Annual variation in the efficiency of adult Herring Gull *Larus argentatus* counts

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Herring Gull colonies off the Finnish coast are mostly small, pairs being in the tens, rarely up to the hundreds. It would be desirable to use counts of adults for monitoring, since small flocks are rapidly counted, and a team of workers could census many colonies in a comparatively short time.

Hanssen (1982) reported that counts of three gull species' (*L. argentatus, L. fuscus* and *L. canus*) adults in Norway, yielded estimates within ±10% of the breeding population. He stated that during the incubation period morning counts especially were very accurate. All fell within a 10% error limit. With such an accuracy, adult counts would clearly be very useful compared with nest-counts which are time consuming and often give errors of ±20% when a single count is used (Ferns & Mudge 1981, Wanless & Harris 1984).

Study area and methods

During an intensive study of the Herring Gull in SW Finland, adult gulls in a small colony off Hanko (see Kilpi 1987) were censused in two seasons. In this paper the use of these data for monitoring is evaluated. Exact counts of nests were made each year during several visits, and all nests were marked. As only one colony was studied, it is clear that the data do not give information on between-year differences in other colonies.

Adult counts were made throughout the 1985 and 1986 season, 16 and 22 counts respectively. All counts used in this paper were made between 09.00 and 11.00 a.m., in fair weather. These totalled 6 counts in 1985 and 8 counts in 1986. Only counts made between the median date of laying and the median date of hatching were used. Thus the analysis was restricted to the period generally considered the optimum census period. Using counts before the median date of laying would have given low first estimates. Counts made late in the season, when the chicks reached an age of about three weeks, gave equally low estimates (Kilpi 1987). It is important to carefully establish whether there are trends in the data collected and to restrict the analysis to a period giving trendless data. In another study (Kilpi, in prep.) I found significant increases in the number of Common Gull *Larus canus* adults present in study colonies as the season progressed.

The census method used here is the same as Hanssen's (1982) method 3, namely, adults are counted from the highest point on the island a few minutes after entering the colony.

In analysing the results, the efficiency of a count was defined as the proportion (%) of birds present, assuming that all breeding individuals were present.

Efficiency of adult counts

The breeding population was 49 pairs in 1985 and 38 in 1986. Breeding was normal in both years. Even though the analysis was restricted to the best period, a slightly rising trend in adults present was found as the season progressed in both years (Fig. 1). These trends were not, however, statistically significant. All adults present cannot be inferred to be part of the breeding population, for part of them are likely to be non-breeding, adult plumaged birds. In 1986, more than the expected number of individuals were recorded in a few counts.

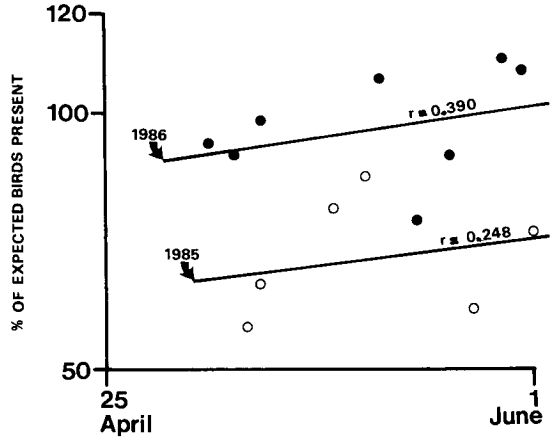

Fig. 1. The percentage of adults observed (in relation to the real breeding population) during the censuses in 1985 (open circles) and 1986 (black dots). The regressions are both non-significant.

The precision of the adult counts is not high. Assuming that all birds are present yields estimates for a single census from a 21% underestimate to a 13% overestimate in 1986, while in 1985 all single counts would have yielded underestimates ranging from 44% to 12%. The error is clearly too large for accurate monitoring. Hanssen's (1982) encouraging results with accuracies of ±10% for morning counts during the incubation period seem too optimistic, and cannot be directly applied in other study areas.

Variation between years

From the monitoring point of view the results obtained here are distressing. More problematic than the low precision *per se* is the fact that the proportion of the adult population encountered differed between the two study years. The number of adults observed in the colony did not differ between the two years ($t = 0.89$, $df = 12$, ns.). Since the breeding numbers differed in the two years (the population in 1985 was 22% greater than in 1986) a lower proportion of adults was present in 1985 than in 1986. The mean proportion of adults encountered in 1986 was about 99% (range 79–113%), and only about 72% (range 56–88%) in 1985. Thus it may be impossible to construct a correction factor that would be applicable between years in estimating breeding numbers.

The variation in the number of adults observed between years is probably the outcome of several factors. Feeding conditions may vary, causing different attendance patterns, and, as pointed out by Wanless & Harris (1984), a variable number of adult-plumaged non-breeders would be included in the counts. Even if many counts during one season might improve the breeding population estimate, the variation in efficiency between years is the actual problem. Thus for monitoring population changes in long-lived birds such as Herring Gulls, with small yearly changes in populations, adult counts appear to be ineffective and much less accurate than nest-counts.

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Selostus: Harmaalokkien aikuislaskentojen suurista vuotuisista tehokkuuseroista

Laskin aikuisia harmaalokkeja eräässä pienessä yhdyskunnassa Hangon edustalla vuosina 1985 ja 1986. Laskin molempina vuosina myös yhdyskunnan tarkan pesämäärän (49 vuonna 1985, 38 1986). Aikuislaskennat tehtiin Hanssenin (1982) menetelmän 3 mukaisesti: luodon laelta lasketaan kaikki aikuiset muutama minuutti rantautumisen jälkeen. Tarkastelin kaikista laskennoista jaksoa, jonka aikana ei ollut havaittavissa aikuisten määrän muutosta. Tällainen jakso oli molempina vuosina muninnan mediaanipäivän ja kuoriutumisen mediaanipäivän välinen aika (kuva 1). Tätä jaksoa voidaan pitää parhaimpana laskenta-jaksona.

Yksittäisten laskentojen tehokkuus vaihteli suuresti: vuonna 1985 tavoitin 56–88% potentiaalisesta pesivästä aikuismäärästä, vuonna 1986 79–113% (oletin, että kaikki olisivat paikalla). Yksittäisen laskennan virherajat ovat siis varsin suuret.

Keskimäärin yhdyskunnassa oli paikalla 70–75 aikuista kumpanakin vuonna. Kun pidetään mielessä, että pesivä kanta 1985 oli 22% suurempi kuin vuonna 1986, laskennoissa tavoitettavien aikuisten osuus vaihtelee siis vuosittain samassa yhdyskunnassakin. Keskimäärin aikuisia lintuja oli v. 1986 paikalla suhteessa kaikkiin pesiviin peräti 99%, mutta 1985 vain 72% (kuva 1). Tämä havainto on seurannan kannalta huolestuttavampi kuin yksittäisen laskennan epätarkkuus. Voi olla mahdotonta kehittää kerrointa, jonka avulla aikuismäärät voitaisiin muuntaa pesivien parien määräksi. Koska pitkäikäisen harmaalokin vuotuiset kannanmuutokset ovat yleensä paljon pienemmät kuin aikuislaskennan virheet, harmaalokin pesimäkannan ainoaksi seurantamenetelmäksi jää pesien laskenta.

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