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EFFECT OF SHIP SPEED ON SEABIRD COUNTS IN AREAS SUPPORTING COMMERCIAL FISHERIES

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Abstract.—Ship speed may have an important effect on the results of seabird surveys. We counted seabirds on a 20.5 × 0.3 km transect in the Kattegat that was sailed nine times with the RV "Heincke." Ship speed alternated between 9 knots and 5 knots. The numbers of the most common species, the Lesser Black-backed Gull (*Larus fuscus*), were significantly higher when the ship was sailing at lower speed similar to that of commercial fishing vessels when trawling in the area. It is postulated that scavenging species (e.g., gulls) are attracted to the low speed of vessels whereas non-scavengers (e.g., auks) are not.

EL EFECTO DE LA VELOCIDAD DEL BOTE EN CONTEOS DE AVES MARINAS EN ÁREAS QUE SOSTIENEN PESCACOMERCIAL

Sinopsis.—La velacidad de un bote puede tener un efecto importante en el resultado de inventario de aves marinas. Contamos aves marinas en un transecto de 20.5 × 0.3 km en el Kattegat que acompañó en nueve salidas de pesca al RV "Heincke." La velocídad del bote fluctuó entre 9 y 5 nudos. Los números de la especie más común, *Larus fuscus,* fueron significativamente mayores cuando el bote navegaba a una velocídad baja más parecida a la del bote de pesca comercial cuando estaba en el área. Se postula que especies carroñeras (e.g., *Larus*) son atraídas a la baja velocidad de los botes mientras las aves no carroñeras no lo son.

Counting seabirds from ships is a well-established and fairly standardized method (e.g., Tasker et al. 1984, van Franeker 1994). However, many circumstances can bias these counts including different counting methods (Tasker et al. 1984, Briggs et al. 1985, van Franeker 1994), activity of the ship (Griffiths 1982, Powers 1982), distance of the birds from the ship (Griffiths 1982), distance at which swimming birds can be detected (Dixon 1977), wave height (Duffy 1983), observer effects (Powers 1982, Ryan and Cooper 1989, van der Meer and Camphuysen 1996), bird conspiciousness (Ryan and Cooper 1989), wind direction (Broni et al. 1985), and wind speed (van Franeker 1994). All these studies suggest that apparent differences in seabird densities may not always be due to the distribution patterns themselves. Such problems are not restricted to seabird studies but are widespread among bird census techniques (Bibby et al. 1992).

Ship speed may also effect seabird counts (van Franeker 1994). To explore this possibility, we quantified the effect of the speed of a nonfishing ship on measurements of seabird numbers at sea. We postulate that slower moving ships will attract birds because their speed resembles that of fishing vessels, which are used extensively by birds as a food source. In the course of this, we adjusted for the effect of bird movement relative to that of the ship by using the snapshot method (Tasker et al. 1984). The area we studied, the Kattegat (located between the North Sea and the Baltic Sea), supported a major commercial trawling fishery (International Council for the Exploration of the Sea 1992). Fishing vessels are known to attract large numbers of many seabird species (see Camphuysen 1993a for review).

METHODS

The study was carried out on 25 March 1993 from dawn to dusk (seven counts one after the other with only few minutes of interruption between the counts) and on 26 March 1993 in the morning (two counts) in the Læsø-Deep, Kattegat. Counts were conducted along a 20.5-km transect between 57°22′N, 11°27′E and 57°11′N, 11°24.5′E with the RV "Heincke" (Biologische Anstalt Helgoland). The transects were sailed at about 9 knots (four times; mean: 80 min, range: 75–86 min) and 5 knots (five times; mean: 122 min, range: 119–126 min). The birds were counted on a 300-m-wide transect to one side of the vessel. Whereas all swimming birds were recorded, flying birds were counted in the transect only using the snapshot method according to Tasker et al. (1984) in order to correct for different flight speeds and directions. All observations were conducted by two observers at any time, rotating in a team of three in total. Common Murres (see Fig. 1 for scientific names) and Razorbills could not be distinguished on all occasions and were consequently summed. The differences between bird densities recorded when travelling at the two velocities were tested by the t-test.

RESULTS

Significantly more Lesser Black-backed Gulls were counted when sailing at low speed (Fig. 1). Although other large gulls were counted in greater numbers at low speed, there was no significant effect of ship speed on other species. Gulls dominated the seabird community, although the general density of seabirds was relatively low (0.7–5.9 individuals/km^2).

DISCUSSION

Lesser Black-backed Gulls showed the largest differences in abundance with respect to ship speed, Common Murres/Razorbills showed the smallest. There are several possible explanations as to why seabird densities were apparently higher when sailing slowly.

First, at high bird densities, it is more difficult to note all birds with the relevant supplementary information (distance, activity, age, plumage) without running into time problems. Hence, the encounter rate of both swimming and flying birds per distance increases with ship speed, the

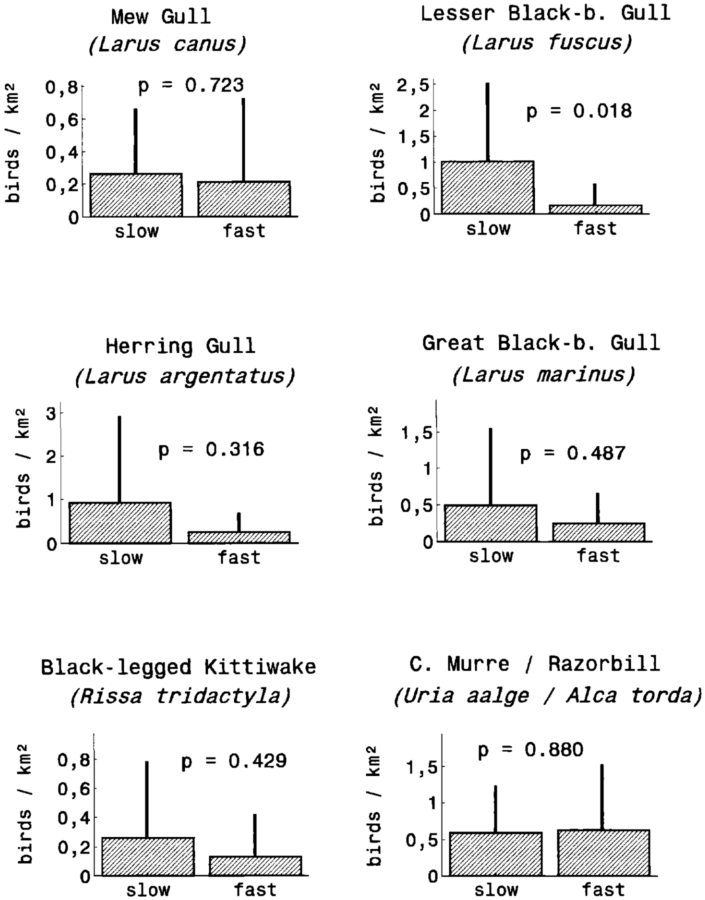

FIGURE 1. Mean densities (+SD) of seven seabird species counted on transects sailed with high (9 knots, $n = 4$ cruises) and low (5 knots, $n = 5$ cruises) speed in the Kattegat.

time for observing and recording becoming less. Due to the relative low overall abundance of seabirds (0.3–3.2 birds/km), this point can be ruled out.

Second, birds are easier to detect when sailing at low speed because the observer has more time to locate a bird in the air or on the water surface within the same area. In addition, the chance that diving birds will appear at the surface is increased when the ship moves slowly. This point is also likely not relevant since auks were most difficult to detect with their dark plumage and they predominantly swim rather than fly. Thus, auks should be affected much more than gulls if sailing speed affects the capability of observers to locate birds. This was definitely not the case in our study.

Third, the velocity of the vessel has an influence *per se* on the density of birds around the ship because birds, especially scavenging gulls, may be attracted to research vessels that appear to be fishing. It is indeed most probable that ships are differently attractive to birds according to sailing speed. The Lesser Black-backed Gull is a species that extensively uses discards and offal from fish trawlers (e.g., Garthe 1993). Fishing vessels do not move fast when trawling and, in the North Sea and surrounding waters, only some boats in the beam trawl fishery exceed 6–7 knots when towing the net (Camphuysen 1993b). Speeds are even lower in other fishing types or when the net is hauled. Such low speeds are similar to those used in this study. Therefore, we postulate that scavenging species (e.g., gulls) react to the low speed of vessels whereas non-scavengers (e.g., auks) do not.

Because the study area is situated relatively close to land (approximately 12 km to the island of Læsø, 40 km to the Swedish coast), it is possible that the roosting behavior by gulls might have influenced our results, especially in the evening hours when the numbers of Great Black-backed Gulls and Lesser Black-backed Gulls varied more than otherwise.

Several authors have determined that seabirds easily learn to exploit new food sources. For example, Drost (1968) observed Herring Gulls learn to associate warning signals with subsequent detonations that brought injured fish to the surface. From studies on board fishing vessels, it is well-known that species such as Northern Fulmars (*Fulmarus glacialis*), Northern Gannets (*Morus bassanus*) and gulls, particularly large *Larus* gulls and Black-legged Kittiwakes react quickly to changing activities of the trawler's crew. During towing the numbers of ship-followers are generally low, but increase suddenly when the net appears on the water surface during hauling or when the ship changes course or speed in advance of that operation (Camphuysen et al. 1993; Garthe and Hüppop, unpubl.). Large gulls even recognize humans individually (Vauk and Prüter 1987, Spear 1988). These examples suggest that gulls could easily learn to associate ship speed with potential food supply.

Although studied only during two days in one specific area, our work suggests that studies focusing on the numerical abundance of birds at sea in areas supporting commercial fisheries should be restricted to vessels sailing faster than towing fishing vessels. To count scavenging seabirds, i.e., seabirds feeding on trawler discards and offal, we recommend a minimum ship speed that is higher than at least the usual towing speeds of trawlers (minimum speed of 7–8 knots for the North Sea). Moving at much higher speeds will tend to increase the probability of missing birds that are difficult to see, particularly those at the water surface. Further studies are needed to corroborate the influence of ship speed on seabird counts.

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