How seabirds share their habitat

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Credit: MPI for Ornithology / Petra Quillfeldt

When different species of seabirds share a habitat with limited sources of food, they must differ in their feeding habits. This specialization is known by biologists as an "ecological niche". Researchers at the Max Planck Institute for Ornithology in Radolfzell have investigated how flexible these ecological niches really are. They discovered that the preying habits of diving seabirds are very different, both in location and timing, within species as well as between different species. Ecological niches are not inflexible; they are affected by different habitats and the need to avoid competition with neighbours or evade predators, and also lead to different forms of behavior within a single species (*Ecosphere*, December 20, 2010).

Seabirds are an excellent species for studying the question of how animals share the limited supply of food in their habitat. Seabirds must

live on land during the breeding season, and over this period they have to share space and food with many other animals. The birds breed in nesting colonies, often in confined spaces that provide protection from predators—the food supply, however, is widely distributed throughout the sea off the coast. The birds must leave the colony to find food and then return to the islands to feed their chicks.

The scientists wanted to know how several species, similar in their demands, are able to breed together on an island and what exactly the differences in their ecological niches are. Using GPS-depth loggers that allow scientists to track birds detailed in three dimensions, researchers in the past have discovered the hunting areas and depths of several diving seabirds, such as penguins and cormorants, but always only for sample colonies. Until now it has been unknown whether these data can be transferred to entire species.

On New Island, part of the Faulkland Islands in the southern Atlantic Ocean, scientists at the Max Planck Institute for Ornithology used GPS-depth loggers to comprehensively study complete a comprehensive study of the hunting habits of four diving seabirds: three species of penguins—Gentoo penguins, Rock Hopper penguins and Magellan penguins—and Imperial shags. In addition, the researchers compared two colonies of each of the three penguin species.

"The results were very surprising," says biologist Dr. Juan Masello. "Based on the ecological niche theory, we had expected especially strong differences between species. However, the data show that the spatial and temporal distribution of birds within the species can also differ greatly."

Magellan penguins, for example, used hunting areas about 40 kilometres apart from each other, whereas the two colonies on land were only two kilometres apart. In contrast, one of the Gentoo penguin colonies often hunted at night, while the other neighboured colony hunted only in the

daytime. In this way, the colonies avoid an overlap in feeding areas and small-scale differences are used effectively." adds Dr. Petra Quillfeldt. In the colony of Imperial shags, the females and males hunt both at different times and places: in the mornings, the females go hunting near the coast, and in the afternoons, the males hunt in the open sea. Thus the different species of seabirds found different solutions to avoid competing with their own species for food.

"Of course, food is not the only factor that determines the distribution of birds around the island," Dr. Quillfeldt explains. "In two of the penguin species, it was very clear that the animals avoided swimming near a seal colony where they could themselves become the prey. This dangerous zone also contributed to the spatial separation of the birds in the sea."

This is the first comprehensive study showing the ecological niches within a species, as well as between species, over the same period of time. It shows that seabirds of different species, as well as colonies of the same species, differ in their temporal and spatial distribution and that they search for food in different areas of the ocean, often far apart, and at different depths and temperatures. The ecological niches of the species studied are far less rigid than previously thought. Even small differences in habitat or in behavior, or the need to avoid competition or predators, contribute to this specialization.

More information: Masello, J.F. et al. Diving seabirds share foraging space and time within and among species. *Ecosphere*, December 20, 2010, doi:10.1890/ES/0-001031

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