ISBE Newsletter Fall 2000 Volume 12 (2): 21-23

Promiscuity. An Evolutionary History of Sperm Competition and Sexual Conflict. Tim Birkhead. Faber and Faber, London, 2000. 272 pp. ISBN: 0-571-1936096.

Before leaving his castle, the lord asked his wife to put on her chastity belt. With the belt locked and the key around his neck, he was able to avoid the trade-off between mate guarding and joining a crusade. In the Middle Ages, a woman travelling on her own risked unpleasant encounters with men. To avoid harassment or worse, she wore a chastity belt. Although historians now think the first story is a myth, the two stories illustrate our thinking of sexual behaviour from either the male or the female perspective.

In his new book *Promiscuity*, Tim Birkhead shows that the history of the study of sperm competition followed much the same path. Not too long ago, sperm competition was seen as a continuation of the battle among males for access to females. As seemed logical (from the male scholar's perspective?), the focus was on males. Thus, they guarded their partner and pursued copulations with other females. However, it became exceedingly clear that mate guarding can be very ineffective- as females may choose to be actively promiscuous. This demanded new evolutionary explanations.

Why are females promiscuous? I doubt that we have a general explanation, but what we do have is a wealth of data on male and female tricks to control the outcome of sperm competition. This book marvelously describes the amazing diversity and utter sophistication of reproduction and places it all in the context of current evolutionary thinking. It is a vivid account of the battle of the sexes, written for a general audience, but with a minimum of concessions to scientific *rigoroso*. Birkhead has taken on the challenge to 'translate' his research field into a readable account for a general public, and he has mastered the fine balance between avoiding jargon-ridden sentences, without simplifying to the point where scientific integrity can be questioned. He also masterfully describes the process of science, the way in which discoveries are made, and the ingenuity or beautiful simplicity of some of the experiments. How do the eggs of a catfish species that 'copulate' in a T-position with the female's mouth latched to the male genital opening get fertilized? By releasing a tiny drop of blue dye into the water beside the male's genital opening at the right moment, Japanese biologists saw how the dye was sucked into the female's mouth, only to emerge, ten seconds later, from her genital opening and on to her eggs.

The book's first chapter paints the history of sperm competition and sexual selection with Darwin, Bateman, Trivers and Parker in the key roles. The first chapter is also used to finish off (once and for all it seems) Baker & Bellis' work on human sperm competition. The style of writing does not leave an inch of doubt about the author's feelings about this research and the media attention it received. Humans are left out of the picture in most of the rest of the book, and that is a pity. A sexy story on human sexual behaviour is *Gefundenes Fressen* for the media, but good scientific work on the subject should be encouraged.

The second chapter discusses paternity: from how we can measure it to how males try to protect it. Then come several chapters to provide an overview of the reproductive machinery: the female reproductive tract as an obstacle course for the sperm, but also as a safe haven (ie: storage site); the penis as a tool not just to deposit sperm, but also to remove it or copulatory plugs from rival males; the testes with a certain pre-occupation with size. Finally, the sperm and eggs themselves, the latter of course the bigger with the nutrients to feed the future embryo, but the former still winning all the medals for extravagance in size and shape. A single sperm can be almost 40 times longer than the body of the animal it inhabits, but it can also lack a tail and use knobbly processes to crawl to the site of fertilization.

The following chapter describes the events of copulation, insemination and fertilization: not so well studied and understood as one might assume for such basic biological processes. And when studied, by reproductive physiologists, then often without the idea of sperm competition in mind. Well, that should change after this book! Sperm competition happens when sperm of more than one male compete for the fertilization of the eggs. But what happens exactly, in particular when fertilization is internal, is the exciting story told in Chapter 6. Who wins the competition? There is plenty of evidence that numbers and quality of sperm and timing of inseminations play a role, but what about the influence of the female on the outcome? Cryptic female choice is a hot topic, and a difficult one to investigate.

The final chapter of the book poses the one question that many readers will have been waiting for. Why are females promiscuous? Many plausible hypotheses are explained, combined with some more or less convincing data and some great anecdotes, but we are still far away from a complete understanding. The book ends with the inevitable *synthesis* after *thesis* and *anti-thesis*: it's not male dominance, not female control, but a battle between the sexes, an evolutionary see-saw of adaptation and counter-adaptation.

Promiscuity is a beautiful book and a great read. An attractive cover, a text filled with natural history gems, and great pictures to illustrate the most spectacular examples. The photos deserved a higher print quality, but that is all there is to complain about. Even though I am familiar with the topic, I was still left amazed and with a sense of beauty. The latter came when I realized how nicely this reproductive diversity with all its intricate complexities can be 'summarized' within the simple framework of evolution. With superb scholarship, Tim Birkhead puts it all in place, but there is still space for further discoveries. What, exactly, led to the evolution of the 20-cm spiny penis of the Argentine Lake Duck (Auk 117:820-825)?

Bart Kempenaers
Research Center for Ornithology of the Max Planck Society
Postfach 1564
D-82305 Starnberg (Seewiesen)
Germany