THE BEHAVIOUR OF THE NEW ZEALAND DABCHICK

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ABSTRACT

Observations and motion pictures were made on New Zealand Dabchicks in August and September 1969. Feeding, agonistic, courtship, and mating behaviour is described and compared with that of other grebes. The two principal courtship ceremonies are the Patter Ceremony and the Diving Ceremony. The former was observed frequently and is common after territorial encounters. The latter may be the ceremony of pair formation and like the former may be important in strengthening the pair bond. These ceremonies differ considerably from those of other grebes studied, but presumably resemble those of the related Hoary-headed Grebe **Podiceps poliocephalus** of Australia.

Although the New Zealand Dabchick *Podiceps rufopectus* is not uncommon locally and is easy to observe, remarkably little has been published on its biology. The most extensive paper is that by Buddle (1939), who studied its breeding on Lake Rotoiti. Sibson (1952) has been collecting data on its distribution and ecological preferences for some time, and there are short accounts or notes by Potts (1870, 1871), Buller (1888, 1905), Biddle (1962), and Edgar (1962). It was my good fortune to visit New Zealand from August 18 to September 16, 1969, and to spend much of this period observing and filming the behaviour of this interesting grebe. Most of the field work was done at the Muriwai sand dune lakes in the Woodhill Forestry Area northwest of Auckland and at Lakes Rotorua and Rotoiti on the volcanic plateau. A short time was spent watching three birds at Kourarau Dam near Gladstone. Observations were made from the shore with binoculars, at times using a car as a hide. Motion pictures and field sketches provided the bases for the figures, which were prepared by Martha B. Lackey.

Of the many persons who made this work not only possible but also extremely pleasant, I am especially indebted to F. D. Drower, R. A. Falla, Wyn and Denys Goddard, Mr. and Mrs. F. C. Kinsky, Mrs. Milford Reed, R. B. Sibson, and E. G. Turbott. The study was supported by a grant (GB 8269) from the National Science Foundation.

The New Zealand Dabchick is clearly a geographic representative of the Australian Hoary-headed Grebe *Podiceps poliocephalus*. Strictly speaking "dabchick" is a misnomer, as these birds differ both in behaviour and in morphology from the "true" dabchicks or little grebes (*Tachybaptus ruficollis* and *T. novaehollandiae*). The New Zealand endemic is somewhat larger, proportionately longer billed, and much more heavily pigmented than its Australian counterpart; it also differs in lacking a distinct winter plumage.

At first glance these birds appear remarkably dull in colour, then one turns and the pale eye becomes conspicuous against the dark head and the rufous breast glows as the sunlight catches it. At times they appear high sterned like Black-necked Grebes *P. nigricollis* and from behind the predominant colour of the feathers is light grey. In the extreme of the high-sterned posture, the folded wings are held at an angle, the tips high, and the flank feathers are spread. Then two patches of silky white feathers, one lying on each side of the lower back and normally covered by the wing tips and the dark ends of the flank feathers, are spread, each in a semicircle centred

around the blackish ankle joint. The thin black tail is held somewhat raised between the two white patches, the whole resembling a large pair of eyes (Figs. 1E, 2F). This posture is mentioned by Potts (1871) " in brief intervals between the dives, the wings are carried high, somewhat in swan fashion, as if the more readily to catch the drying influence of the air." It is my impression, backed up by films, that birds on territory tend to use this posture, whereas birds in wintering flocks do not. Thus it may be a sort of territorial announcement. In its extreme form, it is part of the Patter Ceremony described later.

The pale, hairlike plumes on the head do not show up well in the field and are considerably fewer and shorter than those of Hoary-headed Grebes in breeding plumage. Large white wing patches, formed by the inner two-thirds or more of the secondaries and inner primaries, show when the birds fly. These patches do not extend as far toward the trailing edge of the wing as the larger ones of the Australian species. The sexes are nearly alike in plumage. Males average larger than females, but there is overlap in both wing and tarsal measurements. There is little or no overlap in bill length, and it is usually possible to distinguish members of a pair when they are together by the longer bill of the male.

Compared with other grebes, New Zealand Dabchicks remain very alert; I rarely saw them in the " pork-pie " resting posture so characteristic of grebes. As well described by Potts (1871), they move their heads almost constantly when even mildly disturbed and appear " much more restless and fidgetty than the large Crested Grebe." At times the head is bobbed forward and back like that of a coot, at others it is thrust first to one side and then to the other. These motions suggest the " Principle of Rapid Peering " described by Grinnell (1921), but in the case of the grebes, used for spotting enemies rather than prey.

Flight. — Potts (1871) stated that the Dabchick flies seldom and when it does " it just skims the surface of the water, with a very rapid motion of the wings." I saw one Dabchick frightened by boys in a boat get up and fly off at least one hundred yards with a flock of New Zealand Scaup *Aythya novaeseelandiae.* The grebe flew low, most of the time within a yard of the water, and in spite of its very rapid wing beat it was soon outdistanced by the Scaup. The grebe impressed me as a weak flier, especially as compared with the migratory Horned Grebe *Podiceps auritus.* Although Buller (1888) said that they fly with difficulty and only for a short distance, they must make fairly long overland flights in order to occupy new bodies of water like Kourarau Dam. On one occasion I saw a Dabchick get up and fly against a strong wind in what may have been an upwind flight like those of the Horned Grebe (Storer, 1969).

Feeding. — Like other grebes, these Dabchicks obtain most of their food by diving. The foraging dives which I observed most frequently were of the type described by Lawrence (1950) as the usual "feeding dive," but occasionally a bird leaped clear of the water in what Lawrence referred to as a " springing dive," a type often used in rough water. Twenty-eight timed dives by two grebes on Karaka Lake, August 24 and 25, ranged from 7 to 38 seconds (mean, 24.8; standard deviation, 8.8 seconds). Eighteen intervals

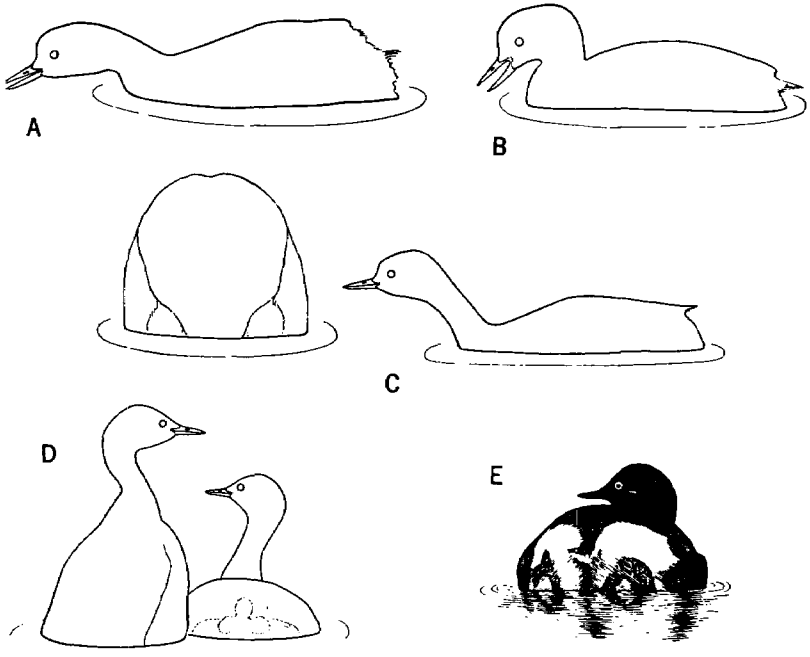

FIGURE 1 — Behaviour of the Dabchick. A: Picking midge off the surface of the water. B: About to cast a pellet. C: Rearing bird (left) showing white patches on either side of the rump. D: Postcopulatory Head Turning. E: Bird on territory, showing face-like pattern when viewed from behind.

between dives ranged from 10 to 37 seconds with a mean of 17. These figures contrast with Buller's (1888) "usual" timings of 20 and 7 seconds, respectively, and with 33 seconds, the mean of 6 dives timed by Edgar (1962) in the Rotorua District. The length of dives presumably is related both to the depth of the water and to the abundance of food, hence considerable variation is to be expected. I seldom saw food brought to the surface in the bill, but when it was, it was pinched repeatedly before it was swallowed. Several birds surfaced with objects about the size of their bills, and one brought up what appeared to be a fish approximately two inches long. From August 30 to September 2 there was a hatch of midges on Lake Rotorua, and Dabchicks spent much time picking them off the surface of the lake (Fig. 1A). One was also seen snapping at flying midges. Dabchicks were also seen picking midges off the surface of the water at Kourarau Dam on September 10. It is likely that much of the food of these grebes consists of small invertebrates which they swallow before surfacing, as in the case of the Horned Grebe on the breeding grounds (Storer, 1969). That invertebrates make up a large part of their diet is also suggested by the fact that I saw three instances of pellet casting. It is noteworthy that these

Dabchicks made no drinking movements before coughing up the pellets with the usual choking motions (Fig. 1B). Horned and Pied-billed grebes *Podilymbus podiceps* make repeated drinking motions at this time (Storer, 1961).

Although feather-eating undoubtedly occurs, I did not observe it, and even saw a preening bird let three of its feathers drift away. When grebes are feeding regularly on insects, a small plug of feathers in the pyloric outlet of the stomach is sufficient to keep chitin and other indigestible material from entering the intestine, and as I have shown in the case of the Horned Grebe (1969) this plug is not cast with pellets. Large masses of feathers are found in the stomachs of grebes which are feeding on fish and may function in retaining fish bones in the lumen of the stomach until they are dissolved.

A variety of food is reported in the literature: Potts (1871) implied that fish and insects are fed to the young. Buller (1888) wrote the food is " small mollusca, among the aquatic plants at the bottom " and reported three " stomachs crammed with a species of leech, about an inch in length and of a pale yellow colour." Oliver (1955) reported the food " consists largely of insects and fresh-water mollusca." According to Buddle (1939) food brought to the young included a " small fish, probably inanga," " a large toi-toi or bully, too large for her to swallow," which she broke up, and " several large koura (fresh water crayfish)," which she also broke up. He also reported a young taking a koura. If, like the Horned Grebe, the Dabchicks swallow small food items under water, the above reports are not representative of the total diet, but strongly biassed in favour of large items.

Comfort Movements. — The comfort movements of all grebes are rather similar. I observed bathing, preening, oiling, swimming-shakes, head-shakes, wing-flapping, wing-and-leg stretches, both-wing stretches, and head-scratching (nomenclature of McKinney, 1965) performed by Dabchicks. The swimming-shakes appeared to be more rapid than those of other grebes, possibly because of the small size of the birds. In the both-wings stretch, the wings were fully extended as in most other grebes. Bathing dives of two kinds were observed: one in which the bird dived head-first and one in which it dived breast-first. Otherwise, I noted nothing remarkable in this category of behaviour.

Shipping a foot under a wing and flank feathers and resting in the " pork-pie " posture, usual grebe mannerisms, were also observed. Of interest was a reaction to a sudden gust of wind which I have not noticed in other grebes. On August 22, there was a strong, gusty southwest wind, and a Dabchick which was facing into the wind lowered its flank feathers, as before diving, just as a gust, announced by its riffle, approached.

Agonistic Behaviour. — New Zealand Dabchicks gather in flocks in winter; up to 40 have been reported in a winter flock on the volcanic lakes (Anon., 1959). During the breeding season, however, they are strongly territorial. On the Muriwai sand dune lakes, most birds were defending territories by the time of my arrival on August 20, but there was considerable variation in the time of breeding of different pairs. One pair with two half-grown young was seen on

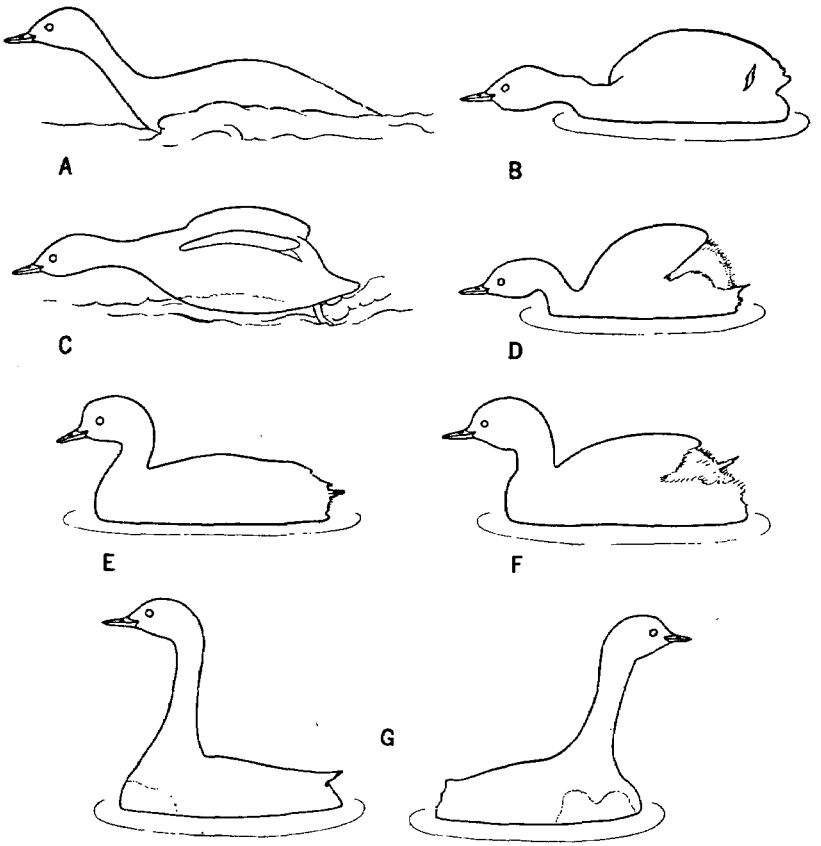

FIGURE 2 — Behaviour of the Dabchick. A: Skidding retreat. B: Threat. C and D: Patter Ceremony. E: Normal swimming posture. F: Usual posture when on territory (see also Figure 1E). G: Head Turning.

Lake Piripoua on August 22. (I would estimate that the eggs for this extraordinarily early brood had been laid in mid-July.) The presence of several single birds guarding territories in late August suggested that these birds had incubating mates, and this idea was supported when occasionally a second bird (in one case with a small young on its back) appeared when trespassers were being driven off by the guard bird. (I did not go into the reed beds looking for nests.) As late as September 14, I saw a closely-knit group of four adults on Lake Kareta, indicating that at least a few were not yet on territory.

The aggressive posture of the Dabchick is like that of many other grebes, the head forward, neck kinked, and body feathers somewhat expanded (Fig. 2B). Short pattering dashes in this posture

are made at other birds. This is probably the evolutionary origin of the Patter Ceremony. Often an attacking bird will fly low over the water at an intruder, at times covering the intervening distance in two flights, each ending in a dive. At the last dive, the attacked bird usually dives also. I saw only one case of actual combat, and in it had a fleeting glimpse of one bird on its back, kicking out coot-like with its feet. Later both dived, one holding on to the other with its bill. Upon returning to its mate, at least one of the combatants had a long session of bathing, preening, and oiling as though its feathers had been badly disarranged.

An upright posture is also used in agonistic situations. One form of this is an appeasement posture similar to that of the Horned Grebe (Storer, 1969) and other species, in which the head and neck feathers are slicked down and the head held somewhat back so that the head, neck, and body form a Z. In the second form, the feathers, especially those of the body, are more expanded. I once saw two birds in an aggressive encounter make short dashes and then assume this posture from which first one, then the other, dived head first. Each then emerged in approximately the same place as it went down. (They were about ten feet apart.) In context, this appeared like the "Token Dive" of the Great Crested Grebe *Podiceps cristatus* (Simmons, 1955) and the Red-necked Grebe *P. grisegena* (Wobus, 1964), but it differed markedly in the type of dive used and appeared to have a less strong aggressive component. It may be related in an evolutionary sense to the Diving Ceremony discussed later and thus may have a sexual component.

The principal appeasement posture is that mentioned above. As in most grebes, underwater attacks usually result in the attacked bird's diving. This is probably to prevent an attack from below. Fleeing by skittering across the water with the wings folded and the feathers of the head and neck slicked down was seen once and resembled the skidding retreat described and illustrated by Simmons (1955) for the Great Crested Grebe, except that the head was held somewhat more forward (Fig. 2A). This kind of retreat results from a sudden disturbance and may be common to all grebes.

Alarm and Predators. — Mild alarm caused by two Grey Ducks *Anas superciliosa* flying over or by my presence resulted in bobbing of the head back and forth and a special posture — the stern very high and fluffed out, the head high, the neck pencil-thin, and the back of the neck awash. Several times I saw Harriers *Circus approximans* swoop at a Dabchick. Each time this happened, the Dabchick made a crash dive, going under breast-first and sending a jet of water perhaps three feet in the air. The alarm posture appears to be in part a preparation for the crash dive and in part a signal. The lowered breast and flattened neck feathers suggest the former and these, plus the expanded, pale flank feathers, all probably have a signal function. In all, I recorded eight crash dives, seven when Harriers flew over the Dabchicks; and one probably resulting from my frightening a bird. The jet of water must be sent up by the feet in the powerful stroke with which they submerge and may have some selective advantage. Although I never saw a Harrier come close enough to be hit by the jet, this may happen occasionally and could well interrupt the hawk's pursuit of the grebe. These

limited observations suggest that the Harrier is the principal avian predator of the Dabchick. Southern Black-backed Gulls *Larus dominicanus,* which visit the Muriwai sand dune lakes to bathe, may possibly take young Dabchicks.

Courtship: Head Turning. — This display may correspond in part with Head Shaking in the Horned and Great Crested grebes, but it is entirely different in appearance, and probably, in derivation. In it the birds appear to fling their heads first to one side and then to the other with such force that the body is turned partway in the same direction. This movement is made in a special posture, the head stretched up, the neck thin, and the body feathers moderately compressed (Fig. 2G). The motion is rapid and jerky, stopping briefly at the end of each turn and at times mid-way in the turn as well. The display is performed in the presence of another bird, the two birds often performing it together repeatedly as a ceremony. (I use " ceremony " in the sense of Simmons, 1955, " fixed, conventional sets of displays.") In the course of Head Turning Ceremonies, the birds remain close together but move about apparently at random, facing first one way and then another.

Head Turning may be set off by mild disturbance and may precede a Diving Display. In mating, it is performed before and after mounting by the active bird and in less intense form by the passive bird before mating. The head movements resemble those used in mild alarm but appear exaggerated and more forceful. The posture resembles that of alarm in that the head is high, the neck thin, and the body feathers depressed. However, the head is held forward, not back as in the typical appeasement posture. Its origin from looking about in mild alarm seems probable, and it is likely the two may grade into one another.

Courtship: Diving Ceremony. — This is an uncommon, but regular courtship ceremony of the Dabchick. The components are shown in Figure 3. In it two birds face each other with their heads up, necks somewhat thin, flank feathers spread laterally so that the white patches show beside the wings, and tails horizontal. One bird lowers its head and points the bill down then raises the head and thrusts the bill toward the second bird. These head movements, which together take one-half second, are repeated, usually first by one bird and then by the other. Then as one bird points the bill downward, the other dives under it. The first bird then turns and faces the second as it emerges from the dive, which takes approximately one second. The whole procedure may be repeated several times, the birds alternating roles or one diving twice or more times in succession.

Diving ceremonies were preceded, and hence possibly triggered, by several types of behaviour. One was preceded by the two birds turning face-to-face, then tail-to-tail, and finally face-to-face. Once two birds dived almost simultaneously, came up close together, swam about " nervously " in the pre-dive posture, possibly with some pivoting, but not with anything that looked like stereotyped behaviour, then the Diving Ceremony began. Once my disturbing the birds led to a Patter Ceremony followed by a Diving Ceremony, and a second Diving Ceremony may have been set off directly by human disturbance.

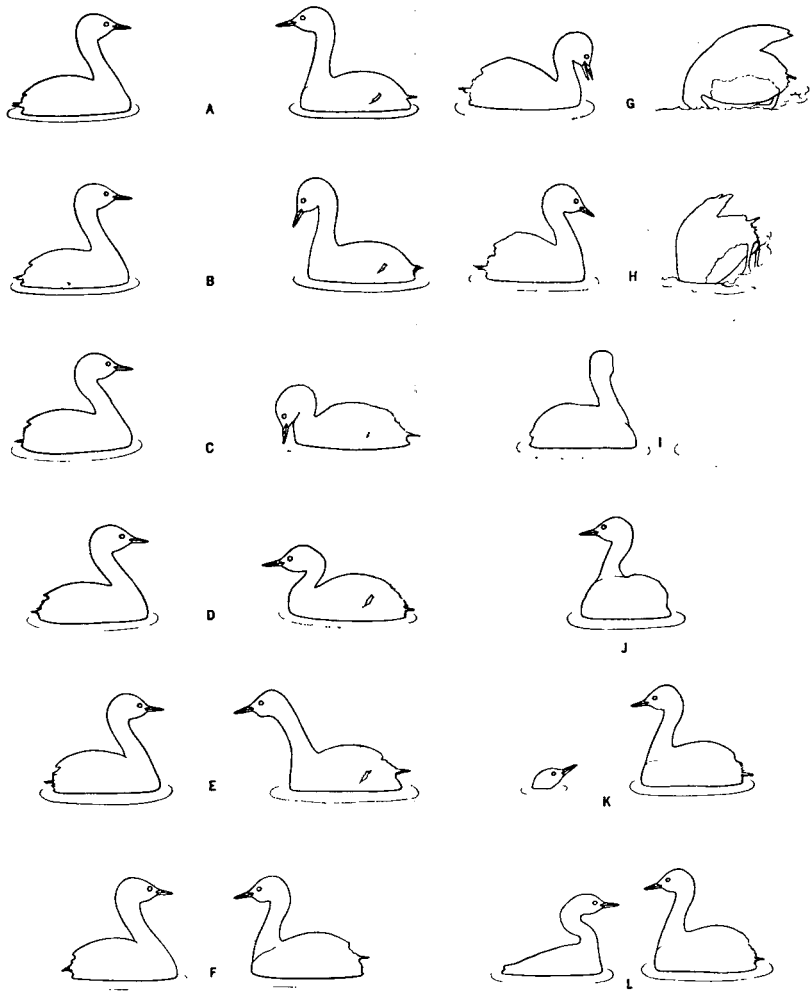

FIGURE 3 — Diving Ceremony of the Dabchick. B and C: Bill dipping. E: Thrusting bill at mate. G and H: Diving. I and J: Mate turning. K and L: Emerging from dive.

The Diving Ceremony is at least superficially most like the Bumping Ceremony of Rolland's Grebe *Rollandia rolland* (Storer, 1967), a ceremony which needs to be filmed and analysed in greater detail. My guess is that the Diving Ceremony is the one by which pair formation takes place and one of those which serve to strengthen the pair bond. Thus it is probably the counterpart of the Discovery Ceremony of the Great Crested Grebe and its close relatives.

The Diving Ceremony contains a complex of agonistic components. The bill-thrusting preliminary is an aggressive act but differs from strongly aggressive thrusts in being delivered from high above the water, an aspect which is emphasised by the lowering and raising of the head which precedes it. The second bird meets this thrust in an almost full appeasement posture (Fig. 3E). Diving at another bird is in grebes usually an aggressive act, but in this ceremony the dive is made from a largely appeasement posture. It is met by a bird facing it (aggressive) but in an appeasement posture. This ambivalence is continued as the bird on the surface turns to face the diving bird as it emerges. In both the bill thrust and the dive aggression appears to predominate, hence only when this aggression can be balanced by sexual motivation does a full ceremony occur.

Courtship: Patter Ceremony. — This was the most frequent courtship ceremony I observed, and it is evidently used through much of the breeding season. It was performed infrequently and in low intensity by birds still in winter groups on Lake Rotorua in early September, very often by pairs on territory on the Muriwai sand dune lakes in late August, and I saw it performed at least once by a pair, one of which was carrying a small chick. I saw it and other courtship and aggressive behaviour more often on clear, calm days than on dark, windy ones.

The Patter Ceremony consists of several elements put together in a variety of ways. As far as I could tell, it is always performed by pairs. The two birds swim together in a special posture, which becomes intensified as they move closer together. In this posture (Fig. 2D) the head is held low and the neck kinked, the folded wings high and close together, and the stern fluffed out. The patch of white feathers growing from the lower back and sides, which makes the white part of the eye-like pattern from the rear, is expanded. Upon coming together, the two birds mill about, remaining close together. At times they are side-by-side, at others face-to-face, or tail-to-tail, but much of the time their orientation appears random. Meanwhile they move their heads, extending or retracting them or moving them from side to side. From analysing motion picture film of these ceremonies, I could find no indication that the sequence of these head and body movements is stereotyped. During this milling about, a bird may depress the throat and utter a low four-note call of very low carrying power. The call is difficult to describe but to my ears sounded like a guttural chatter. After milling about, one bird suddenly patters away from the other (Fig. 2C). In doing so, it makes a loud noise as its feet strike the water and kick up a considerable splash. Immediately before pattering the wings are lowered, concealing the white patches. The patter appears very ritualised, with a propulsive phase lasting almost exactly one-third of a second (8 frames at 24 frames per second) with very little variation. This is followed by a glide as the bird decelerates. At the height of the patter, the bird's body seems to clear the water and occasionally the closed wings are raised somewhat. Toward the end of the glide or immediately after, the bird turns and swims toward its mate. At the start of the patter, the second bird may be facing the pattering bird (18 instances on film), more or less perpendicular to it (14 instances), or facing away (7 instances). By the end of the patter, the figures were 33, 4 and 2, respectively, in all but one

instance the bird moving to face the pattering bird before the patter ended. In all cases the bird had moved to face the pattering bird within a very brief interval after the patter ended. The two birds swam together again, their postures becoming more intense, there was more milling about, then another patter, and so on. The sequence of pattering is not fixed. For example, of 24 instances of pattering in which the bird which had pattered previously is known, the same bird pattered 5 times and the other bird 19. One instance of the same bird pattering three times in succession was recorded. In two films of six successive patters each, there was regular alternation of roles in one and only one repeat in the other. On one occasion I filmed two birds pattering simultaneously, but this must be rare.

Patter Ceremonies appear to be triggered by several things. In my observations, most frequently (12 to 14 times) this was by aggressive behaviour after either the aggressor or the chased bird or both returned to their mates. On four occasions presumed mates coming together after being separated pattered, and after three of these ceremonies, the birds resumed foraging. Twice disturbance resulting from my presence set off Patter Ceremonies; after one of these the birds resumed alarm attitudes and after the other they went into a Diving Ceremony. The circumstances under which Patter Ceremonies are performed resemble those under which Horned Grebes perform at least three ceremonies. In the Horned Grebe meeting after separation and disturbance may set off either Discovery Ceremonies or bouts of Head-shaking, depending on the intensity of the stimulus and the strength of the pair bond, whereas after aggressive encounters, Triumph Ceremonies are most frequent. The lack of uniformity in what precedes and what follows Patter Ceremonies indicates that they are not part of a more complex ceremony.

It is likely that most or all of the few mentions of courtship of the Dabchick by earlier authors refer to the Patter Ceremony, but the descriptions are vague and probably inaccurate. Buller (1905) referred to " the amorous gambols on the water . . . , with their backs arched and feathers puffed out, splashing about and chasing each other in the wildest state of excitement," probably a combination of Patter Ceremonies and agonistic behaviour. Buddle (1939) wrote " then ensued a short period of courting — the male fluffed out his feathers, stretched his neck straight along the water and made short rushes at the female, which then did the same thing." This was probably a Patter Ceremony, although in all Patter Ceremonies I observed and filmed, the rushes were invariably made *away* from the mate.

Mating Behaviour. — As in most grebes, there are two soliciting displays: Rearing and Inviting. Both are illustrated by Buddle (1939: pl. 11, upper right and lower left figures, respectively), but have not been described in detail. I observed mating on the beginnings of a platform of aquatic vegetation at Otaramarae and on a small rock at Rotorua; presumably it also occurs on the nest as in other grebes. The Rearing posture is similar to that of other grebes studied, but I observed no Wing Quivering. (Further observations are needed to prove this point.) Two white spots, one on either side of the rump, showed conspicuously during Rearing and Inviting (Fig. 1C).

In Inviting, the head is turned from side to side in a short arc, and this turning is continued during copulation. However, the head of the passive bird is not raised to stroke the breast of the active bird, as in the true dabchicks *(Tachybaptus)* and the pied-bills *(Podilymbus)*. Prior to mounting, the active bird flings its head from side to side, often using a two-stage turn, that is, stopping the turn briefly with the head pointed forward, the movements thus being left to centre to right to centre to left, etc. During mounting the active bird's posture, as shown in Buddle's photograph (1939: pl. 11, lower left figure), is more upright than the Rearing Posture, and the head it not turned. After copulation, the active bird moves forward over the passive bird's head, which has previously been lowered, and treads water, the body sinking down but the head remaining in approximately the same position as the neck appears to elongate. The water treading is brief and appears less exaggerated than in other species I have observed. Post-copulatory displays consist of more head turning. Both one- and two-stage turns may be used by either bird, but the active bird performs vigorous head flings whereas the passive bird merely turns the head (Fig. 1D).

On at least two occasions at Otaramarae, I thought it was the larger member of the pair which assumed the passive role in mating. Reverse mounting is common, if not regular, in grebes at the beginning of the breeding season. Therefore, one cannot sex a grebe by its role in mating, and I have used the terms " active " and " passive " roles in description of platform behaviour.

Vocalisations. — The Dabchicks impressed me as rather quiet birds; neither of the two vocalisations which I heard was as loud as the noise made by the birds' feet in Patter Ceremonies or during the foot-pattering flights at intruders. This contrasts markedly with Buller's statements (1905) that when pairing starts in September, " the birds become then very noisy, chattering to each other across the water all day long " and " in the breeding season, scolding each other and keeping up a loud confabulation." I suspect that Buller, writing from memory, either confused the noises made by pattering with vocalisations or attributed vocalisations like those of the Australian or Eurasian Dabchicks to the very different New Zealand bird.

The two calls which I heard were the four-note call given as part of the Patter Ceremony (see p. 183) and a mild alarm call which I heard once from a bird which I had disturbed. The bird moved about with its head held high and gave a series of three soft, rolling, somewhat harsh notes which I recorded as *grraaaa.* One film shows a bird with its beak open in a Diving Ceremony just as its mate starts a dive (Fig. 3G), so it is possible that a soft note accompanies this. If so, I did not hear it. Nor did I hear any note during copulation, a time when loud calls are given by many species of grebes (Storer, 1969). Buller (1888) reported " a peculiar sibilant note, from which it derives its native name of *Weweia,*" which I did not hear or failed to recognise. Edgar (1962) reported a " series of low pitched ' tuk tuk tuk ' notes " used to communicate between members of a pair. This probably corresponds with the conversational Platform Call of the Horned Grebe (Storer, 1969) and other species.

Potts (1871) reported that the young utter " a soft trilling note not unlike, but less marked than, the call of the parent birds." From this very limited and somewhat confusing information, it is clear that recordings of vocalisations documented with descriptions of the birds' behaviour at the time are very much needed.

Conclusions. — The Patter Ceremony is unlike that of any other grebe so far studied. In the posture and the " eyed " pattern of the stern, it resembles a posture of coots *(Fulica);* in the pattering rushes, it resembles a display of the Ruddy Duck *Oxyura jamaicensis.* These resemblances, however, must be results of convergent evolution. The Diving Ceremony is most like the Bumping Ceremony of Rolland's Grebe but differs in that there is no bodily contact between the birds. The Head Turning Display resembles a display which has developed into the more elaborate Turning Ceremony of the Great Grebe *Podiceps major* (Storer, 1963). The apparent lack of advertising and a Discovery Ceremony set *rufopectus* apart from the Great Crested Grebe and its close relatives. The fact that the passive bird in copulation does not stroke the breast of the active bird with its head and the few and soft vocalisations set the New Zealand bird apart from the true dabchicks and the Pied-billed Grebe. The absence of drinking before pellet casting is so far not reported in any other grebe. It would thus appear from behavioural evidence that the New Zealand Dabchick and the Hoary-headed Grebe have no close relatives. The ancestral stock must have reached the Australasian region early and differentiated there before the true dabchicks and the Great Crested Grebe arrived.

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