SIBLING SPECIES

J. T. Leverich, Cambridge

What are Sibling Species?

Two or more new bird species may sometimes evolve completely from a parental stock without developing conspicuous external physical differences. Species that are morphologically identical, or very nearly so, are called sibling species.

Surprisingly, there is no evidence to suggest that sibling species are actually any more closely related than are other non-sibling species pairs. However, siblings regularly differ in habitat preference and behavior. Nevertheless, as each pair is more intensively studied, biologists seem to be able to assemble the usual complement of minute morphological characteristics that distinguish the two species. Eventually such distinctions may be found for all pairs. A sibling would then be nothing more nor less than a bird which is relatively hard to identify in the museum tray.

As the previous paragraphs suggest, the applicability of the term "sibling species" is somewhat subjective. Moreover, the phrase has a pecularly "human component". Ornithologists reserve this term for species pairs of which one species was orignially overlooked. A catalog of avian siblings is a historical list of ornithological errors!

As I have mentioned in previous articles (BIRD OBSERVER, Vol. 1, Nos. 4 and 5,) scientists hesitate to classify geographically isolated populations that are morphologically identical as separate species. Hence, all avian siblings are either sympatric or parapatric.

The Semipalmated Sandpiper (Calidris pusillus) was first described in 1766; the Western Sandpiper (C. mauri) was not noticed until 90 years later. The Acadian Flycatcher (Empidonax virescens) was first described in 1810; the Willow Flycatcher (E. traillii) was first recognized in 1831; the Least Flycatcher (E. minimis) and the Yellow-bellied Flycatcher (E. flaviventris) were not "discovered" until 1843. Both of these are cases of sympatric siblings with broadly overlapping breeding ranges. Massachusetts birders should find these two ornithological foibles quite consoling!

The last pair of sympatric siblings was "split" in 1889. Recognition of parapatric pairs is much more difficult, for the relevant evidence is harder to come by. One must first locate the much smaller zone of overlap, which all too frequently turns out to be in an area unfit for human habitation. The ornighologist must go to this inhospitable area and make a detailed study of the behavior of those few individuals (from both species) that share the overlap zone for breeding. The practical difficulties involved are suggested by the following chronology:

1763: the Herring Gull (Larus argentatus) was first described.

1915: Thayer's Gull was described and classified as a geographic subspecies of the Herring Gull (L. a. thayeri). It was originally identified by virtue of a distinctive egg-coloration pattern. The brown eye, so characteristic of this species, seems not to have been remarked upon before the late 1920's.

1950: Salomonsen examined a series of gulls collected in the Frozen Strait, one of the two areas of overlap of these two species. He decided that Thayer's Gull was not conspecific with the Herring Gull, but was instead a race of the Iceland Gull (Larus glaucoides).

1961: Smith found the area of overlap of Thayer's Gull and Kumlien's Gull (Larus glaucoides kumlieni). He proved that these two forms coexist sympatrically in Home Bay on Baffin Island without interbreeding. Thayer's Gull was thus a separate species (L. thayeri).

1966: Smith's monograph correctly diagnosing these siblings was published.

1973: the A. O. U. officially recognized Thayer's Gull as a separate species (see BIRD OBSERVER Vol. 1, No. 5, page 106, 125).

(To the average bird-watcher, who is more interested in his own ability to identify a bird correctly than the niceties of taxonomic classification, the most important dates

in the above sequence will be 1763 and 1915 -- the two dates of first description. Although Thayer's Gull is identifiable in the field, these dates show that it was totally overlooked for 152 years!)

A few other parapatric pairs of local interest, together with the dates of first description, are the following:

1. Greater Scaup (Aythya marila, 1761), and
   Lesser Scaup (A. affinis, 1838)
2. Short-billed Dowitcher (Limnodromus griseus, 1789), and
   Long-billed Dowitcher (L. scolopaceus, 1823)
3. Herring Gull (Larus argentatus, 1763), and
   Kumlien's Gull (L. glaucoides kumlieni, 1883).[2]
4. Eastern Meadowlark (Sturnella magna, 1758), and
   Western Meadowlark (S. neglecta, 1834)
5. Common Redpoll (Acanthis flammea, 1758), and
   Hoary Redpoll (A. hornemanni, 1843).

As noted in the first article of this series, three parapatric sibling pairs were newly recognized in the recent A.O.U. Check-list Supplement (my Category II). One more pair may be recognized soon: Arctic Loon vs. Pacific Loon.[3]

How common are avian sibling species?

Ernst Mayr estimates that fewer than 5% of all bird species are siblings.[4] In North America, the proper figure is probably closer to 1%. Among the lower animals, however, sibling species can be quite common. They occur most frequently among those animals with highly developed chemical senses (smell, taste, touch). Birds share with humans a primary reliance on visual and auditory stimuli and a general incompetency in the other senses. This explains why humans are almost as good at recognizing bird species as the birds are themselves!

Why are there any sibling species at all?

More precisely, the question should be: Why do certain species pairs fail to develop obvious and distinguishing external markings, when such morphological differentiation is typical of the evolution of at least 95% of all bird species?

Biologists believe that certain genetic stocks enjoy an unusually strong selective premium on the maintenance of their basic morphological characteristics. As soon as one mutation takes place, producing an initial divergence from the stock, natural selection sets up a strong counter-pressure in favor of still further genetic changes. These changes will have as "side-effects" the restoration of morphological development along time-tested lines (p. 57).[4] The biologist refers to this phenomenon as developmental homeostasis.

The concept of developmental homeostasis is a poor substitute for an explanation -- frankly unsatisfying. Although it may answer the question of how sibling groups evolve, it only begs the question of why. It does help, however, to explain a few other related facts; namely, quite frequently if a genus contains one pair of sibling species, it will contain more than one such pair. In fact, all species in the genus may be fairly tricky to identify. Not just the siblings but all Empidonax flycatchers fall in this category. Distinguishing the Lesser Scaup from the Greater Scaup is surprisingly hard; separating immature or female Ring-necked Ducks from Tufted Ducks can likewise be unpleasant.

What non-visual characteristics are used for identifying avian sibling species?

Among avian sibling species, the most important non-visual diagnostic character by far is the vocalization pattern. The territorial song is quite characteristic of song-bird species. All Empidonax flycatchers are identifiable on this basis. The Eastern Meadowlark has a well-known piercing five-note song; the Western Meadowlark's song is distinctly more melodious and more complicated, reminiscent of the Bobolink's flight song.

Many sibling species can be identified by their call-notes. The Yellow-bellied Flycatcher has a call-note which is impossible to describe but quite trivial to recognize once it has been learned. Short-billed Dowitchers utter a triple "tu-tu-tu" when alarmed; the Long-billed Dowitcher's call-note is a single, higher-pitched "keek".

MORAL: Learn to bird by ear as well as by sight, and get the vocalizations of sibling

species down pat quickly. One can save a lot of time at the Plum Island salt-pans, if one knows what a Western Sandpiper sounds like!

Behavioral characteristics occasionally are of assistance. By virtue of its longer bill, the Western Sandpiper is able to feed in deeper water than the Semipalmated Sandpiper. It usually does so. Westerns also tend to "dunk" the entire head while feeding; Semipalmateds rarely do so. In fact, most of the Westerns that I have found for myself first caught my attention through their distinctive feeding habits.[5]

What criteria are used to distinguish non-avian siblings?

Certain field-crickets may be diagnosed by their characteristic stridulation patterns (p. 45);[4] fireflies, by their light-flash patterns (p. 51); termites, by their nest structures (p. 50). Sibling species of octopus are infested by different parasites (p. 54). Sibling black flies exhibit distinct salivary gland chromosome patterns (p. 55). To diagnose sibling slugs correctly, one should see the courtship pattern (p. 52). Various sibling moths feed exclusively on different food-grains (p. 40). "The" malaria mosquito of Europe is actually six species, only two of which are dangerous to man; they may be identified by the egg-coloration pattern (p. 35). Certain species of Lepidoptera (butterflies and moths) can be correctly identified only after inspection of the armatures of the male genitalia (p. 41). Bird-watchers have much to be grateful for!

Footnotes

1) Sympatric = sharing a common breeding range; parapatric = having breeding ranges which are contiguous, with perhaps a narrow zone of overlap; allopatric - having non-overlapping breeding ranges.

Among certain lower animals, allopatric sibling species can sometimes be detected by artificial breeding experiments in the laboratory. One need only bring together two sample populations drawn from different localities and then observe whether or not the two groups freely interbreed. Such experiments have been conducted for certain "fruit flies" and frogs, but the procedure is impractical for birds.

2) Note the same familiar pattern: (1) Kumlien's Gull was first overlooked entirely, then (2) after its "discovery" it was thought to be a subspecies of the Herring Gull, and finally (3) it was classified as a subspecies of the Iceland Gull (Larus glaucoides, 1822).

3) Mayr, Ernst and Lester L. Short (1970), Species Taxa of North American Birds (Nuttall Ornithological Club, Cambridge), pp. 28-29, 91.

4) Mayr, Ernst (1963), Animal Species and Evolution (Harvard University Press, Cambridge), p. 38. Unidentified page references in the final paragraph of this article will all refer to this book. References to the primary literature may in turn be found there.

5) The differences in feeding habits and the greater bill length of the Western Sandpaper suggest to me that, as the tide comes in at Newburyport, for example, Western Sandpipers should linger longer in the harbor than do the Semipalmateds. I do not know this to be a fact, but local birders who manage to "catch" the tide might well watch for the phenomenon. I believe that I have once observed the reverse situation, that is, Western Sandpipers arriving first as the tide goes out.

WINTER SONGS OF THE PURPLE FINCH

During nine winters from 1962 to 1972, Stewart Duncan of Boston University recorded the earliest dates on which he heard Purple Finch songs in Essex County, Massachusetts. Three types of vocalization were noted: the familar warbling song, the uncommon vireo song (short phrases of a few notes each), and a vocalization likened to the whisper song similar in pattern to the warbling song but much softer, lasting 1 to 3 seconds, and repeated for 1 1/2 to 3 minutes).

Only twice was the vireo song heard, in February, 1971. The warbling song was noted as early as February 9th, though the author remarks that it is more frequently given later in that month and in March. The whisper song seems to be uttered earliest, beginning in mid-January. From The Auk, October, 1973.

L. J. R.