



# NOTE

## A Drift Experiment to Assess the Influence of Wind on Recovery of Oiled Seabirds on St Paul Island, Alaska

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We used wooden blocks to estimate the proportion of oiled seabird carcasses that were likely to be recovered on beaches of St Paul Island, Alaska following a near-shore oil spill. We released a total of 302 blocks 6 km north of the island in 1997 at the site of a 17 II 1996 oil spill. We used a paired design and released half the blocks when the winds were onshore and released the second half when the winds were offshore. We systematically searched beaches after the second release to recover blocks. We recovered 93 of 152 (61%) blocks released when winds were onshore but only 1 of 150 (0.7%) blocks released when winds were offshore. Given that winds following the 1996 spill were offshore, we conclude that most birds killed at sea following the 1996 spill were likely not recovered on beaches. © 1998 Published by Elsevier Science Ltd. All rights reserved

The impact of oil spills on seabirds is typically assessed by surveying oiled birds on beaches (Piatt *et al.*, 1990; Piatt and Ford, 1996). Estimates of total mortality based on beach surveys are biased by persistence rates and detection probabilities of carcasses (Van Pelt and Piatt, 1995; Fowler and Flint, 1997) as well as the fact that not all carcasses likely drift to shore (Hlady and Burger, 1993). Only a fraction of objects (i.e. carcasses or blocks) experimentally dropped at sea are typically recovered in subsequent beach searches (Hope-Jones *et al.*, 1970; Bibby and Lloyd, 1977; Piatt *et al.*, 1990; Threlfall and Piatt, 1983; Hlady and Burger, 1993; Piatt and Ford, 1996)

On 17 II 1996, the freighter M/V Citrus collided with a crab processor vessel and subsequently spilled an unknown amount of bunker oil 6 km north of St Paul Island under offshore wind conditions. Following the spill, >1000 seabird carcasses, mostly King Eiders (*Somateria spectabilis*), were recovered from beaches on St Paul Island. This spill was unusual in that many birds appeared to have either swum or flown to shore where they subsequently died (Fowler and Flint, 1997). Our goal was to assess the influence of wind on drift and

recovery of objects dropped near the island. We use this information to estimate the fate of birds that died at sea following the 1996 spill.

### Methods

We used wooden blocks to simulate the drift of dead birds in near-shore waters. Hlady and Burger (1993) found no difference in recovery rates for blocks of different sizes; therefore, blocks were cut from standard 9×9 cm lumber in 20 cm lengths. Blocks were painted orange and labeled with a stainless steel tag. Each tag was imprinted with a unique number and reporting instructions. Blocks were released at the site of the oil spill associated with the M/V Citrus, approximately 6 km north of St Paul Island (57°16', 170°15'), on 2 occasions, the first on 18 II 1997 when 152 blocks were dropped from a boat and the second on 2 III 1997 when 150 blocks were dropped by a US Coast Guard helicopter. The winds at the time of the first release were forecast to be onshore for several days; at the time of the second release winds were forecast to be offshore for several days.

A sub-sample of sand-based beaches were opportunistically searched by the public throughout the study. One or more observers starting on 13 III 1997 systematically searched all beaches. All rock beaches were walked and sand beaches were surveyed with a 4 wheel ATV. Sea ice washed onto beaches on the north and east sides of the island on 8 III 1997. Therefore, timing of specific beach searches was modified to account for current ice conditions. Locations of recovered blocks were noted relative to beach segments identified by beach substrate.

### Results

A majority of the blocks (61%) released when winds were onshore were subsequently recovered during beach searches. Conversely, only one (0.7%) of the blocks released when winds were offshore was subsequently

recovered. Blocks were recovered on 30 km section of beach along the north shore of the island; the single block from the second release was found on the southeast corner of the island. Most blocks (73 of 92, 79%) were found on rock as opposed to sand substrate beaches (the recovery location of two blocks was unknown). Winds following the 1996 spill were offshore. Winds following the first release remained onshore for 6 days while winds following the second release were offshore for two days then turned onshore.

## Discussion

Wind appeared to be a dominant factor influencing drift of blocks in the vicinity of St Paul Island. Similarly, Hlady and Burger (1993) concluded that the direction blocks drifted was the result of the combined effects of wind and current; Bibby and Lloyd (1977) and Bibby (1981) concluded that wind was the primary factor influencing direction of drift. Our recovery rate of blocks released with onshore winds (61%) is at the high end of results from other drift studies in which 0–59% of dropped objects were recovered (Coulson *et al.*, 1968; Hope-Jones *et al.*, 1970, 1978; Bibby and Lloyd, 1977; Bibby, 1981; Threlfall and Piatt, 1983; Piatt *et al.*, 1990; Piatt and Ford, 1996). The wind following the second release only remained offshore for two days, yet under these conditions less than 1% of blocks were recovered. In situations where there is extensive coastline, objects have been recovered great distances from the release location (Bibby and Lloyd, 1977; Bibby, 1981; Hlady and Burger, 1993; Piatt and Ford, 1996). The relatively small size of St Paul Island (< 25 km from east to west) may have reduced the probability that blocks were deposited on beaches. Our results demonstrate the recovery of objects on St Paul Island is strongly influenced by wind; however, we caution that these recovery rates may not be relevant to a continuous coastline.

Local water currents appeared to influence the deposition of blocks on specific beaches. Our blocks were dropped in an area < 1 km<sup>2</sup> but were recovered along 30 km section of beach. The fact that we recovered most blocks from rock beaches is contrary to the results of Hlady and Burger (1993) who reported greater recoveries from sand beaches. We found many of our blocks, however, in small, rocky, coves that tend to accumulate jetsam and flotsam. Thus, wind may determine the general path of objects drifting at sea, but the actual location of deposition on beaches appears to be determined by the interaction of local currents and wind.

The edge of continuous sea ice at the time of this experiment was approximately 20 km north of the island and pans of loose ice and slush drifted onto the island 6 days after the second release and froze on the beaches. These ice barriers could have prevented further deposition of blocks on beaches. This ice ultimately melted in place and is not believed to have removed blocks previously deposited on beaches. Thus, sea ice may have influenced our results, though, the magnitude of this potential influence relative to the direct influence of wind alone is unknown.

It appeared that many King Eiders oiled following the M/V Citrus spill either flew or swam to shore (Fowler and Flint, 1997). The winds following the spill from the M/V Citrus were generally offshore and oil was never detected on the beaches. Based on our results, it is unlikely that oiled birds that died at sea following the M/V Citrus spill would have drifted to shore.

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