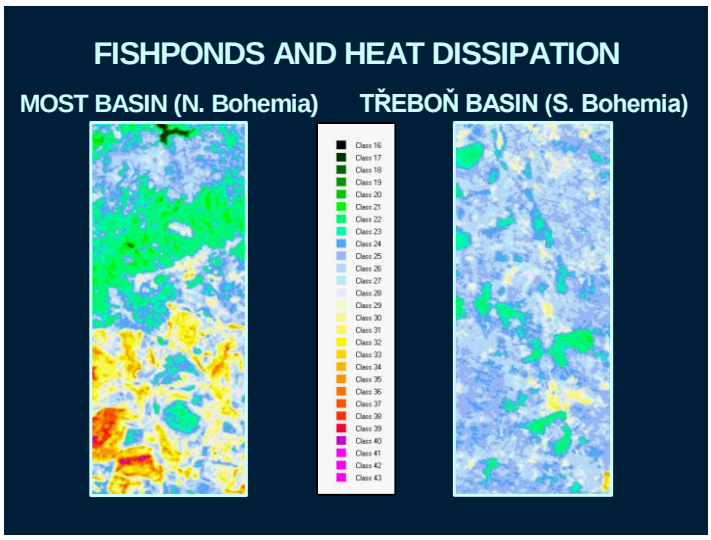
- Erosion control
- Strorage – irrigation, water supply
- Energy yield – small hydroelectric plants
- Stabilization of water discharge
- Recreation
- Climate modification
- Landscape formation
- Biodiversity preservation – Natura 2000

Czech fishponds can thus be considered ecosystems, balancing fish stocks and nutrient inputs and so affecting aquatic (macrophyte) plant growth, phytoplankton and zooplankton communities. However, the increased intensity of fish framing brings about a decline in biodiversity. Plants of unpolluted water are replaced by aquatic 'weeds' (so-called 'ruderal' species), the higher feeding pressure of the fish causes a decline in the organisms living on the bottom of the ponds (the 'benthos') and these changes cause an overall decline in bird species diversity. The key to successful fish pond management is to define the most suitable fish stock level – which might not be the lowest one, thus affecting an effective transfer of energy and matter from primary producers (e.g. phytoplankton) to zooplankton and then to the fish. In many ponds, attempts have been made to reduce the nutrient levels of fish ponds – a process called oligotrophication. Here, the application of phosphate fertiliser was stopped in the 1970s. Since the 1980s, organic manuring has prevailed and this has been accompanied by the accumulation of a fertile sediment on the bottom of the ponds. From this, the available phosphorous is released back into the water.

The fishponds also act as a means of reducing river flow throughout the catchment and, ultimately, as a flood prevention mechanism. For example, the Rožemberg fish pond built in 1590 acted as a major flood defence in 2002. Several fishponds in the area have recently undergone major restoration. For example, the 90 ha fish pond in the Řežabinec National Nature Reserve was once heavily stocked (130 tonnes/ha) and intensively manured, water levels were high and there was no renewal of the stands of reeds, a decline in aquatic plants, and a severe decline in waterfowl. As part of the restoration process here, the addition of manure was stopped, water discharge was adjusted and this resulted in lowered water levels. There was also a gradual reduction of fish stock levels, a regeneration of the reeds and an increase in waterfowl abundance. Similarly at the Malý ústavni pond, a heavy reduction in fish stocks (of Carp and Grass Carp) to 1 tonne/ha, has been accompanied by very careful management of water levels throughout the year. In winter the water level is draw down and is only raised again very slowly in the spring. As a result, the floating-leaved *Nymphoides peltata* has been restored.

Fish ponds also act to dissipate heat throughout the catchment (as shown in the following figures).





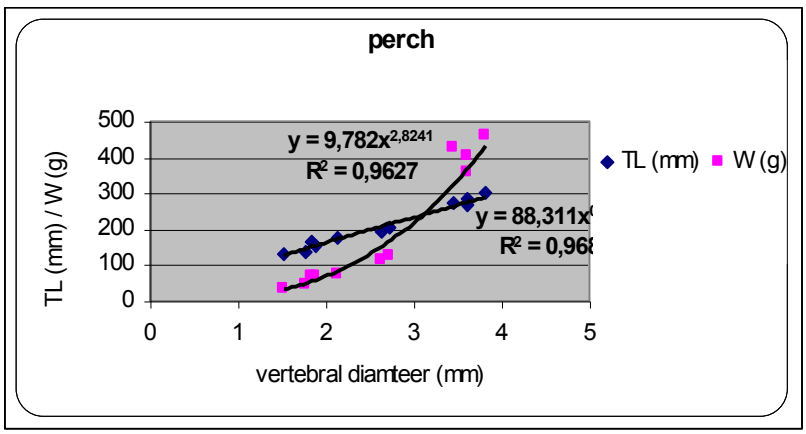
In summary, fish ponds are an essential element of sustainable landscape management in the Czech Republic.

2.3 Feeding habits of the great cormorant (*Phalacrocorax carbo*) on fishponds

Zdeněk Adámek, Jiří Kortan, David Kortan, Veronika Piačková & Martin Flajšhans (University of South Bohemia, Research Institute of Fish Culture and Hydrobiology, Czech Republic, Zátiší 728/II, Vodňany. Contact: adamek.zdenek@quick.cz, kortan@vurh.ju.cz)

In relation to the economic losses to Czech fish production, several fish-eating predators are considered important. These are the Great Cormorant (*Phalacrocorax carbo sinensis*), the European Otter (*Lutra lutra*), followed by the Grey heron (*Ardea cinerea*), and the American mink (*Mustela vison*). Both the Cormorant and the Otter are species protected by law, and their numbers have recently increased considerably as a result of strict protection and improved environmental conditions. However, associated with these increases in numbers, the amounts of economic losses have been rising steadily.

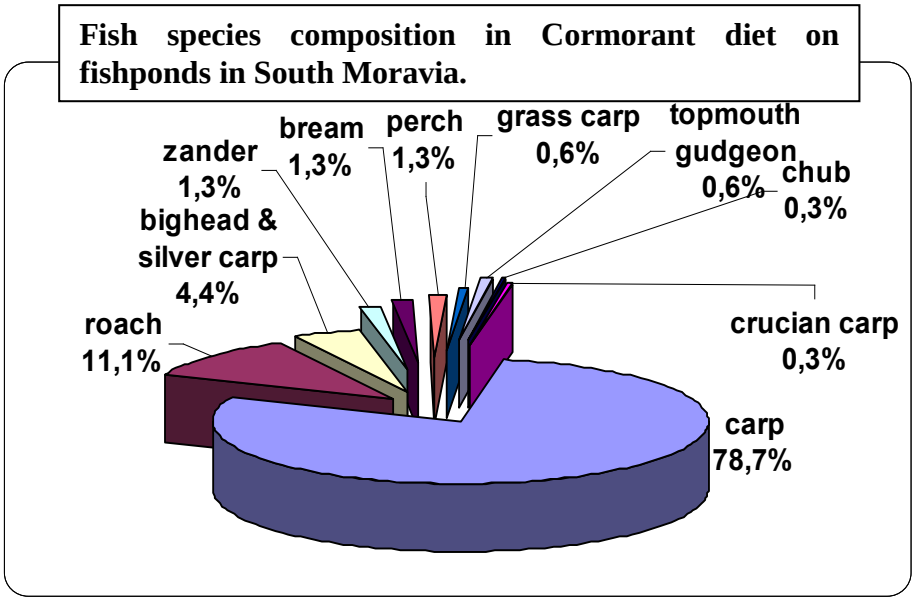
There are a number of important Cormorant issues in the Czech Republic. In fish pond **systems,** the highest predation pressure is during both spring (March – April) and autumnal (October - November) migrations when migratory flocks can number tens to hundreds of birds. Predation impacts upon fish stock are of three kinds. First, direct consumption of between 350-500g of fish per bird per day. Second, the wounding damage to fish. Third, the indirect consequences of Cormorant predation as a result of fish stress – the resulting lower condition of fish reduces their resistance and increases their susceptibility to infectious diseases. There are several possibilities for fish stock protection but shooting and scaring Cormorants have limited efficiency and are regulated by legislation. Similarly, financial compensation for fish losses is considered insufficient and there are misunderstandings and differences of opinion in relation to the estimation of bird numbers, the period of their occurrence, and associated monitoring methods.



For Cormorants, stomach content analysis yields data on prey species and size composition – based upon regression analysis of the diameter of specific vertebrae (e.g. 10th caudal vertebra proximally from urostyl, or other bones where appropriate) and prey size (either as total length [TL] or weight [W]. Thus, measurement of fish bones recovered from Cormorant stomachs can give an accurate estimate of both fish length and weight – and these data can be used to estimate the general diet of Cormorant at fishponds.

For example at South Moravian fish ponds, Cormorant diet is diverse but dominated by Carp (79 %). Other fish species consumed include Roach (11%), followed by Silver Carp (4 %), and Sander (Pikeperch), Bream (*Abramis brama*) and Perch (just over 1% each). In terms of fish size, the smallest individual fish recorded in the stomach contents of Cormorants is 4.2cm, the largest 33.8cm – and the average length = 13.1cm. However, the majority (87%) of the fish

taken are between 5-20cm in length and most of these (56%) are 10-15cm long; the remainder being between 5-10cm (24%) and 15-20cm (20%).

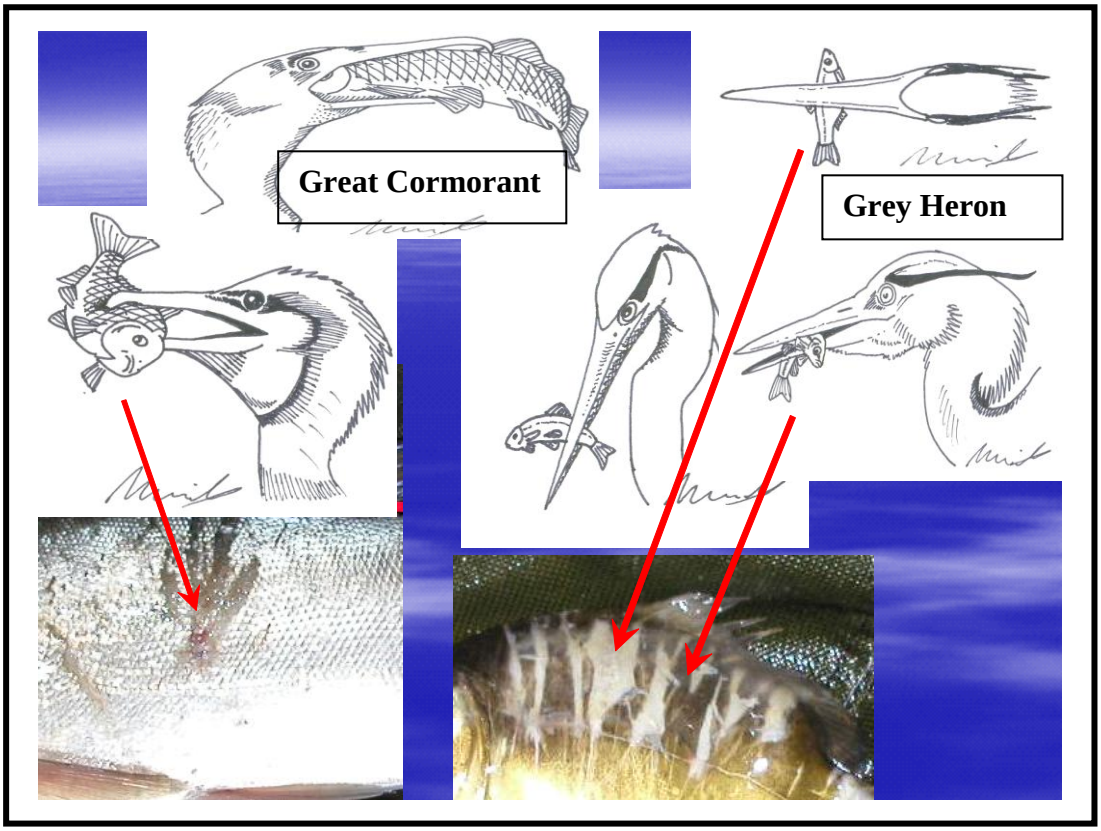


As mentioned above, there are a number of so-called "secondary losses" caused by Cormorants as they hunt for food and chase fish (in addition to the direct losses caused by fish being eaten by the birds). These indirect losses are the result of fish panic reactions which can cause the, to hide permanently resulting in decreased disease resistance or, ultimately, in starvation. Similarly, when Cormorants are hunting in large flocks, they may force fish into the shallow margins of the fishponds where many may die or become stressed. There is thus increased fish mortality due to starvation and stress.

Some fish not eaten by Cormorants are damaged by their attacks, leading to fish wounding and increased susceptibility to viral, bacterial and parasitic diseases. In failed attacks (when a bird fails to catch a fish and swallow it), the tip of the Cormorant's beak usually penetrates through

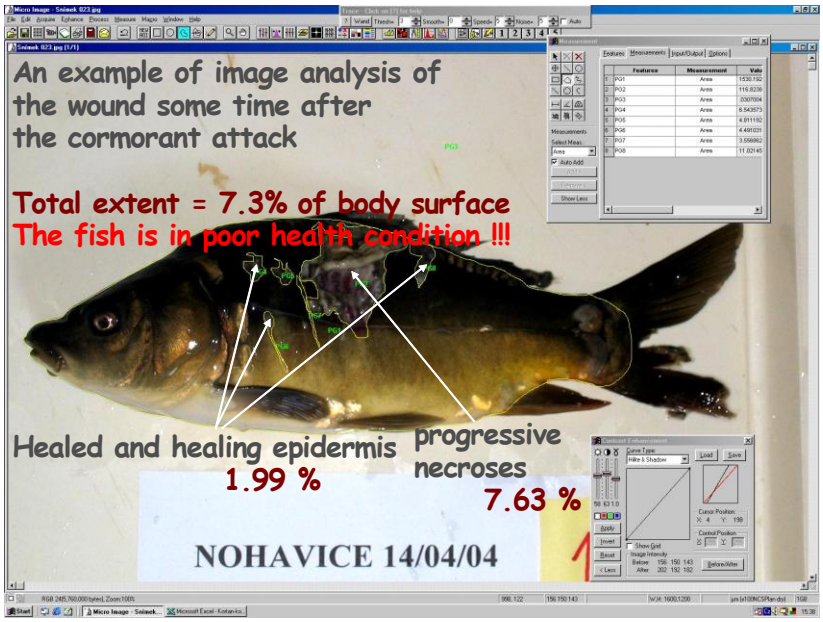
the skin as the birds attempts to grip the fish. The pressure of lower mandible of the beak also causes scale losses and skin and muscle tissue contusions. There is thus further increased mortality due to wounding and diseases.

As elsewhere, it is possible to identify the predator responsible for the damage to fish by examining the characteristic wounds on their skin. We have examined the wounding of fish by Cormorants in considerable detail – their damage being both characteristic and obvious (see Figures below).



Typical imprint of a Cormorant´s beak on a two-year-old Common (mirror) carp.

We have used sophisticated computer analysis to examine the wounds left on fish (for further details, please see Adámek Z., Kortan J., Flajšhans M., 2007: Computer-assisted image analysis in the evaluation of fish wounding by cormorant [*Phalacrocorax carbo sinensis* (L.)] attacks. Aquaculture International, 15[3-4]:211-216). As this example shows, fish wounds are vulnerable to infection and although some healing can occur many fish are extensively wounded and in poor health as a result. We have quantified the amount of wounding and infection in both Carp and Silver carp at a number of ponds at several different locations (for full details, see paper cited above).



Percentage of wounded fish from fish harvested

A

Pond	Year	Area(ha)	Species	% of wounded fish
U Dubu dolní	2007	8.7	Mirror carp (*Cyprinus carpio*)	21
Pohořelický	2007	5.6	Mirror carp	1
Týnský	2007	25.5	Mirror carp	1
Moravské Prusy	2007	11.3	Mirror carp	47,4
Potěšil	2008	77.0	Tench (*Tinca tinca*)	23,5
			Pike (*Esox lucius*)	16.2
Naděje	2008	69.0	Mirror carp	3.3
			Scaly carp (*Cyprinus cario*)	0
			Grass carp (*Ct. idella*)	4.3
			Tench (*Tinca tinca*)	0
			Bighead carp (*Aristichthys nobilis*)	11.1
Víra	2008	17.0	Mirror carp	18.3
			Tench	20.0

Similarly, we have quantified the proportions of wounded fish recovered during fish harvesting – sometimes these can be relatively high (see Table A).

Fish condition indices

B

Pond		n	FCC		P
			wounded	healthy	
Nohavice	mirror	19	1,33 ± 0,14	1,48 ± 0,11	0.0011
Týnský	scaly	33	1,38 ± 0,12	1,41 ± 0,25	0,1251
	mirror	33	1,48 ± 0,21	1,66 ± 0,26	0,0040
U Dubu dolní	mirror	33	1,46 ± 0,33	1,64 ± 0,25	0,0167
Mor. Prusy	mirror	33	1,51 ± 0,25	1,62 ± 0,13	0,0269
Pohořelický	mirror	33	0,95 ± 0,16	1,07 ± 0,06	0,0235

We have also collected data showing that wounded fish are consistently in poorer condition than are fish without wounds (see Table B).

We have also attempted to quantify "fish panic reactions" - the stress reaction of fish caused by the

presence of Cormorants – with netting experiments in February 2008. To do this we examined Catch Per Unit of Effort (CPUE) in relation to standardised catches of two-year-old Carp in a lift net (1x1m, mesh size 10mm) made in the littoral zone (2m distant from the bank) in two fish ponds: one where Cormorants were present and one without the birds. Significantly more fish were caught around the margins of ponds where 80 Cormorants were foraging (on average, 41 fish per netting haul) than in the same locations in the pond where no birds were present (on average, 1 fish per haul). This result suggests that the presence of Cormorants does indeed 'force' fish to move to the margins of ponds.

Our current research is examining the levels of stress indicators (glucose and cortisol hormone levels) in fish. We are also planning to examine blood plasma composition and compare samples of stressed fish those exhibiting normal behaviour. In addition, we are working on detailed parasitological and histological descriptions of both wounded and healthy fish.

In conclusion, Cormorant diet composition on ponds roughly corresponds to the stock composition there. The dominant prey species is highly dependent upon the main cultured fish species. As elsewhere, prey size appears to be the principal selection criterion for individual fish. The most frequently consumed fish prey size ranges from 5-20cm (biomass up to 100g). In general, Cormorants appear to prefer foraging on ponds with a fish stock size between 5 and 20 cm, a surface area greater than 20 ha, an average depth of 1-2m, and the presence of trees around the banks.

Cormorant predation (particularly during spring and autumnal migrations) mostly endangers the two-year-old carp stock, whilst higher losses of other commercial species can be expected if their proportions in the fish community are high. Our work suggests that the argument that Cormorants preferentially consume individual fish in that are in poor health, sick and predisposed to attack is overestimated as a result of the birds' feeding habit. The value of fish stock is also falling as a consequence of stress and the extent of wounding caused by Cormorants during hunting and unsuccessful attempts to catch the prey fish.

We believe that the current level of knowledge on Cormorant feeding habits is satisfactory but must stress that the recognition of the secondary effects of the birds feeding activities is still very poor.

2.4 Changes in numbers and distribution of Great Cormorants on rivers in the Czech Republic and Slovakia

Petr Musil, Jozef Ridzoň and Zuzana Musilová (Department of Zoology, Faculty of Sciences, Charles University Viničná 7, Praha 2, CZ-128 44. Email: p.musil@post.cz)

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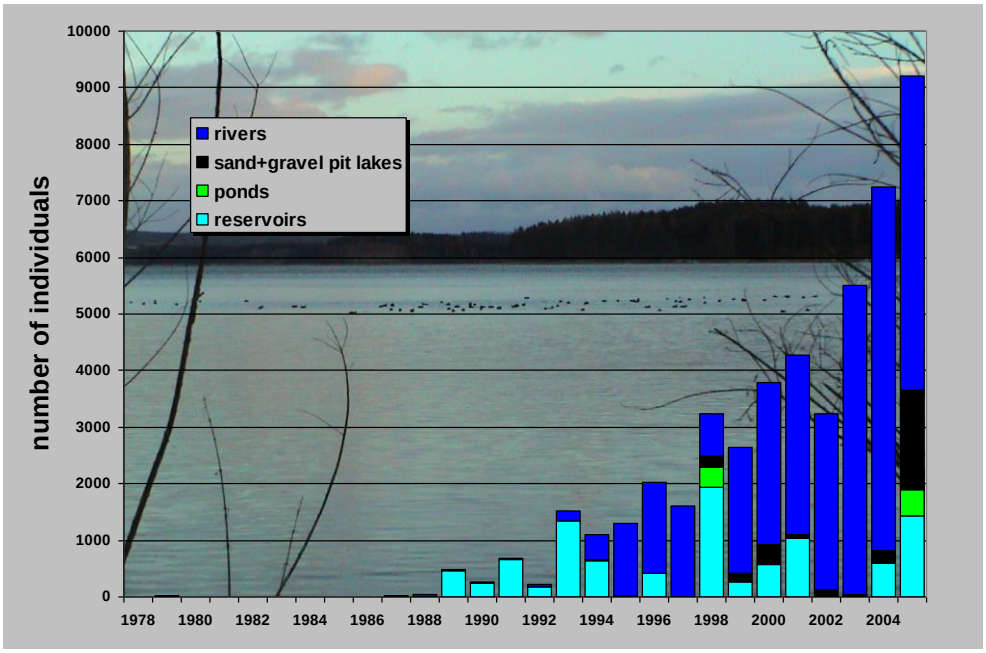
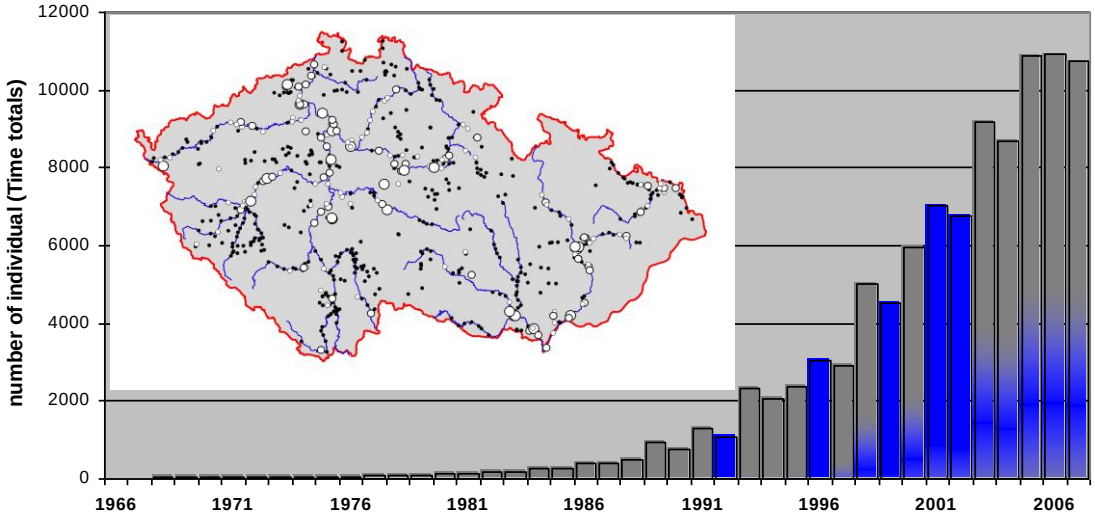
Data on the numbers of Great Cormorants on Cezch and Slovakian rivers are available from Wetlands International's International Waterbird Census. This census (of many species of waterbirds) is conducted each year in mid-January and involves around 300 volunteers. Since 1991, counts of waterbirds have been undertaken in both countries, though at a much larger number of sites (some 150-200) in the Czech Republic than in Slovakia where the number of sites reached around 150 in 1997. In 2003 and 2004, the numbers of sites in both countries increased dramatically (around 400 in Slovakia and around 500 in the Czech Republic). Thereafter the number of sites continued to increase in the Czech Republic (to over 600) whilst numbers in Slovakia peaked in 2005 (almost 500 sites) and had declined to around 300 sites by 2007.

In the Czech Republic in January 2005, cormorants were recorded at 154 sites, during this period the average temperature was 0.9°C and 8,736 birds were recorded. Corresponding figures for January 2006 were 167 sites, -5.4°C, 9,219 cormorants, and for January 2007 were 173 sites, 4.3°C, 8,559 cormorants. In the late 1980s and early 1990s, wintering cormorants were only recorded on standing water reservoirs in the Czech Republic. By the mid-1990s the birds were also recorded on rivers (in increasing numbers) and thereafter birds have also occasionally been recorded on smaller standing waters (ponds and gravel and sand pit lakes, see Figure). Between 1993 and 2005, rivers have been the only freshwater habitat to show a consistent increase in cormorant numbers (from a few hundred individuals to around 5-6,000 over this time period).

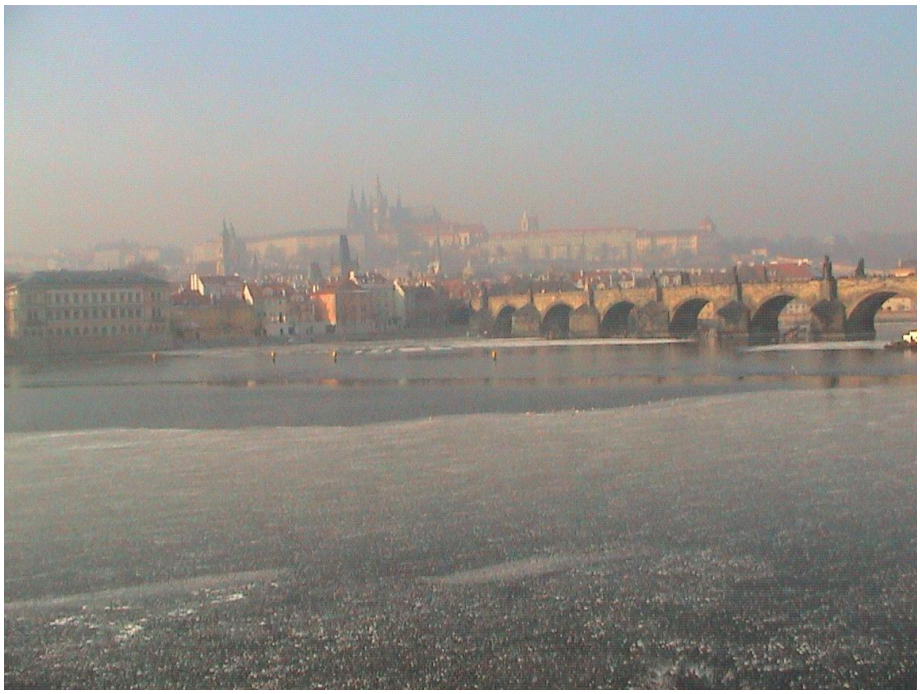


Wintering habitats of cormorants in the Czech Republic

In more recent years, cormorant wintering numbers in the Czech Republic have risen above 10,000 individuls according to International Waterbird Census figures.

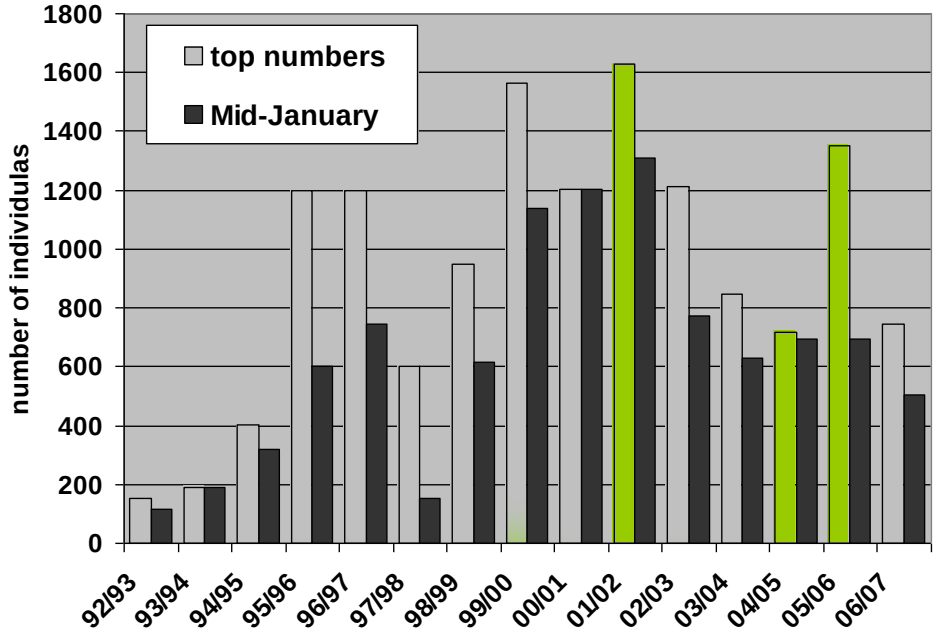


Moreover, as shown in the distribution map, many of these birds occur along river systems throughout the Czech Republic. Thus, overwintering birds in the Czech republic have undergone a dramatic increase. In the 1940s, Wahl (1944 The Birds of Praha) reported no birds

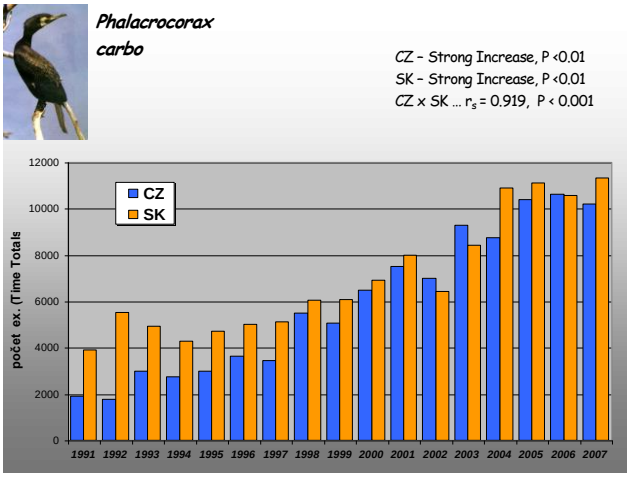


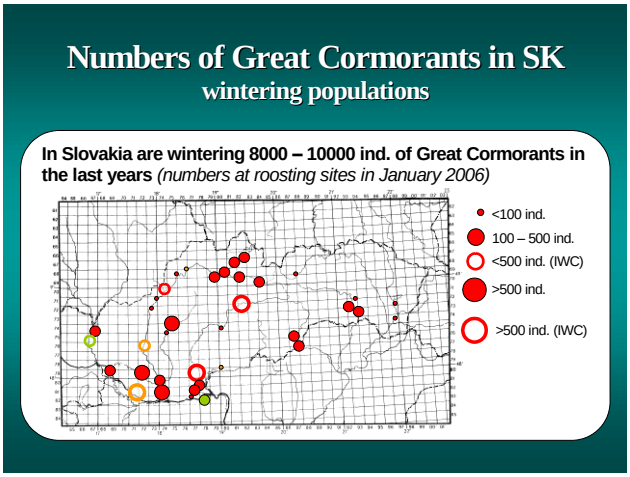
at all, by the 1980s (1982-85) The Birds of the Czech Republic reported some 500-1,500 wintering cormorants. Data from local governments collated by Musil and Martincova in 1999 showe there to be 4-6,000 wintering birds and more recent International Waterbird census estimates now put the overwintering population at around 10-11,000 birds. Cormorants are now commonly seen on the Vltava river in the centre of Prague where, as on other rivers, a protion of the surface remains unfrozen even in winter.

Evidence suggests that some form of carrying capacity may have been reached in recent years within Central Bohemia. Although the maximum numbers of birds counted here consistently exceeds the numbers counted during the regular mid-winter counts, there is evidence that numbers generall have declined in recent years and have perhaps stabilised at between 5-600 birds.



The strong increase in winter cormorant numbers in the Czech Repubic is very similar to that reported in Slovakia. Here, in recent years around 8-10,000 cormorants have been recorded at winter roosting sites.





In Slovakia, Great Cormorants are counted at winter roost sites on the Saturday closest to the 15th of January. Counts are undertaken between 15:00 and 17:00 CET. Birds have been counted on almost all Slovakian roosting sites and counts are organised by SOS/BirdLife Slovakia, the Slovak Anglers' Association, and the State Nature Conservation organisation of the Slovak Republic. Since 2005, cormorants have been recorded in about 40-60 roost sites and numbers have been around 6-9,000 birds, although counts have been variable (see Table). According to our best estimates, a maximum of 10% of wintering cormorants are uncounted in these surveys.

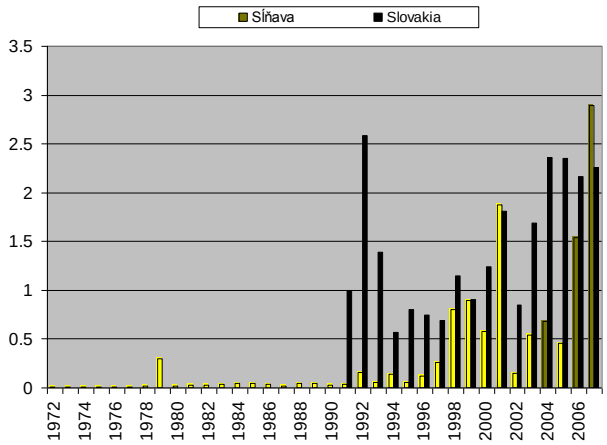
Date of count	Number of roosts	Number of cormorants
January 2005	59	7,521-8,436 birds
January 2006	42	7,669-9,224 birds
January 2007	43	5,991-6,493 birds
January 2008	51	Not yet available

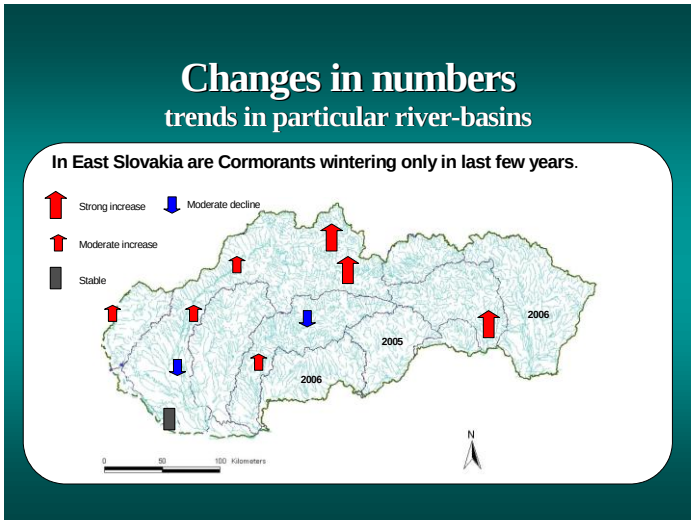
As both anglers and ornithologists are involved in counting cormorants, and these groups tend to have differing opinions on cormorant issues, problems are often raised with the data collected. However, there is a procedure for resolving these problems. Ornothologists and anglers only rarely visit roost sites together – usually, they count birds seperately at the same time. This is resolved by communication between both parties, one warning the other that it will visit a particular site and so reminding them that the correct methodology should be followed for counting.

In 10-20% of cases, different counts are made by anglers and ornithologists at the same site. This is solved by repeated verification and cross-checking of the data. Sometimes, these discrepencies are the result of incorrect methods (by both anglers and ornithologists) and so knowledge of cormorant numbers at neighbouring roosts is used to adjust the count. Alternatively, a best estimate is made for that specific roost.

Undoubtedly, a few roost sites are not found during the counts. In these cases, the maximum count from day-light counts is used. This is a rare event and we have only had to use it at 1-3

sites each year. Incorrect use of counting methods is sometimes a problem. Sometimes we recieve data from day-light counts instead of from night roosts despite the location of the latter sites being known. In such cases, we do not accept the data. Despite these problems in data collection, it is clear that cormorants are wintering in Slovakia in much higher numbers since the 1990s. Previously they wintered, only irregularly, in small numbers. Associated with these increases, there have been some regional declines in cormorant numbers but the main trend has been for increasing numbers of cormorants overwintering throughout Slovakia and for a spread in their distribution from west to east.





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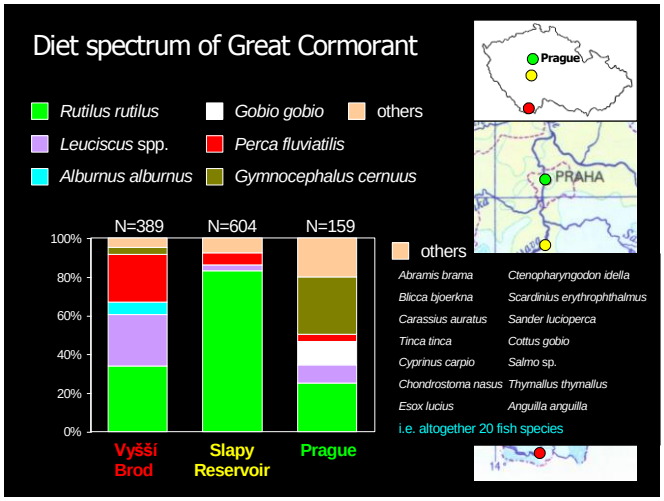
2.5 Feeding Ecology of the Great Cormorant on rivers and reservoirs in the Czech Republic

Martin Čech and colleagues, Biology Centre, Academy of Sciences of the Czech Republic, Institute of Hydrobiology, Na Sádcách 7, 370 05 České Budéjovice, Czech Republic. Email: carcharhinusleucas@yahoo.com

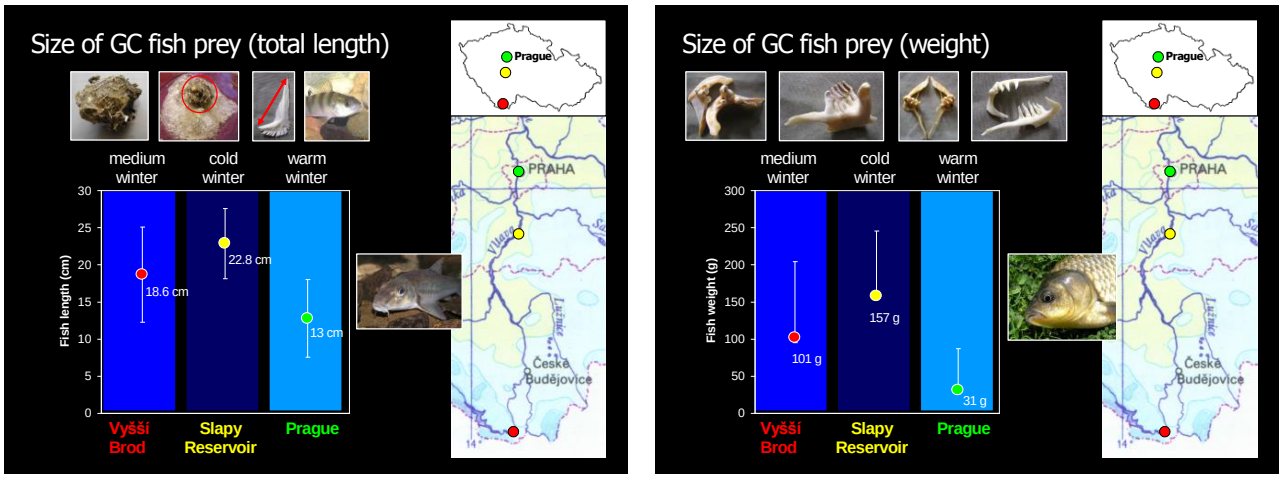


Diet composition of Great Cormorants was carried out by both pellet and stomach content analysis on the Vltava river in Praha, Slapy Reservoir in Central Bohemia and on the upper part Vltava river near Vyšší Brod in South Bohemia. In total, 1,152 fishes of 20 species were identifed. The most frequently recorded species were Roach, Dace/Ide/Chub/ (*Leuciscus spp*), and Perch (*Perca fluviatilis*). In 2007 and 2008,

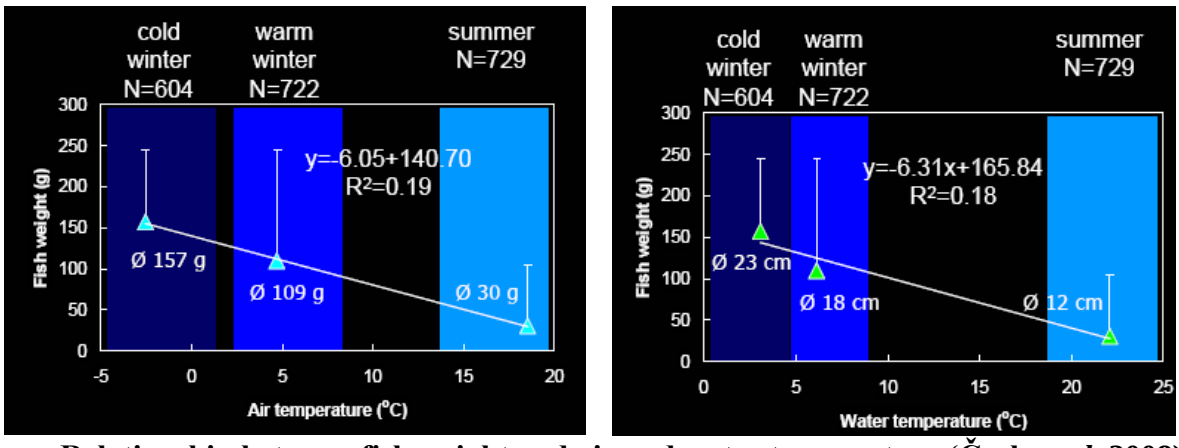
Ruffe (*Gymnocephalus cernus*) was found to be the most frequently consumed fish species on the Vltava river in Praha. Cormorants consumed larger and heavier fishes in colder conditions.

Previous studies have shown that high energy losses during winter do not seem, in Great Cormorants, to be compensated for by an increase in fish intake (Johansen *et al.* 2001). In winter, Great Cormorants reduce time spent diving into cold water but they also dramatically increase their foraging efficiency (Grémillet *et al.* 2001). The prey capture rate of Great Cormorants was estimated to be 12 g min^{-1} in summer (Grémillet 1997) but 60 g min^{-1} in winter (Grémillet *et al.* 2001).

Our studies have attempted to answer the question "do Great Cormorants catch more fish or do they catch larger fish in winter compared to summer?" Sampling cormorant pellets was carried out at the Slapy and Želivka reservoirs in Central Bohemia. We found that during one successful capture and ingestion of a fish, an individual bird gains over 3.5 times more energy in a warm winter and over 5 times more energy in a cold winter than in summer. Then we tested the effect of fish body shape on the swallowing (handling) of prey. Large growing torpedo-shaped species



(Chub *Leuciscus cephalus* and Roach) are relatively easy for birds to swallow. Small, young torpedo-shaped species (e.g. Bream *Alburnus alburnus*) are too small a prey item for Comorants in winter. On the other hand, humped-body shaped species (e.g. Perch) are hard for cormorants to swallow, especially larger fishes.



Relationship between fish weight and air and water temperature (Čech *et al.* 2008)

2.6 The Fish Otter (*Lutra lutra*) in the Czech Republic: distribution, population development, impact on fisheries, public relations

Matouš Šimek and Marie Pacovská

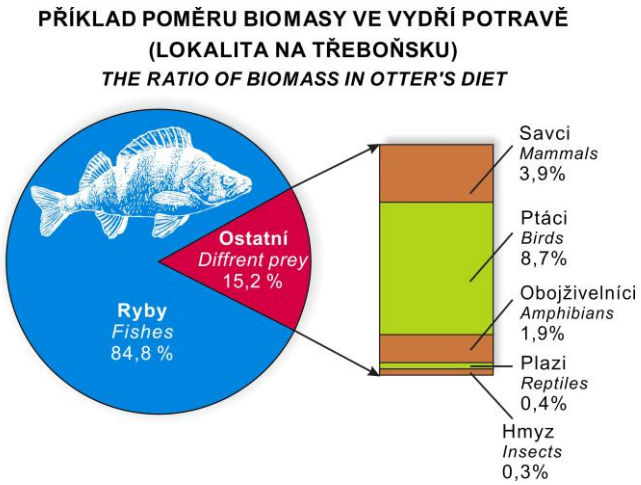
Czech Otter Foundation Fund, PO Box 53, Jateční 311, CZ-379 01, Třeboň, Czech Republic.
Email msimek@vydry.org and mpacovska@vydry.org, respectively.

The Fish Otter (more commonly called the European Otter *Lutra lutra*) is a member of the family Mustelidae. It is mostly a solitary night-active mammal and well adapted to the waterside movement. The otter is the most highly-adapted predators living in the Czech Republic in relation to aquatic movement, having a torpedo-shaped body, and short but very dense fur that holds a layer of air that functions as a waterproof insulation. Otters also appear to have very little, if any, body fat – so they have very few body reserves to use during times of food-stress.

Generally, these solitary animals get in closer contact only during mating and courtship. Pregnancy lasts about two months and 1-4 very small blind cubs are born. These young stay by the side of their mother for up to one year whilst learning foraging techniques. We can recognize the presence of this species in the environment by signs of otter activity – particularly footprints and faecal deposits spraints.

The most dominant fish species in Otter diet are roach, bream, carp and perch. The Otter tends to be an opportunistic forager and does not only eat fish. Its diet also includes crustaceans, insects, amphibians and smaller mammals. Daily food intake is around 1.0kg and more than 1.3kg in winter.

Otters are active in winter (the best time of year to see the animals during daylight). Otters are able to take carp of up to 6kg in weight but do not consume the whole fish – characteristic uneaten remains are left by the water's edge.



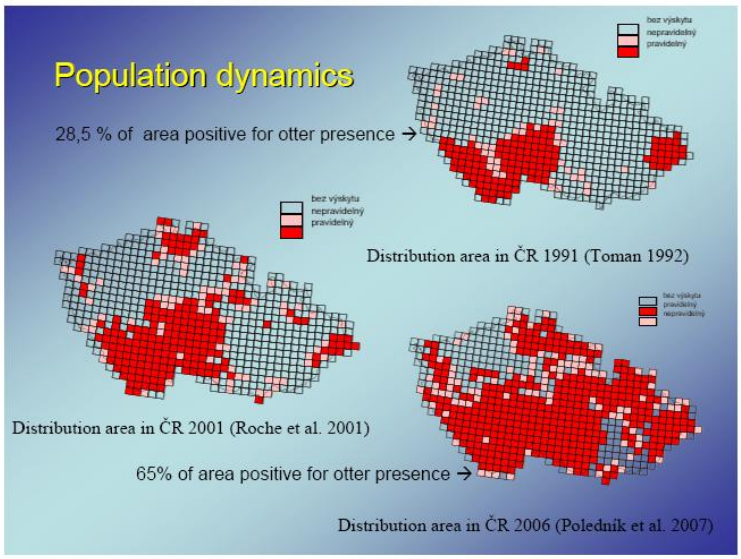
Otters are territorial mammals and individuals defend a home range. Male and female territories overlap (those of males are usually larger). This fact has a lot of important aspects: Otters don't occur in any flocks, so they don't cause serious losses on larger ponds. These individual animals represent bigger problem on small ponds, where it's also most easy for them to hunt.

The size of Otter's home range depends mostly on prey availability, from several km^2 in the Třeboň area (the highest density of Otters in the Czech Republic) to10s km of streams for example in the Šumava Mountains. The number of animals has not increased in central areas of otter presence (i.e. all of South Bohemia) for a few years (probably due to population saturation). It is not a solution for

fisherman to kill Otter in this area because the new, free, attractive territory is very quickly occupied by a 'new' Otter. It is also a crime to kill these animals.

The distribution of Otter has increased in the Czech Republic (1991-2006). Similarly, the main endangering factors (i.e. persecution by a man, canalization of the streams, and water pollution.) have declined in importance in the last decades. Despite declines in these negative factors, traffic still poses a risk – through road kills which are increasing in association with increased Otter numbers and more heavy traffic.

The sociological survey of perceptions of the damage caused by Otter and perceptions of compensation was carried out in South Bohemia. A questionnaire concerning the Otter was submitted to three groups of respondents. They were small-scale private owners (n = 120), angling associations (n = 18) and large fishery companies (n = 12). We found out that 66% of all respondents consider the damage caused by Otters to have increased over the last 5 years. The Otter is seen as the biggest cause of loss for small-scale owners and angling associations (up to 40% loss). For large fisheries, the Otter was ranked second behind cormorants (at larger ponds). Generally, private owners do not consider natural mortality and the diseases of fish to be an issue (22 %). Private owners and angling associations usually underestimate the damage caused by poachers – 50 % and 28 % of respondents don't expect any poaching. Private owners often didn't recognize the Otter (40 % mistaken with American mink *Mustela vison*). 60 % thought that compensation solved the problem at least partly, whilst only 5 % thought it fully solved the problem. However, 35% thought that compensation did not solve the problem at all. Many private owners openly admit persecution of otters.



The Otter is protected by Czech legislation and damage caused by this species can be compensated for by a special legislation act. The compensation is provided for damage caused on fishes bred in fish-nurseries, store-ponds, rearing cages or trout farms. Compensation needs the following steps: an official request to the nature conservation authorities, a site investigation by the nature conservation authorities, a damage assessment by an independent expert (calculation based on pond size, fish stock, otter activity and numbers of otters). The compensation amount is covered by the State budget. There is no official central body dealing with evidence.

2.7 Biological, economic and sociological tools for assessing cormorant confict resolution at different scales in the Czech Republic

Jaroslav Boháč, University of South Bohemia, Faculty of Agriculture, Studentská 13, 370 05 České Budějovice, Czech Republic.

The basis for cormorant-fishery conflict mitigation in the Czech Republic is complex but no more so than elsewhere in Europe. First, mitigation of the cormorant-fishery conflict is not

only a biological problem, thus cultural and social definitions of nature should be taken into more account during the planning processes. Nature conservation should include the views of the local human population and other stakeholders (participative elements to the process). The economical valuation of cormorant impacts should be calculated by non-classical economic methods (i.e. contingent valuation method). Planning measures in conservation should be more bottom-up directed activities. Financial compensation for damage to fish stocks is a positive feature but nevertheless it depends on the goodwill of government to pay it. Compensation is paid from the State budget, thus it is of interest to all people. Regulation of cormorants (i.e. lethal control measures) is problematic due to the fact that birds are on migration flyways and there is often a high turnover of birds at sites. As elsewhere, the local, regional and national level of problem, and its potential solutions, should be considered.

Policy at the national level is based on the Czech Republic being divided into 14 regions. Individual acts are prepared by the Government and approved by the Parliament. Acts are adjusted by particular decree declared, by a relevant ministry. Individual region and municipal authorities can declare decrees with local relevance but the decrees have to be in accordance with national legislation. Overall, The Ministry of the Environment is responsible for environmental and nature conservation and Ministry of Agriculture is in charge of fisheries and hunting policies.

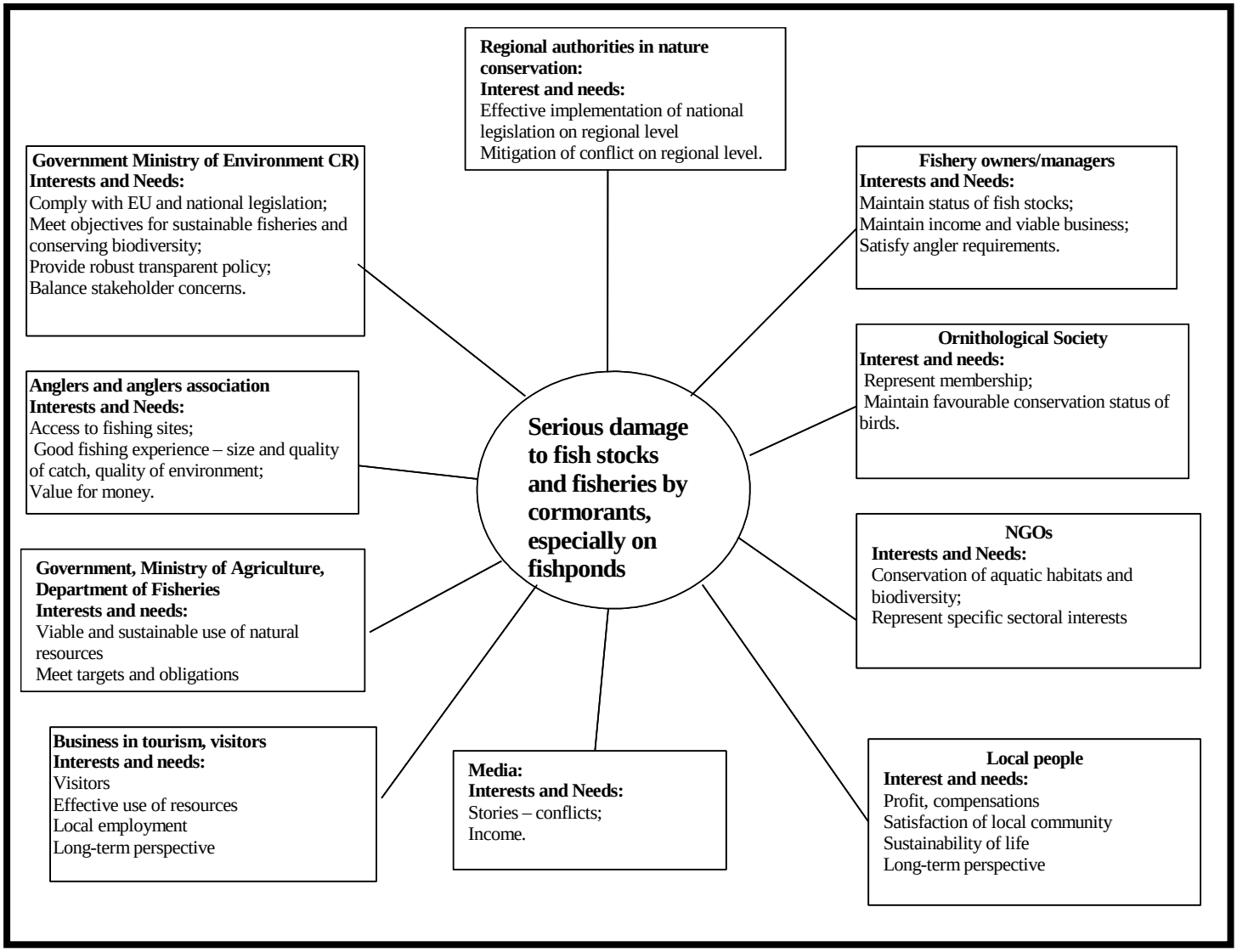
The Czech Republic has no comprehensive plan to deal with the 'model' conflict, but there are mitigation measures (e.g. laws about compensation payments) The key roles for mitigation measures are undertaken by the Ministry of the Environment and regional conservation authorities: authorities from the Academy and NGOs do not have their own view on how to mitigate the conflict.

Compensation (regional and local levels) comes under a general scheme for damage caused by selected, particularly protected, species (including cormorant). Only damage by listed species and listed types of damage (e.g. to fish stocks) are eligible. Importantly, compensation is not paid for damage caused to fisheries in running waters. The amount of compensation paid in individual cases is not related to real damage but to the intensity of bird presence on the relevant water. Following an expert report, the Region authority determines the amount of compensation to be paid - funds for which come from the State budget.

Although every fishpond owner is eligible to applying for compensation for damage caused by the cormorant, most compensation is paid to large fisheries (these constitute the majority of fishpond owners). Many private owners have limited knowledge of compensation law and the bureaucracy connected with procedures for securing financial compensation. As a result, many are discouraged and often take the issue into their own hands and shoot birds. Nevertheless, the total amount of compensation paid annually for cormorant damage is still increasing.

Stakeholders - tourists and visitors, local population and fishermen are considered the main 'stakeholders' in cormorant-fisheries issues in the Czech Republic. The view of tourists and visitors, local population and fishermen on the overpopulation of cormorant in the Třeboňsko Landscape Protected Area and Biosphere Reserve were thus studied. A questionnaire was used to evaluate the sociological aspects of cormorant 'overpopulation' and about 100 persons were contacted directly in each studied stakeholder group (see Boháč *et al*. 2006).

The view of fishermen differed from other respondent groups, evidently due their knowledge about biology and the abundance of cormorants in their areas. The view of fishermen on the solution of conflict was relatively simple - they considered the solution to be the reduction of birds by shooting. On the other hand, fishermen also claimed to need more compensation. Tourists and visitors had relatively weak information about the conflict. On the other hand, this group is positive about the protection of birds and the sustainable reduction of migrating population. Respondents from the local population were well-informed about the conflict and their solution is more "ecological" than that suggested by the fishermen.



Schematic diagram of stakeholders involved in the cormorant-fishery conflict in the Czech Republic

Compliance of paying for cormorant protection was investigated using a number of methods (e.g. contingent valuation, cost-benefit method) and in discussion with fishermen and local people. Contingent valuation methods were used to understand if fishermen and local people were compliant (willing) to pay for the presence of cormorant in the Třeboňsko Landscape Protected Area and Biosphere Reserve. This method is based on the evaluation of the preferences of different people (i.e. they directly determine the value of biodiversity – in this case, the cormorant). It is not a classical economical method – the value ('price') of cormorants is not based on market principles. Respondents can choose the price from precise variants.

The WTP ("Willingness To Pay") value was also determined. The average WTP was 200 Euro for local people and 80 Euro for fishermen. The overall acceptance by fishermen of having to pay is surprising (Sedlecký, Šafařík, 2007).

Media analyses have also been undertaken in the Czech Republic, as part of the work of INTERCAFE's Work Group Three (Linking science with policy and good practice). National media articles from GOOGLE were searched for the words "cormorant" and "cormorants" and these were then analysed. The main material available was from national and regional newspapers. The number of articles used in our Czech Republic analyses was abut five times higher than in other countries and this was presented (to INTERCAFE) as a media Case Study.

The primary **media frame** for fishermen was that the cormorants cause damage for them. The media informs readers that the government compensates the damage to fishermen and that they are allowed to reduce cormorant numbers by shooting. However, these measures are ineffective because of the increasing damage and the migration of birds from outside the country (e.g. Poland, Baltic states). It is reported that the increasing numbers of cormorants in the Czech Republic during migration periods is induced by climate change in Czechia in the recent years (i.e. warmer winters). Interestingly, in the media, information about the protection of cormorants and its aesthetic value is rather sparse.

We also explored **how to better communicate with people about the cormorant-fishery conflict.** It was clear that the media had an absence of information about how to mitigate the conflict. Furthermore, this ambiguity of conflict mitigation was clear from articles based on information obtained from both fishery specialists and ornithologists. There was also an absence of any clear position on the guarantee of nature protection (Ministry of the Environment of CR) and fisheries (Ministry of Agriculture of CR). We suggest that those who wish to assist conflict resolution here must encourage reporters to write stories that suggest solutions to the problem of cormorants and fisheries in the Czech Republic.

SUMMARY

- Mitigation of the cormorant-fishery conflict in the Czech Republic is undertaken mainly through the payment of financial compensation for fish losses.

- Regulation of bird numbers by shooting is ineffective due to the continual turnover of migrating birds. Many believe that European action is thus needed.

- The need of stakeholder (i.e. fishermen, conservationists) engagement in the process of conflict mitigation is clear (a participatory approach is required).

- There is a distinct absence of a management plan for the situation. The reaction of policy makers (e.g. Ministry of the Environment) is slow.

- Better knowledge of the situation at different levels (local, regional national) would almost certainly help move towards a problem solution.

- Any change of law (e.g. protection of the cormorant or its inclusion as a hunting species) is problematic due to the fact that most birds in the Czech Republic are on migration (and shooting these birds is ineffective).

- Increased recognition of the role of ‘culture’ amongst local inhabitants is fundamental for conflict mitigation.

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2.8 Humans versus Cormorants – an Anthropological view

Michaela Ulrychová, Department of General Antropology, Faculty of Social Science, Charles University; *e-mail:* michalau@seznam.cz

We share the world with animals. This means that animals play a lot of roles in our everyday life and can penetrate many spheres of our interests. This penetration sometimes leads to a conflict not only between humans and animals, but also to a conflict between the different social groups that a particular animal has confronted. This is the case in the conflict between fishers and ecologist due to cormorants. These birds are protected animals but, at the same time, they are considered to be an economical pest for many fisheries. In the background of this conflict we can find different understandings of ‘nature’. It is fight between knowledge based on personal experience and knowledge based on abstract studies, a fight between the old, local world and the new, modern “outside” world.

As a result, a study of different views on nature was carried out in the Třeboň area in South Bohemia. This area has been famous for fish production for many centuries but it is also an important Landscape protected area, where cormorants have nested since 1983.

The study can be split into two parts. The first was a review of articles in newspapers. There were two basic pictures of Cormorants, positive and negative – but more frequent were negative articles. In two-thirds of cases, cormorants were described as a natural disaster, as unbidden strangers and, especially, as an economic and ecological danger. Only in one third of articles did Cormorants play a positive role – a picture connected with the importance of biodiversity. In this perspective, Cormorants are considered an integral part of the landscape and an enrichment of our lives.

The second part of the study was based on a qualitative analysis of questionnaires. Responses were obtained from five groups of respondents: “tourists” (n = 23), “local people” (n = 20), “anglers” (n = 19), “commercial fisheries” (n = 13), and “ecologists” (n = 12).

The following questions were asked:

Have you ever seen the Cormorant?

Can you describe or identify the Cormorant?

Is the Cormorant an original species in our nature?

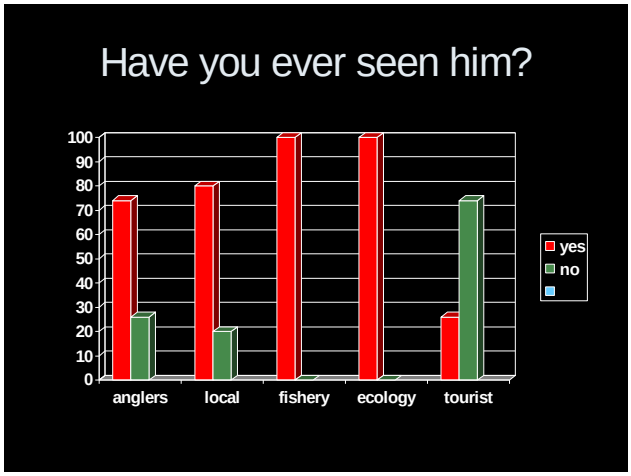
Do you think that the Cormorant belong in our nature?

Do you agree with shooting Cormorants?

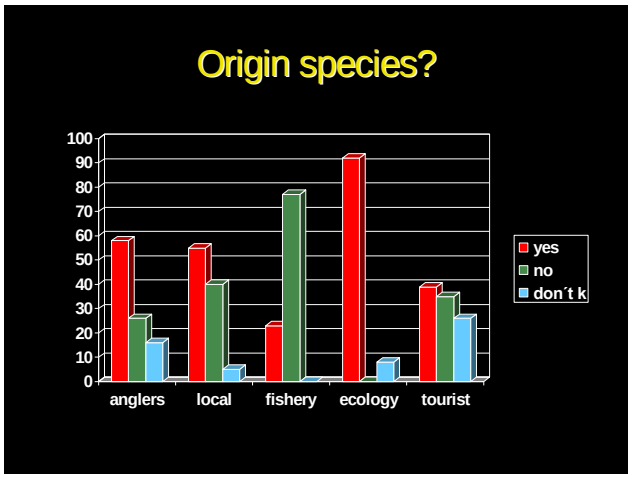
According to my findings fishers, ecologists and local people are familiar with Cormorants, but tourists (50%) and also anglers (32%) were not able to recognise them. When they described the Cormorant wrongly, they described it as white or grey long-legged bird. However, Cormorants

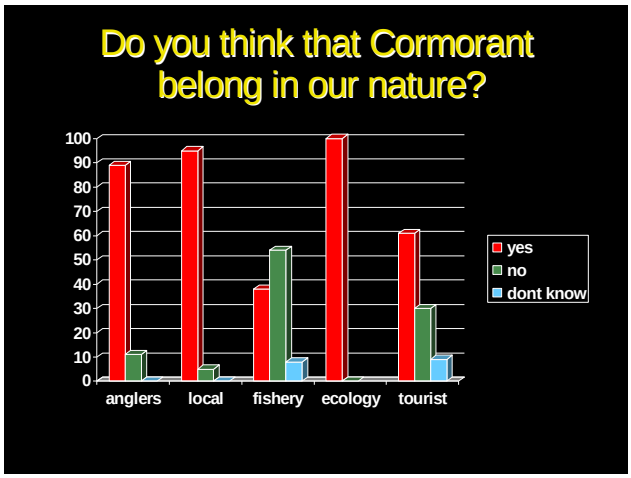
were well known to all groups as fish-eating predators that cause economic losses to fisheries. With the exception of ecologists, respondents from the other groups, did not think that the Cormorant was an original species in Czech nature. This is used as an argument against Cormorants by fishers. However, for other groups it was not so important.

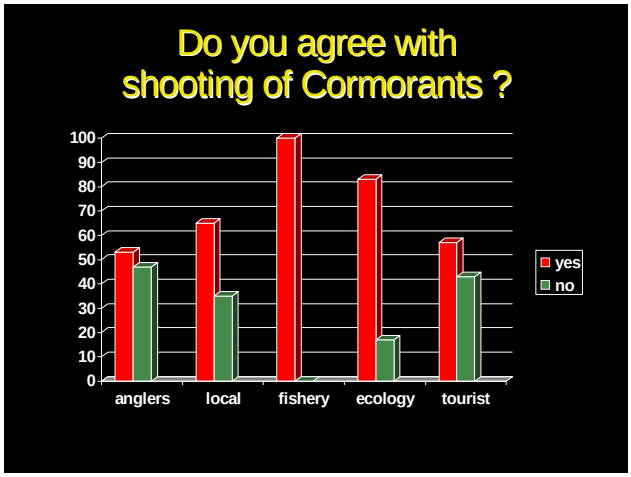
Tourists, local people and anglers perceive Cormorants as an interesting enrichment of our nature. There was no surprise that all anglers agreed with the shooting of Cormorants. On the other hand, the majority of the other four respondent groups also agreed with shooting, especially ecologists and local people.



***Wrong description**: white or grey bird, long-legged bird*







2.9 The Great Cormorant and national nature conservation policies

Jan Šíma & Michaela Krestová, Ministry of Environment of the Czech Republic Vršovická 65, CZ-100 10, Praha 10, Czech Republic; e-mail: Michaela_Krestova@env.cz , Jan_Sima@env.cz

The Great Cormorant is an endangered species according to Act No. 114/1992 Coll. on the nature and landscape protection, as results from later amendments and according to the Decree No.395/1992 Coll., Annex No. III – the list of Specially Protected Animals. This list has not been changed since 1992, updating has been prepared since 2005 and there is a proposal to remove the Great Cormorant from the list.

Legal protection: *(according to the Act No. 114/1992 Coll. and EU Directives)* Section 50 and 56 of the Act. No. 114/1992 Coll.

Specially protected animals shall be protected in all their stages of development. Both the natural and artificial homes they use, and their biotope, shall be protected. It shall be prohibited to harmfully intervene in the natural development of specially protected animals, in particular to catch them, keep them in captivity, disturb, injure or kill them. It shall not be permitted to pick, destroy, damage or transfer their development stages or homes they use. Exemptions from prohibitions may be permitted by a nature protection authority in cases where another public interest considerably overrides the nature protection interest, i.e. in the interests of prevention of serious damage to fisheries.

The Ministry of the Environment may specify by Decree an exemption from a prohibition in the case that the exemption will concern an indeterminate group of persons. The Decree is been in preparation since 2005. The proposal involves (i) the possibility to regulate Great Cormorant as a prevention of damage in fishpond management in reasonable cases, and (ii) the involvement of chosen parts of the rivers (being discussed).

The Czech breeding population of Cormorants is small and does not cause significant damage. Therefore the exemption will not refer to this population. Preparation of the Decree is now suspended because of discussions about the scope (fishponds vs. chosen parts of rivers vs. whole rivers) and the need to determine the relevance of damage levels (i.e. a definition of "significant damage").

The Act No. 115/2000 Coll. on financial compensation for damage caused by Specially Protected Animals provides a compensation for proven damage caused by 7 specially protected animal species. Compensations are currently being paid out. The Act is constructed especially for large carnivores, not so much for fish-feeding predators. It would be better to use some more suitable economical tool for Great Cormorant (e.g. a financial contribution not demanding the proof of damage).

2.10 The view of the Ministry of Agriculture on the current situation of the Great Cormorant

Jiří Pondělíček, Ministry of Agriculture of the Czech Republic, Department of the Fisheries, Game Management and Beekeeping, Těšnov 17, CZ-117 05, Praha 1, Czech Republic; e-mail: jiri.pondelicek@mze.cz

There are two groups of laws concerning Great Cormorant in the Czech Republic.

These environmental laws are:

Act. NO 114/1992 Coll., The protection of Nature and the Landscape

Act. NO 115/2000 Coll., Financing the Damages of Animals with a special Protection.

There are also relevant Agriculture laws, these are:

Act. NO 449/2001 Coll., Game management act

Act. NO99/2004 Coll., Fishery act.

Although the numbers of Cormorants hunted has stayed roughly similar since 2002, the numbers of birds recorded officially has increased considerably. Although the counts of Cormorants made by anglers have also increased in the same time period, they are substantially higher (by some 267%) than the official counts (see Table below).

Year	Official figures	Anglers' statistics	Nos. hunted
2002	17,646	26,141	2,747
2003	18,764	52,880	3,053
2004	21,955	-	3,136
2005	27,744	63,921	2,022
2006	25,885	68,795	2,190

Sea water has not got so much fish as it had in previous years. Fresh water has got as much fish as fishermen put in the water. Cormorants as predators have got special protection. Hunters do not need to shoot Cormorants. Hunters have to have a special licence for hunting, provided by the environmental civil service.

The key questions are:

What will happen to fish, if the numbers of Cormorants keep growing?

Will be there fresh water without fish?

Who will eliminate the Great Cormorants?

PART (3) Integrated working session: exploring the local situation with local experts

As in previous INTERCAFE meetings, each of the Action's three Work Groups worked intensively with local experts in an attempt to (1) better understand the local, regional, and national situations in the Czech Republic but also (2) to put this Czech picture in the wider contexts of the EU and other places/situations that INTERCAFE has learnt from.

3.1 Work Group One: Ecological databases and analyses

By Stef van Rijn and Mennobart van Eerden (additional notes Dave Carss)

Participants: Zeev Arad, Henrik Lykke Sorensen, Josef Trauttmansdorff, Vilju Lilileht, Mikael Kilpi, Dave Carss, Bela Japoshvili, Josef Ridzoň, Tibor Mikuska, Marijan Govedic, Stef van Rijn, Karlis Millers, Botond Kiss, Henri Engström, Catarina Vinagre, Daliborka Barjaktarov

Invited stakeholders: Zuzana Musilová, Jiri Kortan, Martin Čzech

General discussion:
In general, WG1 was asked to consider the following issues: What are the ecological issues? The cormorant and fishes-eye views. Changes in space and time and thoughts on future directions.

MG: Like other meetings, there seems to be poor data on fish production for example and what's the border of the area we are considering?

MC: Fish production is 20,000 tonnes/year but I do not know what it is here.

J-YP: That was an interesting talk about restoration – by manipulating fish density. But over what area is this done – a single pond or a wider area?

MvE: in comparison with France, if ponds are emptied and abandoned, they go over to agriculture. What would happen here?

MC: That depends on what type of agriculture – this may affect the water quality. There are no reservoirs in this area, only fish ponds. There is no commercial fishery on reservoirs, well maybe a very poor Eel fishery. Any fish stock in crease comes form angling – stocking is the main source. Anglers catch 4,000 tonnes per year – comparable to the pond fish production.

MC: There is no problem with cormorants on reservoirs. They are too deep. There is little fish stocking there so the fish stock is low – so there is no significant cormorant impact there. The main problems are below reservoirs – secondary trout fisheries. Rivers (and occasionally reservoirs) are stocked for angling whilst ponds are stocked for commercial harvest. Anglers do say there is a cormorant problem on rivers.

Tibor: It is the same situation in Croatia – rivers and lakes are used for angling, ponds for commercial fisheries. Our breeding population of cormorants is small – about 400 pairs (perhaps the carrying capacity of the fish ponds?). However, the wintering population is ten times more – it tends to stay on rivers and reservoirs – its related to pond management as most are drained and empty of fish in winter time.

3.1.1 The Cormorant-fish-fishery triptych in the Czech Republic

Important factors that influence the relationship and the conflict between Cormorants and fishery are both the trends in bird numbers and in the economic situation in the country.
At a European scale, the Czech Republic is at the major watershed of European rivers; partly running towards the Black Sea and the Baltic-North Sea. For a long period man has tried to exploit water resources by increasing the amount of still waters in this region. Like in Germany, parts of France and further SE at the Balkan these artificial lakes and ponds have been used for fish farming.

General discussion:
Focussed on lack of fish data form most areas/habitats – also that production figures were scarce. Rivers could be categorised as (1) small and upstream or (2) large and downstream. In both types, the fish community was diverse – some 25-30 species. However, the former rivers were dominated by Brown Trout, Rainbow Trout and Grayling, and the latter ones by Roach and Chub, the remaining species not really being a significant part of the fish stock. Pike is everywhere but in very low numbers – perhaps 2% of stock. Wells is present in reservoirs and lowland rivers – but again in very low numbers.

There seem to be two kinds of ponds – extensive ones and extensive ones where the fish are fed with wheat and manure is used as a fertiliser. Here it seems to be about 50:50 extensive versus intensive. There does not appear to be any form of bird protection used at the ponds. But most ponds freeze in winter and some are dry after harvest. There was some discussion over how many ponds are emptied each winter – but it was not clear what the position was.

There was a discussion about financial compensation and the cormorant migration period. There were problems with counting birds. In winter (International Waterbird Census in mid-winter) and breeding periods, the counts are OK. However, during migration it is very difficult to count the birds and it is not done.

3.1.2 The water system and the use by Cormorants

The Czech Republic includes several water system types that are used by anglers or by commercial fisheries. Large rivers, small rivers and reservoirs are mostly stocked with fish species to be used for angling. Large and medium sized fishponds, which already exist since the Middle Ages, are traditionally used by carp farmers.

Nowadays about 20 million kg fish is produced annually in the country of which 420 kg per hectare in the south Bohemian carp region. Since 1995 this is slowly increasing. The diagram depicts the situation in South Bohemia with regard to the presence of main surface water areas. About 15% of all waters is rivers and 85% to more isolated ponds and lakes. For the Czech Republic as a whole the percentage share of rivers is higher (30%) and the percentage share of lakes lower (30%), compared to South Bohemia. Some 30% of all waters belong to lakes and ponds connected to larger rivers, often with dams.

Table 1 (below) shows the fish species and the amount that is approximately produced in the country for the different water body types on an annual basis. The lowest production occurs in small running waters where Trout and Grayling occur. An annual production of some 50 kg/ha is the average. Both in reservoirs and large river sections, fish production is higher, 250 and 300 kg/ha respectively, and fish species involved differ. In reservoirs Bream, Roach, Bleak and Perch dominate, whereas in larger river sections Roach and Chub predominate. The highest annual fish production is recorded in ponds, an average 500 kg/ha is fairly representative for larger regions, but occasionally the more intensively farmed areas may yield up to

1000kg/ha/year. Contrasting to all other (more natural systems), Carp constitutes the most important species.

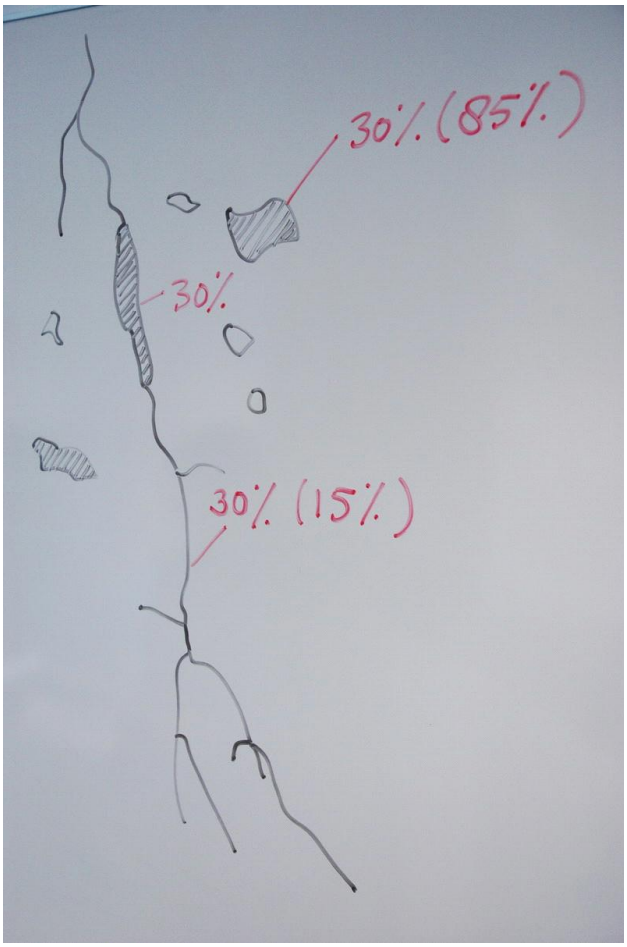


Figure 1 Schematic presentation of main water systems in South Bohemia. Figures refer to percentage of water in the Czech Republic and in south Bohemia (in brackets).

Table 1 Schematised overview of fish species and fish production in different waters systems in the Czech Republic.

Water body type	**Fish species involved**	**Production (kg/ha)**
Large river	Roach, Chub	300
Small river	Trout, Grayling	50
Reservoir	Bream, Roach Bleak, Perch	250
Pond	Carp (grass, silver)	500 (1,000)

Table 2 illustrates how the water surface of the country of the Czech Republic is distributed and how bird numbers are distributed, both in winter and summer. This shows that wintering numbers are higher than in summer and preferably make use of the river system. In summer birds mainly show up more specifically in pond areas where they also breed.

Table 2 Percentage share of different water bodies in Czech Republic and percentage share of use by Cormorants, as well as by absolute number

Body type	% water	% birds (winter)	% birds (summer)	Bird number (winter)	Bird number (summer)
River	30	80	-	8,000	-
Pond	30	5	100	500	1,000
Reservoir	30	15	-	1,500	-

3.1.3 Cormorants and Otters: a comparison

For a better understanding of the actual fish consumption of wild animals in the Czech Republic, we calculated the amount of fish eaten by cormorants and otters. Otters are a well protected species and numbers have increased. They are widely distributed and in South Bohemia. Otters are an important and widely esteemed part of the mammal fauna.

We used commonly available data on fish consumption, from local experts and from available literature.

For Cormorants the consumption can be calculated based on bird counts and the duration of stay, as follows:

- In river areas roughly 8,000 birds are wintering (from November till February), about 1,500 are migrating (in October and March) and no birds are breeding.
- In pond areas roughly 500 birds are wintering (from November till February), about 9,000 are migrating (in October and March) and 1,000 birds are breeding.
- In reservoirs roughly 1,500 birds are wintering (from November till February), about 7,000 are migrating (in October and March) and no birds are breeding.

Table 3 shows the presence of the Cormorants expressed in bird days (based on the actual numbers and the months that they spend in the different areas) separated for the winter, summer and migration periods.

Table 3 Presence of Cormorants, as bird days for three different periods per year and for three major water systems, as present in Czech Republic

Bird days (x 1,000)	Winter	Summer	Migration	Total
River	960	-	90	1,050
Pond	60	160	540	760
Reservoir	120	-	420	540
Total	1,140	160	1,050	2,350

Taking into account that Cormorants take around 400 gram of fish each day this means that roughly 940 tons of fish are eaten by them annually.

Otters eat approximately 1 kg of fish per day and 1.3 kg when they have offspring (during 4 months of the year). The Czech Republic holds about 2,250 animals and it can be calculated that together they consume 891 tons of fish each year.

Table 4 Otters in Czech Republic as consumers of freshwater fish

Number of otters (2,250)	**Presence (in months)**	**Daily consumption (kg)**	**Total consumption (Tons)**
Solitary	8	1	540
With young	4	1.3	351
Total			891

Discussion:
In reality these 'global' consumption rates (i.e. 940 tonnes – cormorant, 891 tonnes – otter) are comparable – they are certainly the same order of magnitude. Why is there not more vocal protest over fish consumption by otters? Perhaps it is because they are inconspicuous – they do not form large flocks and they are primarily nocturnal animals. There seems to be evidence that cormorant breeding numbers in the Czech Republic are controlled (i.e. kept below carrying capacity) to some extent at least. Breeding numbers also appear to have declined after their major tree-nesting colony was destroyed by guano. So, the overall density of breeding birds is low – hence breeding productivity is quite high. It seems likely that the otter is increasing now as a result of environmental protection in the region/country. WG1 did not find out much about the Muskrat – although it was suggested that there was an inverse relationship between them and otters.

3.1.4 Compensation schemes in Czech Republic

For the consumption of fish by Cormorants stakeholders get round 1,000,000 Euro of compensation paid by State money each year. For the consumption by otters about 150,000 Euro of compensation is paid. The order of magnitude of the total amount of fish eaten by cormorants and otters is comparable but the amount of compensation paid to the fish farmers differs greatly (at least a factor 6 difference).

3.1.5 Discussion

The discussions with fish farmers, as well as the observations during the field trip, confirmed the patterns described above. The management measures have resulted in a comparatively low number of breeding Cormorants. Only in a few strict nature reserves are Cormorants allowed to breed. Wintering Cormorants are present in increasing numbers and interactions with fisheries' interests are mainly due to this group. Otters form a biologically comparable predator in terms of amounts of fish taken, but apparently the damage perceived by this species is at a quite different level compared to the Cormorants. This may be due to the fact that Otters are less visible and, perhaps more important, Otters constitute a more quantifiable predation factor than do Cormorants.

3.2 Work Group Two: Conflict management and resolution – mitigation

by Thomas Keller, Bruno Broughton, and Ian Russell

Present (whole all or part of sessions): Robert Gwiazda, Linas Lozys, Oleg Nemenonok**,** Ion Navodaru, Redik Eschbaum, Petr Musil**,** Daniel Gerdeaux, Henrik Lykke Sorrenson, Tamir Strod**,** Timo Asanti, Nils Røv, Ger Rogan**,** Bruno Broughton, Ian Russell, Thomas Keller

Invited stakeholders: Tomáš Kepr, Jan Šíma, Petri Heinimaa

In general, WG2 was asked to consider the following issues: What are the impacts of local culling policy on cormorants and fisheries management? Has the 'intense control' of cormorants at specific places affected cormorant presence/impact in other habitats? How does this relate to INTERCAFE's experiences elsewhere?

Tomáš: In contrast to people involved in aquaculture in ponds, anglers need wild fish, and cormorants reduce wild fish stocks. Thus money is needed for fish stocking. All countries should coordinate cormorant control, i.e. shooting of cormorants.

Henrik: Do you combine culling and scaring?

Tomáš: We protect many sites.

Timo: How is the age determined in flying cormorants? Would it be better to shoot birds at nests to control the cormorant population in CZ?

Tomáš: No, because the winter population is a problem in rivers.

Robert: Reducing the winter population leads to a good situation in the breeding colonies the next year.

Bruno: Where do the stocked fish come from?

Tomáš: Stocked fish are produced by anglers; only rainbow trout and carp are usually bought. Cormorants reduce fish populations below a sustainable level. Fish stocks also loose genetic diversity.

Petr: We should identify places most important to fisheries and focus cormorant deterrence/protection on those.

Oleg: Hydroelectric plants are responsible for reduced fish stocks on rivers. Thus, the plants have to pay for restocking.

Henrik: To focus on important fish protection areas is a good point.

Thomas: Fish stocking is an 'old' concept. To build fish passes and improve spawning sites to improve natural reproduction is the 'new' concept.

Tomáš: This is what anglers do in the CZ. We asked for compensation. Running waters are publicly owned in the CZ. They are our natural heritage. Restocking is based on state funding and angling fees.

Tamir: Is it the case that the production in CZ carp ponds is the highest in Europe?

Jan: Carp is very important for the local economy.

Daniel: In France it is no longer economically profitable to produce carp. To produce grain makes more money. But, aquaculture in France is important for the maintenance of wetlands and biodiversity.

Petr: Here, ponds are fertilized to increase carp production.

Tamir: What about financial compensation?

Daniel: In Europe compensation becomes more and more 'popular' i.e. France, Latvia, CZ, Hungary and Saxony pay compensation. This is important to maintain aquaculture.

Tamir: Is there a connection between shooting permits and compensation?

Jan: No! Compensation is a tool for protection and cormorants are shot, too. In all other areas of agriculture payments/ha are given for special ways of production i.e. for not using fertilizer. But, in aquaculture, proof of damage is more or less impossible.

Petr: Shooting is a means of the government to reduce compensation.

Timo: There may be easier tools than shooting and scaring on ponds. Food attracts birds. You should work on roosts; try to understand the birds; and do research on better solutions.

Petr: Shooting is done before and after the breeding season. The strategy is to prevent a spread of the cormorant breeding population to other ponds by preventing new breeding colonies by flushing birds in very early stages of nest construction.

Nils: Is cormorant shooting in winter of any help?

Tomáš: We protect places that are of special importance. It is important to prevent regular feeding habits. Thus, it is necessary to scare the first birds that explore a water body.

Nils: This is the 'hot spot concept'. It can be compared to the situation in Israel. You need to learn the birds' behaviour.

Bruno: What is the impact of cormorants on other places after the bird removal?

Jan: It is hard for anglers to accept that cormorants should be accepted at some places! Impacts on fisheries are the biggest problem; other impacts like damaging trees are of lesser importance. There is one example of a night heron roost that was affected by cormorants.

Petr. This is a small problem.

Nils: Before coffee break I would like to summarize the situation in CZ like this:
1. The breeding population in CZ is under control (no new colonies allowed).
2. Important areas are identified and cormorant control is concentrated on them.
3. Compensation given for ponds and protection by shooting.

⇒ Conflict resolved.

Integrated working session continued:

Henrik: Is compensation connected to shooting in France and Latvia?

Daniel: You need to wait for the INTERCAFE meeting in Paris to hear details on the French situation.

Oleg: in Latvia, the first consideration is to minimise damage; the second is cormorant shooting; and third comes compensation.

Tomáš: The problem originates in Sweden and the Baltic cormorant colonies.

Tamir: This idea/concept is theoretical.

Daniel: In Switzerland cormorant control is focused on grayling rivers. In France there was an experiment on the river Loire. Cormorants were allowed on the river and at roosts, but not on ponds. This needs a lot of effort and thus is costly.

Tamir: The same is done in Belgium. Also it is important to understand that the effort required to shoot is also high.

Robert: Cormorant management needs/costs money. To shift birds is a good ideas/concept. On the other hand killing affects mostly young birds, i.e. birds in their first year, when they suffer a high natural mortality anyway. Thus, the effects of shooting on the overall size of the active breeding population should be low.

Bruno: How do you 'move' cormorants?

Daniel: By shooting small numbers.

Tamir: The concept is to deter cormorants from one area, but to accept them at other water bodies. Thus, progress can be expected as the birds learn avoidance of danger areas.

Timo: There is a need to look at the breeding sites/countries in the Baltic.

Henrik: Some shooting is necessary. The Danish breeding population has been stable since 1993 at about 35,000 breeding pairs. 50% of these are ground breeding. We do oil the eggs in about 16% of all nests up to 4 times a year. This is better than scaring.

Thomas: We should accept the real world situation, i.e. that there are many European countries that have their independent cormorant policies. Thus, it is better to focus on the places where cormorant problems occur than to dream of a pan-European cormorant management.

Petr: Yes, but we need country-wide concepts. Focus should be given to the upper parts of the rivers and the flowing river sections below dams.

Tamir: Do fishermen want compensation?

Daniel: In Dombes, France, cormorants are shot each Tuesday while duck hunting is allowed Friday thru Sunday since 3 years. This was a success.

Nils: Is there money given to fish farmers for landscape management and for maintaining old local traditions?

Jan: This is an important point.

Oleg: Money is not only given for compensation but also for maintaining biodiversity.

Petr: Is there an interest in increasing the intensity of fish production? Indoor production may be better paid for some fish species?

Bruno: Is there an importation of cheaper fish (i.e. what is the domestic production vs. import)?

Petr: There is a tradition in CZ to eat local carp for Christmas. Also carp is exported to Austria and Bavaria. Also, there are many small ponds for own production (< 1 ha). Many new ponds were created, and this means many new wetlands.

3.3 Work Group Three: Linking science with policy and good practice

by Ilona Cheyne

Present (whole all or part of sessions): Mariella, Ilona, Rosemary, Renata, Erik, Pekka, Faustus, Günther , Susannah, Trude, Jaroslav, Nikolay, John Ingram
Invited stakeholders: 4 x Czech representatives

In general, WG3 was asked to consider the following issues: What is the wider context in which cormorant-fisheries conflicts take place here? What are the key social, cultural, political and economic (including ecotourism) issues? What is the relationship between legislation, its interpretation, the actions taken and policy? Are there other Czech wildlife management cases that we can learn from? How does this relate to INTERCAFE's work in other countries e.g. management plans, working across different spatial scales and with different stakeholder groups or across borders (social, political, geographical, political)?

Nikolay asked to elaborate on his previous point that we have been asked the wrong questions. He believes that over the time he has been in INTERCAFE we have learned a great deal about biology of cormorants, but so much about aquaculture. Aquaculture is increasingly important in the EC and the only way to provide what is otherwise decreasing resource, and to produce rare or endangered species, reproduction for release and commercial use. Aquaculture production is increasing every year, doubled in EC in last decade. Global production going up too. So is the price of fish.

Nikolay believes the purpose of the group is to make proposals to governments of EC about how to maintain supply of fish. Cormorants were unknown in Bulgaria until recently. As a fisherman and aquaculturist, he is not against cormorants and aware that we need to be sensitive to nature.

Nikolay: Should challenge the questions: who is going to eliminate the cormorant and can we have fresh water without fish (in Min of Ag's presentation); it is all about finding a balance.

Sandra: Wider context includes the need to find a balance between fish production and problem of predation; asked the Czech experts how they are trying to find that balance.

Answer: very difficult to answer; in the Czech Republic the problem is between Ministry of Environment and Ministry of Agriculture really a problem of finding internal political consensus

Jaroslav: no real discussion between the ministries; must find a consensus on a management plan, some mitigation of conflict; there are some meetings but not yet effective; some committee/working group but someone else said that it not meeting any more because the fisheries people wanted to be able to shoot cormorants all over the Czech Republic and this was unacceptable

In order to get permission to shoot, fishermen must give evidence of damage; level of damage required will vary from pond to pond, region to region

Nikolay: we need more uniform and clear rules but govt ministry won't produce them

Renata: Ministry of Environment want to drop protection of cormorants, but Ministry of Agriculture refuses because then fishermen wouldn't get compensation; very strong relationship between anglers (fish pond owners?) and the Ministry of Agriculture.

Erik: which is the stronger, the Min of Environment or of Agriculture?

Jaroslav: anglers are very strong.

Erik: but which Ministry is listened to?

Sandra: what about the democratic process, e.g. Parliament? Has the problem been discussed in Parliament?

Answer: only at ministerial level.

Jaroslav: support for angling because it contributes to landscaped nature of the countryside; manmade and loss of fishponds would mean loss of local environment (as has apparently happened in Austria)

Trude: do fishermen get economic support? J – some support, 15% of fishermen's money is compensation (is this right?) and something for protection of ponds under the Nature Protection Law as cultural landscape; Erik: we do the same in Sweden to keep cows in the fields and keep cultural landscape

Mariella: do fishermen need compensation to survive? Rosemary: yes; compensation is actually about managing; Jaroslav: the main source is management (?); no figures known about income from fish production, compensation payments or landscape management subsidies.

N: big producers can produce figures for compensation claims, but small producers can't cope with paperwork

J: many owners are in Prague, so money actually goes to Prague.

Renata: normally shoot about 1,000 cormorants per year in non-breeding season; if protected status lifted, wouldn't be able to claim compensation

Rosemary: similar in Saxony; commercial fisheries not in accord with anglers because paid to maintain landscape and couldn't survive financially by fish production therefore don't want to get rid of cormorants; Couldn't compete with fish produced elsewhere in price and difficulty in marketing carp as against other types of fish which are more popular

N: not so simple because in Bulgaria 20,000 tonnes produce and eaten internally; now 3,000 (8,000 some say) produced; but consumption of carp has increased even though prices up close to trout; demand is therefore increasing

J: agrees that demand for carp is going up in Czech Republic

Sandra: is there some confusion about the economic value of fisheries? Rosemary: competition is with other types of fish which can be naturally reared, etc

N: warmwater aquaculture systems stock in spring and sell in autumn, so have to sell very quickly; greatest peak is in Orthodox countries for St Nicholas' Day (6th December); but sell all through the year, so have to store, but peak is in December

Rosemary: ponds have to be drained in winter otherwise won't survive; N: but movement towards using fishcages in larger reservoirs (therefore presumably year-long) and find that more demand than expected (in Bulgaria at least); Hans-Gunter: there are other fish, e.g. trout, which are not so seasonal

Mariella: some of what we do is think about what other sort of problems do commercial fishermen face here – otters are one but are there others?

H-G: cormorants produce more problems than just fish in his area; not so much carp, but others which are just as important for fishermen, etc.; N: problems, for example with expensive cultured sea bass, will cause the same sort of problem

Scott: thinking about other pressures on water, e.g. drop of industrial pollution, but perhaps more importantly agricultural run-off

Erik: not just carp, but other fish too

N: some fish being introduced in reservoirs to clean water; Rosemary: be careful that they don't escape because can cause environmental damage elsewhere

Mariella: are there other problems? N: problem from aquaculture, e.g. feeding co-efficient is close to 1, i.e. 1 kg food gives 1kg growth therefore high quality food and very expensive.

J: problems of eutrophication

Rosemary: how many kg are taken out of fishponds? [Answer unintelligible]

Renata: some of the areas containing fishponds are protected, so have to mange everything; tendency to overstock; may have to manage water level, etc.

J: nature agency governs 3,000 hectares but natural processes rather than fishponds; much of protected land is under private ownership therefore tension with conservation aims vs compensation schemes; may be restricted in level of production to protect water quality

Nikolay: there is new fisheries fund in EC; reduce fishing fleet, develop aquaculture; will reduce (aquaculture?) production to a quarter but amount of money being spent will stay up so production will actually become more expensive

H-G: still haven't got to wider question; talked about the general area, but not in Czech Republic; other fish produced outside fishponds, e.g. rivers – how are they affected by predation?

Rosemary: don't think there are many fish in the rivers because people have been complaining; have to decide what they want, e.g. conservation, landscape, aquaculture, etc. Not all achievable at the same time.

Sandra: what are the consumer drivers behind fishpond production?

Mariella: why is it important to keep the fishponds as they are? J: flooding control, biodiversity protection, traditional food production, cultural history, keeping water table up in central Europe, etc.

Mariella: what about compensation schemes? Worry in Saxony that would be withdrawn because too expensive; is there concern here? And if withdrawn, what would happen?

J: yes, fisheries are very worried about it. Trude: what about ordinary people? Would it have a political effect if withdrawn? Answer: yes, would mean that not protecting Cz nature

Sandra: how important is forestry in South Bohemia? J: not very but [unintelligible] more important economically than fishponds? Can earn much more working in forestry than fishing. Can survive without fish but can't survive without wooden furniture.

Mariella: how do the cormorants come into this? Debate over how much impact cormorants actually have on fisheries? Do fishermen want a management plan? Reduce population or keep it?

Answer: want to reduce population but still get compensation; want to keep on protected list

Nikolay: fishermen now think shooting doesn't work, and too expensive; recognise that other methods are needed to get 'appropriate' population levels

Mariella: leads to another question – if shooting is a way of controlling cormorants, what effect does that have on nature conservation, e.g. disturbance, mistaken species, etc. Answer: shooting does affect other species; H-G: important pond in Bavaria has population of 50% rare species; no hunting allowed because wouldn't be able to moult if disturbed.

Mariella: same problem in Po Delta about disturbing ducks for hunting; so what else can be used [answer unintelligible]

Renata: regional government has power to restrict hunting dates and imposes other conditions; H-G: is there a difference between fishermen and hunters? Answer: often the same people; could have designated hunters, etc.

Mariella: doesn't shooting make cormorants move further into lakes? Rosemary: can expect cormorants to leave when start shooting so you have to plan for that.

Sandra: but one of the presenters said that hunters not interested in shooting cormorants. Answer: no, it's a matter of money therefore fishermen will pay hunter to shoot

Mariella: in terms of licences, is it easy to get licences to shoot in Czech Republic? Nikolai: agricultural holders can apply, but not in Bulgaria

Mariella: didn't they restrict numbers in Slovenia? Yes, what are the limits in Czech Republic? Renata: limits depend on regional rules which may be restricted according to season, conditions, etc.

Key points of the discussion

Obstacles to mitigating conflicts:

- Disagreement between government ministries, and one more powerful than the other
- Problem is that Ministry of Environment can stall co-operation but not force it, e.g. stopping talks over shooting but this means that the working group doesn't meet any more
- Min of Environment must be consulted when law is about to be redrafted
- Politics of blame
- Is the policy of keeping cormorants protected to preserve compensation support really an open government policy?
- Hunting can't be used as method of control though judicious use under Article 9?
- Landscape management is an important aspect of why fishponds kept and how money is funnelled in

- How much income do fisheries get from landscape management and compensation compared to actual fish production

3.4 General comments and points emerging from plenary presentations and discussion

3.4.1 Work Group One

WG1 presented the figures and tables detailed above (section 3.1), explaining the basic thoughts behind these rough calculations. Comments made in the WG session suggested that many of the issues seemed very local – and were not very easy to represent at the larger, wider national level. WG1 were interested in differences between otters and cormorants – in terms of perceptions and things like financial compensation for fish damage.

Petr Musil answered: Smaller companies do not have the time to apply for financial compensation. Larger companies have the ability to apply for compensation for cormorant damage. The money they receive is "enough" so they do not need to bother asking for compensation for otters. Bigger companies also find it easier to pay for the "expert opinion" required in the process of claiming compensation (see section 2, at the end of presentation 2.1).

3.4.2 Work Group Two

WG2 looked into conflict and management options and followed the first two questions (What are the impacts of local culling policy on cormorants and fisheries management? Has the 'intense control' of cormorants at specific places affected cormorant presence/impact in other habitats?).

The angling on rivers situation here seems similar to other central European rivers. Rivers have multi-purpose uses, there is a lack of spawning habitats, the fishery is largely supported by stocking – alarm bells are ringing. If the fish are not reproducing, there are more problems than just cormorants.

How are cormorants managed at the moment? There seems to be successful management of the rather small breeding population here – it is kept to one colony of about 200 pairs and the creation of new colonies in the area is prevented.

Large numbers of birds are shot in winter and on migration – but efforts are only local and uncoordinated and are viewed as unsatisfactory.

WG2 came up with 3 emerging issues:

(1) It appears that the breeding population of cormorants can be controlled here – particularly the formation of any new colonies.

(2) There is a possibility to improve management during migration and wintering times – focus shooting on the important habitats and leave birds alone elsewhere. The important areas would seem to be upper, narrow, river sections - grayling habitat types. This technique is still working quite well in Switzerland; it is the same concept as we saw in Israel too.

However, this concentration of activity in certain areas is labour-intensive – it needs coordination, effort and money. However it could be useful.

(3) Compensation is an important factor for local economies. It is helpful for resolving the conflict at ponds – if there was no compensation, shooting would be more intensive (so in one way, compensation 'helps' the cormorants). The field trip is needed to find out more and better understand what is going on. As angling experts were working with WG2, the WG had a number of questions – focussed on pond farming:

- What methods are used to deter cormorants – including habitat modification?

- How effective are these measures? How is 'effectiveness' measured?
- Do fish farmers act together or individually/ We know from elsewhere that if people act individually, then birds may just be moved from farm to farm – does that happen here?

- Is there a downside to financial compensation? Do fish farmers feel comfortable with compensation – in relation to their relationship with the Government?

- If the cormorants were to disappear tomorrow, would the fish farmers still be in business?

- Would (or do) fish farmers feel 'better' being paid compensation for landscapes management instead of fir this specific bird-fish issue?

- If biodiversity is an important side-effect of managing the fish ponds they way they are, who measures biodiversity there?

- Because of what is happening elsewhere with aquaculture, have fish farmers here thought about bringing their operations indoors?

- From Saxony we saw that a major issue is the price of fish – they were being undercut by imports (from the Czech Republic) – how much of the fish produced here is for local/national use and how much is exported to other countries?

- What is driving the stocking of fish elsewhere – perhaps it is hydropower?

- How is the breeding population of cormorant s here being controlled in the Czech Republic?

Petr Musil answered this last question: shooting is allowed outside the breeding season and the prevention of new colonies forming is done through human disturbance.

Günther asked if this affected other species?

Someone answered that the shooting is licenced and done through derogation. Only hunters are allowed to shoot cormorants – so its not necessarily the owner of the fish farm. So, activities are correct according to the Birds Directive. Preventing the establishment of new colonies is on the edge of the Birds Directive but if human disturbance happens as part of the usual management practices of the fish farm – then this is what happens.

Scott Jones asked a few more questions – as cormorants are shot, how is this done, when, where, and what follow-up data are collected/available? He then highlighted an interesting conversation between Tamil, Daniel and Thomas Keller – that the disturbance (organisation, information and timing) is essential used to 'educate' the cormorants to use secondary feeding sites and not to visit the economically important sites. Here in Israel the cormorant stay long enough in the region to 'learn this lesson' but they are gradually excluded from some areas. Daniel then said that a very interesting scientific question surrounded this 'moving birds for one place to another' and the wider picture of migrating birds – for example, there has been a decline in the numbers of breeding cormorants in Denmark -what is the consequence for wintering birds in France and Switzerland?

3.4.3 Work Group Three

It seems to be that the Ministry of Agriculture is supported by a very strong interest group – the fish farmers - and that the Ministry of Environment is less 'powerful'. Perhaps older ministries are more powerful than newer ones – or maybe this is just a perception. We also discussed what we term "the politics of blame". In terms of landscape management, it is very important to have fish ponds to maintain biodiversity, and for flood prevention – we've heard recent proof of their value for this. There is a paradox here – cormorants bring money (through compensation) but they cost money too – what's the balance?

There seem to be different rules in different regions of the Czech Republic, the legislation is interpreted in different ways. Fish farmers are important for preserving the traditional landscape here (a non-financial value) and for satisfying cultural traditions (e.g. as a food source, traditional livelihoods, embedded in the landscape). Forestry – economically more important than fish farming – is helped by the wetland maintenance provided by fish farming, it facilitates the climate for forestry – this provides jobs (unemployment is low here at about 4%) in the forest industry.

The public generally seem to support financial compensation – but some also question why compensation should be paid for such 'natural processes' as a bird feeding for its survival.

On the open market there is a trophy price for dead cormorants' beaks – fishermen pay money from the State budget to hunters to kill the birds. In general, income seems to be from fish

production, financial compensation and a subsidy for landscape management – it seems that economically the situation is balanced and stable. Are we correct in thinking of cormorants as being part of the economic system here?

There are several gaps in our understanding at the moment:

- What is the role of environmental protection? Particularly the protection of non-commercial value species and biodiversity?

- Are cormorants just a problem in the fish pond region, or are their wider problems across Czech waterbodies?

- Seasonality – do we have enough knowledge to do timelines of fish reproduction and production, consumer demand, and cormorant numbers?

- What other pressures do fish farmers face? We have not heard much information about other problems.

- There is no national management plan and no move towards a national plan – why?

- If there was to be a national management plan, how would it be done? Who would be involved?

- What proportion of fish farming income is made up of:

    - Landscape management subsidies?
    - Financial compensation for losses to cormorants?
    - Fish production?
    - Other sources?

PART (4) Field trip report and subsequent interview

Day two of the meeting, Saturday 12th April, consisted of a field trip between 0830 and 1800 within and near to Třeboňsko Protected Area and Biosphere reserve (Jindřichův Hradec District, South Bohemia). The field trip was guided by staff from Třeboňsko Landscape Protected Area and included visits to various fishpond systems, observations of a cormorant colony, discussions with local stakeholders from various fisheries companies, and a visit to an exhibition on "Třeboňsko – The Landscape and the People."

Lunch, including a local carp dish, was provided at a Fishery pub "Dvůr Hamr." We were able to observe some of the links between agricultural and eco-tourist activities in the area, the pub forming part of a working farm with family-friendly activities that could include contact with small animals, horses and birds of prey.

A web site that provides more detail on the Třeboňsko area in general is http://www.trebonsko.ochranaprirody.cz/ (click top right of homepage for English version).

This field trip raised a number of very interesting questions about problem solving and the nature of conflict management in fisheries cormorant conflicts in Třeboňsko. Biosphere Reserves (e.g. Stop 4, Třeboňsko Protected Area) offer different models for cooperation and consensus building for many issues, including management planning. While the emphasis in Třeboňsko today is on bureaucratic and legal approaches to problem solving there is significant scope for exploring different models that may be helpful as time goes on. Because cormorant fisheries conflicts in Czechia are situated within a far broader context than "economic vs conservation" issues (e.g. the cultural and identity issues described at Stop 5, Třeboňsko – The Landscape and People), there is significant potential for a wider debate about conflict management processes, and how examples from elsewhere could assist with the specific cormorant fisheries concerns in Třeboňsko.

Our visits also raise a number of questions about how stakeholders are engaged today, the potential for how they might be engaged in the future, and the choices that people in Třeboňsko face now about how they would like to solve problems. One consideration facing stakeholders here, as elsewhere in INTERCAFE countries, is about how to build capacity to support people seeking a broader consensus on management planning and cormorant fisheries conflicts.

Comparisons may be made with the Po Delta context where adversarial bureaucratic and political processes also form part of a "traditional" approach to problem solving that doesn't always solve problems. However, the scale and the level of perceived "interdependence" are different from the Po context and one has a sense that Třeboňsko stakeholders have a stronger history of collective action and cooperation (e.g. Stop 2, Pokornyjan Krvavy), and other things. If true, this bodes well for the development of different, flexible approaches to conflict management approaches as stakeholders search for ways forward – without losing options for bureaucratic processes, where these are helpful.

This report was compiled from the notes of six INTERCAFE participants who took notes on the day. The report describes each stop in turn, the name and organisation of our key informant and the main themes that emerged at each place.

Stop 1: Kardasova Recice

Martin Pecin, Fisheries Manager

Our first stop was the storage ponds at Kardasova Recice, one of three storage facilities for the company that has a total of 450 ponds. The facility, which had existed for many years, was refurbished in 2007 using an EU grant. Between 80% and 90% of the fish stored there are common carp with the remainder made up of Tench and Grass Carp, with some Pike and Pikeperch. Martin said that cormorants often arrived in flocks. In one instance, in March, there were up to 1,000 birds visiting ponds. The loss of fish to cormorants was given as 8% on first year fish.

The main themes emerging from our visit were storage, harvesting, marketing, cormorant management, and compensation.

Storage

The facility was built on an existing small river that flows through the storage facility continuously. There are no fees for using the water but the company pays the government for water quality tests that are done upstream and immediately after the outlet from the facility. The fish are kept in storage ponds for several weeks (2 months maximum) with clean water and sand, as opposed to mud. This is an integral part of their pre-sale conditioning. The fish are not fed and no medicines are used. They lose about 5% of their body weight in storage (mostly fat) depending on storage time and water temperature.

Harvesting and Marketing

Fish weighing 1kg or more are always in the facility prior to marketing. Occasionally, there are fingerling fish about a year old for restocking. Each of the seven tanks could hold about 70,000 kg. Fish are removed on an irregular basis throughout the year depending on market needs, with a clear strong peak harvest from mid-September to mid November for the Christmas market. Market carp are worth about 2 Euro per kg, whereas the one-year fish are worth about 6 Euro per kg.

Prices are negotiated with different customers and fish are then transported live on special lorries. More than 50% of this company's fish are sold abroad, mainly to Germany and Austria, but also to Slovenia, Poland, Italy, France and Slovakia.

Cormorant Management

The company's major problems with cormorants occur during spring and autumn migration periods. Martin said that the company is concerned about cormorant-related fish stress as well as losses with about half of the fish moved to storage showing signs of stress. Cormorants rarely visit ponds <1 hectare due to the length of landing they need, and are managed by three different mechanisms; shooting, active scaring and passive scarecrows. All of these techniques work for about a week but then something different has to be tried as the birds get used to one deterrent.

The company shot 300 cormorants last year, which is 10% of the number shot in the Czech Republic. Most of the employees have a hunting

licence; shooting is site specific and time specific, and in some locations it takes place all year round. The maximum limit on numbers that could be shot was 10% of each flock. Hunters get up early in the morning before the birds arrive and lie in wait. We were shown one of four birds that were shot the previous day from a flock of 100. This bird had a ring from Finland that was taken away by one of our Finnish delegates for identification and follow-up work. Hunters are paid for the work by carp, not by cash.

Compensation
Regarding compensation, all employees keep a diary and are required to log all cormorants seen. Compensation was not regarded as critical to company survival but if the cormorant was removed from the protected list (i.e. compensation was stopped) and shooting was discontinued, then that might push the company into failure.

Stop 2: Pokornyjan Krvavy
Pribyl Karel, Fisheries Manager

This was a visit to a 130 ha fishpond inside a nature reserve that used to contain a cormorant breeding colony. Prior to being gazetted as a nature reserve, fisheries and forestry were the key industries in the area. The pond's name translates as "Blood Pond" because the water derives a reddish/brown colour from the surrounding peaty soils. The area is owned by the State and held on a ten-year lease to the company. At 550 metres altitude this is the highest major fishpond at the top of the catchment. Due to this, it is possible for managers to exert some control over water levels lower down the catchment. Even though this places them at a strategic advantage, a high degree of cooperation exists with a strong sense of ethical water management. As Pribyl told us "water control in this area really means '*interdependence'.*"

Because strict controls exist on what stocking levels and other management practices can be done, the lease is relatively inexpensive. This is a second reason, in addition to its strategic location, why companies are keen to hold the lease to this pond. The large pond area also contributes to water storage for flood control, as does the next lowest pond in the system (200 hectares and also in the nature reserve. The company also leases this and the third highest pond down the chain in the catchment.

No hunting is allowed in the area and there is no compensation for any losses. The main themes emerging from our visit were fishery management in respect of its reserve status and cormorant management.

Fishery Management
At 5,000 kg of fish per hectare, this particular pond had a much lower fish stocking density than many ponds. However they stock with 3 year-old fish from smaller adjacent ponds, at about 20cm length, removing about 40,000 kg after one year. This was compared with an adjacent pond that runs on a 2-year cycle. Weight gain is basically natural although a supplement of grain is added with a feed ratio of 1 (weight of grain to equal the maximum expected weight of harvest).

Secondary damage in the form of fish stress was a key concern for our informant. As the cormorants arrive in the autumn, the fish retreat to the shallow sides of the pond, precisely at the time when they would normally be moving more slowly and going into torpor at greater depths. This leaves the fish exhausted and the stress increases morbidity and mortality.

Regional state officers monitor the zooplankton levels and water quality and also supervise the harvest. This allows them to carry out fish inspections and provide an independent check on the fish count. For managers, autumn oxygen levels are a key factor governing the time when the pond is drained and left empty for the winter. Warm autumns reduce oxygen levels and mean that the pond has to be drained early.

Cormorant Management

Of 30,000 fry stocked in adjacent ponds, cormorants reportedly could limit the harvest to 10% of that number with others damaged. These losses were attributed to winter migrating cormorants which first appeared in the mid-1980s, increased in numbers slowly during the 1990s and rapidly after 2000. The loss of white fish (Coregonids introduced from Finland in the 1880s) reportedly coincided with the arrival of cormorants. At the end of the 1990s managers ceased stocking with Coregonids because they are easily visible and caught by cormorants. A breeding colony of cormorants which became established in 1998, last bred (on land) in 2003 when a severe winter left ice on the pond until the end of March. However, the pond is still used regularly by migrating birds.

Stop 3: Trebonsko Landscape Protected Area and UNESCO Biosphere Reserve

Miroslav Havel [NGO Chairman]

We stopped on a bridge over the River Luznica which flows from Austria 35 km away. The Biosphere Reserve was established between 1977 and 1979. It is around 700 km^2 and contains 40 villages with a population of 30,000 people.

The area is critical for flood control, having a huge capacity (350 million cubic metres) for storage, retention and slowing down floodwater for areas downstream. Water management and nature conservation, then, are the two key drivers for the management of the area.

The area is a complex mosaic with several designated areas, some overlapping into one another. Many of these have some form of legal status including:

- Special nature reserve
- Landscape protected area
- Natura 2000
- Two Ramsar sites – the wetlands and peatlands of Trebon
- EuroMAB Biosphere Reserve (which depends on a voluntary code)
- SPA – 19 species of birds (water and woodland)
- 15 sites of community interest according to the Habitat Directive

The local economy is based on fish farming (500 fish ponds), forestry, and the sand/gravel extraction within the protected landscape area. The river and forest are state-owned, the fishponds, however, are mostly private.

The river is a complex mosaic with many natural features such as meanders, oxbow lakes, alluvial ponds and alluvial forests. It is the source of all water for fish ponds and in total 13% of the area is covered by water (Czech Republic as a whole is 2% water cover). Many species are

locally important. For example, it is a core area for otters with a population of 150. There are 10-15 pairs of breeding white tailed eagles, with an additional population of over-wintering birds. Other bird species include common tern, two species of owl, and kingfishers. Two species of fish (Weather Fish and Spined Loach), protected by the FFH directive, occur in the river.

The main themes to emerge from discussion were cormorant management in a protected area, water quality and co-operation issues.

Cormorant Management in a Protected Area

Cormorant shooting is not so much a licensed activity as it is a process of being granted immunity from the law. Shooting rights can be granted locally, with defined limitations. These include season (although theoretically shooting rights could be granted for all year round), site, or type of site but they do not restrict the numbers that could be shot. The local councils are legal entities which are included in negotiations (see cooperation issues below).

Water Quality

The water flows from Austria 35 km to the north; quality was poor after the closure of a starch factory and when intensive agriculture occurred on the site. The nutrients and water quality were down to a fifth of optimum values. But quality improved after 1990 when the area was transformed into the wetland system existing today. The dramatic reduction in use of fertilisers and pesticides, and the introduction of EU subsidies are major contributing factors to improved water quality.

A need to manage the intensity of fish farming remains, however. Production of around 40 kg per hectare in the middle ages rose to about 100 kg/ha 100 years ago and today is about 600 to 800 kg/ha. Fishponds with high biomass, particularly those on a 2-3 year cycle could harvest up to 2,000 kg/ha. The guide considered 450 kg/ha to be the ideal harvest to avoid water quality concerns. Many people were harvesting 2,000 kg/ha which he considered to be too much and caused effluent

problems. This causes issues with the local communities as the emptying of fishponds incurs no cost in payment in respect of sewage fees, whereas the villages that had sewage plants had to pay to use the river for discharges.

Co-operation Issues

The Biosphere Reserve represents an area of agreed cooperation based on a voluntary agreement. The protected landscape area has an enforceable legal status with the rivers belonging to the State, and ponds mostly in private hands. Management plans are negotiated with local village authorities and then approved by the Ministry of Environment. There is no tradition of consensus building or working in collaborative ways with local stakeholders. Problems are solved by bureaucratic and legal means in which the village councils are legal stakeholders in management planning, including cormorant shooting. As our guide commented '…we are bureaucrats- it is a tradition.'

Laws to protect the otter and to compensate for damage are well established and understood. There was no evidence, however, of this understanding and cooperation being extended to cormorants.

Angling is allowed on some river stretches and angling clubs can stock with native species where fishing is allowed. Anglers also receive subsidies for fish stocking but amounts were not known by our informants. This stocking plan was subject to scientific approval. However the angling clubs do not then own the fish and cannot apply for compensation if lost to cormorants. We got the impression that the angling clubs had failed in legal action and that anglers feel discrimination because private ponds owners could stock and own the fish, while anglers stocking rivers could not benefit in the same way.

Local councils have difficulties on occasion reconciling the different attitudes and approach of the Ministry of Agriculture and the Ministry of Environment; our guide commented that councils see the Ministry of Environment as "much more green". Being at the bottom end of the discussions between the Ministry of Agriculture and the Ministry of Environment is not easy. Our guide commented that Ministries do not work well with local stakeholders as they are unwilling to cooperate. The Biosphere Reserve has drafted a plan but apparently it takes a long time to collate feedback from the villages. Questions remain, though, about how exactly this feedback is incorporated into management planning when it is collated.

Stop 4: Rožmberk Fish Pond, Třeboň Fishery

Jakub Mraz, Fisheries Manager

Rožmberk is the largest fishpond in Central-Europe, built between 1585 and 1592. It was originally around 1000 ha but over time this has been reduced to 489 ha. The volume of water held in the pond is normally 5-7 million cubic metres but this can increase to 75 million cubic metres during floods, making this pond, in common with others, an important aspect of flood

defence. A number of inundation bridges surround the pond and the countryside is dotted with hay barns for drying the hay after floods.

The area is historically interesting, being linked with the New River and the Golden Canal. Some ponds are listed national monuments – the same status as given to the Charles Bridge in Prague. Local authorities are negotiating with UNESCO to have the pond system as a whole listed as a World Heritage Site. These discussions are linked to changes in forestry practices, the other major land use in the area. Presently about 65% of the woodland is spruce and pine, managed for production forestry and biodiversity conservation. With the potential for World Heritage status there is apparently good scope for planting more native broadleaves.

The main themes to emerge from discussion were fishery management, predation, and compensation.

Fishery Management

The fishery is privately owned by Třeboň Fishery Holding and rented from them by Třeboň Fishers. The president of the Třeboň Fishery is also the president of the Czech Fishing Union. The company owns a total of 539 fishponds totalling about 8,300 hectares, making it the largest fish farming company in Europe. The total production from all of these is about 3,000 tonnes - 10% of the Czech production. Assuming two Euro per kg this gives an annual gross income from fish of around 3,000,000 kg of 6,000,000 Euro.

Of the company production, 85% is Common Carp and 15% is made up from Silver Carp, Big-head Carp, Tench, Pike, Wels, Pikeperch, Roach and Crucian Carp. Rožmberk production is about 220 tonnes every two years. They use a four-year cycle and the pond we saw is designated for years three and four. Before year three they use small ponds to hatch 200 million fish fry that are put into the pond when they are 2-years old. These are reared on pellets but

when they are transferred to Rožmberk, they are fed on various grains. The harvest size of the carp is between 2 and 2.5 kilos.

At harvest, late September until November, 85% of the fish are exported to Poland, Hungary, Germany and Austria. Some harvesting takes place in the summer with 200 metre seine nets as there is a small demand for carp in the summer. Autumn harvesting takes place through draining, a process lasting approximately four weeks. Harvested fish are stored in the adjacent storing facilities before sale. Fish storage is distributed evenly around the area to reduce the transport distance. The company is well vertically integrated, owning processing factories that produce fillets, gutted Carp, halves of Carp and smoked Carp.

Predation

Two areas of predation are of concern; otters and cormorants. No actions are taken for otters other than having dogs patrolling freely around the holding ponds. For cormorants managers use a combination of passive scarecrows, and active shooting from boats to scare the birds. Shooting to kill is possible outside the breeding season with permission from the regional authorities.

The cormorants in Rožmberk do not cause as many problems as they do in other ponds because the fish are larger. However, fish that are not in the best condition are vulnerable when introduced into the pond. Jakub estimated losses at around 90% in the first year (fingerling stage), 30% in the second year, and 3% to 5% in years three and four. Cormorants cause most damage in years one and two.

Compensation

Compensation is only granted for damage from the indigenous population of around 200 cormorants, not migrating birds. According to our informants, State authorities do not take compensation responsibility for migrating cormorants due to budget constraints and because they do not see why they would be responsible for cormorants that are arriving from other countries.

The compensation payment is between 1.5 and 2 million Crowns. Compensation helps to offset damage but is not critical to company survival.

Stop 5: Třeboňsko – The Landscape and People

This was an unguided trip to a permanent exhibition and visitor centre called "*Man and the Landscape*" and consisting of exhibits, dioramas, a video on the history of the Region and interactive displays. Full details can be found on their website: (http://www.itrebon.cz/index.php?l=en&p=9&r=0).

Much of the exhibition centred on the historical and contemporary livelihoods that were based on fishponds that started to become established several hundred years ago. The main theme to emerge from this visit was the links between economic, cultural, biodiversity and regional identity.

Economic, cultural, biodiversity and regional identity

The area is being considered as a UNESCO World Heritage Site in part due to the significant artificial engineering that has helped shape the landscape from the Middle Ages. There is a great sense of pride in this combination of human made and natural heritage; the pond builders

are presented as cultural heroes for constructing what has become a focal point in helping to defining the culture of southern Bohemia.

There used to be 150,000 ponds in the entire Czech Republic but the fishpond areas in East Bohemia and Moravia were turned into agriculture in the late 19th century. This was due to the fact that these areas had fertile soil whilst the Southern Bohemia had sandy soil. Today there are 50,000 ponds in Southern Bohemia alone. The pond builders created all this whilst preserving the forest areas and the continuity of this landscape has significant meaning for the identity of the society.

The fish farmers in the region today are seen as cultural custodians for the whole nation. In cormorant-fisheries conflicts, it may be that this is an example of 'constructing the past in the terms of the present'. The problem is framed in "economic vs biodiversity conservation" terms but importantly, the exhibition emphasises two other things that help frame cormorant fisheries conflicts - regional identity and preserving culture - issues that we have met elsewhere in INTERCAFE and REDCAFE.

Zenich Cormorant Breeding Colony

At the end of the day the group visited the Zenich Cormorant breeding colony. There are 200 breeding pairs in the colony - the only breeding colony that has been allowed to establish in the area. The birds are protected from interference and disruption from the fish farmers, but any attempt by birds to nest elsewhere is prevented by fish farmers through disturbance before they set their nests. The breeding season means that shooting stops around mid-March.

Following on from the field trip, some INTERCAFE participants met with the Production Manager of a large fisheries company, Ladislav Strecl, who kindly gave two hours of time to discuss a variety of issues. The meeting was held at the Rybářství company office (www.e-ryby.cz). Discussions covered aspects of production and fish pond management, marketing and sale of fish, cormorant predation and compensation issues.

Interview with Ing. Ladislav Stercl of Rybářství Kardašova Řečice

by Scott Jones, Peter Musil and Andy Griffiths (14th April 2008)

Production and Fish Pond Management

The company produces 1.2 to 1.5 metric tons of fish per year, with numbers fluctuating according to different fish cohorts and fishpond characteristics. The company's ponds have different trophic dynamics and are between 400 and 600 metres altitude, with stocking density lower at the higher altitudes. Not all the fish produced are marketable; some one-year stocking fish are produced and sold to other companies. The company does not breed fish itself but has a close long-term relationship with another company that undertakes this work and supplies just one or two companies. This is a close and stable relationship built over many years with long term contracts to supply fry.

Fluctuation in output is a product of the 4-year cycle, giving ponds of different sizes and positions producing each season, and variable demand for fish of market and stock size. The company's 100+ production ponds are stocked at 200-250 kg 1-year fish per ha – exceptionally at 500 and at harvest for market; increase in fish biomass varies from 200-1300 kg/ha.

The company overwinters juvenile fish in smaller to middle-sized ponds which may be selected because of proximity to human habitation to deter cormorant predation, but the most important factors in determining the siting of fish are water availability and ease of removing juveniles to production ponds (pools within the same system are emptied lowest pool first).

The time of stocking production ponds in the spring is variable. The most important factor is water level and availability. Removal of ice cover is important, and stocking must not be unduly delayed or problems with floating vegetation (which must be removed prior to stocking) will ensue and limit fish feeding. The spring migration of cormorants occupies a shorter time 'window' than the autumn migration, but is unpredictable.

Moving large numbers of fish and managing the water is a complex process and plans are made one year ahead (organising order of ponds to be drained and emptied, trucks to transport juveniles, selecting which ponds to stock first). Migrating cormorants are only one factor to be taken into consideration.

In the longer autumn migration the ponds most vulnerable to cormorant predation (furthest from settlements and human activity) are emptied first. Ponds are drained slowly initially and fish

have to move into open water as the littoral vegetation dries out. As water levels fall and vegetation cover is lost, the fish become stressed due to increased density and water temperature, and through fleeing cormorants. Pond emptying is then speeded up to allow rapid harvest and transport.

Effluent water on drainage of the ponds for harvest or removal of juveniles can have consequences for fish downstream. Limits are set for concentrations of nutrients. These levels are independently monitored. If they are exceeded sanctions are imposed in the form of restrictions on feeding and manuring at that site.

Marketing

Rybářství Kardašova Řečice is an established company with a good reputation for a reliable product. Seventy percent of production is sold from the time it is bought in as fry on the basis of long-term agreements to provide either market or stock fish. Agreements can be made over one year in advance. Exports from the Czech Republic represent 50% of national production. The company exports 75% its own production and prefers to export fish as the market demand is more stable. Domestic consumption of Carp is 1.1 kg per person per year with a population of 10 million, but after media concern with fish welfare this dropped to 0.8 kg, a drop in consumption of 3,000 tonnes. The company is totally dependent for its revenue on sale of fish which represents 95% of its net income (market and juvenile fish).

Threats, Opportunities, Cormorant Predation and Compensation

In an analysis of the company's present position and future prospects by Mr Stercl said that long experience was the company's key strength. The high reputation enjoyed by its product had led to long term established markets; these long term relationships were expected to continue.

Cormorants were regarded as one of the top three problems going forward. They are presently managed with some shooting, scaring, and use of scarecrows. Other concerns were:

- reliance on a single product with a long production cycle (4 years for market fish) with many stages
- changes in legislation
- fluctuations in demand
- changes in price, and
- lack of government subsidy and tax benefits (e.g. relief from tax on fuel were seen as inequalities compared to other forms of agriculture).

Mr Stercl could identify no new opportunities for the company to diversify or find new markets for its products. The threat of cheaper products from China seemed to have ceased when the potential carcinogenic effects of preservatives were identified. In summary, the biggest threats identified were changes in legislation, including those relating to cormorants, its protected status and associated compensation.

Overall Mr Stercl saw fish farming as a complex enterprise and whilst it may appear easy to make a profit the relationship of income to profit was complicated and the company needs now to make a number of investments in ponds, boats, field cars and storage areas. The most recently acquired ponds (1995) and associated facilities had been in a poor state of repair and required much updating. A fish-holding facility had been upgraded with the help of a grant from the Agricultural Structural Fund but these grants were only available between 2004-6. Grants were available to upgrade fish ponds but such grants were linked to proposals that also

improved flood control, when grants from the Ministry of Agriculture of up to 67% of cost were available.

Regarding any unified plan for cormorant management, Mr Stercl felt that this was a matter for discussion. Local populations were not seen as a problem but migratory birds were, and the problem should be dealt with at source (which he identified as the breeding areas).

He recognized that no executive action was possible by INTERCAFE but he did feel that INTERCAFE had a role in generating understanding of the problem by the international community (which he hoped would lead to action).

Mr Stercl was fairly optimistic about the fish pond industry's future. If national compensation ceased, he hoped that international compensation from the EU for a pan-European problem would become available (in line with the price of fish). He expected cormorant numbers to increase slightly, and hoped they would then stabilise. He hoped that a formula could be found to compensate for secondary damage and felt that currently losses were only partly compensated, i.e. for fish consumed, but that associated secondary damage was not adequately compensated. He said that his company has established procedures to generate a good evidence base for compensation, although some NGOs felt that compensation payments were too high,

In his view indirect fish loss, mainly due to stress, had reached such levels in other parts of Europe that some fishermen could not produce a reliable supply of 1-year-old stock fish. His company already supplied 1-year stock fish to two fisheries north of Berlin, one in Belgium which in turn supplied fisheries in France – all with severe problems of cormorant predation. He was concerned that these areas had proved incapable of overcoming the cormorant problem and the same situation will probably apply also to the Czech Republic before too long.

APPENDIX 1 – AGENDA FOR MEETING IN SOUTH BOHEMIA

INTERCAFE@South Bohemia (Czechia)
April 11-13th 2008

AGENDA

"Management Practices in a complex habitat mosaic and at local, regional and national levels"

Expected arrival of INTERCAFE participants: Thursday 10/04/08
Landing at Prague airport
Transportation (approx. 2.0 hours) to Jindřichův Hradec
Shuttle buses arranged.

Thursday 10th – Buffet dinner from 19.00

DAY ONE (Friday 11th April)

07.30 Breakfast

08.30 Welcome speech by *Karel Matoušek*, Mayor of town Jindřichův Hradec,

08.45 Opening session with Dave Carss and Scott Jones. Welcome and Introduction.

Short presentations (15 minutes each)

09.15 Musil P. et al. *Cormorants on commercial fishponds in the Czechia: population development, migration, feeding ecology.*

09.30 Pokorný J. & Pechar J. *Introduction to fishpond ecology*

09.45 Adámek Z., Kortan J. *Effect of Cormorant predation on fish stock in commercial fishponds*

10.00 Discussion

10.15 Coffee break

10.45 Musil P., Ridzoň J. et al. *Changes in numbers and distribution of Great Cormorants on rivers in Czechia and Slovakia*

11.00 Čech M. et al. *Feeding ecology of Great Cormorant on river and reservoirs in the Czech Republic*

11.15 Pacovská M., Šimek M. *Fish Otter in the Czech Republic: distribution, population development, impact on fisheries, public relation*

11.30 Discussion

11.45 Boháč J. *Biological, economical and sociological tools for assessing Cormorant conflict resolution at different scales in the Czech Republic*

12.00 Ulrychová M. *Human versus Cormorants (sociological analysis)*

12.15 Šíma ., Krestová M. *Great Cormorant and national nature conservation policies.*

12.25 Pondělíček J. *Current and future status of Great Cormorant from point of view of Ministry of Agriculture (preliminary title)*

12.35 Open discussion

13.00 Lunch

14.00 Integrated working session with INTERCAFE and local experts to address the following issues:
WG1: What are the ecological issues? The cormorant and fishes-eye views. Changes in space and time and thoughts on future directions.
WG2: What are the impacts of local culling policy on cormorants and fisheries management? Has the 'intense control' of cormorants at specific places affected cormorant presence/impact in other habitats? How does this relate to INTERCAFE's experiences elsewhere?
WG3: What is the wider context in which cormorant-fisheries conflicts take place here? What are the key social, cultural, political and economic (including ecotourism) issues? What is the relationship between legislation, its interpretation, the actions taken and policy? Are there other Czech wildlife management cases that we can learn from? How does this relate to INTERCAFE's work in other countries e.g. management plans, working across different spatial scales and with different stakeholder groups or across borders (social, political, geographical, political)?

16.00 Coffee break

16.30 Integrated synthesis working session with INTERCAFE and local experts and reporting back

18.30 Plenary synthesis session with Dave Carss and Scott Jones

19.00 Dinner in Hotel

20.30 Film 'Cormorant- a protected enemy'

DAY TWO (Saturday 12th April) FIELD TRIP

08.00 Breakfast

08.30 Field trip

Visit to fishpond inside and outside of Landscape protected Area and Biosphere reserve Třeboňsko (District of Jindřichův Hradec, Region of South Bohemia). The field trip will include visits of various fishpond systems managed from Middle Ages as well as an overview of

fishpond and river habitats. We will have possibility to observe a Cormorant colony, to visit the largest Central-European fishpond Rožmberk, to talk with local stakeholders from various fishery companies and to visit fish breeding equipment and Exhibition "Třeboňsko – Landscape and People" in Třeboň. There will be a possibility to watch waterbirds as well as to obtain valuable information about the history and current status of fish production in South Bohemia. The excursion will be guided by the Administration of Třeboňsko Landscape Protected Area.
A Buffet lunch will be provided in Fishery pub "Dvůr Hamr", which represent a good example of agro- and eco-tourist activities in the area.

18.00 Arrive back at hotel

18.30 Group A: Management Committee meeting
Group B: Fieldtrip group collates field trip data

19.30 Dinner in hotel

DAY THREE (Sunday 13th April)

08.00 Breakfast

09.00 Opening session with Dave Carss and Scott Jones – terms of reference, deliverables, outputs, synthesis and time-lines.

09.30 Work Group's to discuss how their outputs will fit into the overall reporting framework.

11.00 Coffee

11.30 Work Group's report back

12.00 Normal Work Group Activities

13.00 Lunch

14.00 Work Group Activities cont.

15.30 Coffee break

16.00 Work Group Activities cont.

17.15 Plenary and Work Group feedback

18.00 Dinner at Museum (former Minority Monastery. The building was founded by the order of German Knights in the 13th century)

20.00 Subgroup meetings

Monday 14th April – Participants leave. Shuttle buses arranged.