

collected in all sections of the country and in all seasons of the year. The bearing of these findings upon the question of butterflies as food for birds has recently been summed up by one of these experts as follows:—"Four records of birds eating butterflies are all that are afforded by the records of the examination of more than 40,000 stomachs in the Biological Survey, and one of these probably relates to the capture of a very recently emerged specimen, or to one torn from the pupa before emergence, as it was accompanied in the stomach by a pupa of the same species. This was an *Epargyreus tityrus* taken by a crow. The other records are *Eudamus* (sp.?) eaten by a yellow-billed cuckoo, and two pierid butterflies captured by king birds" (W. L. McAtee, *The Condor*, January-February, 1912).

Such a mass of evidence (obtained by most careful and painstaking methods from the time the bird is shot in its natural habitat until the last recognisable portion of the stomach contents is identified and tabulated) demonstrates that as a food for North American birds butterflies are negligible, so that the distastefulness of *Anosia plexippus* and its close resemblance by *Basilarchia archippus* appear of no possible advantage to these species so far as birds are concerned. Nor can this be lightly pushed aside as "negative evidence." It shows positively that our birds do not eat butterflies to an appreciable extent, else immensely more than four butterflies should be found in more than 40,000 stomach examinations.

In a recent article relating to the palatability of insects to birds (Proc. Zool. Soc., September, 1911) Mr. Pocock explains that the behaviour of birds experimented upon in the Zoological Gardens was probably due in a measure to "inability in the gardens to feed the birds on living insects other than meal worms. The living prey was evidently a great treat to them, and over and over again I was impressed with the persistence shown by birds in persevering with insects that were obviously not to their liking, returning to the morsels repeatedly as if food of such a nature was too good to be wasted." But in the first succeeding paragraph he says:—"The insectivorous birds in our aviaries seemed to know at once what the butterflies were; they were on the alert the moment one was liberated and pursued it with determination and precision, following its every turn and twist, and either catching it upon the wing or pouncing upon it after settling. It is true that this predatory deftness may have been acquired in relation to the chase of insects other than Lepidoptera, but unless the birds recognised butterflies in general—a group which cannot be mistaken for other insects—as part of their natural prey, it is difficult to understand their eager excitement at the sight of those I offered them."

As an explanation for the conduct of the birds in Mr. Pocock's experiments the first quotation above seems to me sufficient as regards the avidity with which the birds in the gardens pursued butterflies. As regards the deftness with which the birds caught them, it would seem very remarkable indeed if an insectivorous bird normally taking its prey upon the wing could not catch insects relatively so slow and clumsy on the wing as butterflies. The highly theoretical suggestion that "birds recognise butterflies as part of their natural prey" seems to me fanciful, entirely unnecessary, and certainly not preferable to Mr. Pocock's first explanation for the eagerness with which all insect food was received by the captive birds.

As to the converse, it would seem more reasonable and plausible to attempt to explain the deftness of the dodging butterflies as arising from the admittedly

frequent pursuit of butterflies by one another rather than from the supposed attacks by birds.

The pertinency of experiments made under such abnormal conditions and the validity of conclusions reached from them are open to serious question. McAtee (*Journ. Econ. Entom.*, vol. iii., pp. 437-8, 1910) has very well shown the futility of basing conclusions as to their natural food upon experiments with birds removed from their natural environment. He cites a number of cases of captive birds which refused specific articles of food known to constitute a large part of their normal diet, and of others which willingly accepted food which they never get in their wild state. For examples, a confined blue jay refused acorns and beech nuts; a captive bluebird refused one of the ground beetles, *Scarites subterraneus*, and a caged song sparrow refused seeds of lamb's quarter and smartweed; yet these birds in a wild state are known to take these respective foods in quantity. On the other hand, a captive shrike willingly accepted and devoured a goldfish and a black bass, food it probably never takes in the wild state.

Since Mr. Pocock implies that I am one of "the dwindling minority of mimicry sceptics," I should like to suggest that before he assumes too much regarding this "dwindling minority," he make a census of the opinions of working zoologists (with reference to the usefulness of this particular case of mimicry, for example) and learn where the majority actually stands and toward which side of the question the dwindling really tends.

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FROM Mr. Banta's concluding paragraph I am afraid my reference to the disbelievers in mimicry as a dwindling minority hurt his feelings. I hasten, therefore, to explain that it was written in a spirit of "chaff," without any intention to give umbrage. Apart from this, there is nothing in my contributions to the question of the distastefulness of *Anosia plexippus* which, in my opinion, needs explanation or qualification. The statistics Mr. Banta quotes to prove that North American birds do not eat butterflies are full of interest. They show at all events that the birds examined had not eaten butterflies within a few hours of being shot, and they justify the belief that the birds in the areas investigated do not trouble themselves to catch butterflies when other insects are obtainable. It would be very interesting to know if the Department of Agriculture found empty stomachs in any birds shot in districts where butterflies of various kinds were plentiful and other insects scarce. That would be a very important piece of evidence in favour of the contention Mr. Banta upholds.

There is perhaps nothing so impressive in connection with the theory of mimicry as the vast amount of corroborative evidence that has been accumulated since it was first propounded. This stands out in strong contrast to the complete inadequacy of the explanation of the facts on which it is based put forward by its opponents. The repetition of this truism is prompted by Mr. Banta's suggestion that the skill butterflies display in evading the swoop of insectivorous birds has been acquired, not, be it observed, in connection with the pursuit of voracious enemies, but in connection with the apparently often sportive chase of one butterfly by another. If we push this argument to its logical conclusion, we must also explain the vanishing of many butterflies when they alight as the result of that same factor. With this view I can only say that I do not agree.

R. I. Pocock.

Zoological Society, April 27.