DANISH REVIEW OF GAME BIOLOGY Vol. 10 no. 9

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by
ANDERS HOLM JOENSEN

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COMMUNICATION NO. 150 FROM VILDTBIOLOGISK STATION
Vildtbiologisk Station, Kalø, 8410 Rønde, Denmark
1978

DANISH REVIEW OF GAME BIOLOGY

The journal is published and distributed by the

Game Biology Station, Kalø, 8410 Rønde, Denmark

Each paper is issued separately and when a number of papers have appeared (comprising ca. 200 pages) these will be collected in a volume together with a table of contents. The price will be set separately for each volume. For volume 5–10 it is 50 Danish Kroner per volume.

Editor: Anders Holm Joensen. – Assistant editor: Else-Marie Nielsen. – Russian summaries: Axel Mortensen. – Linguistic consultant: Dr. Robert Russel. – Printed by Clemenstrykkeriet, Århus.

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CONTENTS

Introduction

The present report describes the size of the hunters' kill of divers *(Gaviidae)*, grebes *(Podicipedidae)*, cormorants *(Phalacrocoracidae)* and auks *(Alcidae)*, and their respective geographical distribution in Denmark in 1975/76. The analysis was primarily based on a questionnaire survey to hunters.

According to the Game Act of 1967 the following species within these groups have an open season:

Red-throated diver *(Gavia stellata)*	1. Oct. – 29. Feb.
Black-throated diver *(Gavia arctica)*	1. Oct. – 29. Feb.
Great Northern diver *(Gavia immer)*	1. Oct. – 29. Feb.
Great crested grebe *(Podiceps cristatus)*	1. Oct. – 29. Feb.
Cormorant *(Phalacrocorax carbo)*	1. Aug. – 30. April
Razorbill *(Alca torda)*	1. Oct. – 29. Feb.
Guillemot *(Uria aalge)*	1. Oct. – 29. Feb.
Brünnich's guillemot *(Uria lomvia)*	1. Oct. – 29. Feb.

Only the great crested grebe breeds commonly and is widespread in Denmark. Three species breed locally: Cormorant (at present three colonies), razorbill (one colony) and guillemot (one colony). – The three species of divers and the Brünnich's guillemot are non-breeding visitors to Danish waters. More details about their occurrence in Denmark are given on page 10 – 15.

The author is indebted to Mrs. Else-Marie Nielsen who carried out most of the work connected with the questionnaire survey. The Game Biology Station thanks the many hunters who, by replying to the questionnaires, made this survey possible. Thanks are also due to Åke Andersson, Svein Myrberget, I.-O. Pettersson and Teppo Lampio for providing various information on populations and hunting in the Nordic countries, and to P. Hald-Mortensen for information on the cormorant in Denmark.

Material

All hunters in Denmark must possess a general shooting licence valid for one fiscal year (1. April–31. March), and on its annual renewal, must give information to the official bag record on the size of their bag of each species (or group of species) in each county. The method of the official bag record has been described by Strandgaard 1964, 1972 and Joensen 1974.

In the questionnaires used for the hunter's reports to the official bag record, water-birds in a wider sense (corresponding to the Danish term »svømmefugle« = "swimming birds", i.e. birds with webbed feet) are divided into the following categories (not including waders):

a.	Mallard	(one species),
b.	Other dabbling ducks	(five species),
c.	Eiderduck	(one species),
d.	Other diving ducks	(nine species),
e.	Geese	(five species),
f.	Gulls	(five species),
g.	Coot	(one species), and
h.	"other swimming birds"	

For the present analysis it was basically assumed that the last-mentioned category would comprise the species treated in the present report. To evaluate the hunting of these species, a questionnaire was sent to all those hunters,

who had reported bags of "other swimming birds" to the official bag record for 1975/76. The hunters were asked to give information on the number of birds killed and the location of the kill of each of the following categories: divers, grebes, cormorants, razorbills and guillemots. In order to keep the questionnaire as simple as possible, and thereby secure the largest possible number of replies, no distinction was made in the questionnaire between the three species of divers, nor between the two species of guillemots, which can legitimately be hunted. However, the questionnaire also included blank columns, where the hunter could indicate other species, which might have been included in his original figure for "other swimming birds" reported to the official bag record. Finally, the hunters were asked to give supplementary information on the month or season of hunting, the method of hunting, and whether any birds were contaminated with oil.

Table 1. Data on the official bag record and the supplementary questionnaire survey on the category »other swimming birds« in the shooting season 1975/76. See text page 5 – 6.

	Hunters No.	Hunters %	Birds [1] No.	Birds [1] %	Birds per hunter
A. Total kill of »other swimming birds«, i.e. number reported by hunters to the official bag record, and corrected for licence holders not reporting			8579		
B. Reports to the official bag record	1671		8245		4.9
C. Hunters not included in the sample obtained by the questionnaire survey, total	326	20	2641	32	8.1
– Hunters to whom no questionnaire was sent	69	4	862	10	12.5
– Hunters not replying to questionnaire	187	11	1465	18	7.8
– Hunters replying to questionnaire, but replies contained no usable information	70	4	314	4	4.5
D. The sample obtained in the questionnaire survey and used to evaluate the composition of the kill of »other swimming birds«, total	1345	80	5626	68	4.2
– Reports including only species which logically are comprised in the category »other swimming birds«	952	57 (71)	3244	39 (58)	3.4
– Reports including both species logically comprised in the category »other swimming birds«, (above) and species which belong to other categories used in the official bag record (below)	41	2 (3)	336[2]	4 (6)	8.2
– Reports including only species which should not have been comprised in the category »other swimming birds« but by other categories used in the official bag record	352	21 (26)	2046	25 (36)	5.8

NOTES: [1]) In columns B and C numbers of birds are according to the bag record, in column D however according to the questionnaire replies received from hunters, i.e. slightly different from the figures they originally reported to the official bag record.
[2]) The 336 birds included 118 birds logically belonging to »other swimming birds«, and 218 birds which should have been included in other categories used in the official bag record.
NB: Percentage figures in brackets in section D give the proportion of the total sample (section D top line).

THE COMPOSITION OF THE CATEGORY "OTHER SWIMMING BIRDS"

For the shooting season 1975/76, 1671 hunters had reported a total of 8245 "other swimming birds" bagged to the official bag record. An estimate for the total bag of this category is obtained by correcting this figure for the difference between the number of licences issued, and the number of licence holders reporting to the bag record. This is standard procedure, and the average correction factor for the whole country in 1975/76 was + 3.9%. From this the total kill of "other swimming birds" is estimated as 8580 birds, see Table 1.

The questionnaire was sent to 1602 hunters, for whom names and addresses were available, and who had originally reported a total of 7383 birds to the official bag record. The questionnaires were mailed in February 1977, and reminders were sent three months later to all hunters, who had not yet replied (ca. 25%). Table 1 and 2 contain information on various

Table 2. The number of birds of each species (or group of species) on which information was obtained through the questionnaire survey concerning »other swimming birds« in 1975/76, and the number of hunters who reported to have bagged each species (or group of species). Division into the Islands and Jutland according to the hunters' domicile.

	The Islands		Jutland		Denmark total	
	Hunters	Birds	Hunters	Birds	Hunters	Birds
1. Reports on species logically comprised in the category »other swimming birds«, total	454	1516	539	1846	993	3362
Divers *(Gavia sp.)*	100	181	131	274	231	455
Grebes *(Podiceps sp.)*	237	650	317	785	554	1435
Cormorants *(Phalacrocorax carbo)*	172	408	121	415	293	823
Razorbills *(Alca torda)*	93	203	100	235	193	438
Guillemots *(Uria sp.)*	34	51	63	117	97	168
Other (see note below)	4	23	10	20	17	43
2. Reports on species which should not have been comprised in the category »other swimming birds« but by other categories used in the official bag record, total	167	1129	226	1135	393	2264
Mallards *(Anas platyrhynchos)*	7	23	15	35	22	58
Other dabbling ducks *(Anas sp.)*	76	645	74	349	150	994
Eiderducks *(Somateria mollissima)*	7	17	6	15	13	32
Other diving ducks	69	343	78	347	147	690
Coot *(Fulica atra)*	6	36	12	43	18	79
Gulls *(Larus sp.)*	3	13	3	12	6	25
Waders *(Charadriformes sp.)*	12	47	30	208	42	255
Grey Heron *(Ardea cinerea)*	–	–	3	5	3	5
Just stated as »error«	2	5	13	121	15	126

NOTE: Section 1 »other« were reported to be the following protected species: *Cepphus grylle* (5 hunters, 10 birds), *Fratercula arctica* (2 hunters, 7 birds), *Gallinula chloropus* (6 hunters, 21 birds), *Morus bassanus* (2 hunters, 2 birds), *Tadorna tadorna* (1 hunter, 2 birds), and a sick swan *(Cygnus sp.)*.

Section 2 categories »Other dabbling ducks« and »Other diving ducks«: A large proportion of the hunters' reports contained detailed information on the actual species, and the species composition within the present material is by and large similar to that found in the total kill by hunters of these categories (cf. JOENSEN 1974, 1978).

quantitative aspects of the questionnaire survey. 187 hunters (who had killed 1465 birds) did not answer the questionnaire. Replies were received from 1415 hunters, but 70 letters contained no usable information.

The sample used for the present analysis thus comprises 1345 replies, containing information on 5626 birds. These reports can be divided into three categories, according to the species about which they contain information:

1) The largest number of replies (952 hunters, 71% of the usable replies) only contained information on species which logically belong to the category "other swimming birds" (see page 3), viz. divers, grebes, cormorants, razorbills and guillemots, and furthermore protected species, which do not logically belong to other categories used in the bag record.

2) Some replies (41 hunters, 3% of the replies) contained information on the species mentioned above (divers, grebes etc.), but also included species, which logically should have been included in other categories used in the bag record.

3) No less than one-quarter of the hunters replying answered that their bags, which originally were reported as "other swimming birds" to the official bag record in fact consisted only of species which belong to other categories of waterbirds used in the official bag record. These replies comprised 36% of all birds on which reports were obtained through the questionnaire survey.

Table 2 gives the number of hunters reporting each species (or group of species) and the number of birds on which information was obtained. It is seen that among categories erroneously reported as "other swimming birds" to the official bag record, the largest numbers rightfully belonged to "other diving ducks" or "other dabbling ducks", together accounting for three-quarters of the birds erroneosly listed, and thirty percent of all birds in the sample. Without doubt, many hunters have simply confused the three categories containing "other ...", in filling in the report to the official bag record. The fact that several hunters have also listed such species as mallard, eiderduck, coot etc. under "other swimming birds" and which in the bag record questionnaire have their separate columns, indicates that many errors are simply due to carelessness or lack of knowledge of taxonomic classification.

Several previous investigations on the species composition of the bag of different categories of game in the official bag record, have similarly revealed that a certain proportion of hunters make mistakes in filling in the bag record questionnaire, and that the errors may be quite considerable particularly for groups of species bagged in relatively small numbers. In fact when the present analysis was begun it was expected that the category "other swimming birds", not being distinctly defined, would contain a large proportion of birds erroneously placed in this category.

ESTIMATING THE SIZE OF THE TOTAL KILL OF DIVERS, GREBES, CORMORANTS, RAZORBILLS AND GUILLEMOTS IN 1975/76

The following statistical aspects and sources of error should be considered when the size of the total kill of the species considered in the present report is estimated (see Table 3).

1) The basic material consists of information obtained through a questionnaire survey of 993 hunters, who reported bagging a total of 3319 birds of the species considered in the present report.

2) From one-fifth of the hunters who had reported bags of "other swimming birds", the questionnaire survey did not yield information on the species composition of their bags. Normally in such surveys it is reasonable to consider the composition of the total kill identical to that of the sample and thus obtain estimates for total kills by extrapolation. This procedure has for example been applied in studies of the species composition among "other diving ducks" and "other dabbling ducks" (JOENSEN 1974, 1978). Table 3 (section B) gives the estimated additional kill according to this method of calculation.

In the case of "other swimming birds" the method of extrapolation is however likely to over-emphasize the total kill of the species considered in the present report. Since many of the hunters reported that birds listed as "other swimming birds" in fact comprised species belonging to other bag record categories, it is rea-

	A Number of bagged birds on which information was obtained directly through the questionnaire survey concerning »other swimming birds« (cf. Table 2)	B Maximum number of birds bagged by hunters, from whom no report on the species composition of their bag of »other swimming birds« was obtained	C Estimated kill, which was included in the bag record categories »other diving ducks« and »other dabbling ducks« by the hunters	D Total estimated kill (rounded to nearest 50)
Divers *(Gavia sp.)*	455	240	110	800
Great crested grebe *(Podiceps cristatus)*	1435	750	90	2300
Cormorant *(Phalacrocorax carbo)*	823	430	–	1250
Razorbill *(Alca torda)*	438	230	510	1200
Guillemot *(Uria aalge)*	168	90	120	400

Table 3. The components on which estimates for total kills are based. See text page 6–7.

sonable to assume that the proportion of birds listed erroneosly was even larger in bags taken by hunters not reporting to the questionnaire survey. It is thus likely that among the 70 hunters whose replies contained no usable information, and particularly among the 187 hunters who did not reply to the questionnaire at all, a large proportion had not bagged any of the species treated in the present report. This suspicion is supported by the fact that among these categories of hunters the number of birds per hunter was higher than for hunters who only had included bags of divers, grebes etc. in their category "other swimming birds" (see Table 1). To illustrate this point it should be mentioned that three hunters have reported bags of more than one hundred "other swimming birds" to the official bag record. One hunter later replied to the questionnaire, and informed that his bag of 130 birds were in fact *Anas crecca*. The second, with a bag of 410 birds did not reply to the questionnaire, and for the third hunter (who had reported a figure between 200 and 300 birds) the name and address was not available. Judging from other information it is most likely that the bags originally reported by the latter two hunters in fact belonged to other categories; and it is evident that if this assumption holds true, the inclusion of these two hunters in the estimates would considerably exaggerate the kills of the species treated in the present report. The magnitude of the total error introduced by extrapolating species composition in the sample to that of the total kill cannot however be realistically estimated.

3) Analyses of the species composition of "other diving ducks" and "other dabbling ducks" have revealed that divers, grebes, cormorants, razorbills and guillemots are occasionally included in the hunters' reports concerning these categories (see JOENSEN 1974, 1978). In fact, for some of the species treated in the present report, a relatively large proportion of the total kill is listed erroneously (particularly razorbills and guillemots, listed as "other diving ducks"). Table 3 section C gives the estimated additional kills contained in these categories. Since samples taken for analyses of the composition of the two categories of other duck comprise much smaller proportions of the total kill, the figures presented in Table 3 section C are the average values of the three years (1973/74 – 1975/76). These estimates must be considered very approximate.

4) It is later demonstrated that a large proportion of hunters kill the species considered in the present report quite incidentally in connection with hunting of other waterbirds and that the annual bag by most hunters comprises very few birds (see Table 4). None of the species are considered particularly attractive to hunters, and they have little gastronomic value. Since many

hunters are known to fill in their reports to the bag record on the basis of memory only, and not from their game records, it seems reasonable to assume that in many cases such species of little importance are forgotten and thus not reported to the official bag record at the end of the shooting season. The assumption that this type of error is more pronounced for minority species of little importance and little attraction to hunters is of course speculative, although based on a general impression of hunting methods and hunters' attitudes obtained over several years. The magnitude of the under-estimation possibly thus introduced cannot realistically be estimated.

5) In reports to the official bag record hunters in general include only their retrieved bag, but not normally the non-retrieved crippled or killed birds. The bag record data thus under-emphasize the number of birds killed directly by hunting, but there is no information available from which the additional non-retrieved kill can realistically be estimated.

Although a very large proportion of the hunters, who had reported bags of »other swimming birds« to the official bag record, later provided detailed information on species composition through the supplementary questionnaire survey, several sources of error make estimations of total kills of the species treated in the present report quite difficult. One factor is believed to exaggerate (see above, 2) and three factors to under-emphasize the kill (3, 4 and 5). For none of these can the magnitude of the error be realistically estimated. Altogether the estimates given in Table 3 section D are believed to underestimate rather than over-estimate the total kill, but in any case they are only approximate indications of the magnitude of the kill of each species in 1975/76 and should be treated with caution.

According to the official bag record of recent years the annual kill of »other swimming birds« has been relatively constant (between 8000 and 9000 birds in each of five years, 1971/72 – 1975/76). In spite of this the present analysis which covers only one year does not necessarily illustrate all typical sides of the hunting of the species treated, nor does it reflect the »average« composition of their kill.

OTHER INFORMATION OBTAINED THROUGH THE QUESTIONNAIRE SURVEY

Geographical and seasonal distribution of the kill

Through the questionnaire survey concerning »other swimming birds« a very large proportion of the hunters who reported bags of the species treated in the present report, also provided detailed information about the location where the birds had been killed, viz. for all species, 93 – 97% of the hunters, comprising the following proportions of the total numbers of birds contained in the reports: divers 95%, grebes 95%, cormorants 95%, razorbills 89%, and guillemots 95%. The detailed distribution of the kill, also indicating the size of each hunters' individual bag, is shown on the maps in Figs. 1–5. The distribution of the additional kill of birds contained in the hunters' reports on »other diving ducks« and »other dabbling ducks« (see page 7 and Table 3) is quite similar to that shown in Figs. 1–5.

Although the hunters were asked to provide information on the month of the kill of the different species, very few did so. Many did however indicate the season (autumn, winter etc.) and in the following chapters (page 10 – 15) other material has also been used in an approximate evaluation of the seasonal distribution of the kill of the different species.

Size of individual hunters' bags

Table 4 shows the distribution of the kill of the different species according to the size of the individual hunters' bags. It is seen that for divers, grebes, razorbills and guillemots a very large proportion of the total kill is taken by hunters who each bag a very few birds, indicating that most of these birds are killed incidentally during shooting of other waterfowl. This is confirmed by general remarks from many hunters, who reported that most birds were killed during shooting of diving ducks at sea. For the cormorant a relatively larger proportion of the total kill is taken by hunters with larger individual bags.

Size of hunters' individual bags	Divers (*Gavia sp.*) No. of hunters	%	Great crested grebe (*P. cristatus*) No. of hunters	%	Cormorant (*Ph. carbo*) No. of hunters	%	Razorbill (*Alca torda*) No. of hunters	%	Guillemot (*Uria sp.*) No. of hunters	%
1 bird	128		216		141		96		57	
2 birds	57		168		61		45		25	
1 or 2 birds	185	80/53	384	69/38	202	69/32	141	73/42	82	85/64
3 birds	15		77		31		19		5	
4 birds	16		36		21		10		7	
5 birds	8		20		12		9		2	
1 to 5 birds	224	97/86	517	93/72	266	91/61	179	93/75	96	99/95
6 birds	4		16		7		8		–	
7 birds	1		3		1		2		–	
8 birds	–		4		3		2		1	
9 birds	–		2		4		1		–	
10 birds	–		1		2		–		–	
6 to 10 birds	5	2/7	26	5/12	17	6/16	13	7/20	1	1/5
11 birds	1		3		1		–		–	
12 birds	–		2		2		–		–	
17 birds	–		2		1		–		–	
18 birds	–		–		2		–		–	
20 birds	–		–		1		–		–	
22 birds	1		2		1		–		–	
23 birds	–		–		–		1		–	
30 birds	–		1		1		–		–	
34 birds	–		–		1		–		–	
66 birds	–		1		–		–		–	
> 10 birds	2	1/7	11	2/16	10	3/24	1	0.5/5	–	–/–
Total no. hunters	231		554		293		193		97	

Table 4. The distribution of the kill of divers, grebes, cormorants, razorbills and guillemots according to the size of the hunters' individual bags. Percentage values give the proportion af hunters of total number of hunters / the proportion of the total kill of the species taken by these hunters.

Summary of information on the different species

Divers *(Gavia sp.)*.

Three species of diver may legitimately be hunted in Denmark during the five months 1. Oct. – 29. Feb.: Red-throated diver *(Gavia stellata)*, black-throated diver *(Gavia arctica)*, and great northern diver *(Gavia immer)*. They are all non-breeding visitors in all Danish waters being almost exclusively marine, and occur particularly in autumn, winter and spring. The first two species are widespread and common, while *Gavia immer* is much scarcer. There is no data available on the size of the populations wintering in Danish waters. In the questionnaire survey no distinction was made between the three species, and although some hunters indicated which species they had bagged, the data were insufficient for an evaluation of specific differences in hunting.

The total kill of divers in 1975/76 is roughly estimated as ca. 800 birds (Table 3). The large majority of hunters reporting bags of divers had only killed one or two birds, and individual bags of 11 and 22 birds were exceptional (Table 4). Most birds were shot incidentally during shooting of diving ducks at sea.

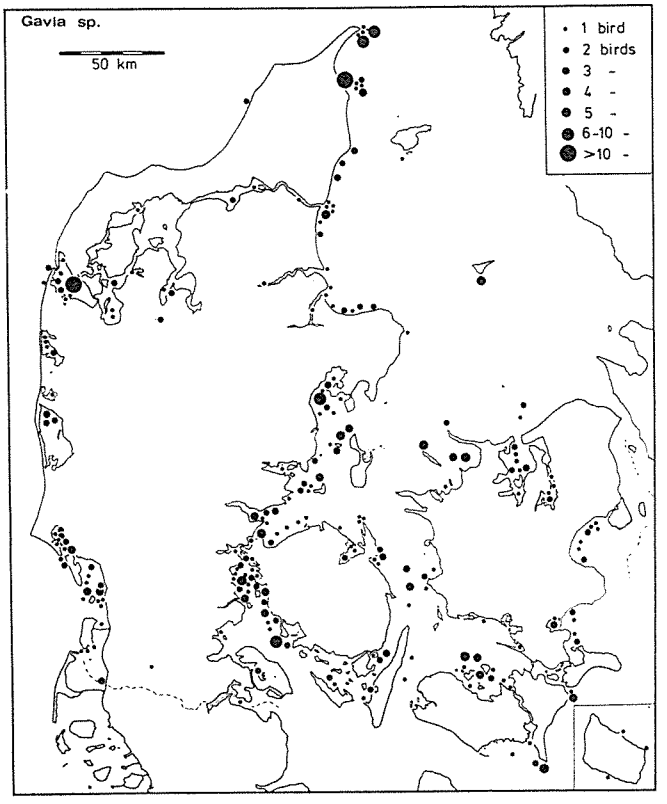

Fig. 1. The distribution of 430 divers *(Gavia sp.)* bagged in 1975/76, and the size of individual hunters' bags.

Fig. 1 shows that the kill of divers is fairly uniformly distributed within all Danish waters. With the exception of three birds killed in lakes in Jutland, all were killed at sea, generally rather far from the coast. The scanty information obtained on the seasonal distribution of the kill indicates a rather uniform distribution over the five months of open season, with peak numbers possibly bagged in the period December–February.

Great Crested Grebe *(Podiceps cristatus)*

Of the five species of grebe occurring in Denmark (four of which breed) only the great crested grebe *(Podiceps cristatus)* has an open season of five months (1. Oct. – 29. Feb.). This species is a common and widespread breeding bird in lakes all over the country. The breeding population in 1975 was estimated as roughly 3500 pairs (DYBBRO 1976). In autumn the birds move to salt- and brackish waters, where the species occurs throughout the winter, being particularly numerous in shallow water along protected coasts. The size of the wintering population is not accurately known, but must comprise several thousand birds, including most of the Danish breeders.

In the questionnaire survey hunters were asked to give information on the number of "grebes" in their bag, i.e. without distinction between the different species occurring in Denmark. 35 hunters

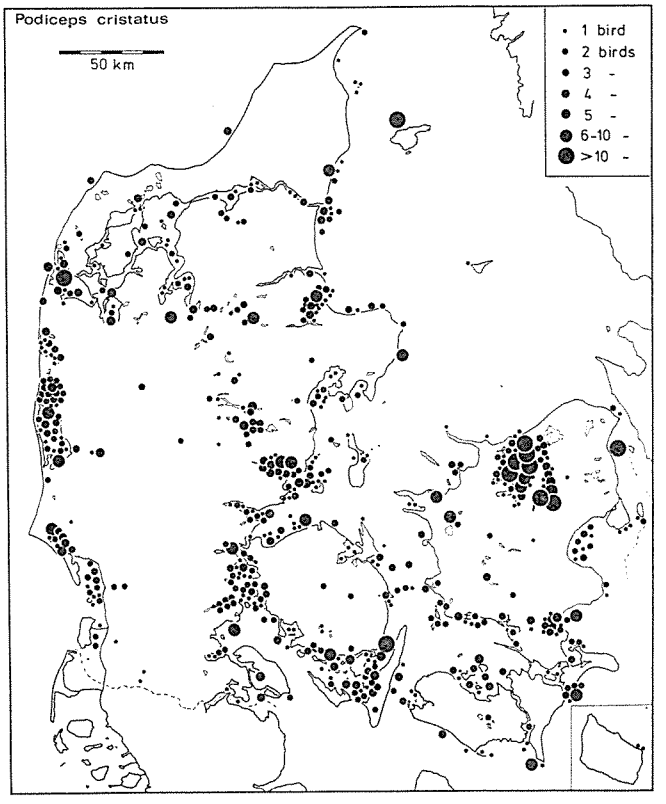

Fig. 2. The distribution of 1350 great crested grebes *(Podiceps cristatus)* bagged in 1975/76, and the size of individual hunters' bag.

did stress that the grebes they had bagged were *Podiceps cristatus* (75 birds), while one hunter reported three *Podiceps ruficollis* bagged. Without doubt the large majority of grebes bagged are in fact *Podiceps cristatus*, but it is reasonable to assume that smaller numbers of other species of grebe are included in the reports received, in particular some *Podiceps griseigena* which are quite common in many salt-water areas in winter.

The total kill of grebes in 1975/76 is roughly estimated as 2300 birds (Table 3). Most hunters had only bagged a very few birds (93% reported 1–5 birds), and only 2% of the hunters reported bags of more than ten birds, with 66 birds as an exceptionally high record (Table 4). Many hunters reported that grebes are mostly bagged incidentally during shooting of dabbling ducks, diving ducks and coot.

Fig. 2 shows that the kill of grebes is relatively uniformly distributed over the whole country. One tenth of the reported bag was taken in lakes and streams, most of these being killed in the early part of the shooting seaon. The large majority of grebes are however bagged in brackish and salt water areas, and a notable proportion of these are killed in shallow fiord areas, for example Roskilde Fjord, Issefjord, Præstø Fjord, Horsens Fjord, Randers Fjord, Stadel Fjord, Ringkøbing Fjord and Ho Bugt. The kill in salt- and brackish waters appears to be relatively uniformly distributed over the whole open season.

Cormorant *(Phalacrocorax carbo)*

The open season is nine months long (1. Aug. – 30. April). Two sub-species occur in Denmark; *Phalacrocorax carbo sinensis* breeds locally (at present three colonies: at Vorsø (several hundred pairs), Ormø (a few hundred pairs) and at a lake on South Funen (a few pairs) (see Fig. 3). The majority of the birds leave the country in autumn and spend the winter mainly in the Mediterranean region, although a small proportion of the birds possibly stay in Danish waters during the winter. *Phalacrocorax carbo carbo* is an autumn and winter visitor to Danish waters, probably mainly from breeding areas along the Norway coast. It is almost entirely confined to the North Sea and particularly the Kattegat, and occurs only exceptionally in waters further south in Denmark (SALOMONSEN 1963, 1972). The population wintering in the Danish part of the Kattegat comprises up to a few thousand birds (JOENSEN 1969, and unpublished data).

The total kill of cormorants in 1975/76 is roughly estimated as 1250 birds (Table 3). Two-thirds of the hunters reporting bags of this species had killed only one or two birds, apparently quite incidentally when hunting other species of waterbirds. 27 hunters (9%) reported bags of more than five birds. The cormorant is traditionally considered harmful to fishery, but it is noteworthy that of the 27 hunters mentioned, only two were professional fishermen (accounting for 30 birds).

The proportion of each of the two subspecies of the total kill cannot accurately be estimated. However, from the scanty information available, it appears that nearly all birds bagged in the Waddensea, the Limfjord and the Northern Kattegat and roughly one third of the birds bagged in the Southern Kattegat (altogether comprising about one third of the total Danish kill) are from the winter

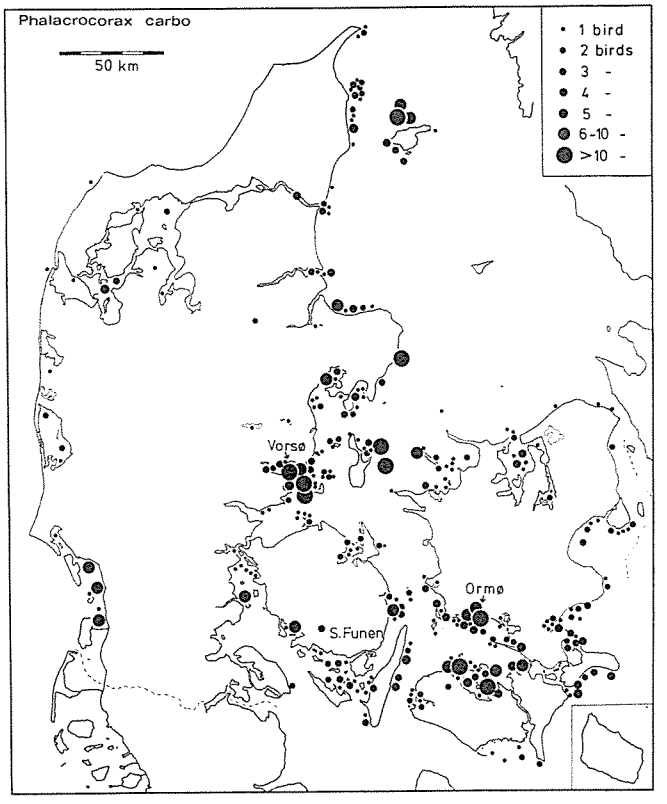

Fig. 3. The distribution of 780 cormorants *(Phalacrocorax carbo)* bagged in 1975/76, and the size of individual hunters' bag.

months, and presumably mainly *Phalacrocorax carbo carbo*. Most of the birds bagged in the Southern Kattegat and nearly all birds bagged in waters further south (altogether roughly two thirds of the total kill) are killed during late summer, autumn and in spring, being presumably mainly *Phalacrocorax carbo sinensis*. 99% of the birds were reported killed in marine habitats (Fig. 3).

Razorbill *(Alca torda)*

The open season lasts five months (1. Oct.–29. Feb.). In Denmark the species breeds only on Ertholmene at Bornholm in the Baltic Sea. In late autumn, winter and early spring it is a widespread and locally common visitor in all Danish waters. Birds wintering in the Baltic Sea and adjacent waters are mainly from Baltic breeding areas, whereas visitors to the North Sea and the northern Kattegat are mainly from Norwegian and British colonies (SALOMONSEN 1963, 1972, MEAD 1974). There are no data available on the size of the populations wintering in Danish waters.

The total kill of razorbills in 1975/76 is roughly estimated as 1200 birds. Some hunters reported that the annual kill has been decreasing over the last decade or so, due to dwindling numbers of birds present in waters where the species is traditionally hunted. Data on birds sold

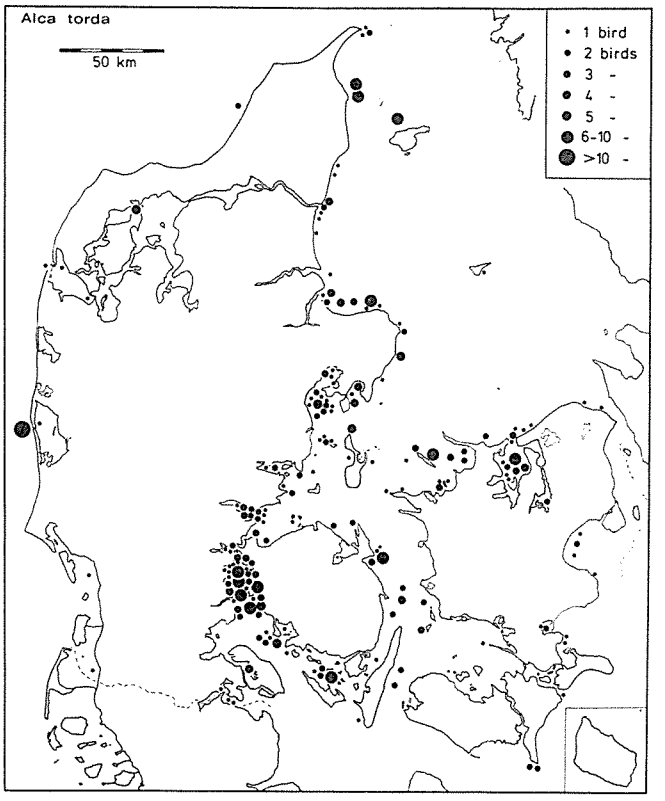

Fig. 4. The distribution of 390 razorbills *(Alca torda)* bagged in 1975/76, and the size of individual hunters' bags.

to a game firm in Copenhagen confirm this tendency, and indicate that formerly the annual kill may have been several times larger than in recent years. Most hunters reporting bags of razorbills in 1975/76 had only killed one or two birds, often incidentally when hunting diving ducks at sea. However, particularly among hunters operating in the Lillebælt, there is a tradition for hunting razorbill more specifically, and several hunters here regularly take larger bags of the species. This is particularly illustrated by data from the survey of "other diving ducks", to which category a large proportion of the total kill of the species is reported by the hunters (see Table 3).

Razorbills are bagged in all Danish waters, mostly rather far from the coasts (Fig. 4). It is estimated that approximately one third of the total kill is taken in the northern Lillebælt. The razorbills are almost entirely bagged in the period December to February.

Guillemot *(Uria aalge)*

Both the guillemot *(Uria aalge)* and the Brünnich's guillemot *(Uria lomvia)* have an open season of five months (1. Oct.–29. Feb.), but since the latter is a very rare visitor to Danish waters, it can be ignored. In Denmark the guillemot *(Uria aalge)* breeds only on Ertholmene at Bornholm, but is a widespread and rather common winter visitor to all Danish waters from colonies in the Baltic Sea and

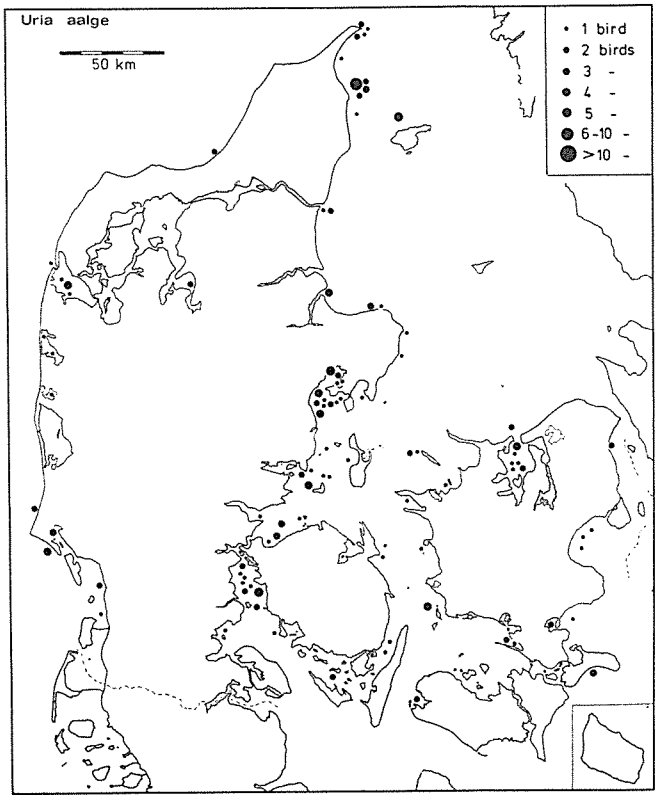

Fig. 5. The distribution of 160 guillemots *(Uria aalge)* bagged in 1975/76, and the size of individual hunters' bags.

coasts of NW Europe (SALOMONSEN 1963, 1972). There is no information available on the size of the population wintering in Danish waters.

The total kill of guillemots in 1975/76 is roughly estimated as 400 birds. The species is only bagged incidentally by a small number of hunters during shooting of diving ducks at sea, mostly rather far from the coasts (Fig. 5). Guillemots are bagged during the whole open season.

Discussion and conclusions

The present report describes quantitative aspects concerning hunting of divers, grebes, cormorants and auks in Denmark in 1975/76. These species were bagged by 1000–1500 hunters, most of whom bagged only a few birds. Only a few dozen hunters bagged more than ten birds of a single species or all the species taken together. Tendencies to specialize in hunting one or more of the species were slight, and quite local. In comparison, ducks are each year bagged by approximately 60,000 Danish hunters, and several thousand of them kill more than ten ducks (JOENSEN 1974, 1978).

The total kill of each species considered varied from a few hundred to a couple of thousand. With a few exceptions other

species of waterbirds, which can legitimately be hunted in Denmark, are bagged in much larger numbers, the exceptions being *Anas querquedula, Mergus merganser* and three to four species of geese (JOENSEN 1978, M. FOG pers. comm.).

Divers, cormorants and auks were almost entirely killed at sea, mostly incidentally during hunting of diving ducks. Most of the grebes were also killed at sea, but one-tenth were bagged in freshwater habitats, mainly incidentally during duck hunting. Previously several of the species considered, particularly the cormorant, were in general considered harmful to fishery. However, this attitude only appears to have been a primary motive for killing the birds for a very small proportion of the hunters in 1975/76. From a gastronomic point of view the species concerned have little attraction, and divers, grebes and cormorants are hardly ever eaten by man.

When evaluating hunting in Denmark of the species concerned, it is relevant to consider their general status in the whole region from where birds killed in Denmark are recruited, e.g. the magnitude of population size and its trends over the last decades, and in addition hunting regulations in neighbouring countries. Although the available information is scanty in several respects (and in the case of hunting regulations possibly incomplete) the following brief characteristics can be established.

The Scandinavian breeding population of divers probably comprises some thousand pairs, and several recent reports mention decrease in numbers and express concern about the wellfare of the populations (SALOMONSEN 1963b, HAFTORN 1971, AHLÉN 1977). Divers are apparently subject to general hunting only in two countries in NW Europe (Denmark and Norway).

The great crested grebe is a widespread and often numerous breeding bird in most of Europe northwards to S. Scandinavia. In general the populations appear to be in good condition. Among the species considered, only the great crested grebe is hunted in several countries, although probably protected in most.

The central European population of the cormorant *(Phalacrocorax carbo sinensis)* has been declining in recent years in most countries (in some quite drastically), and Denmark appears to be the only country where an increase has been observed. The present total population amounts to some thousand birds, of which Denmark contains an increasing proportion. The sub-species is generally considered endangered in Europe. (AHLÉN 1977, BAUER & GLUTZ VON BLOTZHEIM 1966, BERGER 1970, PRZYBYSZ 1975, SZIJJ 1973). The sub-species is only hunted in Denmark and Sweden, although control measures in cases of damage are possibly also undertaken in a few other countries. The Atlantic sub-species *(Phalacrocorax carbo carbo)* is a numerous breeding bird in N. Norway, but disappeared long ago in W. Norway and more recently in the Faeroe Islands, and the breeding population in the British Isles is less than ten thousand birds (HAFTORN 1971, CRAMP *et al.* 1974). The sub-species is hunted in Denmark, Sweden and Norway.

In the whole North Atlantic region breeding populations of razorbills and in particular guillemots are very large, and they are hunted in Norway, Iceland and

the Faeroe Islands, but not in the British Isles. In the southern part of their range, populations have however declined in recent years. Probably most birds killed in Denmark originate from breeding colonies in the Baltic Sea, where breeding populations of both species amount to less than ten thousand pairs. The guillemot has decreased considerably here and is now considered endangered, while as a result of protection the small population of razorbills has increased somewhat. (AHLÉN 1977, BRUN 1971, CRAMP *et al.* 1974, and Å. ANDERSSON pers. comm.). The Baltic populations of auks are only hunted in Denmark.

It must be admitted that in several respects the available information appears insufficient for a thorough evaluation of the influence of hunting in Denmark on the welfare of the species considered in the present report. Since it is most unlikely that sufficient data will become available within the nearest future, it is suggested that continued general hunting in Denmark be considered on the basis of existing knowledge which can be summarized as follows:

1) Divers, cormorants and auks have a low reproductive rate, inplying that their populations can only tolerate a lower mortality (e.g. by huting) than most other waterbirds traditionally considered as quarry species (e.g. ducks).

2) All the species treated feed almost exclusively on fish, and being at the top of the food chain they are particularly exposed to pollution by toxic chemicals. Divers and auks in particular are known to be extremely vulnerable to oil pollution at sea, and they have in recent years suffered considerable (and without doubt under-estimated) losses in N. European waters. Furthermore divers, cormorants and auks are very sensitive to human disturbance during the breeding period, a problem which is causing increasing concern.

3) The populations from which the Danish hunters' toll is taken comprise for all the species concerned only thousands – and not tens of thousands – of birds. From a biological point of view it is questionable to continue hunting such small populations on such liberal terms as is the case in Denmark today. With due reservation to the inadequacy of population data the bags of divers, razorbills and in particular *Phalacrocorax carbo sinensis* appear large compared to existing populations.

4) Recently scientists have expressed concern about the welfare of most of the populations from which the Danish bag is taken, viz. divers in Scandinavia, auks in the Baltic Sea, and in particular *Phalacrocorax carbo sinensis*. The responsibility of Denmark for the welfare and future existence of the latter species, widely regarded as endangered, is evident.

5) General hunting of the species concerned is limited to a small number of countries within Europe, and very few countries indeed join Denmark in huntind divers and *Phalacrocorax carbo sinensis*, and none in hunting Baltic auks.

6) From several points of view divers, grebes, cormorants and auks are of negligible importance as quarry species for Danish hunters.

With the possible exception of *Phalacrocorax carbo sinensis*, the species considered in the present report appear to be in no immediate or rapidly increasing

danger, in respect to their European populations. However, a modern concept of hunting regulation is that of favouring species or populations characterized as "possibly being in a more or less critical or unstable state". In other words, any reasonably well documented doubt about the welfare of an uncommon species should lead to conservation measures which are evidently beneficial for the species in question. With this in mind it appears that from several biological and other points of view it is questionable whether continued general hunting of the species considered in the present report is justifiable, and in particular the hunting of *Phalacrocorax carbo sinensis* is highly questionable.

The doubt about the justification for hunting is less evident for the great crested grebe than for the other species considered in the present report. Also, it appears relevant to maintain the possibility of conducting strictly supervised control of the cormorant and great crested grebe in cases where damage is proved.

Dansk resumé

Jagten på lommer, lappedykkere, skarver og alkefugle i Danmark i 1975/76

Rapporten beskriver jagtudbyttets størrelse, geografiske fordeling m. m. i Danmark i 1975/76 af lommer (3 arter, rødstrubet lom, sortstrubet lom og islom), toppet lappedykker, skarv, alk og lomvie (2 arter, langnæbbet lomvie og kortnæbbet lomvie). Jagttiden for skarv er 1. august–30. april, for de øvrige arter 1. oktober–29. februar.

Materialet er først og fremmest tilvejebragt gennem en spørgebrevsundersøgelse omfattende alle de jægere, som i 1975/76 til den officielle vildtudbyttestatistik havde oplyst om jagtudbytter af kategorien »andre svømmefugle«. Spørgebrevsmaterialet er beskrevet i Tabel 1 og 2.

Jagtudbytterne af de enkelte arter i 1975/76 skønnedes at være (se Tabel 3) ca. 800 lommer (ganske overvejende rødstrubet og sortstrubet lom), ca. 2300 toppede lappedykkere, ca. 1250 skarver, ca. 1200 alke, og ca. 400 lomvier, idet sidstnævnte formentlig næsten udelukkende omfatter langnæbbet lomvie. Disse tal er forbundet med nogen usikkerhed, men må formodes at angive den rigtige størrelsesorden, idet der dog er tale om undervurdering snarere end overvurdering af de faktiske jagtudbytter.

De behandlede arter blev i 1975/76 kun nedlagt af 1000–1500 jægere, og langt de fleste jægere nedlagde blot enkelte fugle (se Tabel 4), ganske overvejende tilfældigt under andejagt. Den geografiske fordeling af de nedlagte fugle ses af kortene Fig. 1–5. Lommer, skarver, alke og lomvier nedlægges næsten udelukkende på havet. Også størstedelen af de toppede lappedykkere nedlægges i saltvands- og brakvandsområder, idet omkring en tiendedel af fuglene dog nedlægges i ferskvand.

Fra et jagtligt synspunkt er jagten på disse arter i Danmark uden nævneværdig betydning, og heller ikke betragtningen af dem og især skarven som skadelige for fiskeri synes at have været et almindeligt motiv for jagten på dem.

De bestande, hvoraf det danske jagtudbytte tages, er for alle arterne kun i størrelsesordenen tusinder, ikke titusinder. Forskere har udtrykt bekymring for bestandene af lommer i de skandinaviske yngleområder og alkefuglene i Østersøen. Bestanden af mellemskarv i Centraleuropa betragtes generelt som truet, idet der er konstateret stor tilbagegang i de fleste lande. Danmark er det eneste område, hvor mellemskarven har vist fremgang i de senere år, og der påhviler derfor landet et voksende ansvar for denne underarts fortsatte trivsel og eksistens. Med undtagelse af toppet lappedykker er de omhandlede bestande kun genstand for jagtlig udnyttelse i et fåtal lande i NW Europa.

På baggrund af den eksisterende omend i visse henseender ufuldstændige viden om de omhandlede arters bestande og deres trivsel kan der rejses tvivl om berettigelsen af en fortsat almen jagt i Danmark, en tvivl, der er overordentlig velbegrundet for mellemskarven, men knap så udtalt for toppet lappedykker. Det synes dog relevant, at der netop for disse to arter opretholdes mulighed for en vis kontrol i særlige situationer, hvor disse arter har forårsaget påviselig skade.

Резюме на русском языке

Охота в Дании на *Gavia sp.*, *Podiceps cristatus*, *Phalacrocorax carbo*, *Alca torda* и *Uria sp.* в 1975/76 г.

В статье обсуждается численность охотничей добычи *Gavia sp.* трех видов: *G. stellata*, *G. arctica* и *G. immer*, *Podiceps cristatus*, *Phalacrocorax carbo*, *Alca torda*, *Uria aalge* и *Uria lomvia* в Дании в 1975/76 г., ее географическое распределение, и т. п. Время охоты на *Phalacrocorax carbo* продолжается с 1 августа по 30 апреля, а на прочие виды с 1 октября по 29 февраля.

Материал главным образом получен анкетным опросом, охватывавшим всех тех охотников, которые в заявках для официальной статистики охотничей добычи за 1975/76 г. заявляли о добычах категории »других водоплавающих птиц«. Материал анкетного опроса описан в Табл. 1 и 2.

Численности охотничей добычи отдельных видов в 1975/76 г. (см. Табл. 3) оценены в прибл. 800 *Gavia sp.*, из которых далеко преобладающую часть составляли *G. stellata* и *G. arctica*, прибл. 2300 *Podiceps cristatus*, прибл. 1250 *Phalacrocorax carbo*, прибл. 1200 *Alca torda* и прибл. 400 *Uria sp.*, причем можно предполагать, что последнее число почти исключительно составляется *Uria aalge*. Эти цифры несколько ненадежны, но есть основание предполагать, что они правильно указывают порядок величины добычи, хотя при этом фактическая добыча охотников скорее недооценена чем переоценена.

Обсуждаемые виды в 1975/76 г. были убиты только 1000–1500 охотниками, в преобладающем большинстве случаев застрелившими только отдельных птиц (см. Табл. 4), главным образом случайно во время охоты на уток. Географическое распределение убитых птиц указано на картах Фиг. 1–5. *Gavia sp.*, *Phalacrocorax carbo*, *Alca torda* и *Uria aalge* убиваются почти исключительно на море. Большинство *Podiceps cristatus* также убивается на морских и солоноватых водных пространствах, однако около десятой части птиц убивается на пресных водах.

С охотничей точки зрения, охота на эти виды в Дании имеет только небольшое значение. Кажется, что значительным побуждением к охоте на них не было и то обстоятельство, что эти виды, а в особенности *Phalacrocorax carbo*, считаются вредителями рыбной ловли.

Популяции, из которых получается добыча датских охотников, у всех видов составляют величины в порядке тысяч, а не десятков тысяч. Исследователи выразили беспокойство относительно популяций *Gavia sp.* в скандинавских районах их гнездования, и популяций *Alcidae* на Балтийском море. В общем считают, что популяции *Phalacrocorax carbo sinensis* в Центральной Европе грозит опасность вымирания, так как в большинстве стран констатировано значительное сокращение ее. Дания является единственной местностью, где за последние годы констатирован рост популяции *Phalacrocorax carbo sinensis*, и этой стране следовательно надлежит возрастающая ответственность за дальнейшее благосостояние и существование этого подвида. За исключением *Podiceps cristatus*, обсуждаемые популяции подвержены охоте только в немногих странах Северозападной Европы.

На основании имеющихся, хотя во многих отношениях и несовершенных знаний о популяциях обсуждаемых видов и о их благосостоянии, можно сомневаться о допустимости продолжения общей охоты на них в Дании. Это сомнение чрезвычайно хорошо обосновано в случае *Phalacrocorax carbo sinensis*, но едва-ли также определенно в случае *Podiceps cristatus*. Однако, кажется уместным, что именно по отношении к этим двум видам следует сохранить возможность некоторого контроля в особых случаях, где эти виды причинили доказуемый вред.

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