nify or diminish observable changes in mortality during the fuel crisis period will also continue.

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Wild mynahs mimic wild primates

THE remarkable accuracy with which captive hill mynahs (*Gracula religiosa*) mimic human speech and other sounds is well known[1]. How this ability functions in nature was entirely speculative until Bertram[2] conducted an extensive field study of hill mynahs in India. Bertram[2] found that hill mynahs in India imitate the calls of other hill mynahs, but never heard a wild mynah imitate another species.

A different situation prevails on Siberut Island, off the west coast of Sumatra, Indonesia. During a 14-week study (1 July–7 October, 1972) of primates in rain forest near the Sirimuri River in southern Siberut[3], I noted several instances of wild *G. religiosa* imitating a particular loud alarm call of Kloss's gibbon (*Hylobates klossii*) and loud spacing call of male pig-tailed langurs (*Simias concolor*).

I saw hill mynahs daily in the study area, usually in groups of 2–10 individuals. The gibbon call that they imitated is a tonal trill at a frequency of ~ 1 kHz and an average duration of 1 s (21 sonagrams). The langur call that they mimic is a panting-like sound, produced by 3–5, or more, exhalation–inhalation cycles, at a frequency of ~ 500 Hz (1 sonagram). Mynah imitations of these calls sound much like the originals but are distinguishable by ear as being mynah calls rather than primate calls just as readily as mynah renditions of human speech can be recognised by ear.

Mynahs imitated calls immediately after the primates produced them. From 16–30 September, 1972, I noted the frequency with which male pig-tailed langur calls were followed by mynah imitations of the calls. Out of 12 instances of calling by one or more male pig-tailed langurs, 10 were followed within seconds by imitations of the call by one or more mynahs. Comparable data were not obtained for mimicking of gibbon alarm trills because I heard none during this period.

Neither gibbon alarm trills nor the male pig-tailed langur call was a common component of the forest background noise during this study. Only 12 bouts of gibbon alarm trills, distributed over 8 days, were heard during the 99 days of study. Pig-tailed langur calls were never heard during the first 11 weeks of the study, but occurred on two-thirds of the days during the final three weeks of study. R. L. Tilson (in preparation) has confirmed that calling by pig-tailed langurs occurs sporadically.

Three kinds of loud primate calls are, at particular times of day, regular components of background noise in the study area. These are the songs of male and female[4] Kloss's gibbons and spacing calls of male Mentawai langurs (*Presbytis potenziani*). None of these calls was imitated by mynahs, in spite of the fact that the Mentawai langur call is rather similar to the pig-tailed langur call which is mimicked. This suggests that perhaps only infrequently occurring vocal signals of other species are mimicked by mynahs. I did not determine whether mynahs imitate vocalisations of other species of birds in the study area.

These findings suggest that such mimicking behaviour is not, as previously thought[2], just an artefact of confinement.

Wild birds detect quinine on artificial Batesian models

EVIDENCE I acquired during an experiment on the evolution of Batesian mimicry indicated that under some circumstances birds can detect quinine dihydrochloride on flour–lard pastry baits. The results of some previous mimicry experiments[1–5], in which pastry baits were presented to wild birds, may need to be re-evaluated because of their tacit assumption that birds can only detect by taste the quinine used to make the models unpalatable. Quinine salts used were the hydrochloride[2,3] or dihydrochloride[1,5]. Pilecki and O'Donald's "solution of quinine"[4] was presumably quinine hydrochloride, which they used previously. Quinine monohydrochloride has only 1:16 solubility[6], so Morrell and Turner[2] probably used the more soluble dihydrochloride to make their 75% solution. Birds in an experiment of Ikin and Turner[1] took nearly as many perfect mimics of two different models as palatable controls, though very few models (70% quinine) were taken. These authors suggested that birds in previous experiments[2,5] may have distinguished "models from 'perfect' mimics, possibly because the quinine causes a slight yellowing of the pastry". So far as I can determine, however, a specific control for detection of quinine has never been conducted.

The intent of my original experiment was to test the hypothesis that the models evolve more slowly than the mimics due to stabilising selection[7]; that is, deviant individual models are subject to predation because birds fail to recognise them as unpalatable. Until my suspicions about detection of quinine by birds were aroused, I used the following procedure in the study. Birds were trained to avoid unpalatable yellow models and palatable (Batesian) yellow mimics, and to choose palatable pink controls. All baits were painted with black patterns. The position of a single black stripe distinguished models from mimics, while controls were painted with four other patterns. I planned next to test avoidance of models with altered black patterns. During training, two scrub jays (*Aphelocoma coerulescens*) avoided yellow model baits treated with a 5% quinine solution (Q-yellow) and yellow mimics (non-Q-yellow, dipped in distilled water). They chose controls (non-Q-pink, distilled water) significantly more than models and mimics combined ($\chi^2 = 127.12$, $P < 0.001$, see Table 1b). Other birds feeding on the baits—6–20 Golden-crowned sparrows (*Zonotrichia atricapilla*), two to six brown towhees (*Pipilo fuscus*), one to two rufous-sided towhees (*P. erythrophthalmus*) and one to two California thrashers (*Toxostoma redivivum*)—did not discriminate among model, mimic and control. I increased the unpalatability of the model, using 60% quinine dihydrochloride for the rest of the experiment. The birds other than jays then chose non-Q-yellow mimics significantly more than Q-yellow models ($\chi^2 = 29.35$, $P < 0.001$, Table 1c). The jays continued to avoid both Q and non-Q-yellow baits significantly.

The first indication that some birds detected quinine visually or olfactorily was that only 12 Q-yellow baits were taken during the 4 d when 60% quinine was used initially, although at least 17 birds in addition to jays were seen feeding on the first day alone (Table 1c). I was certain that the birds did not taste baits without attacking them. I used field glasses to watch