

Wetlands International

Cormorant Research Group Bulletin

Number 5, January 2003



WETLANDS
INTERNATIONAL

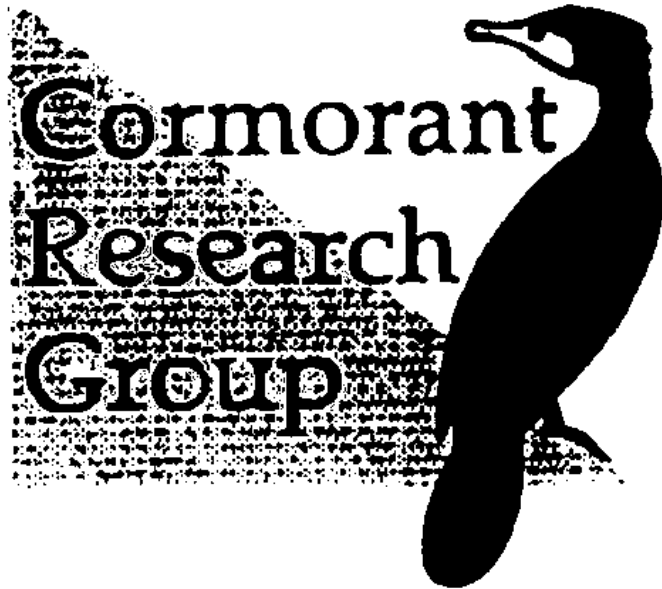
Ministry of Transport, Public Works and Water Management

Directorate-General of Public Works and Water Management

Institute for Inland Water Management and Waste Water Treatment RIZA



Wetlands International Cormorant Research Group



The Wetlands International Cormorant Research Group was officially founded at the Third European Cormorant Conference in April 1993 in Gdansk, Poland. Its main aim is to facilitate the exchange of information on both ecology and biology of the different species of cormorants worldwide and on possible conflicts between cormorants and human fisheries' interests. To achieve this goal, regular meetings and workshops are organised and, at least once a year, the Cormorant Research Group Bulletin will be published. Contributions of ornithologists as well as of fishery biologists and nature management officials to our activities are welcomed.

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Drawings: J. Gregersen

EDITORIAL AND CRG NEWS

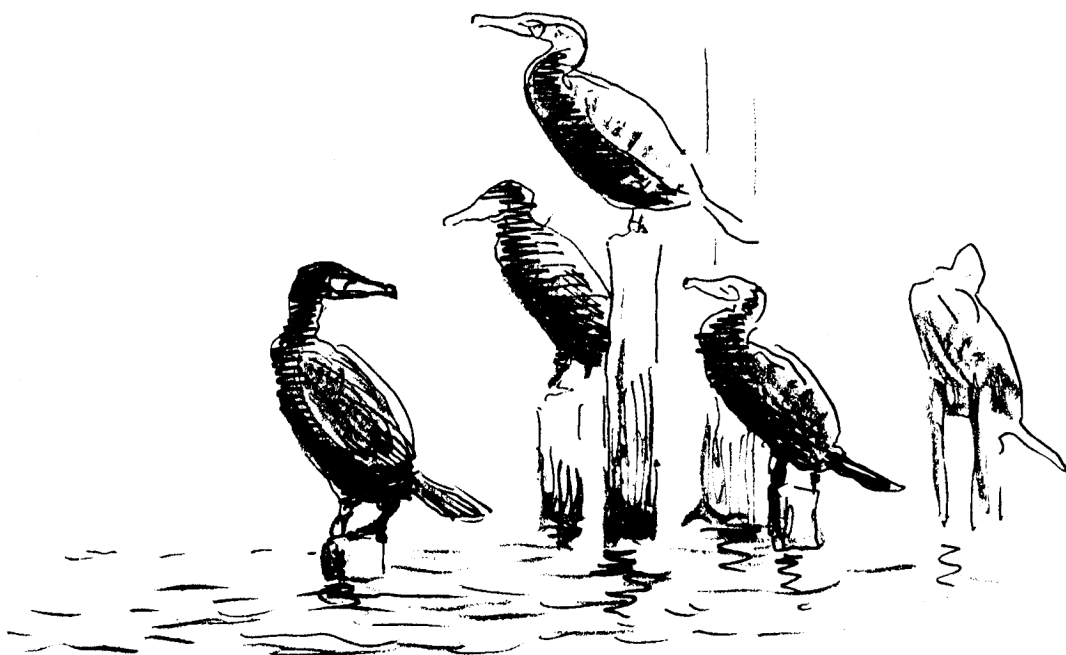
It is a pleasure for us to present hereby the fifth volume of the Wetlands International Cormorant Research Group Bulletin. From the editorial board our best wishes for the year to come! The activities of the group are mentioned below in brief:

1. The group participates in the Pan European project of REDCAFE. This is the EC - Framework V concerted action: Reducing the conflict between Cormorants And Fisheries on a pan-European scale (REDCAFE). Four work packages were defined relating to conflict definition (Hull), the ecology/damage interface (Lelystad), management tools (Horsens) and problem resolving (London). Up to some 18 countries in Europe took participation. David Carss of ITE Banchory took the inspiring lead to get the people, ideas and data together. The final reports will appear during the first half of 2003. For information contact David Carss at dnc@ceh.ac.uk who sent around 19 newsletters in order to feed the flock.
2. We encourage people actively involved in cormorant issues, either problem-related or scientifically or managerial working in the area of the Americas and Australasia to contact Mennobart: YOU COULD BE OUR REGIONAL COORDINATOR!!!
3. For information please refer to the Cormorant Research Groups website which is coordinated by Stefano Volponi from Italy. On this site you can find any update information about the group's activities, plans and ringing programmes (<http://web.tiscali.it/sv2001>)
4. We continue to publish the WI Cormorant Research Group Bulletin. Depending on activities and contributions, a number is prepared. This 5th number will be published also on the website.
5. This winter in January Cormorant roost counts are organized all over Europe and North Africa (announcement elsewhere in this volume).
6. The Freising proceedings will be produced during the first quarter of 2003. They will be a supplement of the 2002 volume of "Die Vogelwelt - Beiträge zur Vogelkunde" (Vogelwelt 123, Suppl.).
7. The next International Cormorant Research Group meeting is planned in Odessa, Ukraine in 2003. Preliminary dates are 10-14 September 2003. The organization is in hands of Dr. Rusev and Dr. Korzukov (olegk@te.net.ua) from the Odessa National University, Department of Biology.
8. We continue to manage the database which records the developments of the European breeding numbers of the Great Cormorant.

9. Mennobart van Eerden has been at the European symposium on the great Cormorant in Strasbourg, organized by the French Ministry of Environment and the Superior Council of Fishing in March 2002. Discussion included the possibilities of European wide management of the population.

We sincerely hope that this issue will be at least as readable, entertaining and worthwhile as its four predecessors and that its contents will stimulate ever more cormorant workers to make their work, or summaries of it, available to their colleagues by means of this bulletin in the following issues.

Mennobart R. van Eerden & Stef van Rijn



Pan European Cormorant Midwinter Census - JANUARY 2003

Wetlands International - Cormorant Research Group

During the 5th International Conference of the Wetlands International Cormorant Research Group held in Freising /Germany the idea of organizing and carrying out a Pan European Cormorant Midwinter census was born. The strong increase and the development of cormorant breeding colonies is well documented in many European countries but - in contrast - not enough information about the actual situation of the migrating and wintering population of Great Cormorants in Europe exists. The aim of a pan European census is to get a picture about the actual population size, migration pattern and distribution of cormorants in Europe as complete as possible. To reach that goal we would like to take advantage of the experience of people joining the existing international water bird-census-network as volunteers in many European countries. The plan is to count all cormorant night roosts (inland and sea coasts) in all European countries and North Africa in mid January 2003.

Therefore we ask for your help and cooperation!

HOW to count great cormorants in winter?

In contrast to the practice of the international water birds counts taking place during daytime – **cormorants counts have to be made by controlling roost sites in the late afternoon**. Ideally, counts should take place **at the end of the day - about two hours before dusk or at dawn**. To avoid double counts, cormorants should not be counted during daytime on their feeding grounds or on their day roosts. Cormorants are highly mobile birds used to fly over longer distances (> 40-60km) between night roosts and feeding grounds.

Numbers of cormorants counted during the daylight activity can not be used for summing up counts to get a total sum /result on a national level and finally will not give an adequate estimate for the overall European population size.

So it is necessary to organize and carry out coordinated simultaneous **night-roost counts!**

WHEN?

Counting date

Following the recommendations to collect data about waterbirds populations on an international level, we choose as counting date the 15th of January or the preceding weekend:

First (preferred) counting date :

15. January 2003

or weekend 11./12. January 2003

(alternate date: following weekend 18./19. January 2003)

Note:

Please pay attention to the fact that on adjacent locations within an area or region where shifts of cormorant flocks between roost sites may occur frequently, simultaneous counts on the same date should be coordinated on a national level to assure accurate counting results!

WHERE and HOW?

Methodology

1. Two European coordinators have been named to be responsible for contacting potential national coordinators in every country (name of coordinators and relevant list of countries see below). To build up contacts support will be given by members of Wetlands International.
2. On a national level identification of relevant roosting sites in every country is necessary (big cormorant roost sites are often well known due to research projects, official winter counts or various national reports), list of relevant roost sites with geographical coordinates should be available.
3. A national coordinator in every country is organizing a national counting team. One person for every location/roost site is needed to count cormorants being present (simultaneous counting date!).

Protocols

4. Use standard forms for counts, either European form or adapted national form for every country according to their specificity. The European Form will be distributed in advance by the European coordinators, instructions about details /notes which should be taken and written down on the form-sheets will be sent out together with counting forms.

For summing up data collected on a national level to get a Pan European census - result, the following basic information from every roost-site count is essential:

- date and hour of count
- name of observer (on specific location)
- name of national coordinator
- name of locality (plus name of department or province, geographical coordinates, position of roost sites should be indicated on a joined map of the roosts at a regional scale)
- Total number of Cormorants being present (at the end of observation time)

5. Collection, summing-up and analysis of counting results in every country should be made by the national coordinators. The total number of wintering Great Cormorants and the national map of the distribution of the roosts should be addressed to the two European coordinators, Dr. Loïc Marion for North-West Europe and Dr. Rosemarie Parz-Gollner for Central Europe, who will finally realise the European synthesis.

Dr. Loïc MARION (coordinator western Europe and Mediterranean, countries underlined, see below)

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Countries in core area:

Norway, Sweden, Finland, Denmark, Estonia, Latvia, Lithuania, Poland,
The Netherlands, Belgium, United Kingdom, Czech Republic, Slovakia,
Ireland, France, Switzerland, Italy, Spain, Germany, Austria, Hungary,
Portugal, Morocco, Algeria, Tunisia, Slovenia, Croatia, Bulgaria, Romania, Greece

Proceedings of the 5th International Conference on Cormorants, Freising, Germany, 17 - 21 December 2000

Cormorants: ecology and management

Thomas M. Keller & David N. Carss (eds.)

The production of the proceedings of the 5th International Conference on Cormorants, in Freising, Bavaria, southern Germany, is in its final stages. The publication will appear early 2003.

Ecological, behavioural and demographic studies form a major part of the approx. 50 contributions to this special issue. However, applied issues are also considered and many studies refer to management measures that have been taken with respect to the birds' interaction with fisheries. Trends in numbers and distribution, particularly of the continental race of the Great Cormorant *Phalacrocorax carbo*, continue to be an important part of our world. However, it will also be dealt with the less frequently reported *Ph. c. carbo* in the Barents Sea region and with *Ph. c. sinensis* in areas as far apart as Japan, Belarus and the Gulf of Finland. Interesting parallels between *Ph. c. sinensis* and the North American Double-crested Cormorant *Ph. auritus* show both the simultaneous developments in bird populations and human perceptions but also the different perspectives on cormorants on both sides of the Atlantic. Also included will be reports about less frequently described cormorant subspecies and species such as *Ph. c. lucidus*, the Pygmy Cormorant *Ph. pygmeus*, the Long-tailed Cormorant *Ph. africanus* and the Darter *Anhinga melanogaster rufa*.

The proceedings will be a supplement (ISBN: 3-89104-667-7) of volume 123 (2002) of the renown German journal "Die Vogelwelt" (Vogelwelt 123, Suppl.) and will be available directly through the publisher at the price of approx. 25.-- Euro. Payment by major credit cards will be possible. When ordering, please, make sure to give the following item code: 315-01034.

There will be three ways to order:

- (1) by mailing to: AULA-Verlag GmbH, Industriepark 3, D-56291 Wiebelsheim, Germany.
- (2) by email: vertrieb@aula-verlag.de
- (3) on the internet: www.humanitas-book.de

The final publication date will be announced on the web site of the Wetlands International Cormorant Research Group at: <http://web.tiscali.it/sv2001/>

Thomas M. Keller, TU-München, LG Angewandte Zoologie, Alte Akademie 16, D-85350 Freising, Germany. t.keller@lrz.tum.de

IUCN Red list release

On October 8, the 2002 Red List is released. The release is be web-based and available since 8 October. Already much media interest has been shown and you can look for mention of the 2002 Red List on BBC online, New Scientist online, and in the Globe and Mail (in Canada). Below you will find the Press Release. This release and supporting information such as a background to the IUCN Red List and examples of species appearing on the Red List, will be posted in a special 2002 Launch kit via the SSC or IUCN website. The updated 2002 Red List will be uploaded onto www.redlist.org tomorrow.

Links to the 2002 Red List will be found via www.iucn.org or <http://www.iucn.org/themes/ssc/index.htm>

IUCN Species Survival Commission (SSC) E-Bulletin - September 2002

This monthly Bulletin, as a supplement to *SPECIES*, SSC's published newsletter, is to keep staff, members and the wider IUCN network up-to-date with news and announcements from the Commission. This issue and all previous issues are available on the SSC website at:

<http://www.iucn.org/themes/ssc/whats-new.htm>

6th International Cormorant Research Group meeting Odessa, Ukraine 10-14 September 2003

We are glad to announce the sixth Wetlands International Cormorant Research Group meeting in Odessa.

Special emphasis will be given on the situation of Cormorants and fisheries in Eastern Europe and the eastern part of the Mediterranean.

Preliminary programme

10 Sept - arrival and accommodation of participants. City tour Odessa.

11 Sept - official opening of conference and several plenary papers.
Afternoon regional papers. Friendly dinner.

12 Sept - conference excursion to the Ramsar site wetland – Delta of the river Dniestr (on the Ukrainian and Moldavian border) with many Pygmy Cormorants. Social and cultural programme.

13 Sept - Papers on each species of Cormorant. Round table discussion on the Pygmy Cormorant. Prepare and adopt a resolution. Slides and video about Cormorants and other birds and Ukrainian nature

14 Sept - Departure. (For real birdwatchers we propose a post conference excursion to the Danube delta - 3 days

We intend to have abstracts of papers and posters ready at the beginning of the conference. Official language is English and Russian with translation.

Main organisers - Odessa National University named after I.I. Mechnikov,
Department of Biology

Please contact:

Dr. Anatoli Korzyukov olegk@te.net.ua

Dr. Ivan Rusev wildlife@paco.net

**CORMORANTS' THE WEBSITE OF THE WETLANDS INTERNATIONAL
CORMORANT RESEARCH GROUP TO PROMOTE THE KNOWLEDGE OF THE
ECOLOGY AND LIFE HISTORY OF PHALACROCORACIDAE**

Stefano Volponi

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Introduction

In December 2002, the *Cormorants* website will be two years old. The first idea of a website dedicated to the "cormorants' world" was born in the summer 2000. At that time I was looking for updated information on cormorant conflicts and examples on how it is possible to reduce cormorant damage at aquaculture facilities. I spent pretty much time browsing the web where I found hundreds of pages dealing with every kind of cormorant stuff. Many of them were somehow interesting and helpful, but the great majority was totally useless, being unspecific or empty of any content. Some others, quite unexpectedly, were only marginally related to *Phalacrocorax* birds referring instead to other subjects such as, for example, search and rescue helicopters, music and press houses, white wine and food brands, restaurants specialised on fish, diving and holidays resorts, telecom systems and even menopause ... Thus, the *Cormorants* website was first conceived as a personal reference area where collect useful information and documents gathered from Internet. However, working on the site construction, I realised that a website might have been much more, i.e. the ideal tool to exploit the unnumbered potentiality offered by Internet for hosting information and data, quickly informing and keeping in touch the diverse and cosmopolitan community of people interested in cormorants and related topics.

Having this in mind and following some excellent examples (e.g. the Shrew (ist's) Site, the Mammal Society and the Seaduck websites), I started to work on the *Cormorants* website whose original main goals were:

- 1) to make available a virtually unlimited and easy to update database on all kind of resources related to cormorants, such as: bibliographic references, low circulation documents and grey literature, study methods and data, research projects, meeting announcements and proceedings, pictures and movies, etc.;
- 2) to be a point of reference for professional ornithologists and birdwatchers, students and teachers, fish-managers and any other person somehow interested in cormorants' biology and ecology.

A "working in progress" version of *Cormorants* was first presented at the 2nd Meeting of the WI Cormorant Research Group, held in Freising (Germany) in December 2000. There, the website has been recognised as a powerful tool to accomplish the mission of the Group, enlarge its auditory, promote its activities, encourage collaboration and quick interactions among members. Thus, *Cormorants* was adopted as the official website of the Group.

Site organisation

The *Cormorants* website wants, first of all, to be informative and easy to navigate through. Thus, contents are regularly updated and arranged to facilitate browsing, information

retrieving and data downloading. From a graphical point of view the structure is rather unsophisticated, but maintained as simple and constant as possible in the different sections. Automatic pop-up, dynamic events and other special effects are almost absent, and used only when they results functional to the content presentation.

At present, the website consist of 220 html files, 40 pdf documents and about 400 pictures (gif and jpg imagines) for a total of 16.8 Mbyte. Website contents is organised in ten sections (e.g. the Cormorant Group and its Bulletin, the colour-ringing projects, literature citations, a directory of cormorant people, species accounts, etc.) each incorporating sub-sections (e.g. taxonomy and classification) or direct links to single pages (e.g. vocalisations, papers published in the Bulletin). A link in the homepage allows the surfer to join the cormorant e-list and send automatic messages to all the list members.

Some statistics

Since the publication on the world web wide, several website statistics have been recorded. This has allowed to keep constantly monitored the number and frequency of website access, the most visited pages, the geographical origin of visitors, the referring URLs and search engines. Overall, in the 24 months period from December 2002 to November 2002, *Cormorants* has been accessed by 17,329 visitors who have viewed more than 56,000 pages (the latter figure is a minimum estimate because only a small number of the pages available in the site are monitored). In the last 3 months period, daily access averaged 47 (DS 2.1) visitors and 142 (DS 16) visited pages.

Most visited sections were respectively those on scientific literature (24% of the overall contacts), which includes all papers published in this Bulletin and meeting proceedings, and on colour-ringing (22.1%), which list all known projects in and outside Europe. The most visited single pages was, rather surprisingly, that on the now extinct Spectacled cormorant (*P. perspicillatus*) (6.2%) followed by those reporting techniques for diet assessment and egg-shell thickness measurements, food intake and prey selection, population estimates (about 2% each).

In the two years period, either the numbers of visitors and viewed pages have steadily risen showing a similar trend and a regular monthly pattern along the year (Fig. 1). Website numbers showed the tendency to increase from autumn to early spring, then to decrease or remain stable during the summer. Curiously, this pattern seems to follow the cormorant annual cycle and the seasonal changes of distribution and intensity of cormorant-human conflicts. Website high numbers correspond to migratory movements and the early wintering phase (when cormorants disperse over their range and become easier to be seen), while low numbers were recorded during late spring and summer, i.e. the nesting period, when cormorants concentrated in the close range of the breeding colonies. This is, however, also the period people spend more time in the field than connected to Internet or they are on holidays...

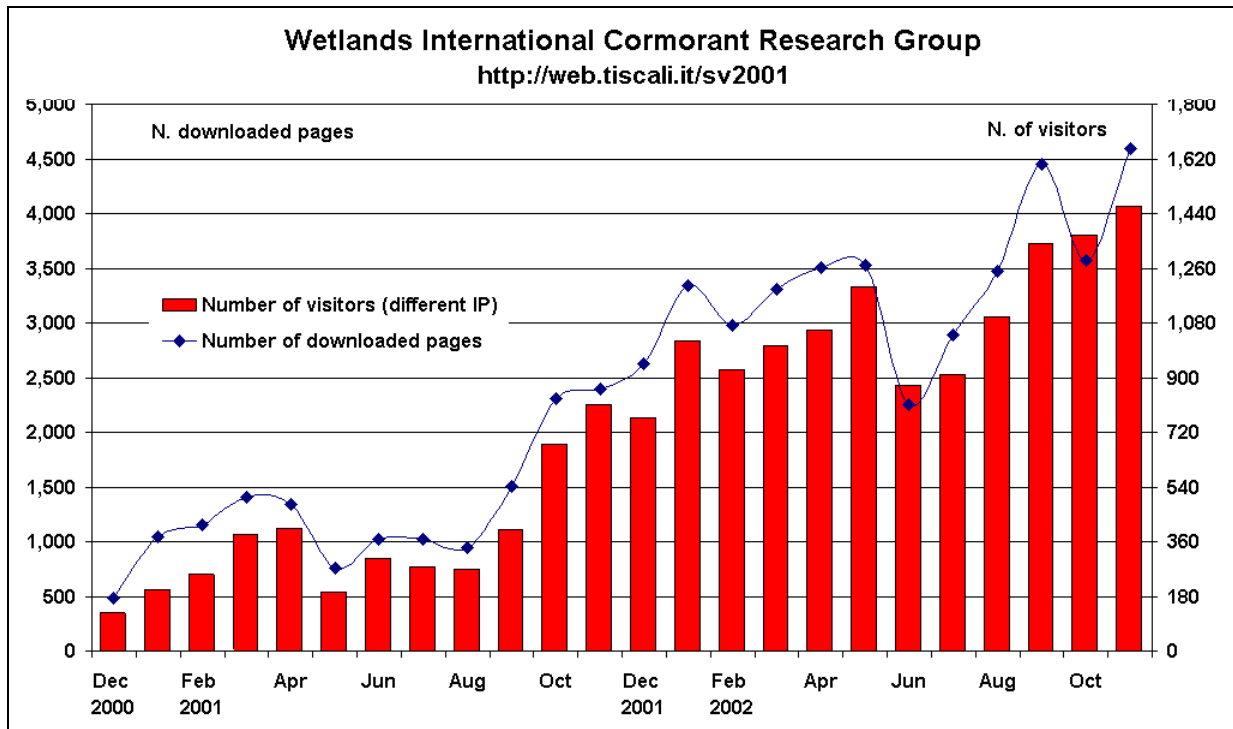


Figure 1. Trend of the number of visited pages and visitors recorded in the period December 2000 to November 2002.

According to their Internet Service Provider, *Cormorants* visitors originated from at least 82 countries distributed all over the continents (Fig. 2). Visits were recorded from the whole North America and Europe, 11 countries in Central and South America, six in Africa and Middle-East, 17 in Asia and far-East. Frequency and intensity of visitors from different countries seem to reflect the content composition of the site and the interest inside the Research Group (which are still skewed towards *P. auritus* and the three European species), as well as the geographical distribution of people involved in cormorant studies or conflicts (Table 1). Unknown, but certainly not negligible, is also the effect of computer distribution and availability of Internet connections.

How visitor get on the site

World wide access to *Cormorants* has been greatly facilitated by the subscription to the most important Internet directories and search engines (e.g. Google, MSN Search, Searchlot, Yahoo!), and by the growing number of links provided by governmental agencies (e.g. U.S. Fish & Wildlife Service), environmental NGOs (Centro Italiano Studi Ornitologici; Ligue Protection Oiseaux Anjou; Schweizerischer Fischerei-Verband; Wetlands International), birdwatching and ornithological societies (Aves Société Ornithologique; Dirk Raes colour-ringing birding; Grupo Ibérico Anillamiento, Staatlichen Vogelschutzwarte Hamburg) and even personal homepages. Search engines and referring URLs work in a complementary way to attract people attention and improve public awareness of the Research Group and its activities. Typing keywords such as "cormorant(s)" and "Wetlands International", alone or even better in combination with "research group", "colour-ringing" or "scientific literature", shows the *Cormorants* in the first rank positions and provides direct links to the homepage or one of the website sections.

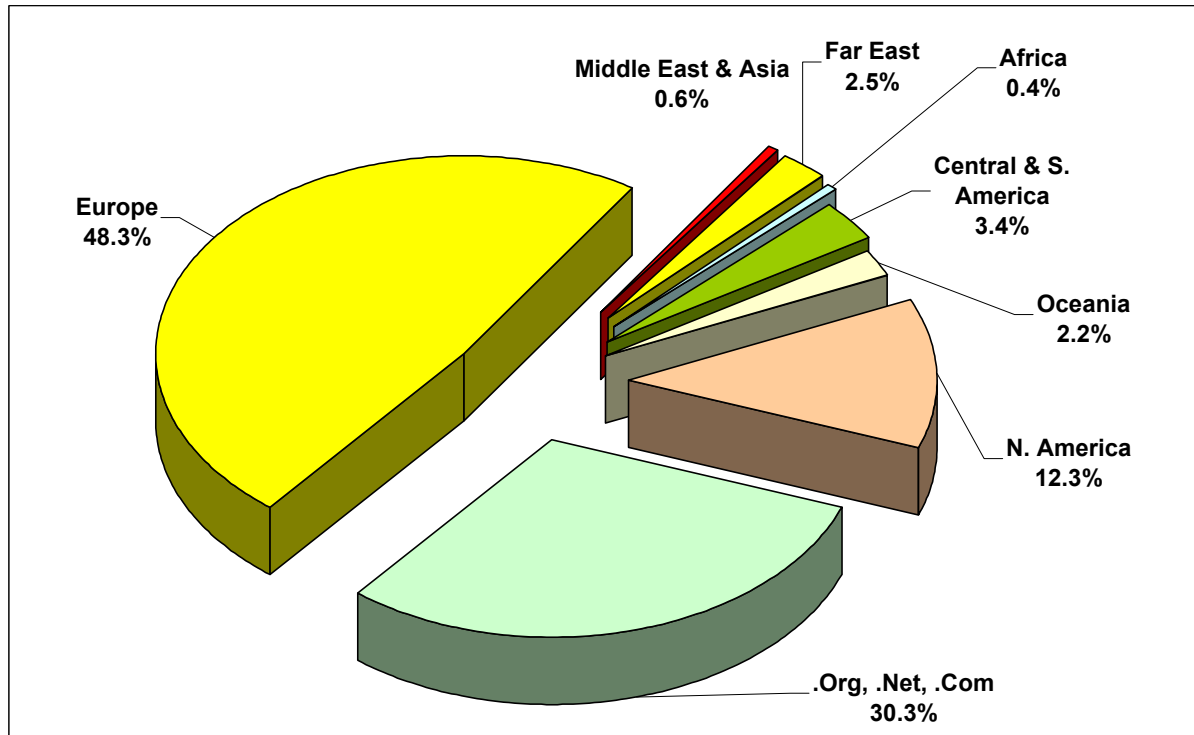


Figure 2. Percentage of visited pages per origin of the Internet Service Providers (N = 42,781)

Who are the visitors

Such a large range of potential access to the website means that it is difficult to answer what exactly is the *Cormorants* audience and what visitors are looking for. However, some information can be inferred analysing the keywords submitted to the search engines, the list of referring URLs, the rank of most visited pages, the daily visitor averages and, finally, the requests for information forwarded to the webmaster.

The outcome of this analysis was indeed quite vague but likely very close to the reality. Thus, the website is more visited on working days than in the weekend (average 16.2% vs. 7.9%) by a wide range of people which encompass academic and professional ecologists, bird-ringers and birdwatchers, anglers and fish-farmers, producers of bird-nets and audio-visual deterrents, film makers, students from primary school to post-doctoral courses and, last but not least, general public. Many of them are frequent visitors which regularly browse the website looking for specific information and data, or just to find answers to only apparently naive questions, such as: "how much fish a cormorant eats every day", "what cormorant species live in the Catalina area", or "why they spend so much time spreading their wings"...

Table 1 Country of visitor origin ranked according to the number of viewed pages recorded from December 2000 to November 2002 (N = 42,781). Only countries accounting at least 1% of the total number of viewed pages were reported. Internet Service Providers from an unknown geographic origin (e.g. .Org, .Net, .Com) were not considered.

Rank	Country	N. visited pages	% visited pages
1	United Kingdom	3,897	9.1
2	USA	3,416	8.0
3	Italy	2,867	6.7
4	France	2,641	6.2
5	Spain	2,064	4.8
6	Canada	1,827	4.3
7	Netherlands	1,414	3.3
8	Belgium	1,077	2.5
9	Brasil	1,013	2.4
10	Germany	983	2.3
11	Japan	845	2.0
12	Australia	686	1.6
13	Estonia	672	1.6
14	Poland	630	1.5
15	Denmark	616	1.4
16	Switzerland	572	1.3
17	Greece	453	1.1

Conclusion

In the very last years, Internet has shown a dramatic development. Thanks to its world wide diffusion, faster and cheaper connections, Internet has created new and not yet completely exploited opportunities for communication and knowledge sharing among people.

Following this new era, *Cormorants* has accomplished the Research Group mission providing easy and free access to documents and updated information as well as allowing fast interaction among cormorants' people.

This has risen new opportunities to the Research Group, which may not only serve for expertise "on demand", but also promote research and projects taking advantage of co-operation among a large number of widely distributed members. Some examples of the role the website may play (advertisement, form distribution, diffusion of results, etc.) are the ongoing projects on the distribution of *P. carbo* and *P. pygmeus* colonies in Europe, and the first international census of Great cormorants wintering in Europe and North Africa scheduled for January 2003.

The new Group activities and the positive feedback received from many people certainly represent a stimulus to improve and further develop the *Cormorants* website.

Acknowledgement.

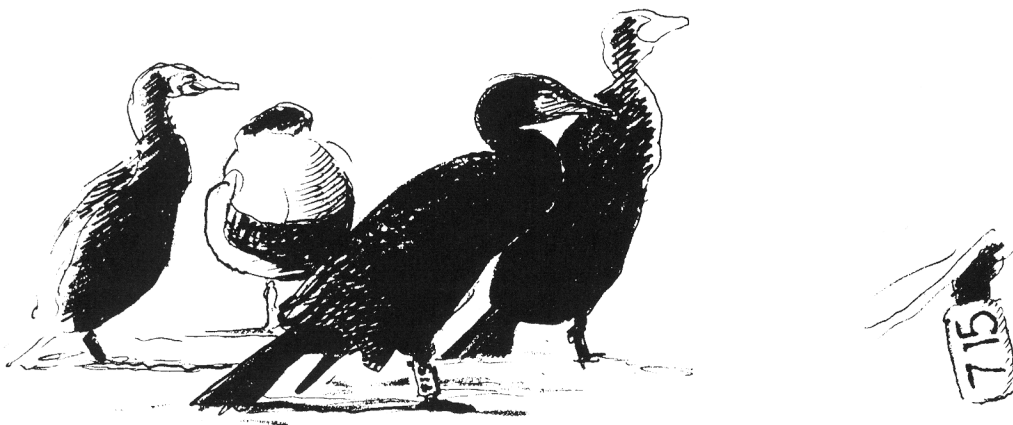
The project of the *Cormorants* website has not received any financial or logistic support and is entirely unfunded. Web hosting has been provided for free by Tiscali.it, site statistics by WebSTAT.com and Nedstat.com, the cormorant e-list by Yahoo.com. Webmastering is carried out by the author on a voluntary basis and thanks to colleagues and web surfers who generously supply with materials, information and suggestions.

¹ The Internet address of *Cormorants* is: <http://web.tiscali.it/sv2001>

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SOCIAL CAUSES OF THE CORMORANT REVIVAL IN THE NETHERLANDS

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Abstract

In the 1960's, the cormorants had nearly become extinct in the Netherlands. After becoming a protected bird species in 1965, the cormorant population recovered very fast and it reached numbers it had not reached for a long time. The great revival of the cormorant population in the Netherlands can only be explained in the light of a change in human behaviour. This article explains the human background to the change of cormorant numbers. The conclusion is that this change is the result of a changed perception of three social groups. Social learning and a shift in the wider context of the discussion altered the perception.

Keywords

cormorants, institutions, multiple perspectives, *Phalacrocorax carbo sinensis*, the Netherlands, social learning.

Introduction

The degradation and loss of biological diversity has never occurred so rapidly as in the past century and is threatening the very basis of human existence. Today's mass extinctions can be compared to mass extinctions in the geological past, in which tens of thousands of species died out following some massive, unknown catastrophe, possibly a collision with an asteroid (Primack, 1993). Extinction had nearly become the fate of cormorants in Europe too. The cormorants are fish-eating birds and are therefore believed to be harmful to the fisheries (Van Eerden and Van Rijn 1997). In 1965, the Netherlands was home to some of the last remaining birds and breeding sites. To prevent their extinction, the Dutch started to protect the cormorants and this helped them to recover very fast from their severe prosecution. Surprisingly, nowadays the cormorants are present in unexpectedly large numbers in the Netherlands. The population even seems to have reached its ecological limits of around

¹ Corresponding author.

20.000 breeding pairs in summer (Veldkamp 1996). It is even more remarkable that the cormorant is still a protected bird species despite its fish-eating habits and their large population size.

This study looks at the change that has accompanied the shift from near extinction to the present abundance. The past has proved that the Netherlands can only be home to the cormorant when the Dutch allow it to be there. The change in the cormorant population therefore means that the Dutch society must have changed. The objective of this study is to explain how the Dutch perception and behaviour changed for the cormorants to be able to return and stay in such large numbers in the Netherlands. The concept of social learning is applied to explain and understand this change. The results are presented in the form of an overview of important events that influenced the development of the cormorant discussion.

The Great Cormorant “*Phalacrocorax carbo sinensis*”

As long as eutrophic water bodies in Europe sustain (relatively) large fish populations, cormorants will remain a potential eye-catching element in aquatic ecosystems. In many places with a (temporally) highly attainable fish stock, depredation on this resource will either occur during summertime (breeding areas) or during wintertime. Cormorants are migratory birds and in winter cormorants are distributed over a vast territory in Europe and North Africa (Van Eerden and Van Rijn 1997). Three areas of wintering can be distinguished:

- Northern Europe: the Netherlands, Belgium, northern Germany and northern France.
- Central Europe: central and southern France, southern Germany, Switzerland and Austria.
- The Mediterranean (southern part of Europe): Italy, Spain, Portugal and northern Africa.

Due to the migratory habit of the species, numbers visiting the small-scale waters may not be adjusted to the “longer term” carrying capacity. During a few days of migration only, large numbers of birds may exceed the carrying capacity. This for example happens to sub-alpine rivers and streams where relatively few birds settle in mild winters as the feeding conditions in the slow-flowing main river are better. As soon as these river stretches are frozen, birds go for the smaller streams that are still open (Van Eerden and Van Rijn 1997).

Transition to an alternative paradigm

Ecological processes determine the potential cormorant population but social processes play a large role in determining the actual cormorant population. Ecological systems function within the subjective boundaries set by men. The realist positivist paradigm, in which reality is thought to be independent of the human observer, is not sufficient anymore when the boundaries set by men are ambiguous. A problem situation can occur in which different parties disagree on the definition of these boundaries (Pretty 1995, Pimbert and Pretty 1995). This is often the case in nature conservation because ecosystems carry a high level of intrinsic uncertainty. The functioning of nature and ecosystems is not easily captured by a set of time and context-free generalisations. Even a few simple processes operating on different scales can impose a distinct variety of characteristics in space and time on the ecosystem (Holling 1995). When dealing with these uncertainties, people will have different views and opinions on reality. Studying change in an uncertain, problematic situation calls for a different approach to nature conservation than realist positivism provides.

Realist positivism is not the only way in which our world can be described. An alternative way of looking at reality is constructionism. Constructionism implies that there are more perspectives and not just one objective truth. Through their interaction, people come to agree about concepts, objectives, acceptable behaviour and the meaning of events and phenomena.

This is how they construct a reality that allows them to operate more or less effectively in their environment (Röling and Wagemakers 1998). Nevertheless, constructionism does not necessarily mean relativism because not every perspective is equally useful. There is an environment and people have to survive in this environment. To survive, they construct 'adaptive knowledge' and they act upon that knowledge. (Maarleveld *et al.* 1997). Management of uncertain systems becomes a learning process in which communication and negotiation are central issues.

Following a constructionist paradigm, the change over time in the cormorant discussion needs to be understood in terms of a change in competing values, beliefs and perceptions of those that are involved in it. This means that the change in the cormorant discussion is a learning process in which various stakeholders with multiple perspectives learn to resolve conflicts and take action. This kind of learning is called 'social learning' (Röling and Jiggins 1998, Parson and Clark 1995, Pretty 1995). Social learning can be a potential force for change. The change emerges as actors 'change their minds' through interaction and dialogue with others (Woodhill and Röling 1998). Social learning is not an exclusive or elite task for 'scientists', 'experts' or 'intellectuals'. It is not a question of specialists 'discovering' the answers. It is a widely shared learning of actors about themselves being an indissoluble element in the cormorant discussion (Röling and Maarleveld 1999, Pretty *et al.* 1995).

Methods and Techniques

There is a methodology that takes a group of people through a number of 'steps' of the social learning process. This is the RAAKS (Rapid or Relaxed Appraisal of Agricultural Knowledge Systems) methodology (Engel and Salomon 1997). RAAKS was designed to help people with diverse interests to begin to work and learn together. It allows actors to design strategies to improve their current situation and take the action. At the core of RAAKS lie the appreciations (the perceptions, pre-occupations, judgments and understanding) of the principal stakeholders. The RAAKS approach helps to make these appreciations explicit as the actors go through the learning process (Salomon and Engel 1997). Instead of actively taking actors through such a learning process, in this study RAAKS was used to develop an understanding about the social learning process the stakeholders had already gone through in the cormorant discussion.

Different techniques were used to collect information about the context, the past and the present of the cormorant discussion:

1. Scientific literature research (secondary information);
2. 'Unscientific-literature' research (secondary information);
3. Interviews (primary information).

The 'unscientific-literature' research was the research of newspapers and magazines that reflected the views of the various stakeholders. Old volumes of newspapers, fisheries magazines, nature conservation magazines and anglers magazines were consulted in the Royal Library in the Hague. All magazines in the period of 1975 till 1999 were checked on articles on cormorants or cormorant damage. These articles were copied. The year of 1975 was chosen as a start because from the late 1970's onwards the cormorant population had recovered sufficiently to be able to lead to complaints again. In total this research resulted in over 100 articles.

The results of this literature research were cross-checked by interviewing 13 relevant stakeholders. These interviews also gave an indication which aspects of the discussion were perceived to be influential on the course of the discussion. The questions and topics of the interviews were based on the outcome of the literature research and guided by the 'windows and tools' of the RAAKS method (Salomon and Engel 1997). The organisations and groups

were chosen from different organisational levels (e.g. Ministry, Product Board of Fisheries, Fishermen's Union and individual fishermen). Those organisations, groups or people were interviewed that were thought to be involved mostly in the cormorant discussion, based on the 'unscientific-literature' research and the snowball method (recommendations by actors already interviewed).

Results

Over centuries time and again the cormorants have had to deal with habitat loss and persecution in the Netherlands (Marteijn and Dirksen 1991). The situation really became alarming during the late 1950's when there were only 3 breeding colonies left in the Netherlands. These colonies were strictly controlled in accordance with the Fisheries Inspection. (Van der Helm, 1994). To prevent their extinction, the cormorants were assigned the status of a protected bird species in 1966. Protection of breeding sites and the ban on a number of persistent pesticides in the late 1960's and early 1970's made a recovery possible (Veldkamp 1997). At first this recovery was quite slow but at the end of the 1970's the cormorants were definitely back in Holland a.o. Marteijn and Dirksen 1991.

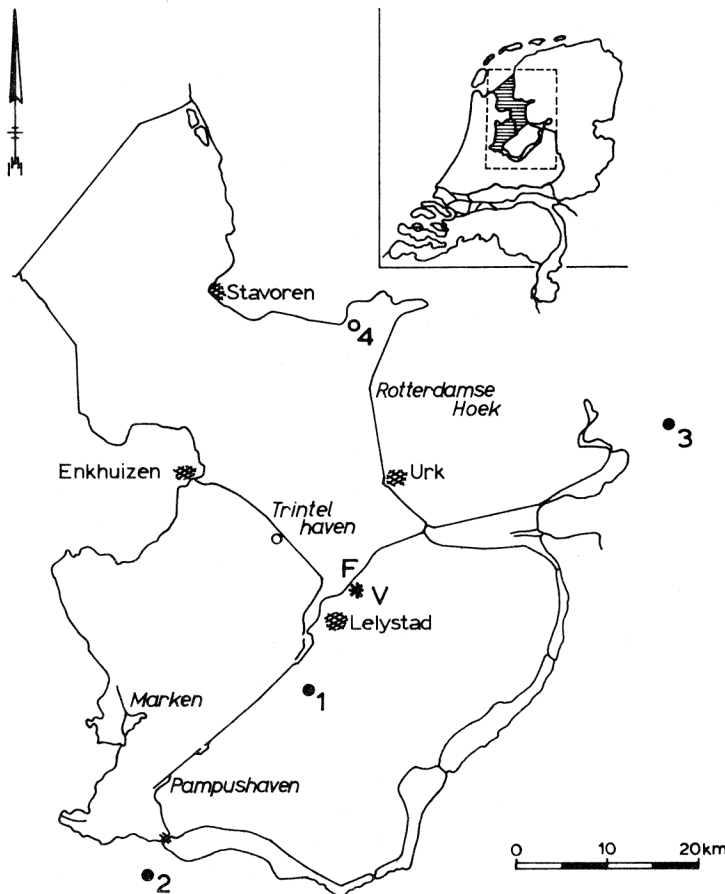


Figure 1. Situation fish farm Lelystad (V), colonies (1-3), gathering site (4)

In 1978 the cormorants settled in the Oostvaardersplassen (a protected area which developed on a planned industrial area) only 10 kilometres from West Europe's largest fish farm (see Figure 1). The cormorants started feeding on the ponds of the fish-farm (Osieck 1982, Moerbeek 1983). The owner of the fish-farm, the Organization for the Improvement of Inland

Fisheries, wanted to be compensated by the Dutch government for the damage caused by the cormorants (Buissink 2000).

After 9 years of legal actions, in 1991 the court decided that their complaints were legitimate. The government had to pay the compensation not only because it owned the nearby protected area but also because it actively encouraged the settlement of cormorants by providing artificial nesting sites in this area (Jongkind 1991). Although the outcome softened the grief, it was too late to save the fish farm in Lelystad. This fish farm had to close down due to the cormorant damage. A new fish farm was opened in Valkenswaard in the South of the Netherlands, far away from the cormorants.

In the 1990's the nature of the cormorant discussion changed. It was characterized by the concerns of the commercial fishermen and by the research on the feeding habits of cormorants. When the decreasing fish yield in Lake IJsselmeer became evident, the cormorant discussion started again.

In order to fight over-exploitation, the commercial fishermen had to reduce their fishing efforts with 50% in 1989 (Jongkind, 1991). This was when they became concerned about the growth of the cormorant population. The Lake IJsselmeer fishermen navigated the lake every day and they saw the large number of cormorants and the amount of fish that these birds ate. This did not seem fair. The commercial fishermen took their complaint to the Ministry of Agriculture, Nature Conservation and Fisheries (Visserijnieuws 1993). The Ministry wanted to have more information about the perceived problem and asked the National Reference Centre for Nature Management to investigate the impact of the cormorants on the commercial fisheries. The National Reference Centre for Nature Management established a working group to which important stakeholders were invited. The working group aimed at estimating the possible effect of fish depredation by cormorants on the commercial fisheries but refrained from qualifying this effect in terms of damage (Van Dam *et al.* 1995). Their goal was to collect information on the relation between commercial fisheries and the cormorants and to explore the current situation. The conclusions of the working group in 1995 were that the main diet of the cormorant on Lake IJsselmeer in the summer consists of perch (24%), smelt (21%), ruffe (25%) and roach (18%), pike-perch (6.2%) and eel (0.5%). The fishermen mainly catch eel, perch and pike-perch. According to the team, the cormorants and the fyke-net fisheries together withdraw 96% of the biomass of small perch (Dekker 1997). As a consequence of the consumption of perch by cormorants, the commercial catch of perch is likely to be several times less than it could have been. Due to the by-catch in fyke-net fisheries the commercial catch of perch is likely to have been reduced to the same extent (Van Dam *et al.* 1995).

After this research, the commercial fishermen have not been able to get enough support for their complaints to enforce restrictive measures on the cormorant population. It had now become very difficult for them to convincingly ground their arguments.

The 1990's have been turbulent times for the anglers as well, but their approach to the cormorant discussion is quite different from the approach of the commercial fishermen. The anglers have never joined in the public discussion between the fishermen and the conservationists. This does not mean that anglers do not experience any problems. Locally, they do face difficulties caused by cormorant depredation, but they do not see the cormorants as a national problem. The Dutch Anglers association accepts the cormorant as a part of the natural ecosystem. They want to solve this problem by adapting the vulnerable angling-waters. They want the waters to become ecologically healthy with enough hideouts for the fish. They expect that the cormorants will then move on to the larger waters, because the fishing effort will become too high on the small waters. Recently the Dutch Anglers Association, the Association for the Protection of Birds, and the Organisation for the Improvement of Inland Fisheries started working together on this solution. They are investigating the influence of the cormorants on angling activities and they are working on possible ecological measures to solve the local problems.

Despite all the difficulties, the cormorant remains a protected bird species in the Netherlands. The government does not want to change this status because there is insufficient support among the Dutch society for active control through hunting or disturbing the nests, besides legislative restrictions to do so.

Since 1965 the influence of the fisheries sector has decreased whereas the support for nature conservation has increased. This has weakened the position of the fisheries sector. On the other hand, the number of members of nature conservation organisations has increased over time and this has strengthened their position (four million members 2002). The increasing cormorant number cannot be the direct cause of decrease in contribution of the fisheries sector to the Dutch economy as the absolute net income of the fisheries sector has increased over time.

Discussion and Conclusions

The social learning process that the actors have gone through after the revival of the cormorant population in the Netherlands can explain the change in the cormorant discussion. In relation to social learning, two important processes in the 1990's can be distinguished. The first and most important process was social learning in relation to the commercial fisheries. The second process was social learning in relation to the angling.

Cormorants, commercial fisheries and social learning

This first process started in the beginning of the 1990's when National Reference Centre for Nature Management was asked to investigate the situation of the cormorants in relation to the commercial fisheries by the Ministry of Agriculture, Nature Conservation and Fisheries. The outcome of this investigation was a shared view of the participating actors on the diet of the cormorant and their effect on commercial fisheries. For an overview of all participating actors see table 1. This shared view would have a great impact on the course that the discussion was to take in the next few years.

Table 1. Parties represented in the working group on Cormorants and fisheries

Research	Policy	Fisheries sector	Anglers	Nature conservationists
OVB RIZA RIVO IBN IKCN	Ministry of Transport, Public works and Water Management / Directorate IJsselmeergebied Ministry of Agriculture Nature Conservation and Fisheries / Fisheries Directorate	Product board for Fish	NVVS	Natuurmonumenten Vogelbescherming Nederland

After the research of the working group, the focus of the discussion shifted to the cormorant as one of the possible causes of the decreasing fish yield. The discussion started to centre on the decreasing fish yield instead of focussing on the diet of the cormorant. This meant that the cormorant discussion had now become part of the broader ‘fisheries’ discussion. All actors were now concerned with the decline of the fish stock in Lake IJsselmeer. Nevertheless, the stakeholders perceived the causes of this low fish stock differently. The fishermen felt that the cormorant was an important determining factor, but the nature conservationists interpreted this as a scapegoat mechanism (the cormorant as the scapegoat). Although both groups referred to the results of the research in 1995, they interpreted the results differently. The nature conservationists concluded that the cormorant forages mainly on non-commercial fish species. They argue that cormorants do have some influence on the biomass of perch, but that this is only to be expected in a heavily disturbed, highly overexploited estuary system like Lake IJsselmeer. The commercial fishermen, on the other hand, concluded that although there was some over-exploitation, the cormorants intensified this by adding extra strain to the system. According to them the cormorants put the fishermen in a sub-optimal position and are therefore an important cause of the over-exploitation in Lake IJsselmeer.

The different actors may interpret the results of the research in different ways, but the working group has nevertheless shifted the way in which the actors define the problem. The direct attention is now away from the cormorants and on the diminishing fish-stock.

Cormorants, angling and social learning

The second process (perhaps a bit less conspicuous) that explains the change in the cormorant discussion is the teamwork on cormorants and angling. In the beginning of 1998, nature conservationists, the Dutch Anglers Association and a research institute together started a project on cormorant damage in angling. As opposed to the commercial fishermen, the Dutch Anglers Association accepts the cormorants as a natural part of the ecosystem. They acknowledge that cormorants can be a local problem, but not a national problem. This project looks at the management of fish and the quality of the aquatic environment. Its tries to strike an ecological balance to prevent cormorant damage, without having to persecute the birds violently. Instead of opposing each other, the nature conservationists and the anglers are working together towards a solution.

Shift in the perception of the Dutch society

The social learning processes in relation to angling and especially in relation to the commercial fisheries are important explanations for the change in the cormorant discussion. Nevertheless there is a third, more general, process that also influenced the cormorant discussion. This third process is a shift over time in the power balance between the nature conservationists and the fishermen. In the 1950's the three cormorant colonies that were left in the Netherlands, were strictly controlled in accordance with the Fisheries Inspection. At that time, the fisheries sector was perceived to be a very important contributor to the Dutch economy. Nowadays, this is not the case anymore. Presently, it is not likely that the Fisheries Inspection would tell the nature conservationists to control the number of cormorants in their preserved areas. The nature conservationists have gained quite some support over the years. The strengthened position of nature conservationists and the weakened position of the fisheries sector have influenced the shift in perception of the Dutch with regard to the cormorants and this influenced the cormorant management. This reasoning cannot be turned around. The position of the fisheries sector weakened but the increase in cormorants cannot have been the cause of this. The cormorant is still a protected bird species (although it is present in large numbers) because the Dutch population as a whole does not support interference in the cormorant population.

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QUALITATIVE AND QUANTITATIVE ESTIMATION OF THE GREAT CORMORANT *PHALACROCORAX CARBO* DIET

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Introduction

In France, the winter population of the great cormorant *Phalacrocorax carbo* reached about 4,000 birds along the sea coasts in 1970. Lebreton and Gerdeaux (1996) observed an exponential growth in numbers during 20 years, up to a mean of 70,000 birds (out of a total of 300,000 in January). Moreover, 55 % of the total population gather near lakes or large rivers. It can be recalled that :

- Cormorants usually eat twice a day (Im and Hafner, 1984).
- The cormorant is an opportunist predator, catching the most vulnerable prey, not necessarily the most abundant (Im and Hafner, *loc. cit.* ; Martucci and Consiglio, 1991; Zanu-Kratky and Mann, 1995). Birds often feed on schooling species (Pedroli and Zang, 1995, *in* Mathieu, 1997).
- The undigested parts of the eaten prey are rejected in pellets. It seems that only one pellet is regurgitated a day (Zijlstra and Van Eerden, 1995, *in* Mathieu, 1997).

Key words : Predation ; great cormorant ; rivers ; France.

Study methods

Diet composition can be studied by pellet dissection or by analysis of stomach content. This last method allows an easier recognition of the prey (species and length) but birds have to be killed. This method is rarely used.

121 pellets from 3 large rivers (Moselle, Allier, Loire) were sampled during spring 1997 (Fig. 1) by the French "Conseil Supérieur de la Pêche". All identified structures were sorted: Otoliths (sagittae), vertebrae, maxillae, opercula bones, cleithra, scales, and for cyprinids pharyngeal teeth and chewing pads. Identification was carried out by determination keys (Spillmann, 1961 ; Wheeler, 1978 ; Brylinski, 1986 ; Libois *et al.*, 1987 and 1988). Prey length is estimated after dissection of fishes of different lengths and measurement of specific structures.



Figure 1 : Sampling areas

1. Moselle
2. Loire
3. Allier

Results

Technical adjustment

The most useful structures for identifying the prey were for cyprinids the chewing pad and the pharyngeal teeth. Scales (and also vertebrae) were used for age determination.

Otoliths were used for perch *Perca fluviatilis* and pike *Esox lucius*. Opercula bone examination (Lecren, 1974) was also used for age determination of perch.

There is a good correlation between fish length and the length of some structures for most species : chewing pad for roach *Rutilus rutilus* (Veldkamp, 1995), rudd *Scardinius erythrophthalmus* and chub *Leuciscus cephalus* (Le Louarn, 1998), pharyngeal teeth for chub (Neophitou, 1988), roach and rudd (Le Louarn, 1998), otolith for perch (Doornbos, in Mathieu, 1977). For bleak *Alburnus alburnus*, the abacus method of Petrova and Zivkov (1989) was used. Weight can then be estimated by length-weight relationships, which are well known for the most common species.

Qualitative results

738 fishes from 14 species were determined¹ (Table I). 121 pellets were analysed, which is probably sufficient for a correct estimation of the diet composition: Paillard (1985) used 48 pellets to show the major eaten species. In all pellets from the 3 rivers, roach represented 68 % of the prey. Predation mainly concerned fishes from 80 to 150 mm length (fork length), one year or two years old. The same pattern was observed for rudd (4 % of the prey). The second

most abundant prey was perch (8 %) with fishes from medium length, 100 to 150 mm. Chub was the third prey in abundance (6 %), length varying between 110 and 160 mm, one or two years old.

Table 1. Prey determination

Species	river/number			N	%
	Loire	Allier	Moselle		
Roach <i>Rutilus rutilus</i>	279	144	83	506	68
Rudd <i>Scardinius erythrophthalmus</i>	18	15		33	6
Chub <i>Leuciscus cephalus</i>	10	28	8	46	4
Carp <i>Cyprinus carpio</i>	11	1		12	
Dace <i>Leuciscus leuciscus</i>	1	5		6	
Bream <i>Abramis brama</i>		6		6	
Silver bream <i>Blicca björkna</i>	9	1		10	
Barbel <i>Barbus barbus</i>	3	7	1	11	
Bleak <i>Alburnus alburnus</i>	5	10		15	
Schneider <i>Alburnoïdes bipunctatus</i>	2	6		8	
Nase <i>Chondrostoma nasus</i>	3	7	4	14	
Perch <i>Perca fluviatilis</i>	19	13	27	59	8
Pike <i>Esox lucius</i>	1	5	5	11	
Catfish <i>Ictalurus melas</i>	1			1	
Total number	362	248	128	738	
Unidentified cyprinids	4	4	1	9	

¹Study carried out by a CSP (High Fisheries Council) INRA (Agronomical Research Institute) agreement

Quantitative results

Daily food intake was estimated by a precise study of 65 pellets. Most of the time, the weight ranged from 100 to 300 g. The average weighed 280 g, but some "meals" could reach 440 to 540 g, and 600 to 700 g. Comparison of these values with pellet volume calculated from their 2 largest dimensions did not show any clear relationship. One can think that :

- Small pellets come from an unusual meal (like the second daily pellet of the nocturnal birds of prey).
- Medium sized pellets with bones derived from big fishes can result from a partial consumption of the prey.

Discussion

Total predation can be estimated when the number of cormorants and the duration of the fishing period are known. For example, the 400 individuals present on the River Allier can eat 75,000 fishes a month (about 4,000 perch and 58,000 cyprinids from the most current species). However, without an estimation of home ranges of the cormorant, river production (and possible changes in food habits), impact of predation cannot be assessed. In this study, most of the prey eaten were juveniles of common species : roach (and rudd), chub. So, future production could be modified. Suter (1991) however, notes that in Switzerland, predation by great cormorants does not exceed in most cases the compensatory mortality threshold, and does not disturb the population dynamic of the prey.

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CORMORANTS IN THE IJSSELMEER AREA: COMPETITOR OR INDICATOR?

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Introduction

Cormorants are highly dependent of the turbidity of their feeding grounds for fishing. They fish preferably in water with intermediate turbidity. In very turbid water the visibility is limiting prey detection and as a result the birds do not hunt optimally. In clear waters, fish can probably easier escape.

Keywords: overfishing, under water climate, water quality, indicator

Results

In the turbid water of the Markermeer system Cormorants feed mainly on Ruffe *Gymnocephalus cernuus*. The diet of Cormorants which feed on Markermeer is comparable with the diet of birds in the lake Veluwemeer, situated between the reclaimed area and the mainland in the end of the eighties/beginning nineties. In this period the turbidity on this lake was very much alike the situation on Markermeer in recent years. When lake Veluwemeer became clear as a result of a large scale water purification programme at the beginning of the nineties, the fish biomass decreased and the fish community became more diverse. Fish species which are more dependent on clear water systems like Rudd *Rutilus erythrophthalmus* and Tench *Tinca tinca* increased and Ruffe decreased. For Comorants the system became less attractive for fishing because of too clear water. The number of birds decreased as well. In the diet of the Cormorants the proportion of Ruffe decreased dramatically and the proportion of cyprinids, like Rudd, Tench, and Roach *Rutilus rutilus* increased and hence diet became more varied. The food consumption of Cormorants ran parallel to the gradients in turbidity and fish communities of the water system (Fig. 1).

Discussion

Competitor or indicator?

In the IJsselmeer area cormorants are only partly a competitor with the commercial fisheries because the birds only catch small prey, mainly perch *Perca fluviatilis*. For eel *Anguilla anguilla* and pikeperch *Stizostedion lucioperca* it is unlikely that cormorants are significant competitors because these species are at relatively low numbers consumed by the birds. The fact that the natural mortality of the fishes has never been measured means that the predation of cormorants can not be compared with the yield of fishermen in later years. Overfishing of commercial fisheries in the lakes IJsselmeer and Markermeer has lead to a large amount of small prey fish in the system because the larger predatory fish (Perch and Pikeperch) are caught intensively by commercial fisheries. The resulting large biomass of small fish causes a high pressure on zooplankton and in turn algae can increase.

The larger number of prey in combination with a better underwater climate for hunting fish is favourable for the cormorants. In this way human interference may have caused better circumstances for cormorants.

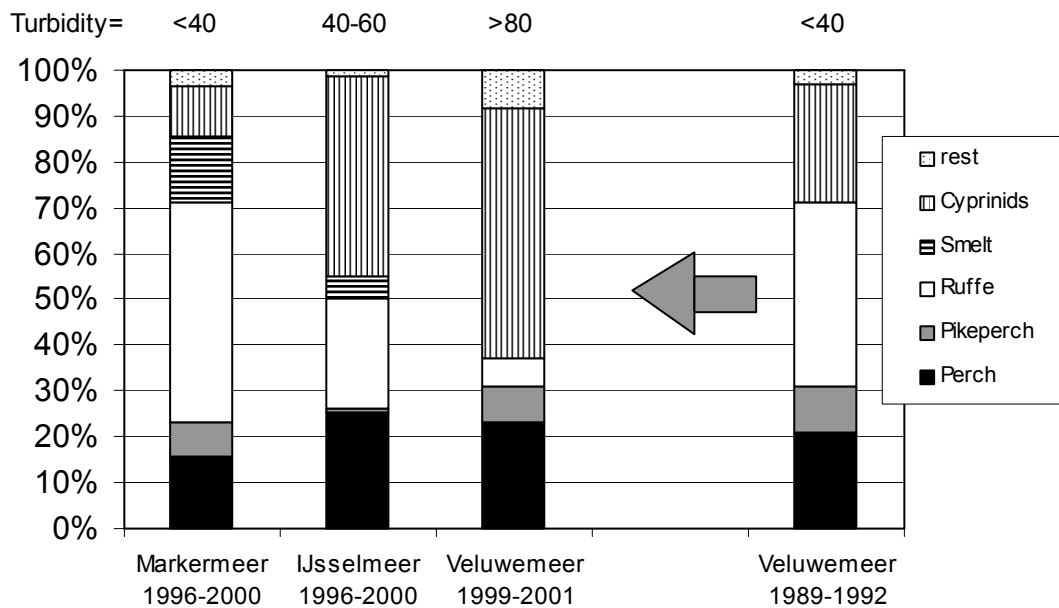


Figure 1. Diet of Cormorants in autumn and winter (by mass), roosting respectively at Lepelaarplassen (Markermeer, N = 1,809), Steile Bank (IJsselmeer, N = 3,530) and Veluwemeer (N = 4,932) for the period 1999-2001 and 1989-1992 (after a change in water quality). Turbidity = Secchi depth (cm).

In spite of an average clear water situation as a result of the smaller supply of nutrients, algal blooms can occur in spring and summer. Though high numbers of cormorants can be interpreted as a result of overfishing by human beings. The number of birds are in this way not competitive to the fisheries but more a signal that the commercial fisheries are far from sustained. Measurements of birth, mortality and food choice of cormorants gained good indications of changing water quality and the conditions of the water system. Less cormorants and a more diverse menu (less Ruffe) indicate a healthier and more clear water system. This gives the opportunity for managers to use the cormorant as an indicator for the state of water quality and to evaluate the level of exploitation of the fish community by commercial fisheries and fish eating birds.

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The report (in Dutch with English summary and texts of tables and figures) can be ordered at RIZA, library P.O. box 17, NL- 8200 AA Lelystad, The Netherlands (11,38 €)

REDISTRIBUTION OF THE CORMORANT POPULATION IN THE IJSSELMEER AREA.

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Introduction

After a period of strong increase and establishment of new colonies in the Cormorant population of the IJsselmeer area, growth levelled off. This occurred after a lake-wide crash in breeding numbers in 1994, following a year with an extremely poor breeding success. In recent years, the Cormorants shift their breeding site more and more towards the central and northern parts of the nearby lake IJsselmeer. Here we analyse whether the redistribution of the birds in the different colonies resulted in stabilizing numbers and a maximised output of young per couple.

Key words: Cormorants, carrying capacity, population expansion, density dependence,

Methods and study area

Annually counts were made of breeding pairs in the IJsselmeer colonies, assessing breeding colonies' output of fledglings later on (*cf* Van Eerden & Gregersen 1995 for methods). Distribution of adults over the feeding waters was based on monthly aerial counts, with additional information collected by observations from ships and from the shores.

Results

In the Netherlands Great Cormorants *Phalacrocorax carbo sinensis* breed in the IJsselmeer area in four colonies: Oostvaardersplassen, Lepelaarplassen, Naardermeer and Enkhuizen. All colonies are situated on the edge of the central lakes (183,000 ha of freshwater) in the eastern and southern part. The population development of the Dutch *sinensis* group has been extensively described by Van Eerden *et al.* (1991), Van Eerden & Gregersen (1995). The growth of the Dutch population has started from the old colony Naardermeer, in a well protected wetland at the southernmost part of the lake system. In 1970 about 2,000 pairs bred in Naardermeer, in 1985 this number had risen to 4,480 pairs. Part of the young produced in this colony did not settle in their 'mother colony' but was present as non-breeders in the IJsselmeer area during the 1970s. In 1978 the Oostvaardersplassen freshwater marsh was founded on new territory in the reclaimed Flevopolder, in 1985 Lepelaarplassen followed and very recently Enkhuizen-de Ven on the West shore in 1990. This growth ran parallel to expansion to other places in The Netherlands, Denmark and other localities in western Europe where *sinensis* breeds (Van Eerden & Gregersen 1995). The rapid increase in number of breeding pairs in new colonies could only be explained by the presence of a large non-breeding cohort. Later, also the returning young from the colony further speeded up numbers. Lepelaarplassen, which was founded between Naardermeer and Oostvaardersplassen, partly originated from Naardermeer birds, the shifting of colonies resulting in a better position for the individuals which had moved with respect to the distance to the fishing waters (Van Eerden & Gregersen 1995).

Suddenly, in 1994 the number of breeding pairs dropped dramatically (Fig. 1). Compared to the year before the maximum figures were Oostvaardersplassen 4,400 pairs (8,000, 55%), Lepelaarplassen 2,600 pairs (5,500, 47%) and Naardermeer 1,850 pairs (1,875, 99%). Thus, Naardermeer was amply affected. This sudden decline occurred in all colonies which rely for their food provisioning on lake IJsselmeer and Markermeer. Even the colony of Enkhuizen, only recently established, decreased from 509 pairs in 1993 to 296 in 1994. Naardermeer birds had started to exploit the lakes in the interior part of Noord-Holland and Utrecht as well as the border lakes between Flevoland and the mainland. This crash did not occur at other places in The Netherlands. There numbers stabilised or slightly declined (SOVON, A.J. van Dijk unpubl. data). Because of the importance of the IJsselmeer population for the country's total, the Dutch population experienced a decrease from 20,460 to just over 14,000 pairs. In later years the IJsselmeer population stabilized around 10,000 pairs (2000), whereas the Dutch population as a whole levelled off at some 20,000 breeding pairs. The Markermeer colony of Lepelaarplassen experienced another dramatic fall in numbers in 1999, the Oostvaardersplassen earlier also in 1987; these were, however, not recorded elsewhere in the region. The conclusion is that the IJsselmeer colonies, being the largest part of the breeding population in the Netherlands, crashed in number of breeding pairs because of one or several lake related factors.

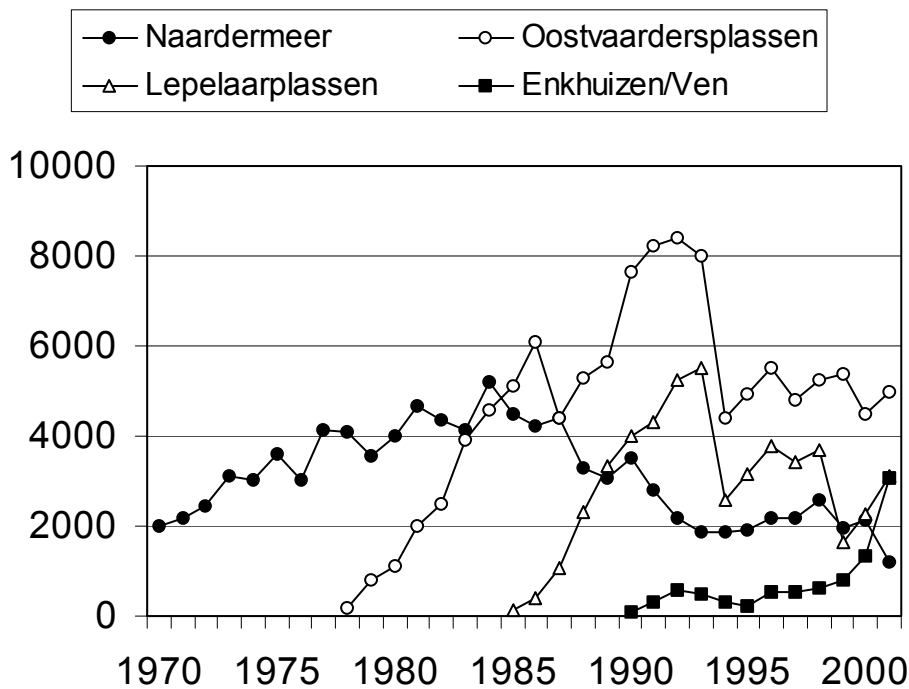


Figure 1. Number of breeding pairs in the IJsselmeer colonies (1970-2001)

The colony of Enkhuizen has expanded recently and the mayor part of the nests were constructed on the ground in dry reed-land. The scarce presence of trees and bushes were occupied in an earlier stadium. The colony is still far from being limited by available nesting space. Predators like Fox (*Vulpes vulpes*), Polecat plus American Mink (*Mustela putorius* & *M. vison*) and possibly Pine Marten (*Martes martes*) may cause considerable mortality amongst young Cormorants and eggs. Ground-nesting is therefore nowadays very much restricted to the most remote parts in the old IJsselmeer colonies (islet situations). In the colony of Enkhuizen-de Ven still no foxes occur.

The recent occupation by Cormorants of the nesting site Enkhuizen is in line with predictions by the Hinterland hypothesis as formulated earlier (Van Eerden & Gregersen 1995). The new colony is situated closest to the central, least exploited part of the lake system.

Fledging success and total reproductive output

Besides the number of breeding pairs occurring in a colony, the breeding success in terms of number of fledged young per nest is a relevant measure of colony performance. The number of fledglings is a first indication of the expected development of the population on the longer term. The last couple of years this fluctuated between 0.25 and 1.0 fledged young per breeding pair for the old colonies (Naardermeer, Lepelaarplassen, Oostvaardersplassen). Earlier, during the 1980s, more young fledged, between 1.5 and 2.5 per nest on average (Van Eerden *et al.* 1991). The fluctuations often occur synchronously between the different IJsselmeer colonies. This is caused by a factor operating simultaneously on all IJsselmeer colonies: the wind-driven turbidity which affects detectability of fish (Van Eerden & Voslamber 1995). In terms of young production, 1993 was the worst year, since these data were gathered annually since 1981. This was the year preceding the crash in numbers. Already during and also after this event output of young was greater. Total number of young fledged fluctuated between 4,800 and 17,400 per annum. Again, the levelling off in reproductive rate is clearly visible suggesting a density dependent effect with total output stabilising around 10,000 young fledged. The colony of Lepelaarplassen, bordering the Lake Markermeer incurred another poor year in 1999 when both a sharp fall in numbers coincided with an extremely low breeding success. In fact this colony crashed for the second time in succession. The colony of Enkhuizen-de Ven is very productive still, even in the poor year 1999, consistent with the predictions of density dependence.

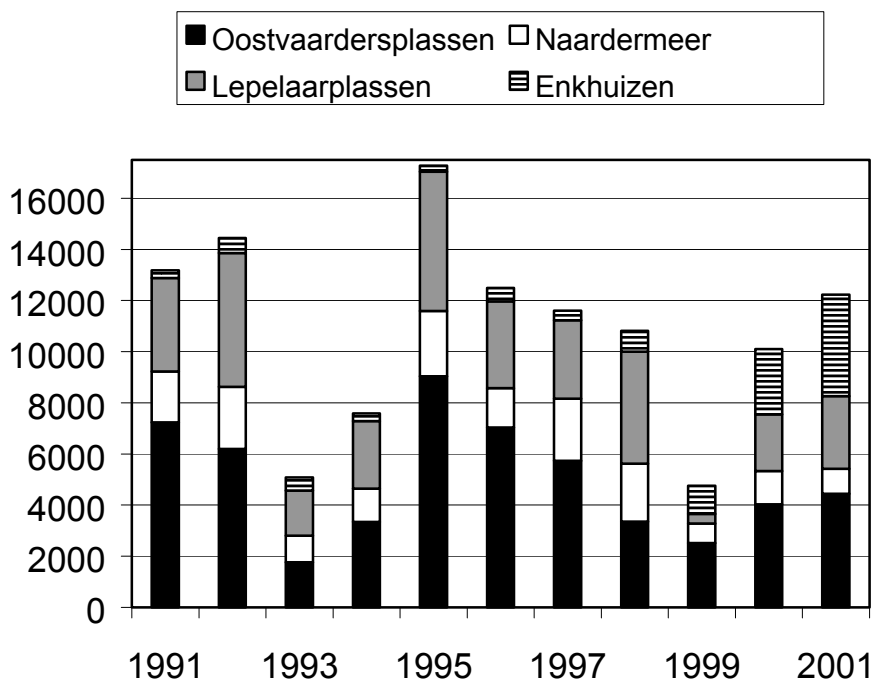


Figure 2. Total output of young in the IJsselmeer colonies (1991-2001)

In conclusion we make two points here: first, breeding output is related to colony phase, expanding newly established colonies having a higher breeding success. Second, the colonies' breeding output may increase after a so called crash event, a sudden decline in number caused by an external factor. Both effects point to density dependent production of young, i.e. a (food) limited capacity of the environment related to the number of birds that make use of it.

Discussion

In 2000 the colony near Enkhuizen started to expand (1355 nests) followed by an outburst resulting in 3,065 pairs in 2001. We suspect the growth in Enkhuizen therefore to originate from an exodus of Lepelaarplassen birds, the colony with the worst hinterland.

The reduced number of fledged young per couple in the old colonies can be interpreted as a density dependent regulation. At the high density of breeding pairs, the food provisioning for the young would become more difficult which could lead to the production of fewer young. The question is why this crash was so severe and not just happened as a regular decline over more years? One of the proximate reasons might be the weather in 1994. In February a cold spell of two weeks occurred after a period of mild weather. Only by 24 February milder weather reached The Netherlands, but ice occurred at lake IJsselmeer well into the first week of March. It may well be that many birds which had come close to the colonies late February suffered from this cold spell and delayed breeding (or skipped breeding completely).

Consequently, fewer eggs were laid (unpublished data K. Koffijberg), but fledging success was not extremely bad. The weather was probably important in delaying the onset of breeding but cannot explain the crash-like reduction in breeding numbers. The other colonies in The Netherlands experienced the same cold-start weather situation, but had no such drop in breeding numbers, so the prime factor must be linked to lake IJsselmeer.

Future developments

Breeding space has never been limiting colony size. All colonies are situated in rather young woods consisting of willow *Salix alba*, *S. viminalis*, *S. cinerea*, in Oostvaardersplassen and Lepelaarplassen and Black Alder *Alnus glutinosa* in Naardermeer. In all colonies, ground breeding also occurs, although this habit has decreased as a result of the presence of Red Foxes *Vulpes vulpes*. Also in future there will be enough space for breeding; the reforestation of the abandoned parts of the colonies takes time but may generate new possibilities within fifteen years from now. Foxes will undoubtedly reach Enkhuizen and may cause a further dispersal of this group. However, as pointed out by Van Rijn & Van Eerden (2002) some 75 sites in the area have potential as breeding place, so breeding space will not be limiting the colonies. After the crash observed in 1994 the population of the Great Cormorant has not recovered to the previously recorded number.

Through density dependence a maximum number of breeding pairs is determined, most likely through competition between adults at the fishing waters. In the IJsselmeer situation the eutrophication process was responsible for the increase, enhanced by the over-fished situation leading to small sized fish. This pattern might be valid for the situation in many European freshwater and shallow coastal waters. If so, then the desired future with fewer nutrients and a sustainable fisheries aimed at higher stocks of predatory fish will definitely mean less space for Cormorants. Depending on the final lower levels of nutrient loads and on the resilience of the water systems (Scheffer 1993) the future state of many freshwater bodies supports fewer Cormorants. We therefore stress the importance of habitat and system management other than species management to reduce the conflicts with Cormorants. Only in this way the problems

encountered can be solved at a European scale, whereas other attempts will most likely fall into the category “mission impossible” (*cf* Van Eerden 2002).

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***Pygmy Cormorant (Phalacrocorax pygmeus)
nesting in Israel***

Simon C. Nemptzov

Background

Pygmy cormorants (*Phalacrocorax pygmeus*) were once a common wintering species in Israel, but they were extirpated in 1960 following loss of wetland habitats and escalating conflicts with fish-farmers in the budding aquaculture industry. In 1974 they began to reappear during winter migration in small numbers, and in 1982 the first nesting pair was recorded in Israel. Over the following two decades the number of migrating and resident birds gradually increased. In spring 1998 there were only 60 nests in Israel, whereas by the following year (1999) they had increased to 100. There were concomitant increases in conflicts with fishpond managers as damage to pond yields escalated, especially in the Bet Shean Valley where there are approximately 1,600 ha of freshwater fishponds.

The Management Program

In fall 1999, the Nature & Parks Authority instituted an organized management program in cooperation with the fish farmers to reduce the damage and to protect this endangered species. The program consisted of non-lethal harassment (with pyrotechnics) of pygmy cormorants throughout the fall and winter at roosting sites near fishponds in the Bet Shean Valley. This activity was aimed at inducing them to translocate, before the spring nesting season, away from the Bet Shean Valley to alternative roosting sites some 20 km away on the shore of the Sea of Galilee (Lake Kinneret), where more “natural” fish prey is available.

Success of the translocation program

The translocation program was partially successful in its first year. By spring 2000 the pygmy cormorants had established 70 nests at two nesting sites around the Sea of Galilee, and there were another 40 in a small nature reserve in the Bet Shean Valley. The program continued with greater success through winter 2000-2001. In the spring 2001 nesting season, they established 5 nesting sites with 115-150 nests (Table 1), but only about 20% of them were in the Bet Shean Valley (Table 2).

These numbers show that the translocation program did not harm pygmy cormorant nesting, but actually facilitated its increase. This successful program used non-lethal methods to translocate a rare avian species, thereby benefiting its conservation by reducing the conflict between these piscivorous (fish-eating) birds and the fish-farmers.

Table 1. Number of nests counted at each nesting site (Spring 2001)

Site	UTM coordinates		Number of nests
	Latitude	Longitude	
1. The Hula Valley			
1.a. Gomeh Junction	674	740	15-20
1.b. Hula Nature Reserve	663	743	5-10
2. The Sea of Galilee (Lake Kinneret)			
2.a. Ginnosar	638	737	35-40
2.b. Ha'on	627	747	35-50
3. The Bet Shean Valley			
3.a. Tirat Zvi	585	740	25-30
Total			115-155

Table 2. Multiyear comparison of pygmy cormorant nesting in Israel

Year	1998	1999	2000	2001
No. of nesting sites	1	2	3	5
No. of nests	60	100	110	115-155
Percent of the nests in the Bet Shean Valley	100	82	44	19-22

***CORMORANT AS A LEAD CONTAMINATION BIO-INDICATOR
IN THE WATER ENVIRONMENT***

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Introduction

Although it is mainly an urban problem, also rural areas, lakes and rivers are frequently contaminated with lead (Kupczyński & Wiśniewski 1997, Frederiksen & Bregnballe 2000). Lead contamination varies in different parts of Poland. However, it is the highest in southern parts of the country where lead is emitted from industrial plants (TMSO 1994, 1996).

The dramatically developing motor industry and lead as a component of paints and batteries are sources of contamination in rural areas. For many years, lead concentrations in living organisms have remained unchanged (often high) despite the emission limits imposed on industrial plants and the production of lead-free gasoline and paint. Lead, however, can remain in soil and water and its reserves are continuously added to the food chain (Blus et al. 1993, Dobrzański et al. 1996, Whiteside 1976). The concentration of lead in the subsequent links of the food chain is compound, which is true for most of the xenobiotic agents (Berny et al. 1994).

In human and animal bodies, lead mainly damages the kidneys and the nervous system as well as inhibiting red cell production (Abdel-Aal et al. 1989, Ochiai et al. 1992, 1993a). Cases of acute deadly lead poisoning in people and animals (mainly wild birds) have frequently been published (Ochiai et al. 1993a, 1993b, Szarek et al. 1995, Volponi 2000). Many authors have described the damaging effects on people and animals living in lead contaminated environments (Fabczak et al. 1997, Górny et al. 1994, Ochiai et al. 1992, Volponi 2000). Continuous exposure to lead is frequently responsible for carcinogenic changes but mainly for disorders related to nervous system damage and damage to the renal tubule. Subsequently irreversible changes occur that result in kidney fibrosis (Kabata-Pendias & Pendias 1999, Kupczyński & Wiśniewski 1997). This lead accumulates in bones and teeth. In cases of bone demineralisation (e.g.: osteoporosis, incubation period) lead is liberated to the cardiovascular system and may cause poisoning that frequently occurs in fish-feeding waterfowl (Ochiai et al. 1992, 1993a, 1993b).

Cormorants come to Poland to breed at the end of February and the beginning of March. Each year they spend 7-8 months in the breeding areas (Lindell et al. 1995). Feeding on fish (Mellin & Martyniak 1991), these birds depend on stocked water reservoirs and are especially sensitive to man-made changes in their natural habitats. They are the final link in the aquatic ecosystem food chain. Therefore they seem to be a good bio-indicator of lead contamination of the environment.

Materials and methods

Eighty 2-year-old cormorants (*Phalacrocorax carbo sinensis*) were used for the experiment. The birds were shot to reduce the species population between 1993 and 1996 from the area of stocked water reservoirs near Olsztyn (in north-eastern Poland).

The study sites included two lakes: Lake Szelaż (S) and Lake Gielądzkie (G). The cormorant population in Poland was reduced under control of the Minister of Environment and Natural Resources Protection.

Every year 5 females and 5 males from a given area were examined. Lake Gielądzkie, being the cormorant hunting ground, is surrounded mainly by arable fields and some forests, whereas mainly forests and some agriculture surrounds Lake Szelaż.

Immediately after shooting three-gram liver samples were taken from the bodies for subsequent analysis of lead concentration. The mentioned xenobiotic was measured after having the tissue ashed and resolved in 0.1 M HNO₃, employing the flameless atomic absorption method (Whiteside 1976). Unicam 939 Solar equipment with an Adax data station was used. Lead levels were expressed in mg/kg wet mass.

The distribution parameters of particular values were determined with statistical tests. To calculate the significance of the differences between the mean values, the following tests were used: Duncan, Student-Newman-Keuls, F-Fisher-Snedecor.

Results

Over the 4 years of study, the mean lead concentration in all recorded livers was 0.220 mg/kg. It was observed that the majority of birds had lower than the presented mean lead concentration. However, 50% of the birds had lower lead concentrations in the liver than the medium value which was 0.138 mg/kg of wet mass.

The cormorants shot in 1993 had on average 0.228 mg/kg lead in the liver. In the subsequent year the lead concentration increased to 0.259 mg/kg, and in 1995 decreased to 0.174 mg/kg. In 1996, the average lead concentration of the livers was similar to the two initial years and was - 2.218 mg/kg of wet tissue mass (table 1). Neither the differences between the above-mentioned means nor the differences between the males and females were statistically significant (table 1).

The majority of the cormorants had average lead concentrations in their livers. The lead concentration in the livers was not significant between years. It could be concluded that the lead contamination of the birds was maintained at the same level with a slight tendency to decrease.

Considering the location of the bird's origin, it was found that birds obtained from area S had higher concentrations of this xenobiotic in their liver than birds originating from area G. Such a tendency was observed in each of the four experimental years (table 1). Despite consistent differences, they turned out to be not significant.

Table 1. Average level of lead in the cormorant liver (mg/kg wet mass) in the period 1993 -1996

Cormorants	Number of cormorants	Year of examination			
		Level of lead in the liver $X \pm SEM$			
		1993	1994	1995	1996
males and females	5 + 5	0.228± 0.053	0.259± 0.060	0.174± 0.044	0.218± 0.054
Lake Szelaġ region	10	0.277± 0.038	0.267± 0.070	0.241± 0.045	0.262± 0.026
Lake Gielądzkie region	10	0.178± 0.032	0.051± 0.056	0.108± 0.017	0.174± 0.040

X =mean, SEM = standard error of the mean

Discussion

However, a slightly lower lead concentration was found in the common heron originating from the same areas as the examined cormorants (Szarek et al. 1995). Considerably higher concentrations of this xenobiotic were found in wild geese obtained from an area located near a steelworks site (Berny et al. 1994).

Considering the location of origin of the cormorants, consistent although not significant differences of bird contamination with lead between the two groups (S and G) were recorded. The livers of cormorants from group S had several times higher contamination levels of the analysed xenobiotic (table 1). The influence of both the nearby urban center and communication routes on the above differences is also supported by other authors. Raiter (1996) reports that cattle grazing in the vicinity of busy motor roads have a many-fold higher than normal lead concentration. Water fowl originating from the ecologically safe areas had average values of approximately 0.16 mg/kg (Struger et al. 1987, Struger & Weseloch 1985). Even the lowest recorded mean lead concentration (1995) in the analyzed cormorant livers was higher. This comparison indicates that despite the recognition of Warmia and Mazury (the nesting area of the analyzed cormorants) region as ecologically clean (MSO 1992, 1996) the studied areas are exposed to toxic lead. Szkoda & Źmudzki (1997) obtained from 0.10 to 0.20 mg/kg of lead in the livers and kidneys of Polish swine and cattle. The values determined in the analyzed cormorants were twice as high. The strong accumulation tendency of this element is shown by the fact that the lead concentration in carp muscle (one of the cormorant's prey) was 0.01 mg/kg (Szkoda & Źmudzki 1997), whereas the lowest mean lead concentration in the birds from one year was 0.174 mg/kg. However, even the highest mean from 1994, which was 0.701 mg/kg, was four times lower than the mean for water fowl reported by Ochiai et al. (1992, 1993a, 1993b). These authors claim that the lead

concentration of 2.9 mg/kg in the liver and of 5.9 mg/kg in the kidneys are responsible for the initial poisoning symptoms (clinical and macroscopical) in water fowl.

Conclusions

Based on the obtained results on lead concentrations in cormorant livers from the four study years, the following conclusions can be drawn:

- Between 1993 and 1996, the lead concentration in the livers of the cormorants fishing on the Lakes Szelał and Gielądzkie was unchanged,
- the cormorants nesting in the vicinity of Lake Szelał tended to be more lead-contaminated than the birds originating from the area neighboring Lake Gielądzkie,
- Areas with intensive farming of land and forests and situated in the vicinity of industrial and urban centers are exposed to stronger influence of xenobiotics (the cormorants from the area of Lake Szelał). The birds accumulate higher amounts of lead than birds originating from an environment of lower exposure to contamination (in the vicinity of Lake Gielądzkie),
- the cormorant is a useful bio-indicator of lead contamination in water systems and indicates the need for further monitoring of the concentration of this element in wild animals from the area of Lakes Szelał and Gielądzkie.

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Frequencies of the motion patterns in the maintenance and agonistic activities of the *Phalacrocorax brasilianus* in the marine and river environments in the state of Paraná, Brazil

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Introduction

The Neotropic Cormorant *Phalacrocorax brasilianus* (GMELIN, 1789), is distributed from the southwest end of the United States to the south tip of South America. The bird is present throughout Brazil (Veitenheimer-Mendes et al, 1993), preferring the clear and little deep waters in low elevations as, for instance, rivers, dams, swamps and coastal waters (Stiles & Skutch, 1995). The behavioural characteristics are usually seen as inferior to characteristics of the system (De Queiroz & Winberger, 1993). However the behaviour is an important tool to understand habitat use and it is necessary in the comparative biology that has been revolutionized by the breakthroughs in the phylogenetic methods (Kennedy et al, 1996).

The objective of this study was to analyse the behaviour of the Neotropic Cormorant drawing a comparative line of the motion frequency patterns in the marine and river water environments.

Material and Methods

The study was accomplished in the period June 2000 - October 2001, on the “Ilha dos Ratos” 25° 51' 755"S / 48° 34' 364" W, in the Guaratuba Bay (coastal area of Paraná) with a population of approximately 1800 birds and in the São Lourenço and Barigüi Parks in the urban environment of the city of Curitiba, where the population oscillated between five and 25 and 1 and 100 respectively. The methods "ad libitum" and "focal animal" were used (Altmann, 1974). The first one for the description of the postures and the second one to obtain the frequency of the postures for the different water systems. The birds were not marked, therefore the individuals were chosen randomly for the application of the methods.

The field notebook records consisted of the times of field observations, number of birds and climatic conditions according to Lehner, 1996.

Results and discussion

The number of birds were recorded together with their behaviour. Notations were made about the observing time and weather conditions. The activities were divided into maintenance and agonistic. 32 motion patterns were observed among these activities (Oliveira & Costa, 2001a; Oliveira & Costa, 2001b; Oliveira, 2001; Oliveira & Costa 2002). In the maintenance activities 27 motion patterns were registered and among them four varieties (table 1).

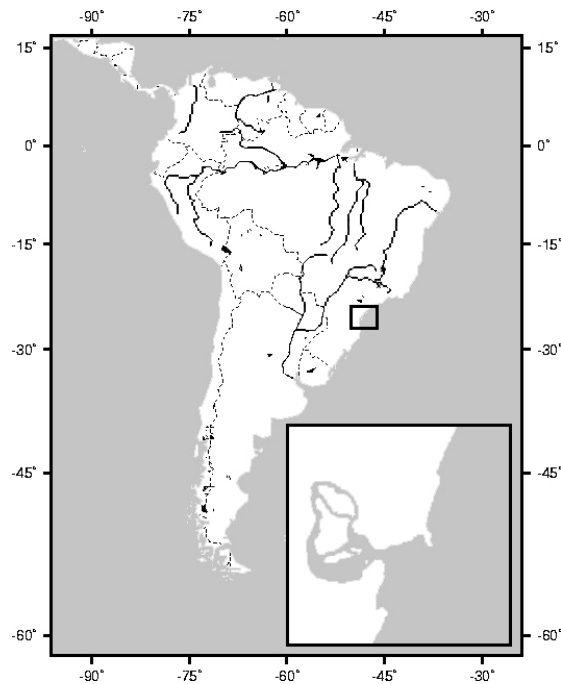


Figure 1. Situation of the study areas

In river water, the motion pattern of cleaning with the beak (36,64%, N=3973) was the most frequent and the resting one (29,65%, N=3973), the second most frequent. While the most frequent pattern in sea environment is the rest pattern (44,4%, N=205) and the pattern of cleaning with the beak (40,97%, N=205) as second. Gwiazda (2000) obtained almost the same data for *P. carbo sinensis* concerning the rest pattern, although he has used the time as unit.

The frequency obtained for the pattern of drying of feathers was of 4,2% (N=3973). Different angles of wings spanning were observed. The total of observed behaviours, Henneman (1982) mentioned by Schmidt (1994) registered for the *P. auritus* a frequency of 2,7% of the total behaviour observed for this pattern. Lekuona (1999) described for *P. carbo sinensis* that the wing spanning happens only after the period in water, for the drying of the wings. This corresponds with the registrations of this work.

Table 1. Frequency of the motion patterns registered in sea and river environments

Behavioural Patterns	Sea Environment (N=205)	River Environment (N=3973)
Resting Period	44,39%	29,65%
Plumage straightening	1,46%	2,47%
Drying of Feathers	X	4,17%
Forage	0,97%	3,25%
Paw Scratching	0,97%	1,74%
Yawning	2,43%	0,90%
Defecating	X	1,41%
Throat shaking	0,48%	3,32%
sleeping	0,48%	0,30%
Drinking water	X	0,23%
Regurgitating	X	0,05%
Wing extension	X	0,33%
Eating	0,48%	0,12%
Beak Cleaning	40,97%	36,64%
Shrinking	1,9%	1,36%
Flying		0,45%
Take off from water	1,46%	X
Ducking with light wings movement	X	0,18%
Ducking	X	0,38%
Moving wings to clean	1,46%	2,06%
Shaking water out of the body	0,48%	4,15%
Bath	1,95%	0,38%
Landing in water	X	X
Moving on tree branch	0,48%	1,48%
Moving in water	1,46%	1,33%
Moving on the ground	X	0,35%
To choke	X	0,18%
Pronounced stretching of neck	1,95%	0,10%

X - observed patterns, though not computed.

Four patterns were registered for the agonistic activities and the frequencies were computed only for the river system. The most frequent motion pattern was the warning posture (62,5%, N=51), followed by the attack posture (21,1%, N=51). The alert posture was the least frequent (10,3%, N=51) followed by the escape posture with food (5,9%, N=51) (figure 2).

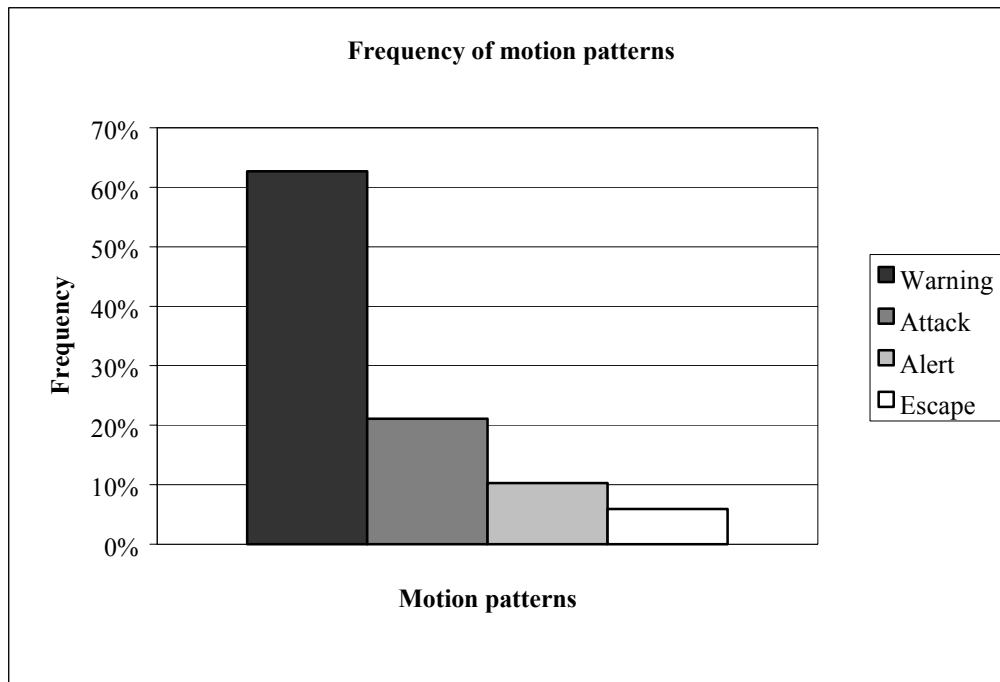


Figure 2. Frequencies of motion patterns concerning the agonistic activity

Ecological Aspect

The greatest importance in the *Phalacrocorax brasilianus* study is its behavioral context.

Although the frequency has been changed, they were not significant due to the sample N (205 – marine environment and 3973 – river environment). This has made it possible to reach a conclusion which was supported by the first hypothesis that was raised which says that the motion patterns would be just the same ones triggered in both environments.

The predominant motion pattern were the “rest posture” and the “beak cleaning” in the maintenance activity.

The a-biotic ecological factors did not influence the behavior patterns execution even considering that in marine environment the bird would move away from the observation place (island) in search for food inside the bay. This fact is explained by direct antropic action next to the feeding place; the sea. Those actions are suggested by ferry-boats, motorboats, ships, yachts, fishing boats and the continental disturbance.

In river environment the observations were accomplished in urban area (municipal park) where the lake was considered the feeding place, not suffering direct antropic influence.

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Short Notes

Ringling cormorants in Normandy - Gérard Debout

The GONm (ringer: Guillaume Debout) start a new cormorant colour ringing scheme in 2002. 64 birds in each of the colonies of Saint-Marcouf and Chausey were ringed.

The colony of Saint-Marcouf is in a GONm reserve : "L'île de Terre ". This is one of the two islands of a small archipelago which lay five kilo meters on the east coast of the Cherbourg peninsula. This colony is known since the late fifties but was probably established just after the second world war. Almost 400-450 pairs breed on the 3 ha island among gulls (great black backed, lesser black-backed and herring gulls), little egrets and others. The birds of Chausey breed on four to six small islets in the Chausey archipelago. These islands lay on the south-west coast of the Cherbourg peninsula, just at the north of the Mont-Saint-Michel. Almost 200-250 pairs breed in Chausey, but the number decrease slowly. The other nesting birds are great black-backed, lesser black-backed and herring gulls. This is one of the few French breeding sites of the eider, the only French one for the red-breasted merganser. Chausey reserve is also the most important breeding colony of the shag in France: more than 1000 pairs.

The birds of Saint-Marcouf are ringed with a metallic ring (Museum Paris) and a combination of 2 colour rings among 4 colours (dark blue, white, red and green) on one leg and on the other leg with a dark blue ring with a white letter M and a white number, 2 for 2002, 3 for 2003, and so on with a bar between the letter and the number. For some birds M is on the top, and for the others the number is on the top.

The birds of Chausey are ringed on one leg with a metallic ring (Museum Paris) and a combination of 2 colour rings among 4 colours (dark blue, white, red and green) and on the other leg with a white ring with a black letter C and a black number, 2 for 2002, 3 for 2003, and so on with a bar between the letter and the number. For some birds C is on the top, and for others the number is on the top.

The first purpose of the study is to know the dispersion area of the birds of each colony and to compare this distribution with the results obtained in the late sixties. Some interesting results (for " pure marine " cormorants) have been already obtained : one bird of Chausey was spotted in the Loire Valley and a bird of Saint-Marcouf was seen in Buckinghamshire!

The second aspect of the study is to know if the conditions of nestlings affect their prospecting abilities when they become adults: are the birds from early or late nests different or not? Are the birds from isolated nests or from a nest in a dense group of nests different? Results will come in the next years.

If you see these birds, please contact us at the following address:

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Colour ringing cormorants in Poland – Szymon Bzoma

Katy Rybackie colony, Poland, Pomorskie 54°21'N 19°14'E

Over 70 ha of pine forest *Pinus sylvestris* covered by several subcolonies with about 9,000 nests of *Phalacrocorax carbo* and 1,000 of *Ardea cinerea*.

Located on Vistula Spit (Southern Baltic coast) between the Gulf of Gdansk and the Vistula Lagoon (main feeding grounds).

Colour ringing with green rings and white letters since 2001 (17 birds, NZA - NZZ) to 2002 (22 birds, RAA-RBH, RBN, REC).

Cormorants' training of hunting - Robert Gwiazda

Young predators often learn themselves hunting techniques and train them by playing. This behaviour is well known for mammals or for raptors but not often observed for water birds. On 2 July 2002 about noon, ca. 100 cormorants were observed in backwaters of the Dobczyce dam reservoir in southern Poland. In autumn 2002 this eutrophic reservoir was ca. 800 ha of area and ca. 10 m of depth. Cormorant occurred at the reservoir all year except for the period with ice cover, but did not breed there. Inside the group of cormorants which were resting on muddy island and swimming around, one young bird was „playing” with a small stiff, yellow, probably plastic tube ca. 10-15 cm long and diameter ca. 1-2 cm. This bird was swimming and handling this tube, then threw it into the water and pull out it dipping the head and neck. That observation lasted about 5 minutes and was carried out from the distance ca. 50 m by scope KOWA 40-60x60. Similar behaviour was observed at the same place on 22 August and on 17 September 2002. One young cormorant from the group of more than 200 individuals was „playing” with the flat piece of black limp material (textile or thin gum), ca. 7-10 cm long. The bird was slowly swimming and keeping the piece into bill. Time after time the cormorant flung up the material into the water, then dived to keep it out. The observations lasted some minutes.

Probably young cormorants can train catching and handling fish. This situation was earlier rarely observed for cormorants outside the breeding colonies where it is well known. It was interesting that birds used small pieces of anthropogenic materials to train.

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Killer Alga in the Mediterranean – Mira Heesakkers and Erik-Jan Malta (from magazine coast line)

The toxic seaweed *Caulerpa taxifolia* threatens sea grass ecosystems in the Mediterranean. This was published as the most recent ecological disaster in Volume 9 No. 2000-9 of the magazine Coastline. In the seventies, the tropical alga was discovered as the perfect decoration for aquaria by the tropical aquarium in Stuttgart. After that public aquaria all over Europe acquired cuttings of the alga. Now it has colonised a wide range of habitats in the Mediterranean and its aggressive way of competing with other species threatens the whole ecosystem. Starting from Monaco in 1982, the species was observed on the Balearics, the coast of Tunisia, at Sicily and the Adriatic. As wintering Cormorants often frequent the areas with eel grass *Posidonia* meadows with colonisation by the new species may also affect the carrying capacity of these regions.

Laser guns and Cormorants - Doris Thienel

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Referring to the use of laser guns type 3B for frightening birds (see also proceedings listed above) Doris Thienel sends us two papers about the effect laser weapons may have on the vertebrate eye. Especially the paper of Gillow shows the detrimental effects of laser light to the human eye. In 1995 a protocol IV was added to the Convention on Conventional Weapons banning lasers as weapons. The discussion of how to use (see also www.aviandissuader.com/usage_facts.htm) or ban (as stated by NABU, the German NGO on Nature Protection) the use of laser guns to frighten Cormorants has hardly started. Readers may react on this issue which is of importance to future developments with respect to safe harassment techniques.

Gillow, T. 1997. The psychological, social and economic consequences of blinding soldiers. *Medicine, conflict and Survival* 13: 327-332.

Peters, A. 1996. Blinding laser weapons. *Medicine, conflict and Survival* 12: 107-113

Reviews

Newson S.E. 2002. Colonisation and range expansion of Great Cormorants *Phalacrocorax carbo* in England. Ph.D. Thesis, University of Bristol.

This thesis examines several aspects relating to the recent growth and spread of inland breeding great cormorants *Phalacrocorax carbo* in England. The overall objective was to improve the current understanding of the mechanisms involved, through a comparison with coastal breeders in the UK, and so allow informed management and conservation decisions to be made in the future.

Methodology for distinguishing great cormorant subspecies, *P. c. carbo* and *P. c. sinensis* thought to occur in the UK using morphometrics is presented and applied in the field at breeding colonies and to birds controlled under MAFF licence on inland waters during the winter. A comparison of breeding performance between inland and coastal breeding colonies in the UK is made and population models developed to examine the importance of demographic parameters on recent population change in the UK. In the final section of this thesis, demographic and spatial data are combined in a space-time model to examine the spread of inland breeding cormorants in the UK. The implications for management of cormorant numbers and future research priorities are discussed.

Engström, H. 2001. Effects of Great Cormorant predation on fish populations and fishery PhD Thesis, University of Uppsala

This work addresses to the increasing population of Great Cormorants in Sweden. In five chapters the author tackles the question of how the avian predator would interfere with fish populations and fisheries. In Sweden Cormorant numbers rose sharply after 1990. In 1999 some 25600 pairs were counted in 154 colonies. In a thorough fish sampling and Cormorant diet investigation at Lake Ymsen, no effects of Cormorant predation on neither fish composition nor density could be discerned. Cormorants took 17 tons and fisheries 12 tons per year. These data compare to 13 resp. 9 kg ha⁻¹y⁻¹. The data were compared with similar investigations at Lake Garnsviken, not under Cormorant predation. Engström further worked on the relationship between eutrophication level of lakes and Cormorant density. Cormorants favour to settle around eutrophic lakes with highest densities at total phosphorus levels of 30 microgram per litre. The question of how Cormorants select fish (size, species) was investigated during three seasons. Perch (28-46% of mass) and Pike (13-30%) dominated followed by Ruffe (14-25%) and Roach (8-20%). Ruffe was taken more than expected and Roach less. Also fish sizes taken were much skewed towards the smaller fishes (8-20 cm). The author related these findings to the habit of individual foraging. An interesting experiment of Cormorant odour tested on fish behaviour did not show clear responses. With respect to the effect of Cormorant predation to fisheries the author has not found a clear effect. The effect Cormorants have on *Anguillicola* infected Eels remains to be investigated. With respect to the tendency of decreasing phosphorus levels in Swedish lakes Engström prognoses a decline in yield given the strong relationship which exists between these two parameters. The Cormorant in Sweden is thus presenting very interesting comparative data to the situation in western Europe with often more heavily nutrient loaded water systems. This thesis is a “must” for those interested in water system approach and integrated management.

Werner, M. 1997. Brutbiologie, Ethologie und Nahrungsökologie des Sokotra-Kormorans (*Phalacrocorax nigrogularis*) am Arabisch-Persischen Golf – Fachbereich Biologie der Technische Hochschule Darmstadt

A rather descriptive but extremely well illustrated dissertation of a species less well known to many of us. Saudi Arabia is home of this *Phalacrocorax nigrogularis* and the study was conducted in the Gulf of Salwah near Qatar between 1992-1995. Birds were ground nesting in dense colonies which may exceed 25000 pairs. The breeding period is from August to April and nests are very close to each other (1.4-1.8 nests/m²) and were hardly more than a small mound with a few feathers. Eggs and young were measured but especially behavioural studies provide a sound basis for future studies. Small coastal dwelling fish species are taken and social (mass-) foraging is the rule. Often birds went away quite long: 4-8 hours foraging trips were often recorded. Relatively little is known of the foraging waters where the birds fly off to. The management of the species (world population c. 180,000 pairs) is uncertain although protected areas occur. The Gulf War caused more than 10,000 victims because of oil spills in the northern range of the Gulf.

Der Kormoran (*Phalacrocorax carbo*) im Spannungsfeld zwischen Naturschutz und Teichbewirtschaftung.

Schönherr, C. & S. Ottenberg (eds.), 2002
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In 15 papers these proceedings of a meeting in Königswartha (Saxony) in 1997 address to the effect Cormorants have on Carp pond fishery. From a European and country by country viewpoint down to the individual ponds the authors try to set the scene of how to judge the position of the Cormorant. Besides diet and impact studies several papers address to protecting measures on ponds. Also, information is presented on how this fishery is carried out: from stocking fingerlings to the harvest of k3 mature fish. Up to 75% losses were recorded and the situation was reported to be alarming in some cases. Some papers remain in German but have English summaries. A useful report which reflects local awareness and measures of compensation as a result of a European change in Cormorant numbers.

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