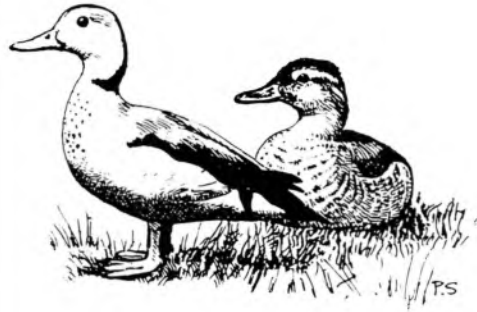


Biparental care behaviour of captive Ringed Teal *Callonetta leucophrys*

GWEN BREWER



Parental care behaviour was observed in three captive families of Ringed Teal. Both parents were very protective of their broods and performed distraction displays to lead people away from their ducklings. Males were more active than females in chasing other birds away from the ducklings. Only females brooded the young. Males frequently perched on "lookouts" while the female and ducklings fed. Male parents retrieved lost or lagging ducklings more often than female parents although the female usually led the brood. Family members greeted each other when they reunited after brief separations and generally formed a cohesive group. One pair renested when their first brood was 24 days old and the male cared for these ducklings while the female incubated the second clutch. This observation and others suggest that male parental care may contribute to a strategy of double brooding in this species.

It is generally assumed that male parental care is important in many near-tropical ducks (Kear 1970), although there is little direct evidence. Siegfried (1974) suggested that for some species of *Anas* with male brood attendance, males may accompany broods primarily to maintain their pair-bonds and he questioned the importance of males in caring for ducklings. Biparental care has been suggested for six species of perching ducks (Cairinini) but has only been described in detail for one of these species, the Maned Duck *Chenonetta jubata* (Kingsford 1986). Male Ringed Teal *Callonetta leucophrys* are reported to contribute a substantial amount of parental care (Kear 1970), possibly even incubating eggs (Johnsgard 1978), but the behaviour involved has not been described and the role of the drake is not clear. In this study, the behaviour of three families of captive Ringed Teal was described to identify male contributions to brood care.

Methods

Five pairs of full-winged Ringed Teal were observed in a large flight pen (55 x 27.5 x 3.6 m) at Cedar Creek Natural History Area, Bethel, Minnesota. This pen is described in McKinney (1967), but it was not divided into two sections during my study. Six nest boxes (33 x 38.1 x 21.6 cm) were spaced at

equal distances around the pen at a height of about 2 m, each with a wooden perch next to it. Boxes contained 5 cm of sand covered with a 2.5 cm layer of peat and bunches of dried grasses, and each was fitted with a wire mesh ladder so that ducklings could climb out easily. Also housed in the pen were eight adult and later ten young Chiloee Wigeon *Anas sibilatrix* and four adult and later ten young White-cheeked Pintail *A. bahamensis*.

Adult Ringed Teal were marked with coloured plastic nasal saddles (males) or discs (females) for individual identification. Six of the ten birds were purchased from local aviculturists, and two of these birds had been in the collection since 1979 (R male and B female). The other four birds (including W female and GA5 male) were raised at Cedar Creek by their parents. All birds were at least one year old. Observations were also made on three hand-reared ducklings.

Scheduled watches, filming, and tape recording were carried out on two of every three mornings during three hour watches starting just before sunrise, between 0515 h and 0530 h Central Daylight Time, from 15 June to 14 August 1984. The period of observation for families was limited to six weeks for two broods (R-B and GA5-W) and three weeks for one brood (RW-Y) when several parents (GA5, W, and Y) and at least some ducklings of all broods showed

symptoms of leucocytozoanosis, a blood parasite disease. These symptoms included a low level of activity, poor balance and coordination of movement, and caused behaviour to be abnormal. Total hours of scheduled observation for each family (after ducklings hatched) were: R male-B female, 42 hours; GA5 male-W female, 38 hours; RW male-Y female, 15 hours.

Some interactions were filmed with an Elmo super 8 sound 10125-XL macro camera and later analysed with a Timelapse Data Analyzer 3420 projector.

Results

Incubation and nest exodus

Three of the five pairs produced offspring and one pair (R-B) produced two broods. Only females incubated eggs, but males remained close to nest boxes throughout incubation. B, W and Y incubated first clutches of eight, 15, and 12 eggs for 25, 28, and 26 days respectively. The unusually large clutches of 12 and 15 resulted from several females laying in a nest. B female's second clutch contained seven eggs and was incubated for 25 days. Eggs were pipped for about 24 hours and the ducklings remained in the nest box for a further 24 hours, losing their down sheaths and drying off while the female brooded them.

Both R-B clutches produced three ducklings that left nest boxes on 30 June and 10 September. On 3 July, five ducklings left the box of GA5-W and eight ducklings left the nest of RW-Y on 28 July. The broods of GA5-W and RW-Y were watched jumping out of their boxes in mid- to late morning. Each female stood below her box and gave bouts of loud, rapid "honks"; Y female called for 5-10 minutes before the first duckling was seen in the hole of the box, W female called for 104 minutes. Males stood below the box, close to their mates. As each duckling hit the ground, the pair ran over to it and inspected it, sometimes poking gently at the duckling. Females continued to call loudly until no more ducklings could be heard inside the box. After a few minutes, the pair and brood moved together into the water. In both cases, male and female Chiloe Wigeon and other male Ringed Teal attempted to inspect ducklings as soon as they reached the ground; both parents

responded by threatening and chasing the intruders away from the brood.

Brood care

During the first three weeks, both parents accompanied the ducklings as they fed, swam, and rested. (Brood-care during the re-nest period for R-B will be presented in the next section.) Typically the male perched on a high vantage point near where the female and ducklings were feeding, remaining alert and flying to a closer perch as the brood moved along. Male parents used the tops of nest boxes, the tops of floating food shelters, and wooden perches fastened to the side of the pen for vantage points. Usually the female led the brood, giving soft peeping calls almost continuously, especially when there was a disturbance. Females gave louder calls when ducklings were more than about 1 m away, and ducklings usually responded by returning to the female. Only females brooded the ducklings, often extending one or both wings so that their tips were touching the ground and part of the white wing patch was exposed.

Males led the entire brood only rarely ($n = 10$) but did retrieve separated ducklings significantly more often than females ($n = 10$ for males, $n = 1$ for females; $X^2 = 7.36$, $P < 0.01$). Males retrieved ducklings separated from the female (by more than 1 m) by going to ducklings, remaining briefly alert nearby, then leading them back to the female and brood. Males slept 0.5-2 m away from their sleeping or brooding mate and ducklings, sometimes remaining alert for a short time after the female had closed her eyes. Males usually remained asleep until the brood became active again, but occasionally a male fed while his mate and brood slept.

Ducklings gave contentment calls when near either parent and distress calls when they became separated from both parents (Kear 1968). All but two parents (GA5 male and Y female) responded to some duckling distress calls by going to ducklings or calling to them. Females gave loud "houii" calls and males gave loud whistles (Johnsgard 1965) when they called to ducklings that were giving distress calls. Either R or B responded to four of five distress call bouts (80%) by calling ducklings (once for B female) or going to them (once for R, twice for B). W and RW each responded to

two of three bouts of distress calls (67%), when each went to ducklings once and called to ducklings once. Ducklings sometimes gave greeting displays by performing Rotary-head-movements (Brewer 1988) when reunited with each other ($n = 4$) or with either or both of their parents ($n = 10$). Rotary-head-movements consist of rapid and repeated chin-lifting movements with a forward component, similar to Chin-lifting described for African Pygmy Geese *Netta pus auritus* (Alder 1963, pers. observ.) and North American Wood Duck *Aix sponsa* (Lorenz 1951–53). Greeting behaviour was first noted in hand-reared ducklings at one week of age and in the pen at 12 days of age.

Both parents defended the ducklings against conspecifics and other ducks (Chiloe Wigeon and White-cheeked Pintail) by threatening, chasing, and pecking (Table 1). Threats include Open-bill Threats (Cramp & Simmons 1977) and Rotary-head-movements. Males were especially active in threatening and chasing other birds away from their broods and performed more total aggressive actions (threats + chases + pecks), threats, and chases than females or pairs. When acting individually, male and female parents directed most of their aggression to other

male Ringed Teal and Chiloe Wigeon; when acting together, parents directed most of their aggression toward Chiloe Wigeon. Aggression toward Chiloe Wigeon was frequent because male Chiloe Wigeon showed great curiosity about Ringed Teal ducklings and approached broods frequently.

Either or both parents sometimes retaliated when other birds threatened, chased, or pecked their young. Retaliations involved threatening or chasing the aggressor, and were performed after five of nine attacks on R-B ducklings (56%), three of six attacks on GA5-W ducklings (50%), and one of one attack on RW-Y ducklings (100%). Most retaliations (67%, $n = 8$) were directed at Chiloe Wigeon.

After defense by either parent, ducklings or family groups occasionally gave Rotary-head-movements when ducklings went to one parent ($n = 2$) or the entire family group came together ($n = 2$). Ducklings sometimes directed Rotary-head-movements towards their parents when other birds were near them ($n = 2$), as a female does in Inciting (Johnsgard 1960), and on two occasions families gave Rotary-head-movements apparently as a group threat to nearby birds.

In response to potential danger, such as a

Table 1. Summary of aggression by Ringed Teal parents.

Individual	Aggression to other ducks near brood:				Targets of aggressive behaviour by male and female parents				
	Threat*	Chase**	Peck	Total**	Other males	Other females	Other ducklings	Chiloe Wigeon	White-cheeked Pintail
Females:									
B	6	2	0	8					
W	9	1	0	10					
Y	4	1	0	5					
Total	19	4	0	23	10	4	1	7	1
Males:									
R	5	7	1	13					
GA5	12	5	0	17					
RW	13	10	0	23					
Total	30	22	1	53	29	3	2	16	4
Both parents:									
R-B	2	0	0	2					
GA5-W	5	0	0	5					
RW-Y	4	1	0	5					
Total	11	1	0	12	2	0	1	9	0
TOTAL					41	7	4	32	5

* Testing Totals for individuals, $P < 0.05$, $X^2 = 9.1$.

** Testing Totals for individuals, $P < 0.01$, $X^2 = 28.7$ for chases, $X^2 = 30.7$ for total aggression.

large bird flying over the pen, ducklings dived or hid in cover. On one occasion, a male gave a loud whistle when near his ducklings apparently in response to the call of a Red-tailed Hawk *Buteo jamaicensis*, possibly to warn the brood. Ducklings up to

about four weeks of age feigned death when handled, as described for five species of adult female ducks taken by foxes (*A. platyrhynchos*, *A. discors*, *A. acuta*, *Aix sponsa*, *Aythya affinis*; Sargeant & Eberhardt 1975). Parents responded to the

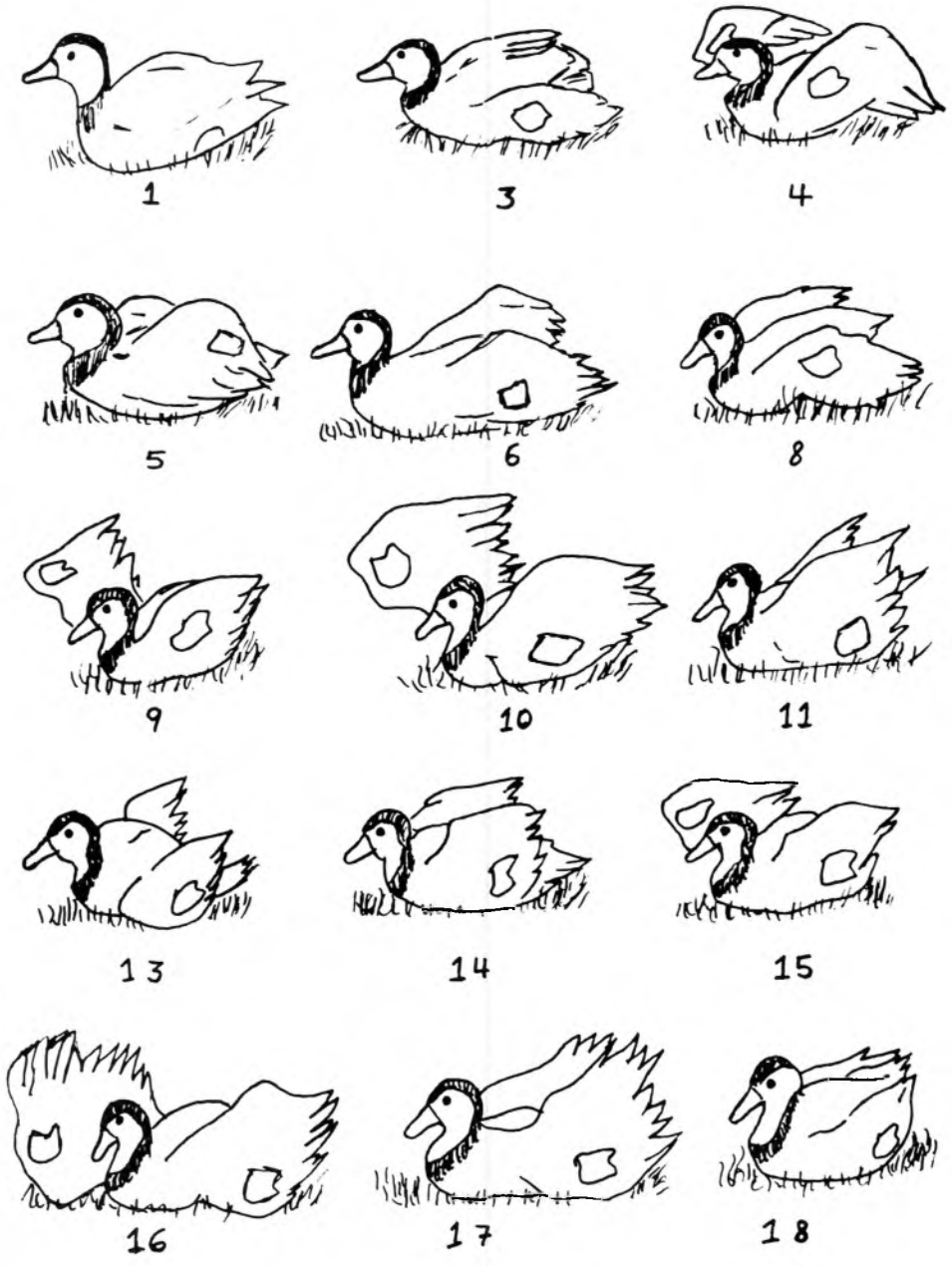


Figure. 1. Male Ringed Teal performing a distraction display on land. Numbers indicate film frames used for tracing from film exposed at 18 frames per second.

close approach of a person by giving loud nasal "honks" and hisses. Both parents of two pairs also performed distraction displays in response to a human near the brood when their ducklings were as young as one day old (Fig. 1). In this display, the birds moved away from the ducklings and the person, flapping half-open wings and conspicuously exposing the white wing patch and speculum. The tail feathers were also fanned during the display and an Open-bill Threat was given as the bird moved forward. On water the birds paddled and on land they scuffled or dragged their bodies along the ground. This species is not included in Hebard's (1960) list of anatids known to perform distraction displays.

Renesting and brood-rearing overlap

The R-B pair began renesting before their ducklings had fledged. On 24 July, when their three ducklings were 24 days old, the pair began inspecting nest boxes together and flew around the pen in nest prospecting flights. The male accompanied his mate on all of these flights, which continued to 1 August. The first observed copulation was on 3 August. Three of the four copulations observed before incubation began were solicited by the female; she adopted a prone posture in front of the male before he began to give pre-copulatory displays. Laying began on 3 August and the incubation of seven eggs began on or about 15 August.

Throughout the pre-laying and laying periods, the male and female continued to care for the ducklings, returning to them after nest prospecting flights, visits to nest boxes, and copulations. Nest box inspections, intensive female feeding, and copulations were typically carried out while the ducklings were sleeping; one copulation took place almost immediately after the pair left the sleeping ducklings. Both parents responded immediately to one bout of duckling distress calls by returning to the ducklings; once, when parents were at a nest box, they did not return until four minutes after the ducklings began to give distress calls. The male escorted the ducklings back to the female twice after separations. The ducklings performed Rotary-head-movements to greet both parents during reunions ($n = 2$) and also directed them towards the male when other birds were near ($n = 2$) and to the pair after an

aggressive encounter ($n = 1$).

When the female was laying or incubating in the box, the male stayed close to the remaining two ducklings while they were active; when they slept, he often fed in the area near the nest box or sat on top of it. He also gave contact calls when the female was in the box ($n = 3$). He continued to defend the ducklings from other ducks, threatening and chasing them when they came near the ducklings ($n = 5$), and he gave a loud whistle once when they gave distress calls. The ducklings generally stayed near their father, and greeted him when they rejoined him on three occasions. The ducklings also greeted their mother ($n = 5$) when she returned after laying or during incubation recesses.

One other pair (RW-Y) showed some pre-laying behaviour while they were still attending a brood. On 8 August, there was a successful forced pair copulation although the brood was only 11 days old. On 10 August, both male and female performed pre-copulatory displays, but no copulation followed. Earlier that morning the female was briefly in a nest box accompanied by her mate. On 11 August, a successful pair copulation was filmed. The pair and ducklings were then removed from the pen on 15 August when several birds, including Y female, showed symptoms of leucocytozoanosis. No further attempts at initiation of a second brood were observed.

Discussion

Both parents actively provided care for their ducklings in this study, in addition to maintaining a pairbond. Female parents led, brooded, and defended ducklings, responded to duckling distress calls, and performed distraction displays, as described for most duck species (Kear 1970). Males defended their mates and also provided care by escorting and defending separated ducklings, responding to duckling distress calls, and performing distraction displays. These aspects of male parental care are similar to those reported for Maned Duck (tribe Cairinini; Kingsford 1986), Chestnut Teal *A. castanea* (tribe Anatini; Norman & McKinney 1987), and Silver Teal *A. versicolor* (tribe Anatini; McKinney & Brewer 1989). In addition, males acted as "lookouts" from elevated perches

while the female and ducklings fed.

The extent of male parental care was especially well demonstrated during renesting, when the male took care of the first brood while the female incubated the second clutch. During that time, he continued to stay close to the ducklings, responded to distress calls given when the ducklings were separated from him, and defended the ducklings. The male and ducklings also greeted one another when they reunited. Although male Ringed Teal were strongly paternal, in this study they did not incubate and did not seem to be more concerned with parental care than the female, as has been suggested (D. Crider quoted by Johnsgard 1978), except when the female was incubating a second clutch.

Family members (parents and their ducklings) formed a cohesive group and maintained close contact. Several displays apparently functioned to reaffirm bonds between individuals. Rotary-head-movements were given as a greeting when two or more family members reunited after a separation. In a similar reinforcement display, after an aggressive interaction all members of a family sometimes came together and gave Rotary-head-movements, as in anserine Triumph Ceremonies (Fischer 1965). Male and female parents gave loud contact calls when separated and also to call ducklings when they became spread out. Ducklings gave distress calls when separated from both parents and parents responded by calling to or retrieving ducklings, thus keeping the family together.

In this study, one pair initiated a second clutch when their first brood was only 24 days old and one other pair with young showed signs of renesting; in 1981, in a nearby flight pen, two female Ringed Teal renested when their broods were 21–28 days old (Jeff Burns, pers. comm.). In the perching duck relatives of the Ringed Teal, only two species have been noted to produce more than one brood per season. North American Wood Duck females produced two broods in one season by abandoning their first broods at a mean age of 33 days (Missouri; Fredrickson & Hansen 1983) or 47 days (South Carolina; Kenamer & Hepp 1987), one to three weeks later than for the observed Ringed Teal, and at least some of the individuals of second broods in wood ducks survived to

breed the next year in Missouri. Phillips (1923) reported that in the Ringed Teal's closest relative, the Brazilian Teal *Amazonetta brasiliensis*, a captive male cared for his ducklings while his mate incubated a second clutch, as in the double clutch situation observed in this study. In the Anatini, similar behaviour has been noted for captive Brown Teal *Anas aucklandica chlorotis* (J. Kear, pers. comm.)

These observations suggest the interesting possibility that the evolution of male parental care in Ringed Teal is part of a strategy to increase individual fitness by raising more than one brood per breeding season. If paternal care increases the survival of two broods or allows two broods to be raised during a limited breeding season, males that provide effective care would have higher reproductive success and should also be preferred as mates by females. The performance of distraction displays and defense of ducklings by males suggest that ducklings are subject to significant levels of predation and that male defense and vigilance may contribute in an important or necessary way to the survival of the first and subsequent broods. Although it has been suggested that Ringed Teal have an extended breeding season in the wild (Weller 1968, Johnsgard 1978), it is not known if individuals could successfully complete two breeding attempts without overlapping the rearing of the first brood with the incubation of the second.

Male Chestnut Teal (Norman & McKinney 1987), Chiloe Wigeon (pers. observ.), and Maned Duck (Kingsford 1986) have been noted to continue caring for ducklings when their mates disappeared in wild populations. In this study, however, the pair-bond was still intact and the female continued to provide care to the ducklings when she was present. The Ringed Teal strategy seems to be clearly different because two broods are raised, and male parental behaviour is probably favoured by factors other than high female mortality. Studies of Ringed Teal in the wild are needed to determine whether double-brooding occurs, if the first and second broods overlap, if predation on first broods is a strong selective factor, and in what ways males contribute to the survival of their young.

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