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Konnevesi-symposium on antipredatory behaviour: concluding remarks

After an intensive week in late November 1991 where, in addition to 34 talks, individual and group discussions about the evolution of antipredatory behaviour during the coffee breaks, at meals, and in the hot sauna, the participants of the symposium gathered on the Friday morning for the last session of the meeting. The quality of the symposium was underlined by the fact that everybody was still present to hear the last talks on "Predator-prey coevolution as an evolutionary game". In the following discussion we tried to sum up the current stage of the research on antipredatory behaviour and make some predictions about the future: where do we go from here?

First, it was concluded that predation risk can be considered a strong selective force since being eaten has a drastic consequence on the fitness of an animal. When studying the effects of predation, its role as a direct mortality factor is, of course, obvious (Fig. 1A), and can, for example, cause changes in population densities. Direct impact of predation on population density has been one of the main subject of interests of population ecologists. As interesting, however, are the indirect effects of predation on selection of life history, behaviour, diet choice, etc (Fig. 1B). There should be an inverse correlation between antipredator behaviour and mortality, since if there is a high probability of being killed there is no use doing these behaviours, especially not if they are costly. The indirect effects of predators on the population level are totally neglected in the literature until now.

The point of considering predation as a cost of foraging was discussed. The alternative is to model energy intake with predation only as a constraint. Energy intake must be included in a fitness function. Fitness should be correlated with energy, but it is less obvious to regard it as a function of, for example, predator inspections. However, energy is worth more if surviving, and nutritional state may be unimportant if eaten by a predator! Time should also be considered as a constraint. An animal must allocate its time to

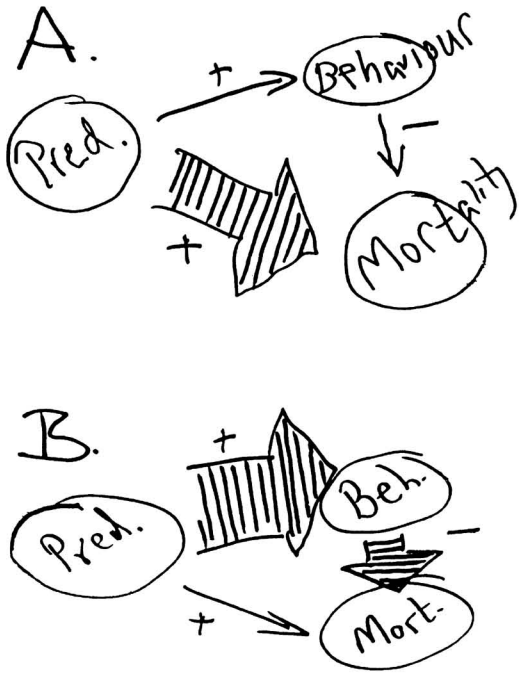

Fig. 1. A: The view of the direct effect of predation on the mortality of animals compared to effects on the behaviour as perceived until recent years. B: Future perspective of research where indirect effects of predation should be focused more as a mortality cause, too (according to J. Brown).

different behaviours, for instance, when not inspecting predators it can forage.

A new approach to science was called for. Research should be more integrative among areas in order to get a wider perspective. It is important to integrate models, field surveys and experiments to learn more about patterns in nature. When looking for adaptations, coordinating studies of different types of behaviour should be done more often than has been the case in the past. Conflicts across situations must also be considered. What happens at other times can influence current behaviour. Furthermore, there can be interactions between predator and prey behaviour. If a behaviour still does not seem to be adaptive this can be due to evolutionary constraints. However, demonstrating lack of adaptations can be difficult. Tradeoffs should be studied in the first place, to try to get adaptationist explanations, and after first showing why a behaviour is not adaptive, phylogenetic constraints should be invoked. Some systems may be only partly adaptive, — animals are not stupid but also not perfect. A framework for working on developmental constraints is needed. This would give us a potential to understand more of the world.

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