

- DAWSON, D. G. 1981. Counting birds for a relative measure (index) of density. Pages 12-16 in *Estimating numbers of terrestrial birds* (C. J. Ralph and J. M. Scott, Eds.). *Stud. Avian Biol.* 6.
- INOUE, D. W., W. A. CALDER, AND N. M. WASER. 1991. The effect of floral abundance on feeder censuses of hummingbird populations. *Condor* 93:279-285.
- JOHNSTON, D. W., AND E. P. ODUM. 1956. Breeding bird populations in relation to plant succession on the Piedmont of Georgia. *Ecology* 37:50-62.
- JUANES, F. 1986. Population density and body size in birds. *Am. Nat.* 128:921-929.
- LAWTON, J. H. 1989. What is the relationship between population density and body size in animals? *Oikos* 55:429-434.
- PERRINS, C. M., AND T. R. BIRKHEAD. 1983. *Avian ecology*. Blackie and Son, Glasgow.
- TERBORGH, J. 1989. *Where have all the birds gone?* Princeton Univ. Press, New Jersey.
- WHITTAKER, R. H. 1970. *Communities and ecosystems*. Macmillan, New York.

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## Definitions for Migrant Birds: What is a Neotropical Migrant?

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As a North American who has spent three years living in the Temperate Zone of the Neotropics (Paraguay), I often have wondered what the term "Neotropical migrant" refers to. Although some authors define a Neotropical migrant as any species of bird that migrates within the Neotropical biogeographical realm (Stangel 1992, Koford et al. 1994), the prevailing view of a Neotropical migrant is a species that breeds in North America and spends the nonbreeding season south of the Tropic of Cancer (e.g. Hagan and Johnston 1992a, b, Finch and Stangel 1993), a view which excludes austral (southern) and intratropical migrants (Levey 1994). Levey (1994) adopted a broader view of the term "Neotropical migrants" by including the latter two groups of migrants in the definition. I agree with Levey's arguments that austral and intratropical migrants need to be studied for both scientific and conservation reasons. However, by lumping all of these birds into the same category, we blur the already obscure definition of what a Neotropical migrant is and is not, which leaves us begging for a more precise set of terms and definitions for the various groups of migrants.

In the New World, there are two fundamentally distinct systems of long-distance latitudinal migration: (1) breeding birds in temperate North America that migrate southward to spend the winter in warmer climates, often in Central and South America; and (2) breeding birds in temperate South America that migrate northward to spend the winter in warmer climates, but only rarely in North America. The distinctiveness of these two groups of migrants is accentuated by the timing of their seasonal cycles, which are essentially half a year apart. Biogeographers have

long agreed that most of North America (north of central Mexico) belongs to the Nearctic realm, whereas Central America, the Caribbean and all of South America (south to Tierra del Fuego) belong to the Neotropical realm (e.g. Brown and Gibson 1983; see Fig. 1). In my mind, the two groups of migrants could logically be referred to as: (1) "Nearctic migrants," which breed in temperate North America and migrate southward; and (2) "Neotropical migrants," which breed in temperate South America and migrate northward. But instead, North Americans have persisted in selectively applying the term "Neotropical migrants" to the species breeding on the North American continent and wintering to the south of the Tropic of Cancer, which all but precludes the use of the term for migrant species breeding in temperate South America. The use of this term in this context is so pervasive that it frequently graces the titles of articles in the major North American ornithological journals, as well as the titles of two recently published symposium volumes (Hagan and Johnston 1992b, Finch and Stangel 1993). The term has been echoed repeatedly by conservation organizations and alliances, such as Partners in Flight. As a consequence, workers such as myself have been forced to use the term "austral migrants" in reference to migrant species breeding in South America (e.g. Chesser 1994, Hayes et al. 1994, Hayes 1995).

As Levey (1994) and others have proposed, we could simply refer to all of these migrants as "Neotropical migrants," which is certainly logical because these species all winter in the Neotropics and their ancestors probably evolved in the New World tropics (e.g. Brown and Gibson 1983). But then what definitions

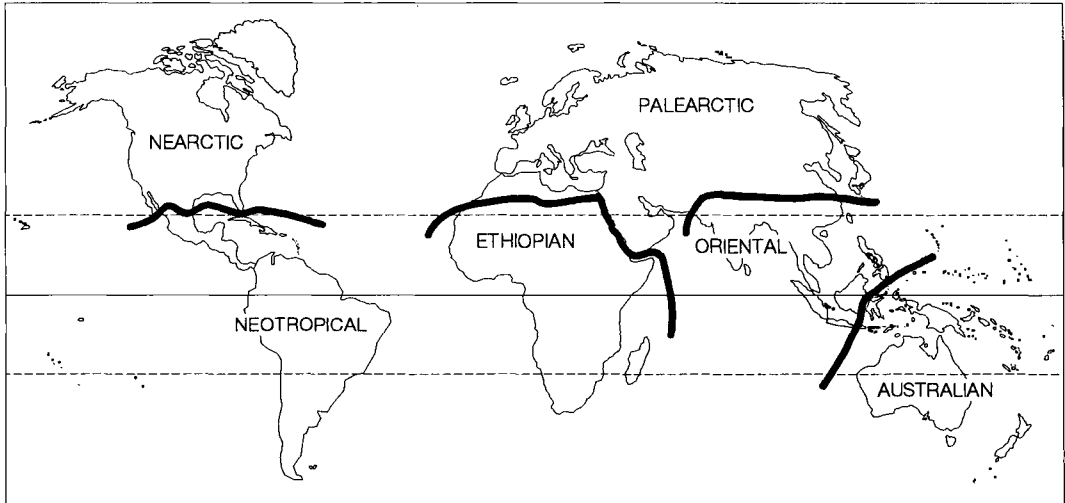


Fig. 1. The biogeographical realms of the world recognized by most biogeographers (based on Brown and Gibson 1983).

should we use to distinguish between the two major groups of migrants? The major geographical distinction between these groups is where they breed rather than where they winter. Hagan and Johnston (1992a) and Levey (1994) referred to Neotropical migrants breeding in North America as "Nearctic-Neotropical migrants," a precise and accurate term, but used the vague term "austral migrants" for species breeding in South America. These two terms are hardly comparable. The term "austral migrants" could equally apply to migrant species that breed in Africa, Australia or Antarctica, which are also in the Southern Hemisphere. Likewise, the term "boreal migrants" (northern migrants) could apply to migrant species breeding in either or both the Nearctic and Palearctic.

To avoid confusion and ambiguity in the use of these terms, I recommend that a more precise terminology be standardized. I propose that the following set of terms and definitions be adopted by ornithologists:

*Altitudinal migrant.*—Any species of bird or population of the species that regularly migrates from one altitude to another on an annual basis within a biogeographical realm.

*Austral migrant.*—Any species of bird or population of the species breeding in the Southern Hemisphere that regularly migrates northward during the nonbreeding season.

*Australian migrant.*—Any species of bird or population of the species breeding in Australia or New Zealand that regularly migrates northward during the nonbreeding season.

*Boreal migrant.*—Any species of bird or population of the species breeding in the Northern Hemisphere that regularly migrates southward during the nonbreeding season.

*Ethiopian migrant.*—Any species of bird or population of the species breeding in Africa that regularly migrates northward during the nonbreeding season.

*Intratropical migrant.*—Any species of bird or population of the species that breeds in the tropics and regularly migrates to another area of the tropics on an annual basis.

*Nearctic migrant.*—Any species of bird or population of the species breeding in North America that regularly migrates southward during the nonbreeding season.

*Neotropical migrant.*—Any species of bird or population of the species breeding in South America that regularly migrates northward during the nonbreeding season.

*Palearctic migrant.*—Any species of bird or population of the species breeding in Europe or Asia that regularly migrates southward during the nonbreeding season.

These terms are not mutually exclusive. With this set of definitions, boreal migrants would include both Nearctic and Palearctic migrants, whereas austral migrants would include Australian, Ethiopian, and Neotropical migrants. To give an example, the Peregrine Falcon (*Falco peregrinus*) as a species would fit most of these definitions; the North American populations would be considered Nearctic migrants as well as boreal migrants, and the South American populations would be considered Neotropical migrants as well as austral migrants.

I realize that such a drastic change in the meaning of the term "Neotropical migrant" will be resisted initially and will take time to be accepted. However, if the status quo continues, we will continue to be confused by a plethora of imprecise terms. Science demands precision and logic in both our terms and

definitions. In the case of naming different groups of migrants, the names should be based on long-accepted terms and definitions of biogeographical realms (e.g. Brown and Gibson 1983; Fig. 1).

Given the above definitions of Nearctic and Neotropical migrants, how do we distinguish between (1) Nearctic migrants that migrate entirely within the Nearctic, and (2) those that migrate to the Neotropics? The distinction between these two groups of migrants is important for both scientific and conservation reasons. I suggest that the most precise terms, awkward as they may be, are "Nearctic-Nearctic migrants" and "Nearctic-Neotropical migrants," respectively. An alternative (but less precise) set of terms might be "temperate Nearctic migrants" and "tropical Nearctic migrants," which could be simplified as "temperate migrants" and "tropical migrants," respectively. The same principle of combining terms could be used for species migrating within or between other biogeographical realms (e.g. Palearctic-Palearctic migrants, Palearctic-Ethiopian migrants, Palearctic-Oriental migrants, Palearctic-Australian migrants).

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#### LITERATURE CITED

- BROWN, J. H., AND A. C. GIBSON. 1983. Biogeography. C. V. Mosby, St. Louis, Missouri.
- CHESSEY, R. T. 1994. Migration in South America: An overview of the austral system. *Bird Conserv. Int.* 4:91-107.
- FINCH, D. M., AND P. W. STANGEL (Eds.). 1993. Status and management of Neotropical migratory birds. U.S. Dep. Agric. Forest Serv. Gen. Tech. Rep. RM-229, Fort Collins, Colorado.
- HAGAN, J. M., III AND D. W. JOHNSTON. 1992a. Introduction. Pages 1-3 in *Ecology and conservation of Neotropical migrant landbirds*. Smithsonian Institution Press, Washington, D.C.
- HAGAN, J. M., III AND D. W. JOHNSTON (Eds.). 1992b. *Ecology and conservation of Neotropical migrant landbirds*. Smithsonian Institution Press, Washington, D.C.
- HAYES, F. E. 1995. Status, distribution and biogeography of the birds of Paraguay. *Monogr. Field Ornithol.* No. 1. American Birding Association, Colorado Springs, Colorado.
- HAYES, F. E., P. A. SCHARF, AND R. S. RIDGELY. 1994. Austral bird migrants in Paraguay. *Condor* 96: 83-97.
- KOFORD, R. R., J. B. DUNNING, C. A. RIBIC, AND D. M. FINCH. 1994. A glossary for avian conservation biology. *Wilson Bull.* 106:121-137.
- LEVEY, D. J. 1994. Why we should adopt a broader view of Neotropical migrants. *Auk* 111:233-236.
- STANGEL, P. W. 1992. Just what is a Neotropical migrant? *Partners in Flight Newsl.* 2(1):29. National Fish and Wildlife Foundation, Washington, D.C.

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