Sammanfattning: **Kullstorlek, produktivitet och populationsförändringar hos svarthakedoppingar i en atypisk miljö**

En population av svarthakedopping (11–24 par) som undersöktes under tio år i skärgården i Korsnäs i södra Österbotten hade en medelkullstorlek på 5,1 ägg (tabell 1). Ungkullarnas storlek var i medeltal 2,9. Båda värdena är klart högre än motsvarande värden hos svarthakedoppingar som häckar i små, näringsfattiga sjöar i Sydösterbotten. Den undersökta populationen minskade från 24 till 11 par för att sedan under åren 1984–88 åter öka till 22 par.

Resultaten visar att lokala bestånd av svarthake kan ha en god häckningsframgång och att reducerade bestånd kan återhämta sig över blott några år. Emellertid är uppgifterna om till exempel vinterdödligheten hos svarthakedoppingen och effekterna av eventuella förändringar i traditionella häckningsmiljöer bristfälliga, vilket gör att orsakerna till artens märkbara minskning i Finland alltjämt är höljda i dunkel.

References

Fjeldså, J. 1973: Territory and the regulation of population density and recruitment in the Horned Grebe Podiceps auritus arcticus Boje, 1822. — Vidensk. Meddel. Dansk Natur. Forening 136:117–189.

Ferguson, R. S. & Sealy, S. G. 1983: Breeding ecology of the Horned Grebe, Podiceps auritus, in southwestern Manitoba. — Can. Field-Naturalist 97:401–408.

Fuchs, E. 1982: Bestand, Zugverhalten, Bruterfolg und Mortalität des Haubentauchers auf dem Sempachersee. — Ornithol. Beob. 79:255–264.

Lammi, E. 1983: Mustakurkku-uikku. — In: Hyytiä, K., Kellomäki, E. & Koistinen, J. (eds.): Suomen lintuatlas: 22–23. Helsinki.

Merikallio, E. 1958: Finnish birds. Their distribution and numbers. — Fauna Fennica 5:1–181.

van der Poel, A. M. 1984: Overwinteringsgebieden, plaatstrouw en levensverwachting van Nederlands Futen Podiceps cristatus. (Summary: Wintering areas, site tenacity and life expectation of Dutch Great Crested Grebes Podiceps cristatus.) — Limosa 57:43–46.

Skidell, J. 1980: Hornborgasjöns doppingar. (Summary: The grebes of Lake Hornborgasjön.) — Vår Fågelvärld 39:393–396.

Ulfvens, J. 1988: Comparative breeding ecology of the Horned Grebe Podiceps auritus and the Great Crested Grebe Podiceps cristatus: archipelago versus lake habitats. — Acta Zool. Fennica 183:1–75.

Uusitalo, R. 1969: Mustakurkku-uikun (Podiceps auritus) pesimisbiologiasta Etelä-Satakunnassa. (Summary: On the breeding biology of the Horned Grebe (Podiceps auritus) in South Satakunta.) — Porin Lintutieteellisen Yhdistyksen Vuosikirja 1968:45–48.

Uusitalo, R. 1976: Mustakurkku-uikun pesimisbiologiasta, erityisesti habitaatin valinnasta Lounais-Suomessa. — Unpubl. M.Sc. Thesis, Dept. Biol., Univ. Turku, 95 pp.

Author's address: Johan Ulfvens, Natur och Miljö, Sjömansgatan 35, SF-00150 Helsinki, Finland.

Received 12 December 1988, accepted 22 February 1989

Solitary pairs of Great Black-backed Gulls *Larus marinus* prevent strangers from mobbing a predator model at their nest site

Mikael Kilpi

Mobbing (i.e. flocking around a predator, see Kruuk 1964) is a typical feature of colonial gulls. The function and adaptive value of this behaviour have remained elusive, though many facets of the problem have been studied (Conover 1987). The benefits or costs of "communal" mobbing for a particular territory owner in a colony are also obscure.

Large gulls, such as the Great Black-backed Gull *Larus marinus*, breed both solitarily and in colonies in the same area (see Bergman 1982, Götmark 1982). As strange gulls are often attracted to mobbing events, even at sites of solitary pairs (see Kilpi 1988), we might expect that such solitary pairs would either accept "help" in mobbing (thus behaving as colonial gulls) or reject any strange gulls.

I recently suggested (Kilpi 1988) that solitary pairs of nesting Great Black-backed Gulls actively defend the air "territory" around their breeding islet against strange gulls attracted to the site during temporary disturbances. Thus, Great Black-backs seemed to actively prevent any "communal" defence by strangers recruited to the site.

Table 1. Behaviour of territory owning Great Black-backs during the experiment.

Behaviour	yes / no
Attacking predator model	12 / 0
Patrolling in air	9 / 3
Attacking strangers	9 / 3

During the breeding season of 1988 I used a stuffed American mink *Mustela vison* to create a predator intrusion on the territories of 12 solitary pairs of Great Black-backed Gulls.In the study area off the Hanko peninsula, most Great Black-backs breed solitarily, though a few colonies also exist (Kilpi 1987). The pairs studied were each nesting on a small islet with no other nesting gulls. The mink model was first tested outside any breeding territories (on a loafing site) to check whether stray gulls passing it would react. Stray Herring Gulls *L. argentatus*, Common Gulls *L. canus* and Black-headed Gulls *L. ridibundus* passing the model reacted by calling, circling, and even attacking it. This indicates that the mink model was perceived as a predator, releasing mobbing even outside the colonies.

Each pair was subjected to the predator model only once during late incubation to the hatching of the first chick. Each time the mink was placed 2 m from the nest, and observations were made at a distance of about 100 m from the site. I counted the number of attacks per minute made on the model at each site for about 4–5 minutes (mean 4.3±1.7, total time 64 min). I also recorded the numbers of strange gulls attracted to the site, and the general behaviour of the territory owners. The behaviour of the latter could easily be classified into (a) active mobbing of the predator model, (b) patrolling the air above the site flying in circles, and (c) attacking strange gulls and Hooded Crows *Corvus corone cornix*.

During all the disturbances (n=12), strange gulls (Great Black-backs, Herring Gulls and Common Gulls) and a few Hooded Crows were attracted to the site. The mean number of strange birds of all species attracted was 12.2±8.4. Common Gulls probably do not represent any threat to Great Black-backed Gull offspring. All the other species recorded are likely to prey upon both eggs and chicks. The mean number of individuals of these species recruited to the disturbed sites was 6.5±5.7. The general behaviour of the territory owners during the experiment is summed up in Table 1.

Most pairs attacked strangers vigorously, and in no case were strange Great Black-backs, Herring Gulls or Hooded Crows allowed to attack the predator model. Common Gulls attacked the model on two occasions, but were subsequently driven off. The mean attack rate (attacks per minute) on the mink model during the experiments was 9.9±5.0 (n=12 experiments).

I hypothesized that an increase in the number of recruited strangers would decrease the rate of attack against the model. The total rate of attack on the model by both birds of the pair was not significantly related to the number of recruited strangers (r_s= –0.22, n=12, r_s=–0.13, n=12, for all intruders and "harmful" intruders, respectively). Qualitatively, it is, however, clear that patrolling is the strategy used against strange birds on such occasions.

I further hypothesized that there might be a division of labour between the pair members, one of the birds devoting its time to patrolling, while the other attacked the predator model. Therefore, I recorded the attacks made on the model by the two birds separately. I then calculated the attack rate per minute for each bird, and the ratio of the rate of the active bird to the rate of the less active bird. The ratio varied between pairs, the mean being 3.65±4.2 (n=11 pairs). In four pairs out of 11 (36.4%), the attack ratio between the two members of the pair differed significantly from an equal ratio (χ^2-test and Fisher's exact probability test). This indicates that in some cases the parents divided the labour, one attacking the predator model, while the other attacked intruding birds. I further theoretized that the attack ratio between pair members would be more biassed towards one pair member as the need for patrolling grew, i.e. the flock of strangers increased. There was, however, no significant relationship between the size of the intruding flock and the ratio of attacks against the predator model (r_s=0. 23, n=12, ns.).

The results show that strange gulls (or crows) are attracted to a mobbing event at solitary nests of the Great Black-backed Gull. Why they are attracted, is not known. Crows are probably drawn to the site by the potential prey and the same may be true in the case of the gulls. This may be the case in a colonial situation as well. Seen from a distance the mobbing of the predator may not always suggest an intrusion but rather resemble any event involving circling flights and calls, such as a feeding. When strangers are attracted by this behaviour, the territory owners clearly prevent them from approaching the site, defending the nest against both the terrestrial predator and the potential aerial predators. Thus, solitary breeding pairs of Great Black-backs actively prevent communal mobbing.

Acknowledgements. Soli Bergholm and Roni Andersson prepared the mink models, Hannu Pietiäinen made valuable comments on the manuscript, and the Academy of Finland provided funding.

Selostus: **Pesivät merilokit eivät pesäpaikallaan salli vieraiden lokkien hyökätä petomallin kimppuun**

Kesällä 1988 käytin täytettyä minkkiä tutkiakseni yksittäispesivien merilokkiparien poulustuskäyttäytymistä. Kaikki parit hyökkäilivät minkkiä kohden, ja jokaisen kokeen aikana (n=12) myös muita lokkeja (meri-, harmaa- ja kalalokkeja) sekä variksia ilmaantui paikalle kiertelemään, keskimäärin 12.2 vierasta lintua. Merilokit hyökkäilivät aktiivisesti näiden tunkeilijoiden kimpuun (Taulukko 1), eivätkä sallineet niiden hyökätä minkin kimpuun, lukuunottamatta kahta kalalokkia kahdella eri pesäpaikalla. Joissakin tapauksissa toinen merilokkiemoista käytti lähes kaiken ajastaan hyökkäämällä vieraiden lintujen kimppuun, parit siis jakoivat puolustuksen keskenään. Työjako ei kuitenkaan ollut merkitsevästi riippuvainen vieraiden tunkeilijoiden määrästä. Tulos osoittaa, että yksittäin pesivät merilokkiparit aktiivisesti ehkäisevät ns. yhteispuolustuksen, jota pidetään eräänä yhteiskuntapesinnän etuna.

References

Bergman, G. 1982: Population dynamics, colony formation and competition in Larus argentatus, fuscus and marinus in the archipelago of Finland. — Ann. Zool. Fennici 19:143–164.

Conover, M. R. 1987: Acquisition of predator information by active and passive mobbers in ring-billed gull colonies. — Behaviour 102:41–57.

Götmark, F. 1982: Coloniality in five Larus gulls: a comparative study. — Ornis Scand. 13:211–224.

Kilpi, M. 1987: Lokkikannat Hangon Läntisellä selällä 1978-1986 (Summary: Gulls off Hanko 1978-86). — Lintumies 22:13–19.

Kilpi, M. 1988: Offspring-defence behaviour towards a human intruder in three species of gulls: Larus marinus, L. argentatus and L. canus. — Ornis Fennica 65:156–162.

Kruuk, H. 1964: Predators and anti-predator behaviour of the Black-headed Gull. — Behaviour, suppl. 11:1–129.

Author's address: Mikael Kilpi, Department of Zoology, University of Helsinki, P. Rautatiekatu 13, SF-00100 Helsinki, Finland.

Received 6 December 1988, accepted 31 December 1988

A "gang" brood of two Black Grouse *Tetrao tetrix* hens

Arto Marjakangas & Ahti Marjakangas

We report here a case of two broods of the Black Grouse *Tetrao tetrix* joined together. On 27 June 1988, 14 or 15 chicks were flushed into flight in a dense group on a drained pine bog in Ylivieska (64°N), W Finland. Immediately afterwards two hens, 3 m apart, rushed into flight for a few metres and started a distraction display among nearby dwarf shrubs. The flushing distance for both the chicks and the hens was about 8 m.

The females of some polygynous grouse species are spaced out in territories during egg-laying and incubation (e.g. Herzog & Boag 1977, Hannon 1980, Wegge 1985), and this pattern has been also suggested for the Black Grouse (Angelstam et al. 1985). This spacing behaviour probably serves to reduce density-dependent predation and to ensure adequate food resources. For the same reasons, even broods tend to avoid each other (Bergerud & Gratson 1988). "Gang" broods have been documented earlier at least in the Willow Grouse *Lagopus lagopus* (Erikstad 1985) and in some North American grouse species (Bergerud & Gratson 1988). They are evidently extremely rare in the Black Grouse and Capercaillie *Tetrao urogallus* (P. Rajala, pers. comm.). According to Bergerud & Gratson (1988), broods may join together only at the end of the breeding season, abandoning their anti-predator options of inconspicuousness and distraction, but this explanation does not fit in the present case. We do not know whether the broods were together only temporarily, but considering the mean clutch size of the Black Grouse in the central parts of Finland (8.3; Helminen 1963), the chicks had survived very well.

In 1988, there was even a case arguing against the assumption of territoriality, in which two females nested successfully 27 m apart at a distance of 800 m