

Recognizing species

Jerry A. Coyne

Evolution and the Recognition Concept of Species: Collected Writings of Hugh E. H. Paterson. Edited by Shane F. McEvey. *Johns Hopkins University Press: 1993.* Pp. 234. \$32.95, £24.50.

FOR 20 years, Hugh Paterson and his students have waged a *jihad* against one mainstay of evolutionary thought, the biological species concept. Developed by Ernst Mayr and Theodosius Dobzhansky, the concept treats species as interbreeding groups separated from related groups by 'reproductive isolating mechanisms', genetically based barriers to gene exchange such as mate discrimination, ecological preference, and sterility or inviability of hybrids. Paterson and his colleagues contend that this concept is deeply flawed, and, in this collection of 17 published papers, try to replace it with a new view of species.

Their "recognition concept" treats species as "that most inclusive population of individual biparental organisms which share a common fertilization system". In Paterson's view, aspects of the fertilization system most relevant to speciation constitute the "specific-mate recognition system", the set of cues that individuals use to detect conspecific mates (pheromones, courtship rituals and so on). The main difference between the two concepts is that the recognition concept delimits species only through mate recognition, so that other isolating barriers play no part in speciation.

The recognition concept is claimed to remedy several problems with the earlier concept and to aid research on speciation. These claims do not survive close examination. For example, Paterson repeatedly insists that the term 'isolating mechanism' has teleological overtones that mislead supporters of the biological species concept by endorsing the erroneous idea that reproductive barriers are 'mechanisms' directly created by natural selection to protect the adaptive gene complexes of species. (The alternative view, now widely accepted, is that these barriers are usually the accidental by-products of natural selection acting within species.) There was indeed some early confusion about the origin and meaning of reproductive isolation, but just as we do not reject Darwin's views because of the errors and excesses of social darwinists, so we should not reject the biological species concept because it was misinterpreted and over-extended by some of its adherents.

Paterson's second criticism of the

biological species concept is that it is "relational": using it, one recognizes species only by their reproductive isolation from other species. He claims that his recognition concept, by stressing interbreeding *within* a group, defines a species without reference to other species. This is a false distinction. Both concepts are nonrelational when assigning two individuals to the same species (they interbreed); they become relational when assigning individuals to different species (they do not interbreed). Indeed, Paterson admits as much several times: "If the SMRS [specific-mate recognition system] of individuals of a daughter population changes such that they no longer recognize as mates members of the parental population, then a speciation event has occurred".

Does the recognition concept offer any advantages over the biological species concept? The only substantial difference is how they treat forms of reproductive isolation not involved in mate recognition. Populations isolated solely by ecological divergence or hybrid sterility (such as newly formed polyploid plants) are considered species by the biological species concept but not the recognition concept. Paterson argues that taxa isolated from their relatives by intersterility alone could not coexist, for the forms would mate randomly and the rarer would go extinct. If coexistence of genetically isolated forms is essential for speciation, then barriers acting after fertilization do not by themselves delimit species. But this requirement also invalidates the recognition concept—even species isolated by complete mating discrimination cannot coexist unless they also diverge ecologically. Competitive exclusion is common among species with demonstrably different fertilization systems, such as introduced species that outcompete native ones. On balance, the recognition concept is actually subsumed by the biological species concept, in which mate discrimination is considered to be one form of reproductive isolation. I see no advantages in ignoring the other forms.

To be sure, the book is not wholly without value. Its discussion of mate recognition emphasizes an important but neglected aspect of speciation, and Paterson gives a useful assessment of teleological views on speciation, although they are now held by very few. These good arguments, nonetheless, are often mired in inflated rhetoric and marred by out-of-context quotations, questionable assertions that biologists support the biological species concept because of "deep-seated biases inherent in our Western cultural background", excessive repetition (few new ideas surface after the first 50 pages) and tiresome lectures on how to do science (do we really need to hear, for example, that "references provided by authors need

to be checked to see that they say what they purport to say"?).

Finally, the authors' notion that they are overthrowing a major paradigm imbues the book with a revolutionary tone: "Once it is realized that the whole class of isolating mechanisms can be dispensed with entirely, the mind is freed from a set of ancient shackles—true tyrannies of the past—and genetic species can be looked at with fresh eyes". This hyperbole is inappropriate to a "revolution" that proves to be only a noisy skirmish that fails to depose current ideas about speciation. □

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■ Just published is *Species, Species Concepts, and Primate Evolution* edited by W. H. Kimbel and L. B. Martin, the most recent volume in Plenum's *Advances in Primatology* series. The book contains 21 chapters arising from a 1991 symposium. Price, \$138.

■ Species concepts were also the subject of a recent *Scientific Correspondence* (*Nature* **364**, 20; 1 July 1993).

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