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Abstract

Why is shorebird density so high in Walvis Bay? Delayed blooming and Benguela upwellings

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The southwestern shores of the African continent are major flyway destinations for hundreds of thousands of migrant shorebirds, but the reasons for such high densities are still debated. Suitable habitat runs the full length (10° latitude) of Namibia's 1 450km desert coast and high wader densities of up to 450 birds/km are known to occur along the central sections at 23°S. The shoreline immediately adjacent to the main Benguela upwellings at 27°S, on the Diamond Coast, might be expected to have high wader densities because it is adjacent to one of the strongest nutrient pumps in the world. To determine if this pump adds to high density in the south and the south western coast in general we surveyed the Diamond Coast in January 1996 (i) to determine the density and diversity of birds there, (ii) to investigate the effects of habitat and coastal diamond mining on bird diversity and, ultimately, (iii) to understand how the Benguela Current upwellings affect shorebird densities along the entire Namibian coast.

Along the 380km Diamond Coast shorebirds occurred at a mean density of 30 birds/km, with hot spots of density (89 birds/km) and richness (26 spp.) apparent on rocky shores. Despite the proximity of nutrient-rich waters from the upwellings, the shores there held fewer shorebirds than those farther north. Shores in central Namibia hold up to 450 birds/km and then decrease again farther north to the Cunene River where densities decline smoothly to 10 birds/km. Thus trends over the entire Namibian coastline indicate smoothly increasing and decreasing shorebird density trends centred on 23°S (Walvis Bay). There the densities are fifteen-fold higher than on any other shoreline in southern Africa.

We suggest that the apparent deficiency in shore bird food at the site of upwelling can be accounted for by 'delayed blooming' of phytoplankton. Nutrients are upwelled in this area together with very cold and oxygen-poor bottom water, neither condition being conducive to the blooming of plankton. However, as the water is pushed northward by the strong Benguela Current, it warms by about 4–6°C and becomes oxygenated, allowing plankton to utilise the high nutrient content. By the time it reaches central regions the blooms are subjected to inshore winds that are peculiar to the central coast of Namibia. This accentuates the accumulation of phyto- and zooplankton along the shores, supplying food for the invertebrate prey of shorebirds. Not only shorebirds but also macro-invertebrates and the desert-breeding Damara Terns, *Sterna balaenarum*, exhibit their highest densities here, with lower densities both north and south. This provides evidence of a wide-scale effect not confined to shorebirds alone.

Shorebird-rich areas in other parts of Africa (e.g. Mauritania at 20°N) are also fueled by upwellings and similar processes may be at work there. We conclude that Walvis Bay lies at the heart of a nutrient-rich system that begins 400km to the south on Namibia's Diamond Coast.

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