

Why young birds forage at nutritionally poor and dangerous places: classical food-safety trade-offs mediated by variation in foraging ability

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Food-safety trade-offs are generally studied in the context of energy state. Animals in low energy states tend to accept the highest danger levels in return for higher energy gains. However, successful foraging requires animals to be able to find and handle food items efficiently and adequately compete with other foragers at the same time. Individuals will differ in the extent to which they have mastered both types of skill. Here we examine how individual differences in competitiveness and foraging skills affect the trade-off between food and safety in Red Knots *Calidris canutus canutus*. Why do some young knots select feeding areas that are poor in food and low in safety? At Banc d'Arguin, Mauritania, a tropical area of intertidal mudflats on the West African coast where this study was carried out, Red Knot feed at low tide, mostly on seagrass meadows. During high tide they have to retreat to the “dangerous” shoreline to roost. Surprisingly, some birds remained in near-shore foraging areas even during low tide, and these birds tended to be young. To quantify habitat use of different classes of birds in habitats that differ in predation danger, food densities, and substrate complexity we distinguished (1) a bare zone very close (0–40 m) to the approaching raptor concealing dune ridge and relatively poor in buried bivalve food and (2) the seagrass beds somewhat further (40–250 m) offshore that were thus safer and also richer in food. Observations of age-related agonistic interactions, energy intakes rates, and indices for energy state (abdominal profile index), showed that, due to limited skills in foraging and competitiveness, young birds achieved higher intake rates in near-shore bare habitat where they fed in “easier” substrate, with fewer competitors, but with higher predation danger

and lower food abundance. Observations in spring, when adults fuel up for migration, show higher numbers of birds foraging in near-shore foraging sites, despite the fact that, due to their higher fat loads, these birds must suffer reduced escape ability. We conclude that the young birds that feed on the nutritionally poor and dangerous bare near-shore habitat, due to their limited skills in foraging on seagrass and competition with dominant conspecifics, achieve higher feeding success in bare than in seagrass habitat. In spring, the trade-off between energy gain and safety shifts towards accepting higher risks for greater energy gains, although during this time predation danger may have somewhat relaxed.

Habitat heterogeneity and persistent demographic structuring in Red Knots wintering at Banc d'Arguin, Mauritania

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The quality of non-breeding habitats has large-scale effects on the fitness of migratory birds. Spatial segregation according to age or sex during the non-breeding period is a well known phenomenon in migratory species. It has been discussed that either dominance behaviour or habitat specialisation is driving habitat segregation. We discovered, that in a comparatively small wintering site (less than 16 km²), a socially foraging shorebird, the Afro-Siberian Red Knot *Calidris canutus canutus*, shows a remarkable stable differentiation in sex and age between two high tide roost and adjacent foraging areas less than 2 km apart. The birds were highly site-faithful to “their” site, and only a small proportion of birds switched sites between winters. The movements that took place were directed from the site with more females and adults to the site with more males and juveniles. Red Knots at the site with more females and adults had longer bills. Surprisingly, survival was also higher at that site. We discuss the mechanisms driving this habitat segregation and how individuals might be able to move nevertheless.

