

## Kin vision?: a reply to Stuart

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(Received 19 November 1990; accepted 21 November 1990;

MS. number: sc-612)

Stuart (1991) doubts my claim (Grafen 1990) that only one case of kin recognition has been convincingly demonstrated, and questions the 'conceptual criteria' for kin recognition on which my claim is based. He sets out the argument, and the link between these points, with admirable clarity.

The primary question is really what does one want 'kin recognition' to mean? My original paper would have been more explicitly entitled 'Do animals really recognize kin in a way that is different from the way they recognize mates, neighbours, and other organisms and objects?'. Certainly animals use recognition systems to recognize their offspring, their siblings and their parents. But to the extent that they do so in the same way that they recognize their mates and their neighbours, I feel it is unhelpful to say they have a kin recognition system. They merely have a recognition system that they apply, sometimes to kin, and at other times to non-kin. To repeat an analogy (Grafen 1990, page 44), we do not talk about a special kind of vision, to be called 'kin vision', because we see our relatives, or because we use our sight for kin selective purposes. If we confine the meaning of 'kin recognition' to systems that work in a special way for relatives, we could say we were using a strict sense of kin recognition.

The main alternative is to argue that if animals treat relatives differently in any way, then they must have some way of distinguishing them from non-relatives. It may be simply physical proximity, but even this can be considered 'kin recognition', in a loose sense. Stuart (1991) argues that to be consistently functional in approach, we should adopt the loose sense of kin recognition, and then of course there are many well documented examples of kin recognition.

The strict meaning of kin recognition is an important one that should be recognized, whatever one chooses to call it. 'Kin recognition by genetic similarity detection' is one possibility. This was the sense I used in my paper, and I hope that the

intention and arguments of my paper are clear with that understanding.

Is any biologist surprised if a fox recognizes its neighbour or its mate, or a swallow feeds its offspring in the nest? I am still astonished that tadpoles can recognize their paternal half-siblings. The enormous interest in the literature on 'kin recognition' springs largely from the remarkable abilities demonstrated in a wide range of animals to discriminate by genetic similarity. The strict sense of the term 'kin recognition' faithfully reflects the central phenomenon and the core of interest of the field.

This can be seen in the controls that experimentalists perform. Why bother to look at paternal rather than maternal half siblings? Why prevent association between individuals later to be used in recognition studies? If what matters is simply whether individuals can recognize relatives, it does not matter whether they do it because of a shared environment or by early learning. The experimental protocols most commonly used make sense if it is 'kin recognition by genetic similarity detection' that is under study.

The strict meaning of kin recognition is common. For example, Wells (1987, page 407) said: 'Assuming, for the sake of argument, that kin recognition in humans is at least a strong possibility...'. In the loose sense, there is no argument about it: humans do recognize their mothers and fathers and brothers and sisters. But it is clear what Wells meant: kin recognition by genetic similarity detection. I presume this is also what Fletcher & Michener (1987, page 4) had in mind as 'kin recognition *sensu stricto*'.

In the loose sense of kin recognition recommended by Stuart (1991), the division between recognition of kin and recognition of mates and neighbours is inessential. The best understood recognition system, Linsenmair's (1987) wonderful study of *Hemilepistus reaumuri*, shows that mates and offspring are recognized in the same way; any logical category of work on recognition that

includes the burrow admittance system in *Hemilepistus* should include mate recognition and neighbour recognition. In the loose sense there is no natural subject of 'kin recognition'.

The strict sense concentrates on how information is transferred, and so really is about recognition. The loose sense recommended by Stuart focuses on what can be done with that information, and so is not really about recognition but about kin selection in general. For one nestling to be accused of kin recognition because on average its fellow nestlings are related to it extends the definition in my view too far. In kin recognition, the means by which information is conveyed should be special for relatives, and this implies that genetic similarity (virtually the definition of relatedness) must play some part in the mechanism of information transfer. Thus allelic matching, as practised by *Botryllus schlosseri* (Grosberg & Quinn 1986), is a central example. If Linsenmair's *Hemilepistus* use their recognition system to avoid inbreeding, they would be relying on the fact that the recognition cues are genetic, and so this too would be a case where genetic similarity was crucial in the acquisition of information. Sharing a nest or being introduced are ways of obtaining information about relatedness which would work equally well if the categories learnt were quite different. For example, a cuckoo chick 'knows' that its nestmates are not relatives.

In conclusion, I stand by my claim that only *B. schlosseri* has been convincingly shown to have a recognition system that works specifically for kin. Probably many other animals have such systems, but none has to my knowledge been satisfactorily demonstrated. I also stand by my use of the term 'kin recognition' to imply that the recognition system works specifically for kin, and is not a general system that can be used for kin and non-kin alike. The potential for misunderstanding means that it is probably if unfortunately wise to spell out what is meant each time the term 'kin recognition' is used.

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