

OBSERVATIONS ON THE GREAT GREBE

By ROBERT W. STORER

The Great Grebe or Huala (*Podiceps major*) is widely distributed in temperate South America from southern Brazil to Tierra del Fuego. A major center of abundance is in the lake districts of southern Argentina and southern Chile. The observations on which this report is based were made by Frank B. Gill and me near Llifén on the east shore of Lake Ranco, Valdivia Province, Chile. Here we were the guests of A. W. Johnson, who kindly permitted us to use his fishing lodge, "Quinta Chucao," and who in many other ways helped us in our work. We are also indebted to Mr. and Mrs. M. Hadida for their hospitality and for access to their property, from which most of the observations were made.

La Poza is a deep, nearly land-locked cove approximately three miles south of Llifén. Its southwest shore is formed by the delta of the Río Milahue, one of four major streams of Andean origin which empty into Lake Ranco. Small areas of reeds (*Scirpus*) and brush grow in the shallow water at the edge of the delta, and in these a colony of 25 to 30 pairs of Great Grebes had started building nests by October 5, 1961. The nests were still unfinished and no eggs were found on the date of our last visit to La Poza on October 16. Almost without exception our observations were made from a sandy point marking the northern shore of the narrows separating La Poza from Lake Ranco. We used no blind as the grebes were tame, even inquisitive, frequently approaching to within 50 feet of the shore to investigate us (fig. 1a and b). Their curiosity seemed greatest when we were accompanied by the Hadidas' dogs, a great dane and a fox terrier. On the other hand, it proved very difficult to approach the birds in a boat.

ADAPTATION TO HABITAT

The Great Grebe is well adapted for life on large, open lakes. Its adaptations in many ways parallel those of the Western Grebe (*Aechmophorus occidentalis*), and for many years the two were considered congeneric. Wetmore and Parkes (1954) showed that *major* should not be included in the genus *Aechmophorus*, a view which is strongly supported by behavioral evidence reported here and by the structure of the cervical and thoracic vertebrae to be reported on in detail elsewhere. Whether or not *major* is correctly placed in the genus *Podiceps* is a question on which I prefer to withhold judgment until more detailed anatomical studies can be made.

The adaptations for life as a fish-eating inhabitant of large lakes include the long, narrow body, the long neck, the long, pointed bill, and the large feet. The narrow body is most evident when the bird is in the hand; and in this, the Great Grebe differs from the broader-bodied Red-necked Grebe (*Podiceps grisegena*) much as the Common Merganser (*Mergus merganser*) differs from the Common Goldeneye (*Bucephala clangula*). The long neck and spear-like bill must be efficient tools for the capture of fish. The posture of the neck in certain displays (the S-neck Posture, fig. 1h) suggests that there may be a trigger mechanism like that in the necks of herons, anhingas, and the Western Grebe. However, as has been mentioned, the structure of the vertebrae show that such a mechanism, if present in the Great Grebe, must be considerably different from that in the Western Grebe.

APPEARANCE

In plumage color and pattern, the Great Grebe bears a superficial resemblance to the Red-necked Grebe; the crown, hindneck, and back are blackish, the neck and

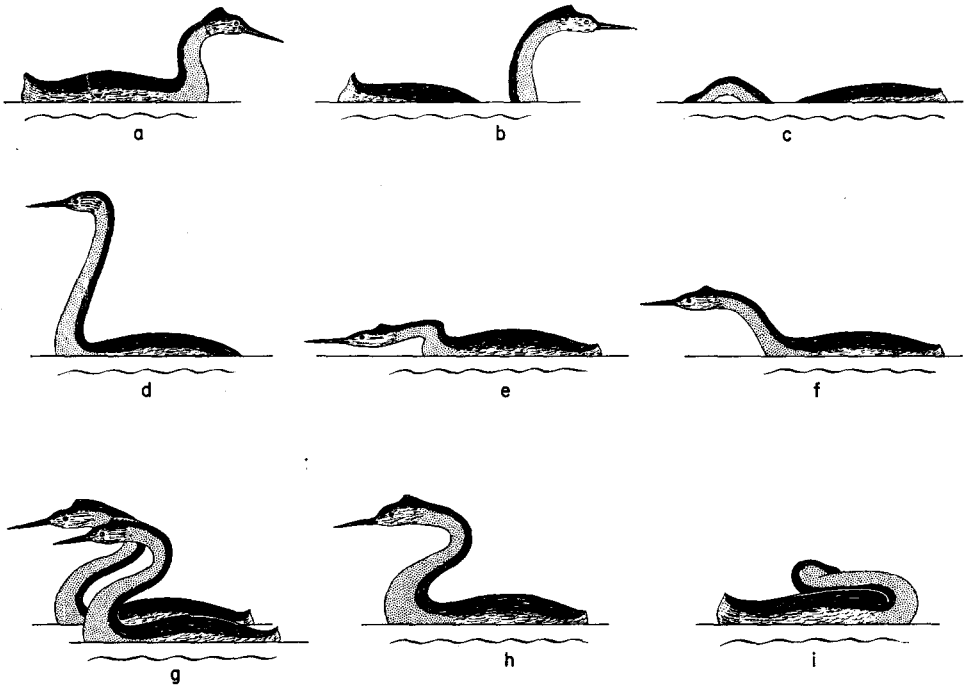


Fig. 1. Postures of the Great Grebe (*Podiceps major*). a and b, "investigating"; c, looking under water; d, Z-neck (appeasement or mild fleeing) posture; e, intense threat; f, mild threat; g and h, S-neck posture; i, Pork-pie (resting) posture.

upper breast rufous, and the belly white. However, the resemblance stops there. Unlike the black "three-cornered hat" of the Red-necked Grebe, the crests of the Great Grebe are medial—a small one, rhinoceros-like, in front of and between the eyes and a larger, more posterior one, which when erected bears a striking resemblance to a Mohawk tonsure or the crest on a Greek helmet (fig. 2e) but when nearly flattened shows as a pair of low lateral ridges on the top of the head. The black portion of the plumage is strongly glossed with green, like the corresponding parts of the plumage of the Rolland Grebe, *Podiceps rolland* (*sensu lato*), a feature quite evident in the field.

In freshly-killed birds, we found the iris to be dark brown with an olivaceous cast and a narrow ring of whitish or cream-colored spots surrounding the pupil. In life, the iris appears a deep red-brown. Set in a steel-gray face patch, the eye is not conspicuous like the brilliant red eyes of many species of grebes. During some displays, however, the eyes, or part of them, appear conspicuously white. As nearly as we could make out from watching the birds in life and from examining a freshly-killed one, this is the result of rolling the eyes forward in their sockets and exposing part of the white of the eye. The literature on the species indicates that the eye color may be more variable than we found it. It has been reported as "dark brown (occasionally yellow)" (Gibson, 1920:83), "magenta" (Crawshay, 1907:152), and red (Goodall, Johnson, and Philippi, 1951:372).

As in most grebes, the wings have conspicuous white patches. These are variable in extent and may include parts of the primaries as well as the secondaries. In at least some individuals, the tips of the secondaries and the under wing coverts are tinged with rufous. There is no white patch near the anterior edge of the wing as is the case

in the Great Crested Grebe (*Podiceps cristatus*) and the Red-necked Grebe. In life, a rather surprising feature of the plumage is the rufous under tail coverts, which are displayed conspicuously when the tail is cocked, as it frequently is, even when the birds are resting.

FOOD

The day-to-day activities of the Great Grebe differ little from those of other grebes. The birds dive with an easy grace, depressing the feathers of the head and body before submerging. Their food, at least the large prey items, is brought to the surface and pinched with the bill and manipulated before being swallowed. We saw several small fish handled in this way, and one tadpole (presumably *Calyptocephalella gayi*) fully four inches long was manipulated repeatedly and was finally dropped and lost. On at least one occasion we saw a Great Grebe peck at a piece of emergent vegetation as though taking an insect from it. On three or more occasions we saw a bird swallow feathers which had come out in the course of preening; in no case did it appear that the feathers were actually plucked for the purpose. Silversides (pejerreyes) of the family Atherinidae have been reported in stomachs of the Great Grebe by Barros (1927), Bros (1929), and Reed (1925) and are evidently a common food of the species. Young water birds, including coots, are also taken (Reed, 1925; Crawshay, 1907). Barrows' observation (1884:316) that one Great Grebe "which I shot on June 29, had only long, fine, water-grass in the stomach, not even the smell of fish" is very odd; possibly this material was swallowed in lieu of feathers after pellet-casting.

BEHAVIOR

We observed drinking motions, but no pellet-casting, which in view of the fish diet may be rather infrequent (Storer, 1961). Gaping or yawning motions were frequently seen, as was a quick shake of the bill to remove adhering drops of water. The resting posture (fig. 1i) known as the "pork-pie" attitude and figured for the Great Crested Grebe by Huxley (1914: pl. 1, fig. 2) is the usual one in the Great Grebe. In this posture, the tail is frequently held up and the rufous under tail coverts are conspicuous. As is the case with other grebes, one foot is often carried "shipped" under the wing while the bird swims with the other foot. Prior to shipping, the foot is shaken several times to remove the drops of water adhering to it. Preening, oiling, and bathing movements are much the same as those of other species of grebes studied. Swimming shakes are frequent, the birds usually facing into the wind and rising partway out of the water to perform them. Perhaps owing to the large size of the birds, the shake appears to be rather slower than in the smaller species, and the lateral motion of the shake more apparent. Wing flapping is a frequent action, especially after bathing or preening, and a slow shuffling of the closed wings was observed several times. The one-wing-one-foot stretch was performed on several occasions and at times was accompanied by raising both crests. Stretching the wings by holding them arched over the water for several seconds was another presumed comfort movement which we noted.

Aggression.—The commonest type of aggressive behavior we observed was a simple threat (fig. 1e and f) in which the head was lowered, the bill parallel to the water, the throat slightly distended, and the neck in a characteristic kinked posture. As in the Red-necked and Horned (*Podiceps auritus*) grebes, there appears to be a direct relationship between the intensity of the threat and the degree to which the head and body are lowered. On one occasion, we saw what Simmons (1955:139) describes for the Great Crested Grebe as "Token-diving," the bird slowly submerging in a low threat posture and reappearing above the surface in almost the same spot four or five

seconds later. This seems to be an extreme form of the simple threat. On another occasion, a bird in an intense threat posture held its wings somewhat raised over its back and slightly spread, the white patches showing. This posture suggests a possible derivation from an intention motion to attack by flying across the water. It was also reminiscent of the Cat-display in the Horned and Red-necked grebes (Storer, MS) in which the wings are but slightly spread in marked contrast to the corresponding posture of the Great Crested and Eared (*P. nigricollis*) grebes (Simmons, 1955:144; McAllister, 1958:296).

Birds may attack from an intense threat posture, dashing across the water with the body parallel to and nearly clear of the water and the head and neck still in the threat posture. These attacks may be made with or without the use of the wings. In one instance, we saw two birds fly at each other and hit, breast to breast, their bodies raised perhaps 45 degrees from the horizontal at the time of contact. The combatants' bills were apparently not used in this encounter. Birds also attack from the threat posture by diving in pursuit of another bird, the pursued usually fleeing by skimming across the water, its feed paddling with great rapidity. In extreme cases, the wings are used as well as the feet. This type of behavior closely resembles that of the Western Grebe and of the Great Crested Grebe as illustrated in Simmons (1955:143). We did not observe the pursued bird dive and attempt to flee under water, the usual reaction of Horned Grebes under similar circumstances (Storer, MS). On at least one occasion after fleeing, a bird assumed an appeasement posture similar to that of the Horned Grebe (Storer, MS). In this, the feathers of the head and neck were compressed as during fleeing, but the head was held somewhat back, the head, neck, and body forming a modified Z (fig. 1d). This probably corresponds to the "furtive-posture" of the Great Crested Grebe (Simmons, 1955:142), although in that species, the head is shown as being held slightly forward.

When a pair of Great Grebes swam near to investigate us, the larger of the two, presumably the male, held his head somewhat higher than did his mate, and he appeared thicker-necked. This difference in posture is comparable to that in at least the Horned, Red-necked, and Western grebes and may have some bearing on the dominance relationships between members of the pair.

Courtship displays.—Like the other large grebes so far studied, Great Grebes have elaborate courtship ceremonies which are compounded of several rather simple displays and postures. Some of these displays resemble those of other species; others are rather different. Our observations suggest that the Great Grebe differs from many grebes in lacking both a display in which the body is held vertically in the water (Penguin-dance) and a display in which aquatic vegetation is held in the bill (Weed-trick). Further, the ceremonies seemed to me to be less stereotyped than those of the other species which I have watched.

Two postures which we frequently observed as components of courtship displays and ceremonies we termed the "S-neck" posture (fig. 1g, h) and the "Upright Mohawk" posture (fig. 2c, e, f). In the former, the Mohawk crest is partly raised and the upper half of the neck forms an even curve. The lower segment of the neck is somewhat straightened when the head is held high, or it is curved when the head is held lower; in the former case the neck assumes roughly the form of a question mark and in the latter it resembles the letter "S." The Upright Mohawk differs in that the neck is stretched upward, the Mohawk crest is fully erected, the lower part of the neck is somewhat swollen and bulbous in appearance, and the anterior portion of the breast, also somewhat swollen, appears white below it.

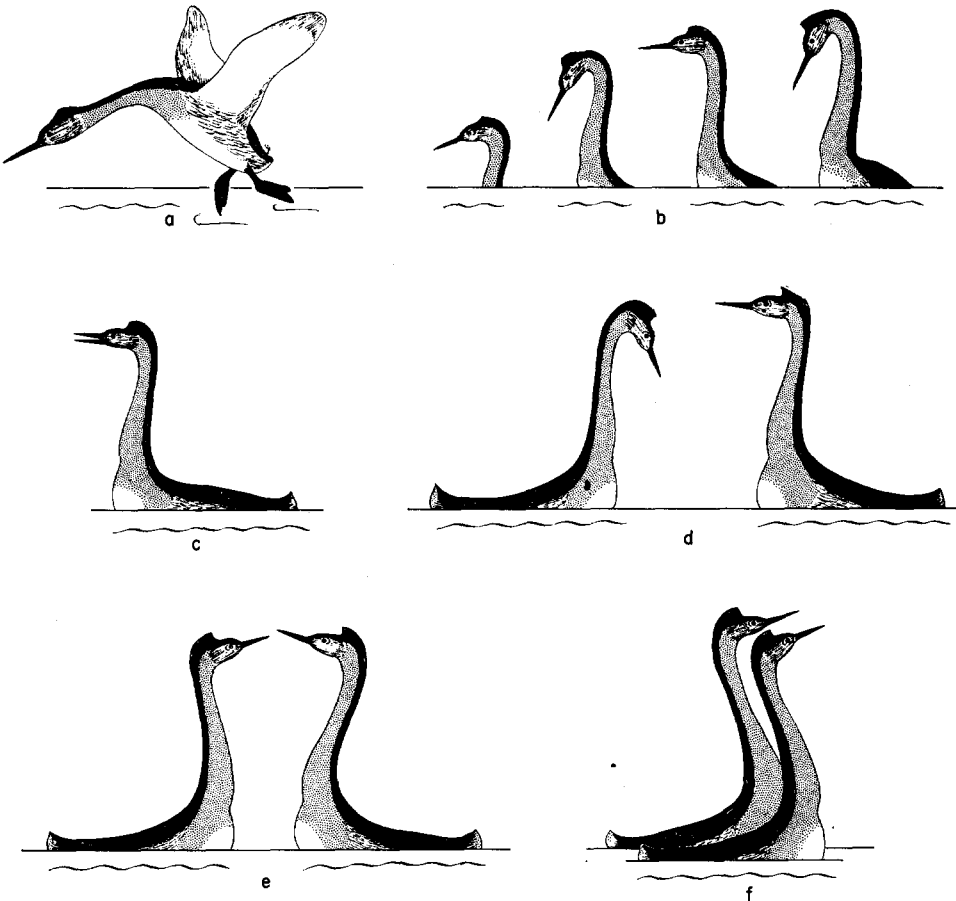


Fig. 2. Courtship displays of the Great Grebe. a, Ceremonial Flying-away; b, four successive stages in the Ghostly-penguin Display (with nod); c, Advertising; d, Nodding; e and f, Turning.

The S-neck posture may correspond at least in part to the Cat-display of the Horned and Red-necked grebes (Storer, MS) for, like it, it is used in mildly aggressive situations. It is also used by both members of a pair swimming side by side in what may correspond to the Triumph Ceremony of the same two species, although it does not appear to be so frequently used in this situation or so highly ritualized as the corresponding display in the two northern species. Slow head shakes and Turning (see p. 284) may be performed by birds in the S-neck posture as well as in the Upright Mohawk posture, but in no case did we observe Nodding in the S-neck posture. When head shaking or Turning were observed, the two birds performing them were always in the same posture.

The Upright Mohawk posture is used in Advertising (although in this display the Mohawk crest is not always fully raised) and in the Nodding and Turning Ceremony. It appears to have a weaker aggressive and a stronger sexual component in its motivation than the S-neck posture.

Advertising in the Great Grebe in general resembles that in such species as the

Great Crested (Simmons, 1955:194), Eared (McAllister, 1958:291-292), and Horned (Storer, MS) grebes. The head is held high, the neck being stretched nearly straight upward (fig. 2c); the Mohawk crest may or may not be spread, and the tail is cocked, the rufous under tail coverts conspicuous. As in other species for which similar behavior is known, a species-specific call is given while the bird is in this posture. In the case of the Great Grebe, the call is the plaintive wail so vividly described by Hatcher (*in* Scott and Sharpe, 1904:78) and so familiar to anyone who has watched these birds at the onset of the breeding season. On one occasion we watched a presumed female, which was in a normal swimming posture and was uttering the short, conversational "tin-horn" note, gradually go into the advertising display. As she slowly stretched her neck upward to its full length, the calls gradually lengthened until they became the full wail. On another occasion, a presumed female in the advertising posture with the Mohawk crest raised gave the wailing call several times and then followed it with several sharp, bark-like notes. These were followed by a swimming shake and the assumption of the thin-necked alert or appeasement posture, which gradually subsided into the normal swimming posture.

Nodding (fig. 2d) is performed in the Upright Mohawk posture, while the members of a pair are approaching each other or are face to face on the water. The head is turned downward until the bill makes an angle of between 45 and 60 degrees with the horizontal and then raised until the bill points slightly upward. The motion is slow and deliberate and is repeated several times. The birds may nod alternately or one bird may nod more frequently than the other. Either member of the pair may initiate this display, which is often succeeded by Turning. A single nod may be given by a bird performing the Ghostly-penguin Display, but this appears to be the exception rather than the rule.

Turning (fig. 2e, f) is usually performed in the Upright Mohawk posture, although in a somewhat less intense form it may be done in the S-neck posture. The members of a pair turn from the face-to-face position and swim side by side for perhaps one or two feet, then turn face to face, then in the opposite direction from which they first swam and swim a foot or two, turn face to face, and so forth, up to as many as twenty times. The Turning has a mechanical appearance, and the birds pause momentarily when face to face before continuing the turn to the direction away from that in which they had just been swimming. Turning probably corresponds in part to Head-shaking in the Great Crested Grebe.

Ceremonial Turning-away is the usual ending for a full Turning Display. The birds turn tail to tail and slowly swim apart, gradually relaxing from the stiff Upright Mohawk posture to a normal swimming one. It is similar to the Turning-away of the Horned, Eared, and Red-necked grebes at the end of the Discovery Ceremony.

Ceremonial Flying-away (fig. 2a) appears to be the counterpart of a portion of the "Display Ceremony" of the Great Crested Grebe (Huxley, 1914:513; Simmons, 1955:192). A Great Grebe may suddenly turn and fly away from its mate. During this short flight, the bird's head is held down and the Mohawk crest is partly raised. Unlike Great Crested Grebes, Great Grebes clear the surface of the water, but they keep their feet down after rising too high for them to paddle. On landing the bird assumes the Upright Mohawk posture and further displays often follow.

A Ghostly-penguin Display (fig. 2b) was observed several times. The displaying bird dove, swam under water past the second bird, and slowly emerged, facing away from the second bird. Although somewhat similar to the corresponding displays of the Great Crested, Horned, Eared, and Red-necked grebes, it differed in at least four

respects: (1) The long dive was not punctuated by emergences in a false bathing posture as in the Horned, Eared, and Red-necked grebes, nor was the bird so near the surface that it made a ripple (as in the Great Crested Grebe). (2) In at least three instances a bird gave a single nod as it emerged. (3) In no instance was the head held forward as in the Rearing posture, the usual position during the Ghostly-penguin Display of the Horned, Eared, and Red-necked grebes. (4) The body remained in a horizontal or nearly horizontal position as the bird emerged.

Bill-flicking, a rapid upward motion of the bill with a circular component, was performed by both members of a pair after each had given a Ghostly-penguin Display and immediately before Ceremonial Turning-away. The context suggests that it is in some way comparable to Nodding and/or Turning.

The courtship activities of the Great Grebe are less stereotyped than those of the Great Crested, Horned, Eared, or Red-necked grebes. Nodding and Turning is the most fixed ceremony; we observed it in 15 of the 23 courtship sequences recorded in our notes. Typically, it started by members of a pair swimming together in the Upright Mohawk posture, continued with Nodding (from one or two to more than ten nods by each bird), then Turning (from several to at least 20 turns), and finally a Ceremonial Turning-away. Variations were common. In five Nodding and Turning ceremonies the only preliminary was swimming together in the Upright Mohawk posture; however, in four ceremonies one of the birds performed a Ghostly-penguin Display just prior to the swimming together, and in three, the ceremonies followed mildly aggressive activities in which the S-neck posture was used. In three ceremonies, the preliminaries were not observed. While nine of the 15 ceremonies ended with the usual Ceremonial Turning-away, three were broken up by a third bird. Of the remaining three, one ended with the presumed male chasing the presumed female, one with the two birds swimming away side by side, and one with the presumed male turning and the presumed female following.

The Ghostly-penguin Display was a component of 11 of the 23 sequences, but it was evidently less rigidly attached to a ceremonial pattern than Nodding or Turning. Six sequences contained single Ghostly-penguin Displays, four contained two each, and one, three. Of these 17 displays, five were followed by Nodding or a Nodding and Turning Ceremony in the Upright Mohawk posture, five by a Ghostly-penguin Display by the second bird, one by a Ghostly-penguin Display by the same bird, one by Turning in the S-neck posture, one by Ceremonial Flying-away, one by mutual Bill-flicking, one by a chase (apparently the result of displaying to a member of another pair), and two by no further courtship activity. The preliminaries to Ghostly-penguin Displays were also varied. Aside from the six instances in which one of these displays triggered a second similar one, Ghostly-penguin Displays twice followed Ceremonial Flying-away by the mate, four times Advertising or the assumption of the Upright Mohawk posture by the mate, and once Turning in the S-neck posture. In the remaining instances the preliminaries were not observed.

Ceremonial Flying-away was less frequent; it was a component of five sequences and was performed twice in one sequence. Twice it was followed by a dive and Ghostly-penguin Display by the mate, and four times it ended sequences. Once it followed the mate's Ghostly-penguin with a nod; in the other five instances it followed Ceremonial Turning-away (once) or drifting apart after Nodding or other courtship activities. Its use after Nodding and Turning parallels the similar flying-away in the Display Ceremony of the Great Crested Grebe (Simmons, 1955:192). However, we saw nothing comparable to the Cat-display after Ceremonial Flying-away; and as the only

display which we saw to follow was a dive and Ghostly-penguin by the mate, we have no indication that a Display Ceremony like that of the Great Crested Grebe is used by this species. The high frequency (five out of seven cases) with which it ended sequences of courtship activities shows that it is frequently used after other displays when one member of the pair is more strongly motivated to continue displaying than its mate.

Copulation.—The general pattern of platform behavior in the Great Grebe is similar to that in several species of *Podiceps* (McAllister and Storer, 1963). Mounting is preceded by Inviting (fig. 3b) by the passive bird. The second soliciting display, Rearing (fig. 3a), may precede Inviting, may intervene between Inviting Displays, or may be omitted entirely. Vigorous shaking of the closed wings may or may not occur while a bird is Rearing. We saw as many as three bouts of Wing-shaking in the course of a single Rearing Display, and at least once, the white in the remiges was conspicuous during Wing-shaking. During copulation, the passive bird remains in the inviting position while the active bird holds its neck somewhat arched (fig. 3c). The active

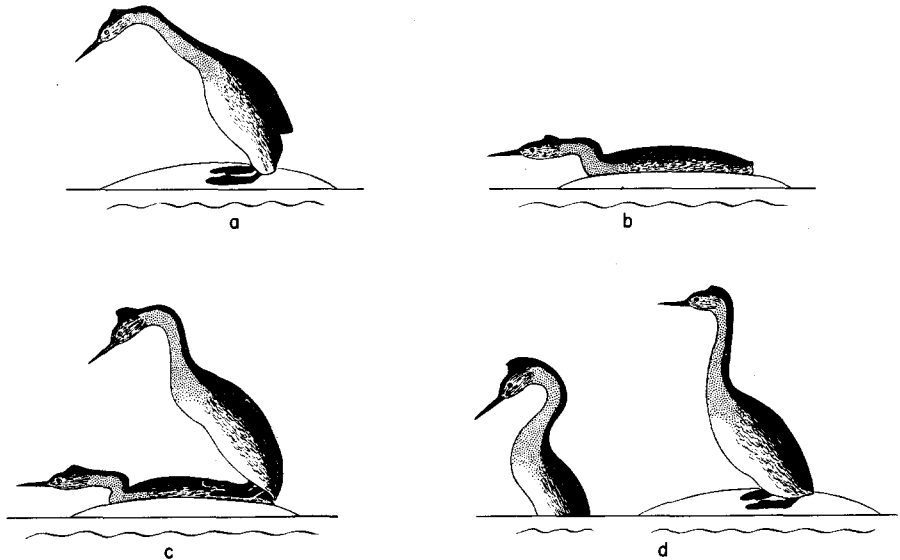


Fig. 3. Platform behavior of the Great Grebe. a, Rearing; b, Inviting; c, copulation; d, postcopulatory water-treading.

bird dismounts over the head of the passive bird and treads water in a false bathing posture; this posture is gradually relaxed as the water-treading is slowed down and the bird assumes a normal swimming posture. As the active bird dismounts, the passive bird raises its head (fig. 3d) somewhat as does a Red-necked Grebe under similar circumstances. Postcopulatory head-shaking is rare; we observed it only once in one bird of a pair. Bill-flicking was seen at least twice, once by a Rearing bird and once by a bird prior to mounting.

Twice we observed nearly simultaneous copulations on adjacent nests, which suggests that activities on one nest may stimulate copulation by neighboring pairs. Although we could not be certain, we once saw what we believed was a case of reverse mounting, which is to be expected in view of my observations on other species of grebes.

DISCUSSION

The behavioral evidence which can be used in attempting to determine the systematic position of the Great Grebe is largely negative. That is, the differences between this species and the others which have been studied are more conspicuous than the resemblances. In lacking a Discovery Ceremony and a Cat-display and in details of the Ghostly-penguin Display, the Great Grebe differs from the Great Crested, Red-necked, Horned, Eared, Silver (*Podiceps occipitalis*), and Taczanowski's (*P. taczanowskii*) grebes. In lacking a display in which the body is held vertically, it differs from these six species as well as from the Western and Least (*P. dominicus*) grebes. In its lack of a Weed-trick, it differs from the Great Crested, Red-necked, Horned, and Western grebes and resembles the Eared Grebe. The Nodding and Turning Ceremony bears some resemblance to the Discovery Ceremony, but both it and the other courtship ceremonies seem less stereotyped than those of the northern species of *Podiceps*. This may be a result of lack of selective pressure in the form of the presence of similar sympatric species with which hybridization might occur.

The aggressive behavior, particularly the threat and appeasement postures, shows a general resemblance to that of many other grebes, especially those of the genus *Podiceps*. Token-diving is shared with the Great Crested and Red-necked grebes and thus may be correlated with large size. The use of the mutual S-neck posture in some ways parallels the Swimming-together of the Great Crested Grebe (Simmons, 1955:188) and the Triumph Ceremony of the Horned and Red-necked grebes (Storer, MS).

The copulatory behavior and the lack of a canal in the hypotarsus for the tendon of *M. flexor perforatus digiti II* indicate that the Great Grebe belongs with the *Podiceps-Aechmophorus* group as opposed to the *Tachybaptus-Podilymbus* group (Storer, 1963). In its courtship behavior the Great Grebe is perhaps closer to such species of *Podiceps* as the Great Crested and Red-necked grebes than it is to *Aechmophorus*, but it is not closely related to either. Its resemblances in form to *Aechmophorus* and in color pattern to the Red-necked Grebe are the results of convergence. Pending further study, it seems best to keep the species *major* in *Podiceps*.

ACKNOWLEDGMENTS

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SUMMARY

The Great Grebe (*Podiceps major*) of temperate South America resembles the Western Grebe in size and form and the Red-necked Grebe in color pattern.

A colony of 25 to 30 pairs was studied near Llifén on Lake Ranco, Valdivia Province, Chile, between October 5 and 16, 1961.

Day-to-day activities resembled those of other species which have been studied. The simple threat and appeasement postures likewise resemble those of several other species. Token-diving was observed once, and an S-neck posture was used by Great Grebes in mildly aggressive situations.

Courtship activities included Advertising, a Ghostly-penguin Display, Ceremonial Flying-away, and the more complex Nodding and Turning Ceremony. These activities seemed less stereotyped than the courtship displays and ceremonies of the northern species of *Podiceps*.

Platform behavior is of the *Podiceps-Aechmophorus* type.

Behavioral evidence indicates that the Great Grebe may be more closely related to the large species of *Podiceps* than to *Aechmophorus* but it is not very close to either. Its resemblances to the Western Grebe in form and to the Red-necked Grebe in color pattern are the results of convergence.

LITERATURE CITED

- Barros V., R.
1927. Apuntes para el estudio de la alimentación de las aves de Chile. Rev. Chil. Hist. Nat., 31:262-265.
- Barrows, W. B.
1884. Birds of the lower Uruguay (conclusion). Auk, 1:313-319.
- Bros, R.
1929. Observaciones sobre el pato tripoca (*Erismatura vittata* Ph.) y el pato colorado (*Querquedula cyanoptera* Vieill.) en el Valle de Marga-Marga. Rev. Chil. Hist. Nat., 33:379-382.
- Crawshaw, R.
1907. The birds of Tierra del Fuego (Bernard Quaritch, London).
- Gibson, E.
1920. Further ornithological notes from the neighborhood of Cape San Antonio, Province of Buenos Ayres. Part 3. Phoenicopteridae—Rheidae. Ibis, 1920:1-97.
- Goodall, J. D., Johnson, A. W., and Philippi B., R. A.
1951. Las aves de Chile. Vol. 2 (Platt Establecimientos Gráficos S.A., Buenos Aires).
- Huxley, J. S.
1914. The courtship-habits of the great crested grebe (*Podiceps cristatus*); with an addition to the theory of sexual selection. Proc. Zool. Soc. London, 25:491-562.
- McAllister, N. M.
1958. Courtship, hostile behavior, nest-establishment and egg laying in the eared grebe (*Podiceps caspicus*). Auk, 75:290-311.
- McAllister, N. M., and Storer, R. W.
1963. Copulation in the pied-billed grebe. Wilson Bull., 75:166-173.
- Morrison, A.
1940. Brief notes on the birds of south Chile. Ibis, 1940:248-256.
- Reed, C. S.
1925. Breves notas biológicas referentes a las aves chilenas. Rev. Chil. Hist. Nat., 29:189-191.
- Scott, W. E. D., and Sharpe, R. B.
1904. Reports of the Princeton University Expeditions to Patagonia, 1896-1899. Vol. 2, Ornithology Part 1, Rheidae-Spheniscidae (Princeton University, Princeton, N.J.).
- Simmons, K. E. L.
1955. Studies on great crested grebes. Avic. Mag., 61:3-13; 93-102; 131-146; 181-201; 235-253; 294-316.
- Storer, R. W.
1961. Observations of pellet-casting by horned and pied-billed grebes. Auk, 78:90-92.
1963. Courtship and mating behavior and the phylogeny of the grebes. Proc. XIII Internat. Ornith. Congress (in press).
- Wetmore, A., and Parkes, K. C.
1954. Notes on the generic affiliations of the great grebe of South America. Jour. Washington Acad. Sci., 44:126-127.

Museum of Zoology, The University of Michigan, Ann Arbor, Michigan, December 14, 1962.