



100 YEARS AGO

Some fifty years ago Japan was a hermit nation more than five centuries behind the times, to-day she constitutes a new and important factor in the problem of the distribution of the world's commerce. The story of the foreign commerce of Japan since the restoration of imperial authority in 1868 is told by Mr. Yukimasa Hattori... Two remarks towards the end of his paper will show the conclusions to which Mr. Hattori has come. "Japan must rely on industrial development rather than on agriculture, and must try to excel in the quality of goods produced rather than in quantity." "Japan possesses all the advantages necessary to make her a great manufacturing country. Her people possess exceptional skill, and labour is relatively cheap: coal is abundant, and the raw material is easily obtainable either at home or in the neighbouring countries." Those readers who have followed the steps in Japan's development since 1868 will be prepared to agree with Mr. Hattori that his country is but "at the very beginning of beginnings" of what will yet be seen. From *Nature* 17 November 1904.

50 YEARS AGO

Freedom, Loyalty, Dissent by Prof. Henry Steele Commager. Like Prof. A. Macbeath's plea for heretics at the British Association meeting in Belfast, the five essays collected in this volume develop the pragmatic argument that the right to dissent, even to be wrong, is an imperative necessity for a society in which science or any other creative activity is to flourish... Prof. H. S. Commager's essays are addressed to an American audience, but quite apart from the evidence they afford that there are those in the United States itself who have a national audience and are not afraid to attack McCarthyism, his refreshing defence of intellectual freedom will appeal to all scientists who welcomed Prof. Macbeath's forthright words. In the accents of Mill rather than of Burke, he argues for the encouragement of the experimental attitude in science, because "if we create a climate of opinion in which scientists fear to be bold and original or if we require that they work only on projects that appear to be of immediate importance to us, we shall end up with scientists and scientific knowledge inadequate to the tasks that we impose upon them". From *Nature* 20 November 1954.

placed among the ant grubs. In most species — the 'predatory' large blues — the caterpillar then moves to safer chambers, returning periodically to binge-feed on ant grubs. But in two 'cuckoo' species (Fig. 1), the caterpillars remain among the brood and become increasingly integrated with their society. Nurse ants feed them directly, neglecting their own brood, which may be cut up and recycled to feed the parasites⁵.

Cuckoo-feeding is an efficient way to exploit *Myrmica*, resulting in six times more butterflies per nest than is achieved by the predatory species⁶. The downside is that social acceptance is won only through secreting chemicals that so closely match the recognition codes of one host species that survival with any other ant is unlikely⁷. Thus, a typical population of a cuckoo *Maculinea* species depends exclusively on a single *Myrmica* species — which, however, differs in different regions of Europe⁸. Predatory *Maculinea* are more generalist; nevertheless, each species survives three to five times better with a single (and different) species of *Myrmica*⁶.

Theory suggests that the adaptations of cuckoo-feeders evolved from predatory ancestors, rather than vice versa⁶. It was also suspected that, because *Myrmica* ants have spread across Eurasia to form many similar-looking, physiologically distinct cryptic species, their *Maculinea* parasites, especially parallel radiation, with new species exploiting new hosts when these evolved⁸. The taxonomy of *Maculinea* has been notoriously confusing, with some authorities recognizing five species, others twelve.

Als and colleagues' molecular results³ support some ideas but overturn others. Working on seven *Maculinea* species (including all undisputed ones), and three parasitic species from their presumed sister genus *Phengaris*, they confirm that both butterfly groups evolved from a common ancestor, most probably a predatory social parasite. Cuckoo-feeding clearly evolved twice after the genera diverged, once in *Maculinea*, once in *Phengaris*. We suggest that it may have begun a third time, in the dusky large blue (*M. nausithous*); this species is still a predator, but has several attributes of cuckoo-feeders and achieves some social integration.

The surprise in the results lies in the relatedness of different species and populations. All predatory large blues contain such major differentiations that, as Als *et al.*³ point out, certain populations "may represent cryptic species". The authors do not speculate how many might exist, but a conservative interpretation of the data suggests that *M. arion*, *M. teleius*, *M. nausithous* and *M. arionides* may each be split into two similar-looking species, making (with *M. cyanecula*, here established as a true species) nine different

predatory *Maculinea* species where four had previously been recognized. A mere 21 predatory populations were sampled for this analysis, so the results raise the evolutionist's dream (but the conservationist's nightmare) that many other populations of these globally threatened butterflies may represent separate species, each more endangered than their original 'morpho-species'.

On the other hand, Als *et al.* found little evidence for the predicted cryptic speciation among cuckoo species. Indeed, they suggest that two recognized species (*M. alcon* and *M. rebeli*) might conventionally be regarded as one. Frustratingly, the ant host is known for only a few of the populations used for genetic analysis. The next challenge is to see whether genetic divergences (or similarities) in 'species' match host or other biological shifts. There are hints that some may: the genetically distinct Japanese and European populations of *M. teleius* specialize on very different *Myrmica* species, whereas the genetically close East European populations of *M. alcon* and *M. rebeli* mimic chemically similar ants and could indeed be one species.

Why is this important for conservation? The *Maculinea* have been flagship species since their selection as one of three priorities for butterfly conservation by the World Conservation Union (Queen Alexandra's birdwing of Papua New Guinea, and the Mexican roosts of monarch butterflies were the others). Their populations were undoubtedly endangered, but the problem is amplified if the recognized species consist of several cryptic forms, many needing a different ant with a different habitat requirement.

Als *et al.* rightly argue for fresh priorities. We will need to study the species status and host-use of surviving populations of predatory large blues across their entire ranges. Furthermore, the neglected genus *Phengaris* should be afforded the same priority status as *Maculinea*: it is equally specialized and endangered, and may hold the key to understanding the early evolutionary history of this intriguing group. ■

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