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BOOK REVIEW

Atlas of Pacific Salmon. XANTHIPPE AUGEROT. University of California Press, 2005. 161 pp. (ISBN 0-520-24504-0).

Xanthippe Augerot's *Atlas of Pacific Salmon*, subtitled ''The first map-based assessment of salmon in the North Pacific'', is a large-format (12'' wide by 8'' high), colorful, informative, and easily read book that weaves together aspects of Pacific salmon biology and conservation status with the geography and human activities that affect them. These fishes are exceptional in their many and complex connections to humans: at once a spectacular and iconic form of wildlife, a cornerstone of the Pacific Rim ecosystems, and a valued commodity for humans. Their homing migration and death after spawning make them an instantly recognizable symbol of migration, they feed bears and countless other forms of wildlife after their death, and they are the objects of commercial, recreational, subsistence and ceremonial fisheries, and commercial aquaculture. There are many books and symposia volumes available on the biology of salmon and trout, and on the various human activities such as fishing, hydroelectric dams, and habitat degradation that have driven some populations to (or over) the brink of extinction, so what does this book have to offer?

Augerot and her associates at the Wild Salmon Center and at Ecotrust have produced a map-based book providing information on the distribution and status of salmon, the geography of the Pacific Rim where they evolved, and the threats to salmon. The book is rich with color photographs, original illustrations, and numerous maps in Mercator projection showing the ecoregions used for analysis of information on salmon. There are four levels of ecoregions, ranging from two Level 1 Ecoregions (Arctic and Pacific oceans) to 66 ecoregions at Level 4 (*e.g.,* Yukon River, Klamath River). Augerot has organized the information into six sections: The Fish, The People, The Place, Distribution and Risk of Extinction, Threats to Biodiversity, and Migration Ahead (referring to the policy recommendations rather than the migrations of salmon). The great strength of the book is that it uses high-quality maps and visual images, linked to jargon-free prose, to convey important information. Maps reveal the patterns of such things as the maximum spatial extent of glaciation, the distribution of different groups of indigenous people, locations of salmon hatcheries, magnitude of salmon catches, chlorophyll production in the ocean and sea surface temperature, terrestrial habitat type and vegetation, and human population density. Combined with side-bars, illustrations (*e.g.,* drawings of the major types of commercial fishing boats and their gear), old photographs (*e.g.,* cannery operations) and modern ones, the book invites you to open it and learn about salmon and their world. Even readers who consider themselves relatively informed about salmon will find new information. Many of us in North America will find the wealth of details about rivers and other natural features of Asia and especially Russia, and the factors affecting salmon there, exceptionally valuable. Augerot has gone to special lengths to research the Asian populations, and this alone is reason to read the book.

The purpose of the book, however, is not merely to inform armchair naturalists but also to convey a sense of urgency regarding the constriction in range and loss of salmon diversity, and to motivate action. Many populations have become extinct or reduced in abundance, and life history patterns and population structure have become simplified by habitat alterations and artificial propagation of salmon in hatcheries. These issues are raised in the text and also illustrated in maps (with summary tables as well) showing the levels of extinction risk (low, moderate or high) and the number of extinct salmon populations in the different ecoregions. The maps provide information for Russia (except the Arctic drainages) but not Japan, where the populations are so dominated by hatchery production that estimates were deemed meaningless. North American salmon are reported from California north to Oregon, Idaho, Washington, British Columbia, and Southeast Alaska but no information is given for central, western, and northern Alaska. These latter areas contain large concentrations of salmon so the absence of data for them is unfortunate. Indeed, the book indicates that the data displayed represent ''at most an estimated 10% of *Oncorhynchus*'' (p. 65). This incomplete coverage was attributed to difficulties in gathering appropriate data, and the information in the book was largely drawn from articles in *Fisheries* (the Bulletin of the American Fisheries Society), and from the ''best expert judgment from biologists in Russia and North America.''

The problems the author and her associates had in obtaining reliable, standardized data on the distribution, abundance, and status of salmon throughout their range are echoed in the final chapter, which calls for a ''North Pacific Ecosystem Approach'' to salmon conservation. This approach includes more comprehensive and standardized salmon monitoring, changes in management from an emphasis on biomass to biodiversity, protection of core habitat areas, greater cooperation among agencies and nations, and creation of infrastructure to facilitate data sharing. These seem like laudable goals but we should not conclude that the agencies responsible for salmon management are incompetent, nor that no one has had these ideas before. Collecting reliable data on the abundance of fish populations is a surprisingly difficult task, especially if there are many thousands of populations, and careful analysis of the data takes time. Agencies such as the Alaska Department of Fish and Game have meager budgets and vast responsibilities. I have a lot of sympathy for these biologists who make the day to day decisions that protect our natural resources. There is no question that better data and more coordination among agencies would give us a clearer picture of the overall status of salmon. However, I am not sure that it would actually improve salmon management. One could make a good case that salmon management has performed best in Alaska, where only one agency (Alaska Department of Fish and Game) is involved, and has performed worst on the Columbia River, where numerous state, federal, tribal, inter-tribal and non-governmental organizations are involved, and salmon are tagged, counted and sampled in every way imaginable. Nevertheless, I commend Augerot for proposing changes rather than just bemoaning the status of salmon, and for her faith that salmon can remain an important part of the regions ecosystems.

In summary, the book's strengths are in its visual appeal, diverse forms of content (maps, text, art, photos, graphs, etc.) and clear writing. In terms of content itself, the material on Russia will certainly be viewed by salmon biologists as especially valuable. This book is not designed to convey the rich details of salmon and trout life history and behavior (and cutthroat trout are not covered at all), nor is it written for a technical audience. Readers used to the scientific convention of linking statements in the text with specific citations may be frustrated by the lists of sources for each chapter that are not referenced in the text. There are some questionable generalizations and some details are not accurate. Most unfortunately, the original illustrations of juvenile salmon got mixed up, and what is listed as a juvenile sockeye salmon is clearly a picture of a pink salmon, and what is listed as a pink salmon is a repeat of the steelhead trout picture. However, these matters do not really detract from the overall impression that the book gives, and from its motivational message.

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The Genesis of Animal Play. GORDON BURGHARDT. MIT Press $50.

> ''When I play with my cat, who knows but that she regards me more as a plaything that I do her?''
> Michel de Montaigne (1533–1592), French essayist.

Play as a behavior has been discussed, debated, rejected, accepted, defined and redefined since the time of Aristotle and even before. In ethology, play has been largely subjugated to a category almost as disregarded as ''Other'' in our ethograms and time budgets: we

don't know what it is, and we don't know what to do with it. But we know it when we see it, to paraphrase Supreme Court Justice Potter Stewart. In our own research on the social behavior of crows, macaque monkeys, and killer whales, we certainly record behavior that we want to label as ''play'' but when pushed for a definition of this behavior, especially for a definition that encompasses the behavior in all three species, we have difficulty doing so.

Recently, play behavior has received a little more recognition in works that have attempted to critically define play and to explore functional and evolutionary hypothesis. In each of these works, play is first defined, and in each case, it almost seems that play is defined in a way that contributes to the thesis of the work. This has been one of the weaknesses of scientific investigations into play as an adaptive (or non-adaptive) behavior.

So how is this latest effort different? Burghardt has a specifically-defined goal for this book: to examine the evolution of play behavior, to dig back into the phylogenetic history of animals for the roots of play. He makes it clear at the outset that his point is not to examine the function of play, or the adaptive significance of play, although having made this point, he does an excellent job of reviewing the work on both of these topics. So the book is well-titled: Burghardt is, indeed, exploring (and we use this term carefully) the genesis of play behavior in phylogenetic groups, from eutherian mammals, through marsupials, birds, reptiles (did dinosaurs play?), amphibians, and fish (you'll be surprised), even back into invertebrates. When, in what group, did play first arise? Is play behavior mono- or polyphyletic? How do the answers to these questions help to answer questions of function and adaptive significance? These are the issues that are raised and answered, to the degree that current knowledge permits an answer.

The book is divided into two sections, with the first section of six chapters dealing with definitions and theory and the second unit of nine chapters providing a review of play behavior, its occurrence and form within taxonomic groups, and a final summary chapter. Chapter 1 discusses play in an ethological context while chapter 2 provides a history of the scholarly consideration of play, including perspectives from a variety of fields of inquiry including the developmental psychology of human play and Darwin's consideration of play in humans and animals. These two chapters lead up to chapter 3 in which Burghardt provides a five-point set of criteria for the definition of play. In most cases, the five criteria contain multiple attributes; at least one attribute in each criterion must be met for a behavioral example to be considered play. Chapter 4 demonstrates the use of these criteria in the most obviously playful species while describing the diversity of play. Chapter 5 revisits the history of play research to summarize the major efforts and findings in past work. To introduce the second unit, chapter 6 establishes the framework for explaining how play could have originated.

The second unit is the real heart of the book. Chapter 7 discusses constraints on play data that is available for most species of animals, before chapter 8 launches the reader into an playful tour through the animal kingdom, beginning with the placental mammals, and continuing into the marsupials (chapter 9), the monotremes (chapter 10), birds (chapter 11), ''cool reptiles'' (chapter 12), fish (chapter 13), and finishing up with invertebrates (chapter 14). The book ends with an excellent review chapter that steps back to the five criteria, and then comes forward with both conclusions and some proposals for future directions. For example, Burghardt notes that animals that play often have active life styles, moderate-to-high metabolic rates, generalist ecological needs requiring behavioral plasticity, and adequate-to-abundant food resources. Lastly, the book includes References, and Animal, Name, and Subject indices.

The book is well-produced, sturdy and professional. The indexing is thorough and we found no typographical errors. One minor quibble: a number of phylogenetic trees are reproduced and levels of play behavior, of different forms, are labeled upon them using boxes filled with patterns (*e.g.*, solid for definite play, open for no known occurrence, diagonal or cross-hatching for intermediate levels). The diagonal and cross-hatching is difficult to separate for us: it is not intuitive that cross-hatching represents greater intensity than diagonal hatching: we would have preferred intensifying shades of gray, for instance. The pricing is very reasonable at $50, allowing this text to be used in a graduate seminar, where the topic could invite a very broad interest from ethologists across taxonomic lines, child psychologists, education specialists, neurobiologists, and evolutionary biologists. The book is a wonderful demonstration of the power of the comparative approach to evolutionary questions, and it belongs on the shelf of anyone who is interested in social behavior, in any species, or who wants something a bit more specific than ''I know it when I see it'' when asked to define play.

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