PERCH FIDELITY OF CORMORANTS *Phalacrocorax carbo* OUTSIDE THE BREEDING SEASON

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**ABSTRACT**

The perch fidelity of the Cormorant *Phalacrocorax carbo sinensis* has been studied during migration and winter time on a roost at Lake Geneva, Switzerland. A one-perch fidelity index was computed for 217 individuals. It appears that the perch fidelity increases with the age of the Cormorant, but is not correlated with the duration of stay of the bird on the roost. This last point, confirmed by examples of young birds migrating to the south and showing a high fidelity during their short stay on the roost, tends to prove that the competition for a perch on inland lakes is but one of the factors influencing the latitudinal distribution of the Cormorants according to age.

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**INTRODUCTION**

The large colour ringing scheme organised since the beginning of the 1980s in the central European population of the Cormorant *Phalacrocorax carbo sinensis* has allowed the monitoring of the nesting and migrating activities of individual birds. Cormorants are gregarious throughout their annual cycle and use communal roosts to spend the night. The nest site fidelity was already treated by Kortlandt (1942). A large amount of data has also been collected in Danish colonies (J. Gregersen, unpubl.). Furthermore, the fidelity to a certain roost on the wintering grounds and stop-over sites has been described by Yé sou (1995).

As the perch availability is often limited in the northern wintering grounds, especially on inland lakes, a detailed study of the perch fidelity within a roost could enlighten the supposed role of social competition leading to the latitudinal winter distribution of the birds, in which young birds and females winter further south than adults and males respectively (Van Eerden & Munsterman 1995). The aim of this paper is to provide an analysis of the degree of perch fidelity on a winter roost in Switzerland.

**MATERIAL AND METHODS**

Extensive colour ring reading activities have been carried out at the roost of Les Grangettes (Noville, Lake Geneva, Vaud, Switzerland) from 1984 to 1989 (Reymond & Zuchuat 1995), leading to 2244 observations of 291 different birds. A particular effort was made during the winters of 1986-1987 and 1987-1988, when rings were read at intervals of on average 3.7 and 4.4 days respectively, from August to May.

The roost of Les Grangettes consists of a 1.5 km long breakwater. This array of rock boulders was designed to protect a large reed belt from the waves. The boulders, with an average volume of 3 m\(^3\), emerge irregularly up to 2.5 meters from the water surface. With the aid of pictures each boulder was given a number. Thus, it was possible to record the position of each Cormorant sighted. The observations were carried out in the late afternoon, when the birds were returning to the night roost from their fishing areas. Except when chased off by another individual or disturbed by a boat, the birds generally stayed for the night on the perch they first occupied. Nevertheless, in a few cases, birds were found to occupy more than one perch during the same late afternoon.
A preliminary study of the data collected had shown that almost all individuals exhibit a certain 'fidelity', to a specific part of the breakwater (typically a 50 meter stretch, i.e. 30 boulders), with an important proportion of the birds even faithful to one particular rock. Hence, a perch fidelity index (PFI) was computed. For each Cormorant observed more than five times in the same season, the most occupied rock is determined and each case of occupation of that precise rock (the ‘main rock’) given a weight of 20. The two contiguous boulders to this main rock are given a weight of 19, and so on till weight zero. All the observations are consequently weighted according to this linear pyramidal decreasing scheme. The sum of the weighted observations is expressed as percentage of the maximal weighted sum, i.e. number of observations × 20. This percentage is used as PFI. In case an individual used two different rocks, a PFI was calculated for each rock separately, and combined afterwards.

For each Cormorant, the following information was also known: age, duration of stay at the roost Les Grangettes during the season considered and the number of seasons that the bird has been sighted at the roost.

RESULTS

A total of 217 individuals has been spotted 5 times or more during the same winter season and for each of them the perch fidelity index (PFI) was computed (mean = 65, max = 100, min = 10, SD = 24.6). We give here examples of the three typical behaviours observed (Table 1). For two individuals the PFI was adapted to the use of two main perches.

The calculation of PFI allows us to determine whether perch fidelity is varying with age, with duration of the stay at the roost and with the number of seasons in which the bird had been observed before at Les Grangettes. The perch fidelity is globally increasing with the age of the Cormorants and with the number of seasons spent before (Fig. 1). However, no relationship was observed when the PFI was plotted against the duration of stay. A complete statistical analysis using a dynamical grouping method was performed on the following variables: PFI, age, duration of stay and number of previous seasons. No group of Cormorants presenting similarities in any combination of those variables could be selected.

To confirm that the age of the Cormorants correlates with a higher degree of perch fidelity, we selected 24 birds which had been observed more than five times each season during at least three consecutive seasons. These birds have been classified according to the development of their PFI.

![Fig. 1. Perch Fidelity Index (PFI) of individual Cormorants at Les Grangettes. Lake Geneva (Switzerland), in relation to: (A) the number of previous seasons a Cormorant was observed and (B) age of the birds. Data presented as mean and range within a certain winter season.](image-url)
Table 1. Examples of perch fidelity patterns throughout various seasons in three individual birds at the roost Les Grangenttes, Lake Geneva, Switzerland. Type A refers to a ‘one block faithful’ individual (ring BLUE M21), type B to an ‘erratic individual’ (ring BLACK PSO) and type C to a bird using two perches (ring RED K83). All birds were ringed as a nestling in Danish colonies. PFI refers to Perch Fidelity Index (see Material and methods). The number of the site refers to numbers which were given to the rock boulders (blocks) that make up the roost.

<table>
<thead>
<tr>
<th>Type</th>
<th>Period/PFI</th>
<th>Number of observations at a site</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>29.01.85 - 15.03.85 / 71</td>
<td>5 at block 2/7/3, 2 at a block within 100 m</td>
</tr>
<tr>
<td></td>
<td>12.09.85 - 17.03.86 / 85</td>
<td>14 at block 2/7/3, 1 at 11 blocks away, 2 at other blocks</td>
</tr>
<tr>
<td></td>
<td>11.09.86 - 01.03.87 / 89</td>
<td>16 at block 2/7/3, 2 at blocks far away, 1 at a contiguous block</td>
</tr>
<tr>
<td></td>
<td>03.09.87 - 07.03.88 / 97</td>
<td>29 at block 2/7/3, 1 at a block nearby, 1 at a block far away</td>
</tr>
<tr>
<td></td>
<td>22.09.88 - 05.03.89 / 100</td>
<td>13 at block 2/7/3</td>
</tr>
<tr>
<td></td>
<td>13.09.89 - 18.02.90 / 100</td>
<td>10 at block 2/7/3</td>
</tr>
<tr>
<td>B</td>
<td>30.09.86 - 07.01.87 / 20</td>
<td>9 at blocks scattered over 1 km</td>
</tr>
<tr>
<td></td>
<td>02.09.87 - 08.01.88 / 32</td>
<td>13 at different blocks</td>
</tr>
<tr>
<td></td>
<td>22.09.88 - 11.02.89 / 45</td>
<td>5 at block 15/N/2, 6 at different blocks far apart</td>
</tr>
<tr>
<td>C</td>
<td>14.10.85 - 15.11.85 / 100</td>
<td>6 at block 6/1/12</td>
</tr>
<tr>
<td></td>
<td>02.10.86 - 19.10.86 / 65</td>
<td>5 at block 6/1/12, 2 at a block nearby, 2 at block 1/7/7, which is situated 600 m apart from block 6/1/12</td>
</tr>
<tr>
<td></td>
<td>22.09.87 - 14.11.87 / 93</td>
<td>4 at block 6/1/12, 14 at block 1/7/7, 1 at a block nearby block 1/7/7</td>
</tr>
<tr>
<td></td>
<td>22.09.88 - 27.10.88 / 100</td>
<td>7 at block 6/1/12, 9 at block 1/7/7</td>
</tr>
</tbody>
</table>

i.e. increasing PFI, constant PFI, decreasing PFI and varying PFI.

DISCUSSION

As already mentioned in the introduction, the Cormorants tend to use a repeatable scheme to optimise their migration routes and wintering time, implying a high site fidelity or even a ‘time schedule’ fidelity (Reymond & Zuchuat 1991, Yé-sou 1995, Reymond & Zuchuat 1995). The perch fidelity as presented above fits well with this tendency.

In which way could the fidelity to a single perch be profitable to a Cormorant? The lack of need for an everyday search for a good perch (i.e. well elevated above the water, protected from the waves and easy to defend) and maybe the well established relationships with the neighbours could be considered as advantages. This is enhanced by the fact that some individuals show a high one-perch fidelity in a large sector of the breakwater of which the very adjacent boulders form a uniform wall of regular height. Nevertheless, it appears that the one-rock faithful Cormorants generally stay on boulders which seem, from a ‘human point of view’, to be comfortable. Unfortunately, it was impossible to quantify the comfortability of the occupied rocks.

The general increase of the PFI with the age of the Cormorants can be understood in two ways. Cormorants may tend to increase their fidelity while growing older for the reasons indicated above. Moreover, individuals that survive longer are likely to be stronger than others, which allows them to defend a particular rock more effectively.

The lack of correlation between the PFI and the duration of stay indicates that the competition for perches on the wintering grounds is not an absolutely determinant factor forcing weaker birds to go further south. Numerous examples have been recorded of birds spotted only in autumn for a short time on their way south, showing a high fi-
delity to one particular ‘comfortable’ rock: for example RED K83 (see Table 1) and this striking example, YELLOW KX (ringed as nestling on 3 July 1986 at Oostvaardersplassen, The Netherlands), observed 16 times on a good block from 18 August 1986 till 19 October 1986 during his first-year migration, and observed 15 times on another good perch on his second year migration (19 August 1987-14 November 1987).

Three hypotheses were put forward to explain the latitudinal distribution of the Cormorant (male and female, adult and juvenile): ‘Body size hypothesis’ (resistance to cold weather), ‘Arrival time hypothesis’ (higher breeding success for earlier arrivals) and ‘Social dominance’ (see Van Eerden & Munsterman 1995). The first and the last hypothesis suggest mechanisms through which the variation in latitudinal distribution could be achieved, the second one provides a functional explanation. With respect to the last hypothesis dominant birds could cause subdominant birds to move further south. A way through which this could happen is by competition for roosting sites. The results in this paper show that PF1 is not positively correlated with duration of stay. If we assume that PF1 is associated in some way with dominance rank, it is unlikely that social competition for roosting sites is an important factor which causes birds to leave the site. Some birds, although capable of successfully defending a perch, may still migrate further south.

ACKNOWLEDGEMENTS

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REFERENCES


SAMENVATTING

Doortrekkende en overwinterende Aalscholvers zijn trouw aan een vaste zitplaats binnen de roestplaats Les Grangettes in het Meer van Genève (Zwitserland). Deze plaatstouw wordt beschreven aan de hand van waarnemingen aan 217 (door kleurringen) individueel herkenbare vogels.

Van al deze vogels is een index van plaatstouw aan één specifieke zitplaats berekend (PF1). Deze index lijkt positief gecorreleerd te zijn met de leeftijd van de vogel en met het aantal seizoenen dat een vogel al eerder van de roestplaats gebruik gemaakt heeft. Er is echter geen sprake van een positief verband tussen plaats­ trouw en de duur van het verblijf.

Het feit dat in het algemeen vrouwtjes en juveni­ len (kleinere vogels) zuidelijker overwinteren dan man­ netjes en adulten (grote vogels) is in het verleden wel eens toegeschreven aan een mogelijke sociale domi­ nantie van grotere individuen over kleinere. Sommige vogels echter trekken wel verder zuidwaarts, terwijl ze goed in staat zijn hun favoriete zitplaats te verdedigen. Deze bevinding suggereert dat in ieder geval concurr­ tie om goede zitplaatsen geen belangrijke factor is voor de individuele keuze van het overwinteringsgebied.