INDICATOR #03

Shorebirds – red knot

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Shorebirds are the most diverse group of Arctic breeding birds and one of the most abundant. From the Arctic, they migrate to their non-breeding grounds along well-defined flyways that circle the world. As a group, however, their recent conservation status has been unfavorable. Trend data are only available for 65 of the 112 breeding shorebird populations that are wholly or largely confined to the Arctic. Of these, 35 populations (54%) are in decline, 29 are stable, and only one is increasing (Figure 3.1) [1].

The red knot, *Calidris canutus*, is an example of a long-distance migratory shorebird. It has been the subject of extensive research worldwide including studies on its breeding cycle, winter ecology, and stopover sites. It is a typical representative of high Arctic shorebirds and is, therefore, a good indicator species for the whole group. As one of nature's most prodigious travelers, it excites the interest of wildlife enthusiasts, scientists, and conservationists worldwide. For this reason its migration system is among the best known of all shorebirds, although many mysteries still remain.

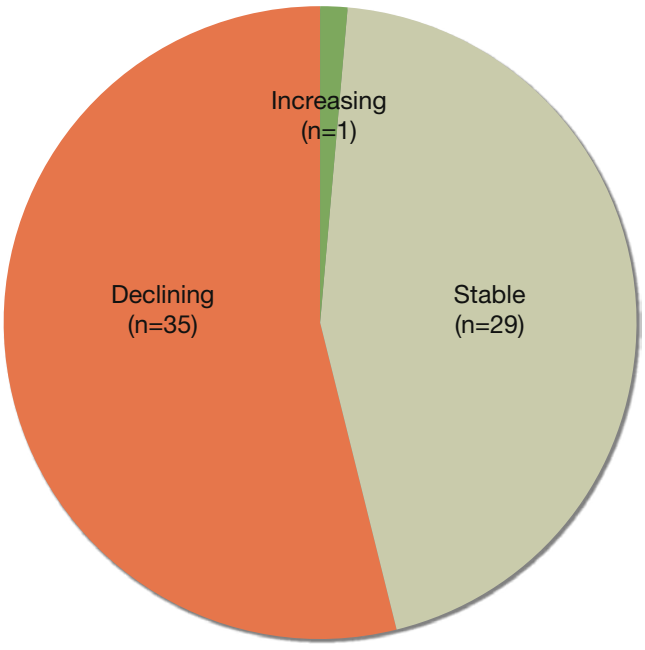

Figure 3.1: Trends in 65 breeding shorebird populations that are wholly or largely confined to the Arctic [1].

Together, the six red knot subspecies have a circumpolar Arctic breeding distribution although each breeds in a discrete area and mainly winters separately. Non-breeding sites range as far south as New Zealand, South Africa, and Tierra del Fuego (Figure 7.2). In many of these places numbers are counted annually, but several important populations, including those of whole subspecies, are not yet adequately monitored.

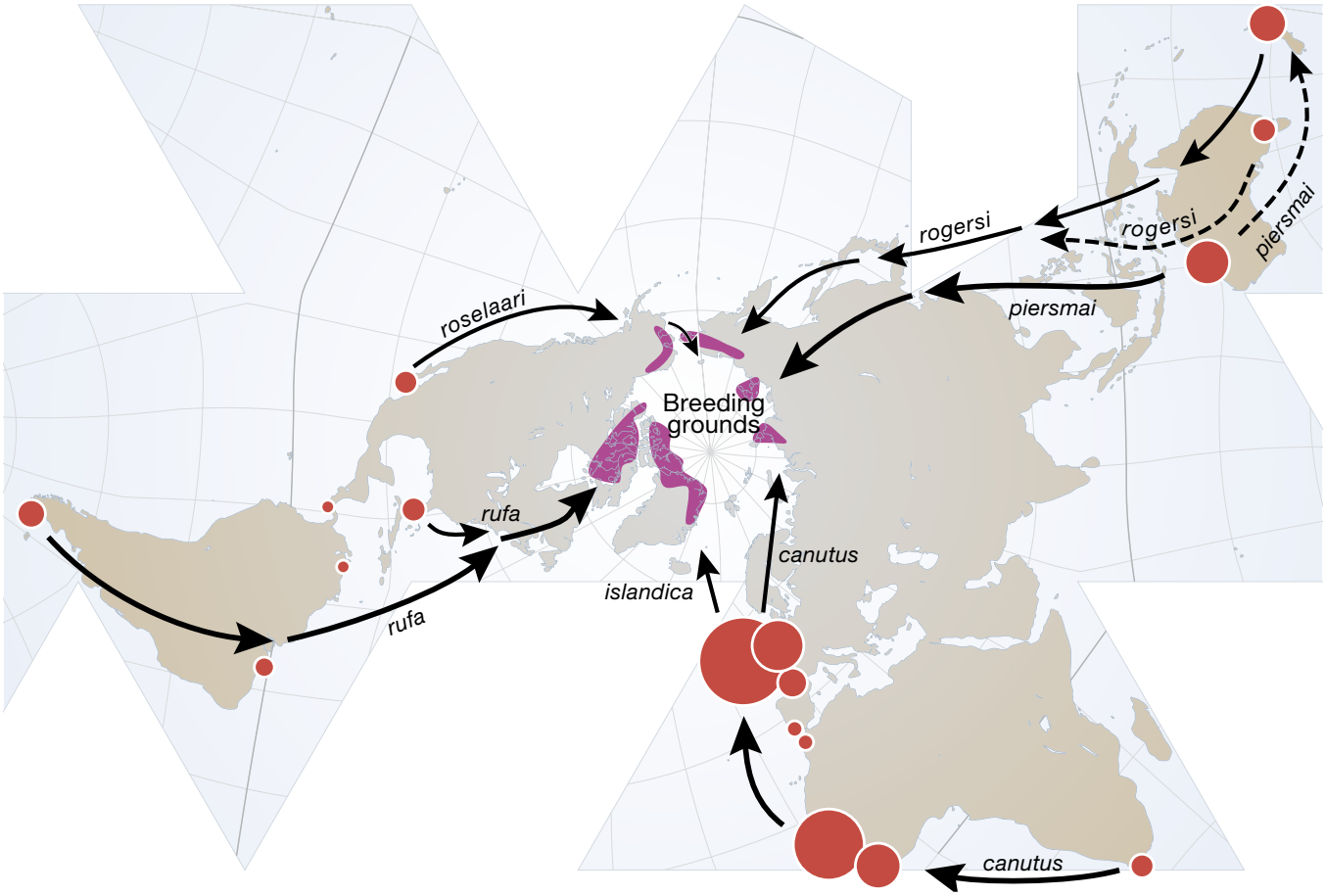

Figure 3.2: Worldwide distribution of the six recognized subspecies of the red knot [2]. All breeding areas (dark purple shading) are on high Arctic tundra where adults spend June–July. After their long-distance migrations, they spend the non-breeding season (August–May) mainly in intertidal, soft-sediment habitats (red dots, which are scaled according to population size).

Population/ecosystem status and trends

Of the six subspecies of red knot, by far the largest populations are those of *C. c. canutus* and *C. c. islandica* (Figure 3.3). *C. c. canutus* winters mainly in West Africa and has its breeding grounds centered on the Taimyr Peninsula of northern Russia. *C. c. islandica* winters in northwest Europe, and breeds in Greenland and northeast Canada. Large numbers of both populations, however, are highly dependent on one very large site: the Wadden Sea. There, mechanical shellfish harvesting has so severely depleted the food supply that both populations are thought to have suffered population declines, especially that of *C. c. canutus*. Mechanical shellfish harvesting was stopped in 2006 but it is too early to know whether it has had a beneficial effect on either population [3].

There is insufficient evidence to determine the population trends of the two red knot subspecies of the East Asian – Australasian Flyway, *C. c. rogersi* and *C. c. piersmai*, but both are thought to be declining with several sites recording lower non-breeding numbers in recent years [4]. Their relative status is also confused because although most *C. c. piersmai* are found in northwest Australia and most *C. c. rogersi* are found in east Australia and New Zealand, there appears to be some overlap. The migration route of both subspecies takes them through the coastal regions of Southeast Asia, especially along the shores of the Yellow Sea. These regions are currently undergoing extensive development with whole estuaries being filled in and converted to human use. It is quite likely that it is habitat loss in this region that is having a

detrimental impact on both populations but this has yet to be proved.

The populations of both Western Hemisphere subspecies, *C. c. rufa* and *C. c. roselaari*, appear to be vulnerable. The population of *C. c. rufa* was thought to be as high as 170,000 as recently as 2001[5] but is now down to 30,000 [6]. Undoubtedly, the most significant factor has been the depletion of the food supply at the final northbound stopover in Delaware Bay, USA. There, knots and other shorebirds time their migration to coincide with the mass spawning of horseshoe crabs, *Limulus polyphemus*, and in the past they made rapid mass gains to fuel their onward migration by feeding on surplus crab eggs. Since the mid-1990s, the horseshoe crab population has been over-harvested for use as shellfish bait and the supply of eggs has been greatly reduced [6]. Studies have shown that red knots which fail to gain sufficient mass in Delaware Bay have lower survival rates [7].

The status of *C. c. roselaari*, which breeds in Alaska and on Wrangel Island and winters along the American Pacific coast, is unclear. In May 1980, there was an extraordinary and well-documented count of 110,000 *C. c. roselaari* at a stopover site in western Alaska but nothing approaching such numbers has been recorded before or since. Now, stopover numbers in Alaska suggest a population not exceeding about 35,000. Further south, however, in the United States and Mexico where it is thought that all *C. c. roselaari* winter, numbers recorded have never exceeded 10,000.

The subspecies of red knots have a disjointed Arctic breeding distribution ranging from just south of the Arctic Circle at 63°N (*C. c. rufa* and *C. c. rogersi*) to 83°N, nearly the most northerly land in the world (*C. c. islandica*)

Taimyr Peninsula, Russia Peter Prokosch

(Figure 3.2). They nest in areas of sparse vegetation, often close to a damp area where the chicks can feed. They arrive on the breeding grounds in late May to early June and the eggs hatch in early July whereupon the females depart from the nesting area leaving the chicks in the care of the males. The males leave in early August and the young soon after.

Breeding success can be very variable depending mostly on weather conditions and the abundance of predators. If there is a late snowmelt, or if the weather is cold leading to a reduction in invertebrate food for the young, and/or if there is an abundance of egg or chick predators such as Arctic foxes *Alopex lagopus* and jaegers, *Stercorarius* spp., breeding success can be almost negligible. But in years when such factors have the least impact, as many as half the birds seen on the non-breeding grounds may be juveniles. Year-to-year variation in breeding success arising from random changes in Arctic weather and the often cyclic abundance of predators are natural phenomena which usually lead to only minor changes in otherwise stable shorebird populations.

Concerns for the future

With a total world population of a little over one million (Figure 3.3), the red knot is not yet threatened as a species but there are good reasons to be concerned for its future. Like most long-distance migratory shorebirds, red knots are highly dependent on a limited number of key stopover and wintering sites, making them particularly vulnerable to habitat change. Among the most vital sites are the last major stopovers before the final flight to their Arctic breeding grounds. These are of key importance because in those places the birds require sufficient food resources not only to sustain their long flight but also to ensure their survival during the early part of the breeding cycle when Arctic food resources can be scarce. Other sites may be of equal importance when they form part of a chain of "stepping stones" in which each link is indispensible.

Subspecies	Estimated population size	Trend	Source
C. c. islandica	450,000	Decline	[1]
C. c. canutus	400,000	Decline	[1]
C. c. rogersi	90,000	Probable decline	[4]
C. c. piersmai	50,000	Probable decline	[4]
C. c. roselaari	35,000	Not clear	[6]
C. c. rufa	30,000	Major decline	[6]

Figure 3.3: Population estimates of the six subspecies of the red knot.

Another concern for the future is the possible impact of climate change. In the short term, it may be beneficial if it leads to earlier snowmelt and a greater abundance of invertebrate food. In the longer term, however, red knot breeding habitat may be lost as the tundra zone is pushed northwards towards the Arctic Ocean.