A display of the Boat-billed Heron, *Cochlearius cochlearius*.—Recently I received two photographs of the Boat-billed Heron, one of which shows the bird's resting posture, and the other, a display which seems not to have been previously described. The photographs were made in the Museu Paraensis Emilio Goeldi, in Belém Para, Brazil, on 10 August 1964, by Dr. A. Stanley Rand, who kindly permits their publication. In the first (Figure 1A) the bird is at rest and gives a rather different impression from the more usual, hunchbacked pose of artists' rendition. (It should be noted that while the whole abdomen appears black, the abdomen is actually chestnut and the flanks only black.) The second (Figure 1B) shows the fully spread crest and nuchal plumes as seen from in front and somewhat above. This individual (both photographs are of the same bird) was one of several, adults and chestnut-backed immatures, in a large flight cage in the Museu Goeldi gardens, and the only one that approached, followed, and displayed to people who were just outside the cage, as it did to Dr. Rand when he entered the cage to photograph it. Presumably it had been hand raised and had formed an attachment for humans as social and sexual objects, a form of attachment that can be loosely included in the category of "imprinted relationship." Imprinting has been recorded in at least one other heron, the South American Tiger Heron (*Tigrisoma lineatum*) (see W. H. Thorpe, *Learning and instinct in animals*, Cambridge, Harvard Univ. Press, 1963; p. 406).

The boatbill is one of the lesser known herons. This may be due in part to its habitat and range, swamps and shores of tropical sections of the Americas, and in part to its nocturnal habits. However, the species is common locally, apparently, and is kept in zoos not uncommonly. A. Wetmore (*Smiths. Misc. Colls.*, 139(11): 9–10) has given an outline of our knowledge of its biology. Lorenz (1938, *Proc. VIIIth Intern. Orn. Congr.*, 1934, p. 217) wrote that the species "has exactly the same appeasing [ceremony]" as does *Nycticorax nycticorax*, the Black-crowned Night Heron, despite the differences in crest feathers, and that the plumes of the night heron have no function in sexual display. The latter part of the statement has been questioned a number of times and is probably not true.

The sexes of the boatbill are much alike, except for the slightly smaller and grayer appearance (and shorter crest [?]—the plumages of this species are still inadequately understood) of the female. One can assume that the ornamental crest and nuchal plumes of broad, lanceolate-tipped feathers have developed mainly through mutual sexual selection and are used primarily in mutual sexual displays to stimulate the members of the pair and maintain the pair bond, as G. K. Noble *et al.* (*Auk*, 55: 7–40, 1938; see pp. 30–31) have postulated for the Black-crowned Night Heron. However, it must be remembered that many herons have crests and may use them and other plumes in a variety of other contexts, sometimes in the presence of other birds or sometimes when out of sight of other birds.

I have tried to relate the photographed display of the boatbill to displays discussed by A. J. Meyerriecks (*Publs. Nuttall Orn. Club*, no. 2, 1960) for some North American herons, and by R. P. Allen and F. P. Mangels (*Proc. Linn. Soc. New York*, 1938–39, nos. 50, 51, pp. 1–28, 1940), and Noble *et al.* (*op. cit.*) for the Black-crowned Night Heron. It seems the boatbill's crest display is analogous to the "stretch display" of the Green Heron (*Butorides virescens*) and the "stationary stretch display" of the Snowy Egret (*Leucophoyx thula*) (Meyerriecks, *op. cit.*; pp. 44, 134) and the "reversed stretch display" of the Black-crowned Night Heron (see R. S. Palmer, *Handbook of North American birds*, vol. 1, New Haven, Yale Univ. Press, 1962, p. 479; and Allen and Mangels, *op. cit.*, figs. 1–5). All these displays seem to have evolved to serve the same function, despite the differences in ornamentation and poses of the

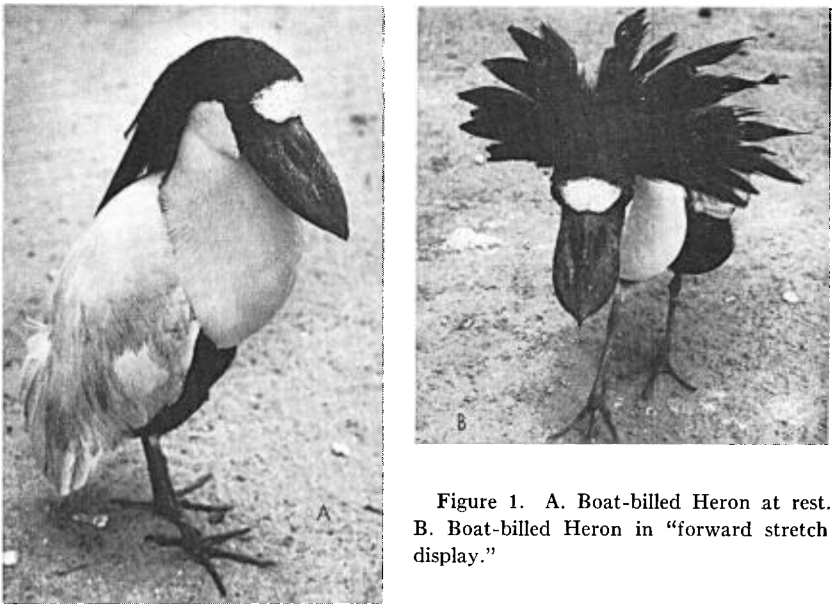

Figure 1. A. Boat-billed Heron at rest. B. Boat-billed Heron in "forward stretch display."

birds. Further, in addition to being analogous, they seem also homologous as the following comparisons indicate.

In the Green Heron the head is moved up and back, bill pointed up, and the lanceolate interscapular plumes are spread, forming a fan behind the head. In the Snowy Egret the pose is similar, with plumes of the breast spread and the scapular plumes spread and erected so that they touch the somewhat erected crest feathers. In the Black-crowned Night Heron, in the culmination of the reversed stretch display, the head is stretched down, so that it is below the breast, top of head down, bill pointing backward, white plumes pointing forward, contrasting with the black of raised crown feathers, while the white neck contrasts with the black of crown and back. In the Boat-billed Heron the position of the head is intermediate and the white of forehead and neck contrasts with the dark bill, crest, and flanks. It might be called the "forward stretch display" to stress both the analogy and the homology involved.

From the photograph it appears that the eyes of the boatbill may be bulged in this display as in that of the Black-crowned Night Heron. The lifted foot of the displaying bird suggests that this display is accompanied by foot movements or dancing movements, again as in the Black-crowned Night Heron. Dr. Rand tells me a snapping or rattling of the bill seemed to accompany this display, correlating with the song, "snap-hiss" or "plup-buzz," of the bowing Black-crowned Night Heron (see Palmer, *op. cit.*: 479). Presumably a series of other displays is used by this monogamous species in which both sexes incubate, and in hostile behavior in the colonies in which this species nests.

There is nothing in this display that precludes placing the boatbill in the family Ardeidae instead of considering it as closely related to that group but in the monotypic family Cochleariidae. However, familial status may not reflect the facts as much as it does the evaluation and weighting of characters in the light of the systematic "climate" of the day. In this connection, it is interesting to note that Salvin and Godman in 1901, in the *Biologia Centrali-Americana, Aves*, vol. 3, p. 185, wrote that while Mr. Sharpe considered the boatbill to be an exaggerated form of night heron, they preferred to follow Mr. Ridgway and consider it a distinct family. Most American writers have followed this course, but the trend today seems to be the other way (see W. J. Bock, *Amer. Mus. Novit.*, no. 1779, 1956). It will probably take several more decades for a nearly complete reversal of usage. If so, the family Cochleariidae will have had about a century of active life.—A. L. RAND, *Chicago Natural History Museum, Chicago, Illinois.*

Subspecies of Recent and fossil birds.—It is commonly accepted that the temporal range of a living species may be extended into the past on the basis of fossil evidence. Reproductive isolation cannot be used as a measure of species validity in allochronic forms; hence, determination of species limits in closely similar forms may be difficult, but not necessarily more so than in contemporaneous, allopatric forms.

A problem arises if the remains of fossil forms differ only slightly from skeletons of living animals. Howard (1964: 235–237) and Simpson (1961: 175–176) have argued that forms with minor differences are often best treated as temporal, or successional, subspecies. In avian paleontology, the use of temporal subspecies has been confined to Pleistocene birds, and forms of greater antiquity have been referred to fossil species. Some workers, however, have allocated Pleistocene fossils to extant subspecies, and it is on this procedure that I wish to comment. Wetmore (1956: 3) considered it "extremely doubtful procedure in most cases to assume that Pleistocene subspecies were the same as those encountered in the region today." In my opinion, this assumption is never valid.

The problem of carrying modern *subspecies* backward in time differs somewhat from extending the temporal range of a species. Modern subspecies are populations that exhibit some degree of difference as compared with other extant populations of that species, and which breed in definite geographic areas. The characteristics of each subspecies are usually assumed to be adaptive to *present* conditions, and thus they bear no necessary relationship to similar characters found in fossil forms. Furthermore, since breeding range is rarely demonstrable from fossil material, and since breeding range is an essential component of the definition of modern subspecies, the use of the names of extant races for fossil material is clearly unwarranted.

The commonest allocation of fossil remains to modern subspecies has been in the Canada Geese. Because the range of variation in fossil elements of *Branta canadensis* is similar to that found in the modern species, and because of the comparatively slight age of the fossils, a few writers have relegated fossil and subfossil material to modern subspecies, for example *B. c. canadensis* (Howard, 1962: 7; Wetmore, 1940: 20), *B. c. hutchinsii* (McCoy, 1963: 340; Wetmore, 1931: 19–20), and *B. c. minima* (Friedmann, 1934: 89). Considering only *B. c. hutchinsii*, it is evident that the allocation of a fossil to this subspecies is based on four assumptions: (1) that the range of *hutchinsii* today approximates its Pleistocene distribution, (2) that no other small Canada Geese fall within the size range of *hutchinsii*, (3) that no modern races of small Canada Geese have evolved since the Pleistocene, and (4) that no populations of small Canada Geese have become extinct since the Pleistocene. The first two assumptions are invalid, and the third and fourth are untestable.

In the case of *hutchinsii*, the impropriety of allocating fossil material to this sub-