

Book Review

SPERM WHALES: SOCIAL EVOLUTION IN THE OCEAN. Hal Whitehead. University of Chicago Press, Chicago and London, 2003. ISBN number 0-226-89518-1. 431 pp., HBK: 80 USD and PBK: 30 USD.

Some 20 years ago, Hal Whitehead and colleagues set out on their quest to study the behaviour of sperm whales through spending long periods at sea in the company of the living animals. Over the intervening years, Hal has established himself as the most prolific of sperm whale researchers, and I looked forward to reading his contemporary summation of this fascinating animal's biology. I was not disappointed, and, after forgiving him the description of the right whale as a "fat, lumpy animal," read the book twice from cover to cover.

It is divided into nine chapters, each with a summary and an Appendix. Chapter 1 ("An Animal of Extremes," 29 pp.) is a general introduction to the evolutionary history, morphology, anatomy, and life history of the sperm whale. Chapter 2 ("The Oceanic Habitat," 48 pp.) describes the whale's environment, its diet, and natural enemies. Chapter 3 ("On the Move Through an Ocean," 33 pp.) covers horizontal and vertical movements and their costs and benefits. Chapter 4 ("Populations," 22 pp.) includes geographic structure, current population estimates, and historical trends. Chapter 5 ("Behavior and Vocalizations," 73 pp.) describes the unique click and other vocal outputs of the species, as well as behavioural aspects such as foraging, socializing, aerial behaviour, birth, calf behaviour, and defence against predators. Chapter 6 ("Societies," 80 pp.) is, by the author's admission, the core of the book. In it, he explores the spatial and social scales of sperm whale society, delineates social units, and discusses issues such as care of the calf and mating systems. In Chapter 7 ("Cultures," 30 pp.), Hal describes his "quest for sperm whale culture," and the evidence for acoustic clans and some group-specific movement patterns that support the existence of a culture. Chapter 8 ("Social and Cultural Evolution in the Ocean," 44 pp.) gives the author's thoughts on how such a social and cultural system might have evolved, the implications of the development of the largest brain and nose in the animal kingdom, and the amazing similarities between the social structures of sperm whales and elephants. In Chapter 9 ("The Future," 14 pp.), Hal summarizes

past effects of whaling on and future threats to the species, how sperm whale studies might continue, and what we might discover regarding their society. The Appendix ("How We Study the Sperm Whale," 11 pp.) contrasts the old whaling studies with new field techniques for studying living animals. Over 600 references are cited, 10% of which emanate from the author and his colleagues.

Hal Whitehead is one of those rare animals, a first-rate field biologist with a strong quantitative background, and this ability comes through clearly in the number of original analyses described in the book. But the text has been carefully crafted so that even the more numerically challenged of us can understand what has been done. The book is well written, logically laid out, and easy to read (apart from the use of boxes, which I think are simply disruptive in a text with this format). It is garnished with quotes from old and new whaling literature, and the illustrations by Emese Kazar of various aspects of behaviour are particularly charming. Unfortunately, the graphs are not consistent in line thickness or font size, so that some reproduce poorly (Figure 6.8). There are very few typos, the most serious probably being the scales in Figure 6.6 that presumably should have been in m rather than km. I interrogated the bibliography repeatedly and was unable to find any missing or incorrect citations.

A vast amount of new information on sperm whales is provided and is skillfully combined with some of the old whaling data to produce the first comprehensive account of how the sperm whale's social organisation may have evolved. Personally, I do not find the idea of sperm whales having "culture" (in the sense of information acquired through social learning leading to similarities in behaviour among members of a population) particularly surprising. As an old whaling scientist, I find some of the more pertinent questions surrounding the mating system of the sperm whale. Why, if female schools off the Galapagos were accompanied by a large male for 75% of the time, did calf production decline drastically? Hal speculates that either additional males were needed or that females were exercising mate choice, as suggested by the degree of paternal relatedness within groups (but could synchronisation of oestrus [Best & Butterworth, 1980, *Reports of the International Whaling Commission*, Special Issue 2, 137-140] have played a part?). As the author states, ways

of studying mating tactics in sperm whales are needed, and here paternity analyses (although logistically challenging) might help.

An alternative explanation for the decline in calf production, reduced foraging success, is largely discounted because defecation rates (equated with feeding success) were unchanged. But between 1985 and 1999, the number of females off the Galapagos decreased dramatically, as they moved to the coast of the Americas from Panama to Chile, a move that the author feels was induced by poor feeding success. Could the decline in calf production have been the first response to poor foraging conditions, to be followed by emigration when conditions did not improve?

Unfortunately, our understanding of the abundance and shoaling behaviour of the sperm whale's principal prey, mesopelagic squid, is seriously deficient. This ignorance about many aspects of the sperm whale's prey also influences our ability to interpret several elements of the sperm whale's social system and behaviour. Hal's analyses tend to favour predation risk as the key element in the evolution of sperm whale groupings, despite his admission that for most killer whales, sperm whales seem not to be on the menu. But given that 75% of a female's day is spent foraging, in which some 750 squid might be caught, and that cephalopods have notoriously variable abundance, it seems reasonable to assume that prey availability and quality may be equally likely to be the driving force behind the sperm whale's social evolution. But until we can discover more about what happens when the whales descend for 100s of metres below the surface (possibly with the aid of new telemetry devices), we are largely in the realm of speculation.

I hope these few comments have shown that this book is full of stimulating questions and ideas about sperm whales. It has come at a most opportune time, as the Scientific Committee of the IWC is currently contemplating a (long overdue) re-assessment of sperm whale stocks. But the book is of far wider significance. It is essential reading for any student of social evolution in Cetacea, or in large mammals in general, for that matter.

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