

EMARGINATION OF THE LONG PRIMARIES IN RELATION TO POWER OF FLIGHT AND MIGRATION

WITH ONE ILLUSTRATION

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THE KIND of wing best adapted to strong quick motion is of the long, pointed type as exemplified in such birds as swallows, swifts, terns and certain falcons. In a wing of this kind the primaries are of course long, and are narrow at the tip. A swallow is a passerine bird developed from some such form as a thrush or sparrow but differing in capacity for continuous flight, and in any group of similar birds superiority in flight is shown by approach to the hirundine form of wing.

A familiar example is seen in the wing of the Nighthawk compared with that of the Whip-poor-will. In some cases the narrowing of the primaries takes place abruptly, forming what is called an emarginate or attenuate primary. In the best developed case of emargination all of the inner web that projects beyond the secondaries, when the wing is opened, is affected. This is perhaps best exemplified in the Eagles, where the usual slow and easy motion that goes with a broad wing may be changed to a rapid beating of the wings that accompanies a great burst of speed. The emarginate primaries of the Fish Hawk are of the same form and for the same reason. The Falcons have less emargination, not from any lack of rapid wing movement, but because the whole primary is already narrow.

If emargination is a sign of power of flight we should be able, in such groups of birds possessing it that have migrations of varied lengths, to correlate amount of emargination with length of migration. The Owls of North America offer an opportunity.

The Barn Owls represent a tropical family only one species of which has obtained a foothold in the United States. There is no emargination at all. The following show slight emargination: Burrowing, Elf, Pigmy and six genera of tropical or subtropical distribution. A small degree of emargination occurs in the genus *Asio*, but the Short-eared Owl, reaching to Arctic regions and with an extensive distribution, has more than the Long-eared. The Screech and Barred and Acadian owls have only a little, but the Great Horned Owl shows a further advance, this bird being of a bold and vigorous nature and having in one race acquired arctic distribution, and the whitening plumage that is so common in that region.

The three species of owls that are strictly boreal are at once distinguished from all the others by the much more evident emargination. The Hawk Owl, Great Gray Owl and the Snowy Owl are limited to the far north in the breeding season and are common to both hemispheres. In winter the Hawk and Great Gray owls move south, in the east to northern New England, but the Snowy Owl goes farther south, even occasionally to the southern states.

The number of primaries affected by emargination in the owls may be as high as five or six, and in general the depth of the emargination is in proportion to the number. In order to save a lot of tedious description, I have copied the outlines of the North American owls from Ridgway's plates in his *Manual of North American Birds*. To his *Birds of North and Middle America* I am indebted for the information used in this article.

Emargination of the long primaries occurs in the genus *Tyrannus*. Here Ridgway notes a sexual difference, the females having less than the males. If the emar-

gination is less in the females and, by our thesis, in the southerly species, we should find the least degree in females of the southerly birds. This is so, as the following quotations from Ridgway will show, the comparison in each case being that of the female with the male.

T. tyrannus, north to Hudson Bay, female adult with "tips of longer primaries less attenuated". *T. verticalis*, western U. S., north to British Columbia, adult female with "tips of longer primaries much less attenuated". *T. dominicensis*, north to southern U. S., with "tips of longer primaries less distinctly attenuated". *T. vociferans*, north to southern Wyoming, with "tips of longer primaries not distinctly if at all attenuated". *T. cubensis*, of Cuba, with "tips of outer primaries indistinctly attenuated". *T. crassirostris*, of Mexico, with "outer primaries very slightly attenuated". *T. melancholicus*, north to southern border of U. S., with "tips of longer primaries much less distinctly attenuated, sometimes hardly at all". Emargination, then, reaches or approaches the vanishing point in females of the most southerly species.

Among birds of prey emargination is more strongly marked in large birds, presumably related to the larger and more swiftly moving prey they are able to capture, but in *Tyrannus* this is not so, the smaller birds showing more than the larger. This follows from the simple law that in any genus of tropical or semi-tropical birds

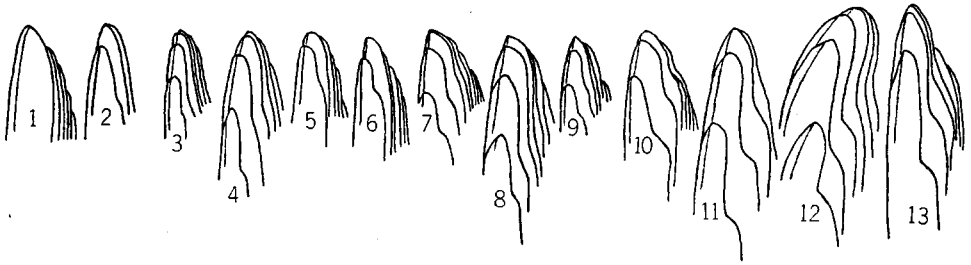


Fig. 9. OUTLINES OF LONG PRIMARIES OF NORTH AMERICAN OWLS, AFTER RIDGWAY, SHOWING INCREASE IN EMARGINATION AS THE RANGES OF THE SPECIES BECOME MORE NORTHERLY. 1, Barn; 2, Burrowing; 3, Elf; 4, Pigmy; 5, Long-eared; 6, Short-eared; 7, Screech; 8, Barred; 9, Saw-whet; 10, Great Horned; 11, Hawk; 12, Great Gray; 13, Snowy.

migrants are recruited from the smaller birds. I have been much interested in tabulating measurements of the different genera in this category and find the same rule holds good; for example: *Icterus*, *Piranga*, *Planesticus*, *Coccyzus* and, in the family we are considering, *Myiarchus*. The Whip-poor-will, one of the smaller of its genus, leads in the race for the north, and the Red-winged Blackbird leaves a larger relative in Mexico. In the Vireo family and in the Hummingbirds the larger members remain in the tropics.

The genus *Muscivora* has emarginate primaries, but there are only two species, both of southerly distribution and therefore not available for our study. It is well to notice that like *Tyrannus* this genus has a well developed wing, the only kind in which emargination occurs.

That the male in *Tyrannus* should show more emargination than the female is quite in accordance with our principle, since the male has the longer wing, at least in proportion to the tarsus; but to the question why the male requires more ability in flight than the female, no answer is ready.

Bridgeport, Connecticut, January 4, 1926.