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well understood, and of course the author favors his own hypotheses and interpretations. He clearly distinguishes what is generally accepted from what is conjectural and controversial, however, and in the process he flags areas needing more research. Experts might question details in their own areas of expertise, but I doubt that many will disagree about the usefulness and importance of this book.

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Interactions at Sea

Seabirds and Other Marine Vertebrates. Competition, Predation and Other Interactions JOANNA BURGER, Ed. Columbia University Press, New York, 1989. x, 339 pp., illus. \$45.

Joanna Burger has assembled an eclectic set of papers that examine a variety of ecological interactions. The value of the book is in its diverse coverage; it is not a tightly integrated collection with a clear theme. Four chapters examine interactions between marine birds and mammals, two the impact of fisheries, and others seabird community structure and the relation between birds, their prey, and predatory fish. An introductory chapter reviews the marine biology of seabirds.

The strongest focus is on interactions of marine birds and mammals. Pierotti offers useful observations of birds foraging in the vicinity of whales and pinnipeds. He shows that bird attendance varies with the species of mammal, that some whales may use birds as cues to the availability of prey, and that when feeding in association with whales, herring gulls (*Larus argentatus*) have a higher success rate in capturing prey than when foraging without cetaceans present. An unfortunate aspect of the chapter is the proliferation of categories of bird aggregations; the reader must keep in mind up to a possible 20 types. Warheit and Lindberg examine how presumed competition between pinnipeds and marine birds since the Miocene has shaped the evolution of seabird communities. Present competition for breeding sites on some islands is documented, but the authors make what seems to be an unwarranted extrapolation that such competition has shaped whole regional avifaunas. Their data are not convincing, and the authors ignore the possibility that changes in seawater temperature could have accounted for the loss of faunal elements. Au and Pitman, expanding on a recent publication, provide an excellent overview

of the at-sea ecology of tropical Pacific seabirds and their dependence on tuna for access to prey, a topic also discussed by Hulsman. An interesting finding is the lack of association of seabirds with small dolphins in the absence of tuna. Au and Pitman suggest that both the birds and the mammals cue on the tuna for access to prey and that birds ignore dolphins unaccompanied by tuna. Unfortunately, they had to rely on the number of birds present to indicate the presence of tuna, no independent measure of tuna abundance being available, so the discussion has a degree of circularity.

The contribution of Safina and Burger is an expansion of two recently published papers and as such seems disproportionately long at 79 pages. The authors show that bluefish (*Pomatomus saltatrix*), while competing with terns for prey, also were important in increasing the accessibility of prey. Of particular interest is the result that a non-significant correlation between tern density and prey density found in the early years of their study became significant with additional sampling in later years. This result suggests that time as well as spatial scales of measurement are important in identifying the extent to which the abundance of seabirds reflects the abundance of prey.

Furness, Hudson, and Ensor examine the interactions between various species of birds as they compete for offal (discarded portions of commercially valuable fish) and discarded fish (unused whole fish) available from boats fishing near the northern British Isles. They find that the importance of offal versus discarded fish differs between bird species and hypothesize that successful dominance for access to offal may have had important consequences for the population size of one or more species of seabird. They show that variations in fish year-class size and in fisheries regulations can affect the population dynamics of these bird species. Jones and DeGange focus on the horrific rates (possibly more than half a million birds annually) of seabird mortality in gill nets in the North Pacific. Of particular concern is the loss of breeding adults from the seabird fauna.

More careful editing might have reduced some of the problems mentioned above, but in toto the book is attractively produced and is a worthwhile addition to the library of those interested in the ecology and conservation of marine birds and mammals. Those seeking examples of interspecific competition and commensalism will also find interesting material in this book.

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