The hand rearing of young Blue Duck

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Introduction

The Blue Duck *Hymenolaimus malacorhynchos* of New Zealand is an isolated species of uncertain affinities and is still largely unstudied, both in captivity and in the wild. It lives in fast-moving mountain streams, is apparently insectivorous, territorial, and has a long pair-bond (the male sharing the care of the young), all unusual features in the dabbling ducks with which it is generally classified.

In September 1968 a request was made by the Wildfowl Trust to collect eggs from the wild so that ducklings could be hand-reared and later shipped to England. Permission was granted and a clutch of four was taken from near the Hopuruahine River, North Island, on 25th November. They were successfully incubated by a bantam hen and hatched a month later.

This paper deals with the development of the Blue Ducks to one year of age. Aspects of the species' ecology and sexual behaviour will be considered in other publications.

The attempt to propagate the species in captivity was a sad failure. One male duckling died at eight days and the other at seven months. The females succumbed within a few days of each other at one year old. However, valuable knowledge was gained and it is fortunate that, as the clutch would have been destroyed by a flood that swept the nest-site away, nothing was lost from the wild population.

Downy young

Of the published descriptions of the young of Blue Ducks, only that of Potts (1870) is full and accurate. Later accounts (Delacour 1956; Johnsgard 1965) erroneously state that the ducklings lack the dorsal spotting typical of many anatid species, and the illustrations in Phillips (1926) and Delacour (1956) are incorrect for the same reason. Scott (1958) had, however, noted the 'curious golden brown spot on either side of the back' of young Blue Ducks in the wild.

The following description is an amplification of Potts' (1870):

> Bill, greyish-blue lightest on the lower mandible and rosy at the tip; membranous appendage, slaty black, well overlapping the lower mandible, basal part of both mandibles furnished with interlocking lamellae. Iris, dark brown. Legs and feet, yellowish-brown with pale digits and darker joints and webs.
>
> Body, upper surface dark grey, suffused with metallic green sheen brightest on the back. Cheeks and under surface, white with a dark stripe through the eye; a vertical dark line joins the eye-stripe to the crown. Wings, dark except for a white line where the secondaries will appear. A dark band runs along the upper thighs to the heel. Tail, rather long and greenish above with, at each side, a chestnut dorsal spot; under-tail chestnut.

The predominantly green, white and chestnut colour of these ducklings is probably unique and is certainly startling. In many respects, however, their patterning resembles that of the downies of other dabbling and perching ducks (see Figure 1). The vertical dark stripe from the eye to the crown is unusual and found otherwise only in Black-headed Ducks *Heteronetta atricapilla* (Weller 1968) and Torrent Ducks *Merganetta* (Johnsgard 1966), the taxonomic positions of which are also somewhat problematical.

Sexual dimorphism of the ducklings

The young birds were sexed, by cloacal examination, and given numbered web-tags at 11 days. It was noted subsequently that the colour of the dorsal spots differed in the sexes. In the two males, the spots were a uniform dark chestnut, while in the females the down was mainly pale fawn with only a few chestnut plumules. This variability was not seen at hatching and indeed does not clearly indicate the sex of the skin of a day-old duckling in the Wildfowl Trust Museum. However, photographs of the live birds at seven days show the difference quite distinctly and a colour picture of wild ducklings reveals the same dimorphism. Further material is obviously required. This feature as an indicator of sex appears to be unique, but has probably never been looked for in other waterfowl, where in any case it would hardly be obvious as the spots are normally pale, like the underparts.

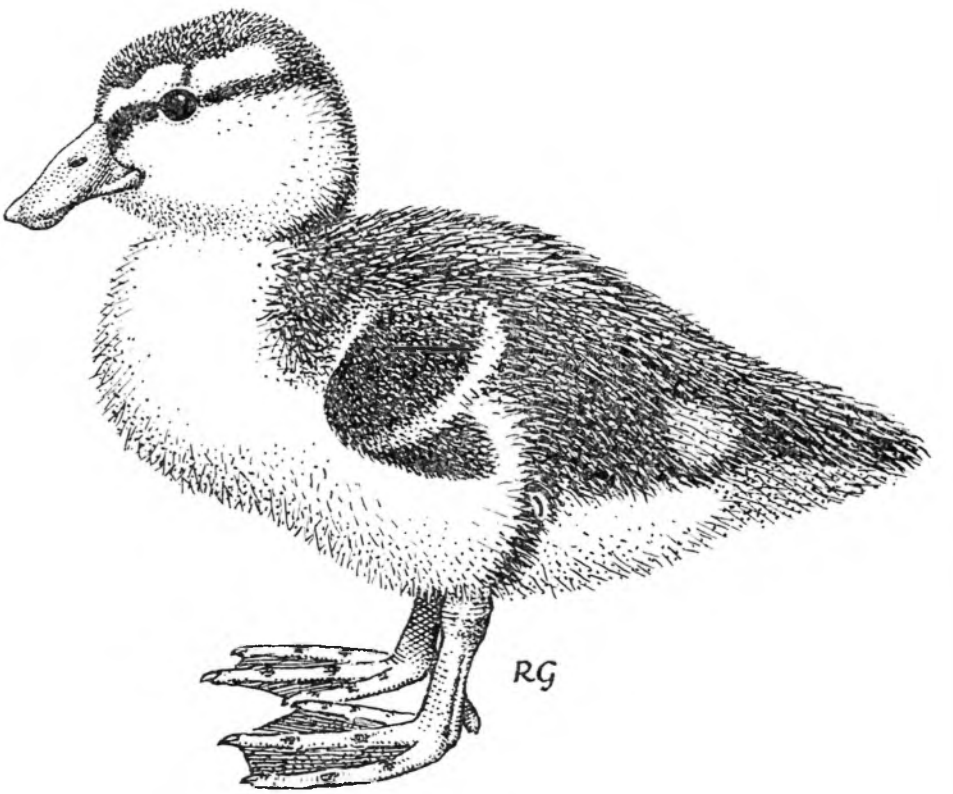

Figure 1. Downy young of the Blue Duck.

Table I. Feather growth in young Blue Duck.

Age in days	
24	Scapular feathers out of sheaths, but still beneath down.
26	Scapulars, underwing coverts and tail feathers showing through down.
29-31	Secondaries out of sheaths.
32	Feathering on face.
33	Crown of head well feathered.
36	Primaries out of sheaths. Belly almost completely feathered.
41	Head, neck and body nearly fully feathered. Down remaining on mid-back, lower neck and flanks. Primaries and secondaries not yet visible between the wing coverts.
46	Down visible only on mid-back.
48	Secondaries appearing from wing coverts. Dorsal spots losing definition.
56	Considered fully feathered, although traces of down could still be found at 97 days. Wings short, primaries barely longer than inner secondaries.
70-77	First flights.

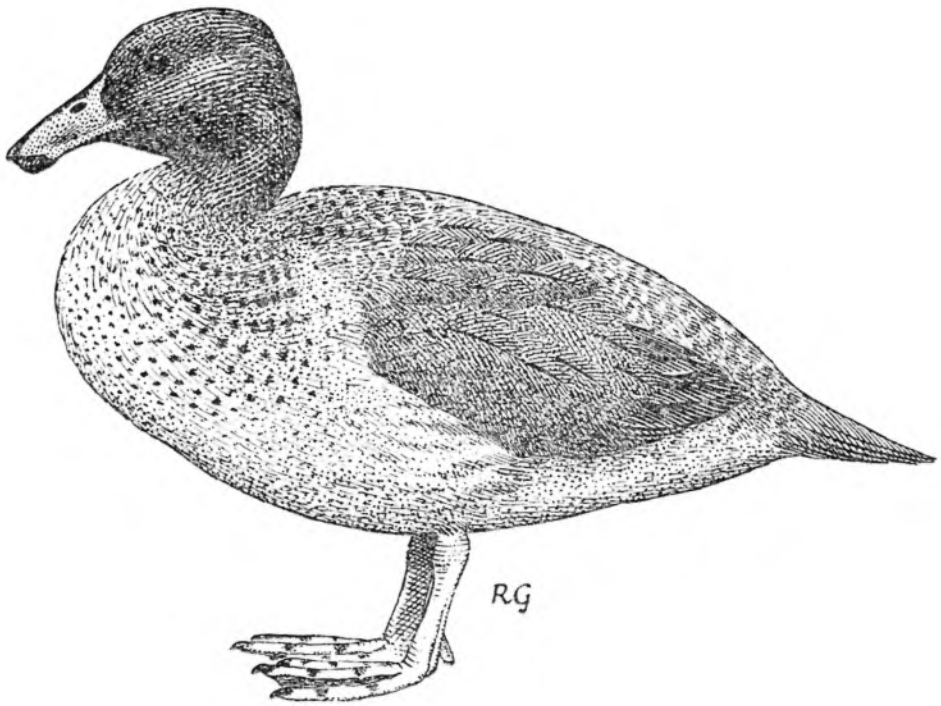

Figure 2. Juvenile Blue Duck in first plumage.

Feathering

The first contour feathers were noticed breaking from their sheaths beneath the down at 24 days. Table I shows the stages of feather growth. The juvenile first plumage (see Figure 2), which lasted from 8 to 20 weeks, was lead grey, with brownish shading on the wing coverts and heavy dark brown spotting on breast and shoulders. The undertail coverts were ginger, but otherwise the chestnut patterning of the adult was absent. The bill was light blue-grey, with a dark grey band from the culmen to the nail, and the eyes were dark brown.

At six months, full adult plumage had been attained; the bill was turning white and the iris distinctly yellow. At one year, the eyes were as golden as those of the adult, but the dark streak along the bill was still not completely eliminated (see Plate XIIa facing p. 97).

In July, a single adult male in the Slimbridge collection, and the two juvenile females, all moulted their wing feathers. The young birds were now only six to seven months old and it seems possible that in New Zealand the first change of flight feathers would have occurred not at this stage, but when the ducks

were a year old—the normal age for temperate species. This suspected change in wing-moult pattern after a shift from one hemisphere to the other poses the question whether adult plumage may also have been acquired earlier than usual. Observation in the natural habitat will confirm or deny this interesting possibility.

The rate of feather growth is slow in comparison with temperate dabbling ducks from higher latitudes. Flight in the Mallard *Anas platyrhynchos*, for instance, is achieved between 49 and 56 days (Scott and Boyd 1953). In waterfowl, a long fledging period has a tendency to be correlated with a long incubation period (Lack 1968). Thus the Mallard has an incubation period of 27-28 days (Ogilvie 1964) and the Blue Duck of 31-32 days (Kear unpublished), making it one of the longest among dabbling ducks.

Changes in body weight and linear measurements

Until they were nine weeks old, the young birds were weighed almost daily. Immediately upon arrival at Slimbridge they were placed in quarantine and could not be handled again until they were 14 weeks old. Subsequently, a single female was weighed when she was moved to another aviary. Table II shows average body weight at weekly intervals, and Figure 3

Table II. Average weight in grams of Blue Duck.

Age (weeks)	*Males*	*Females*
Hatching	49	48
1	66*	73
2	142	143
3	246	241
4	368	346
5	450	438
6	519	519
7	612	582
8	677	619
9	708	623
14	805	710*
23	—	742
Adult	887 range 753-1,077 (8 birds)	750 range 680-850 (5 birds)

* 2 birds until this age, 1 thereafter.

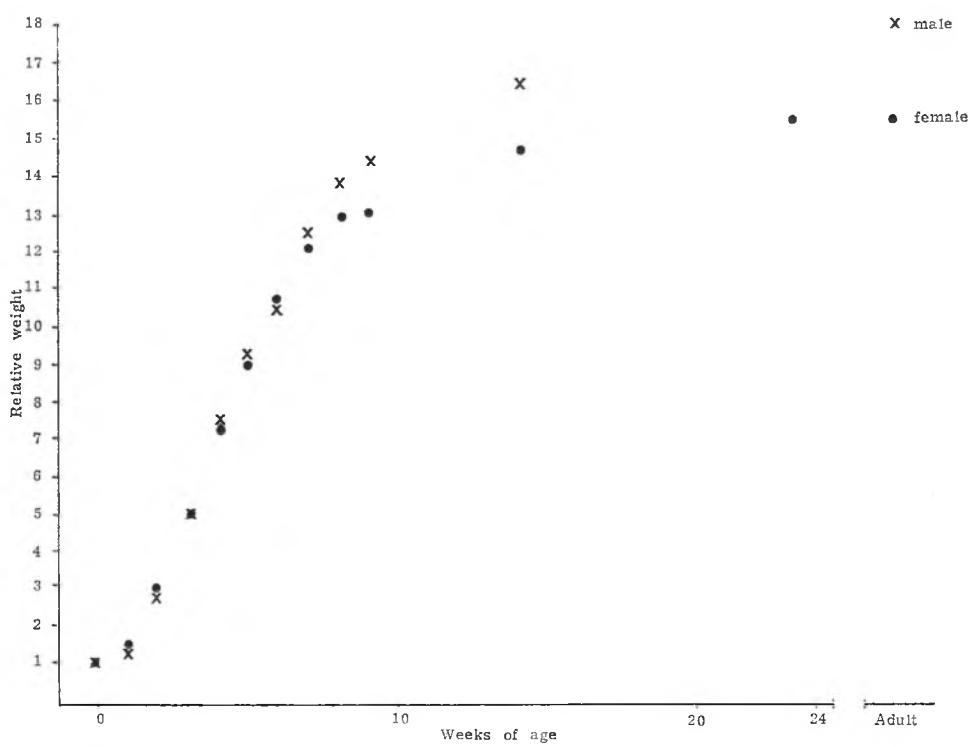

Figure 3. Relative growth curve of Blue Ducks (hatching weight equivalent to 1.0).

shows the relative growth curve, with hatching weights adjusted to 1.0. Adult weights are from Kear (unpublished).

At hatching Blue Ducklings are larger than young Mallard, which weigh about 35 gm. (Kear 1965), although adult Blue Duck average some 200 gm. lighter. This phenomenon of relatively large eggs and young is general among New Zealand waterfowl. The growth curve is, however, less steep than that recorded from higher latitude ducks, such as the Mallard (Southwick 1953) or the Tufted Duck *Aythya fuligula* (Kear 1970)—another feature common in New Zealand ducks.

Apart from the bill length, very few linear measurements were made because of the danger to the birds of prolonged handling. Some are given in Table III. As far as these go, they indicate that, except in weight, the birds are almost full-size at 14 weeks. Certainly the leg in many waterfowl develops quickly, presumably an adaptation to life on fast flowing water. Weller (1957), Dzubin (1959) and Kear (1970) all found that in diving *Aythya* species, the tarsus reaches full length between six and eight weeks.

Changes in the length of the bill (exposed culmen) are shown in Table IV. These data suggest that growth is rapid to 63 days but relatively little occurs after that, although the culmen does lengthen slightly after the flying stage is reached. Similar curves for bill growth are found in other ducks (Weller 1957; Dzubin 1959).

Table III. Average measurements in millimetres of Blue Duck.

	Hatching	*1 week*	*14 weeks*		*Adult*	
			♂	♀	♂	♀
Head (bill tip to back of skull)	44.2	48.0	91.4	84.8	91.7(4)	86.2(6)
Tarsus length	23.3	25.8	50.7	47.5	49.8(4)	47.0(4)
Tarsus thickness	1.8	2.2	4.6	4.6	4.8(4)	4.7(5)
Wing	—	—	225	215	233(4)	217(3)

Table IV. Culmen length in millimetres of Blue Duck.

Age in days	♂	*Not sexed*	♀
hatching		15.3	
8		18.3	
17		24.7	
22	28.2		28.0
28	31.0		30.0
35	34.0		33.4
42	36.1		35.4
49	38.5		36.3
56	40.0		38.3
63	41.6		39.1
97	43.4		39.7
adults	44.0		40.8
range	42.3-45.1 (4 birds)		range 40.3-41.6 (6 birds)

Feeding

Persuading the ducklings to feed was no problem and they started gaining weight during their third day. Like other young dabbling and perching ducks, they initially pecked at small objects nearby and especially at shiny green and yellow objects which moved. The facial stripes, obscuring and protecting the small shining eyes, and pale bill tip, contrasting and attractive, both suggest a pecking habit.

For the first ten days the birds were given a turkey-starter meal, sieved egg-yolk, duckweed *Lemna* sp., chopped earthworms *Eisenia* or *Allolobophora* sp., maggots, flies, woodlice *Porcellio* sp., chopped bivalve molluscs *Amphidesma* sp., and quartz grit. From 16 days their diet consisted of earthworms (about 20 a day each until they were 30 days old), starwort *Callitriche* sp., and chick-starter 'Niblets' (a commercial meal in crumb form).

Live food was preferred but good quantities of 'Niblets' were taken, especially as the birds grew. As well as pecking, they used various other feeding methods. They 'burrowed' a great deal, even at two days old, pushing the bill into crevices (in the lawn, for instance, or under stones, or between human toes) and moving it

rapidly from side to side. Woodlice were discovered beneath debris in this way. Maggots and other preferred titbits mixed with meal were found by pulling the bill *backwards* through the food. Items were also successfully sieved by sucking food and water in at the tip of the bill and squirting the water out at the sides of the mouth. The vacuum-cleaner action of sucking food off rocks, described by Scott for the adults, was not seen, probably because of the artificial rearing situation. At 10 days the ducklings were eating whole earthworms by picking up one end and shaking them from side to side as they slipped further down the throat. At 30 days, on the first of many subsequent occasions, the birds were seen doing a little grazing in a Mallard-like fashion. At 125 days they were first noticed diving to the bottom of their pond for food.

Other behavioural changes

The bantam proved an admirable foster-parent; she and her family did a great deal of travelling by car and plane before hatching and during the first two weeks and she never lost her calm demeanour. The ducklings imprinted well and responded to at least some of her calls. They froze at her alarm note, apparently without previous learning, but did not respond initially to her feeding clucks, although they were associating these with food by 16 days of age. By the fifth week the hen was losing interest and on the 44th day was seen attacking them, so was removed.

As might be expected in a species evolved in a land without indigenous mammals (except seals and bats), the ducklings were relatively tame and readily accepted the presence of human beings. Indeed, they soon learnt that people were very efficient providers of food, took many titbits from fingers and, on excursions to look for woodlice, followed the humans more closely than their foster-mother. They remained tame and frequently called to and approached visitors at Slimbridge. Their lack of fear was not absolute, however, and they were still freezing at sudden sounds at three weeks of age. On the 21st day their reaction to a stuffed and mounted Stoat *Mustela erminea* was tested (the hen having been removed). The effect was immediate and they rushed to the end of their coop in an apparently alarmed condition. Adult Blue Ducks in captivity show little response to this mammal (which was unfortunately introduced into New Zealand in 1885) and it may be a serious predator of the species in some places in the wild. On the 26th day, the sight of a visitor in a bright orange frock again apparently panicked the birds, which rushed into their coop and did not emerge until the woman had left.

The ducklings themselves were a close-knit group up to the time they were separated into pairs, in adult plumage, at 23 weeks. Aggressive action was never obvious. They did a great deal of nibbling at each other's heads and faces and were still sleeping touching each other at 10 weeks (a behaviour that normally ceases at fledging).

The voice of the young birds was typical of those of dabbling ducks (Kear 1968, and unpublished). The contact call was a rapid two- or three-syllable sound and the distress call consisted of slower notes, resonating at a higher frequency. No trills were heard, but a slurred sleepy call was given rarely, when the ducklings were under the hen at night. At 33 days the voice was starting to change, that of the females becoming more guttural. The rasping quack of the adult female was obvious at 10 weeks, at a time when the drake was still contact calling, but by 14 weeks a clear whistle was his normal greeting. As Phillips (1926) surmised, Buller (1882) was incorrect in attributing the whistle to the female, a misconception still apparent 80 years later (Child 1961).

A good part of the ducklings' day was spent preening and oiling their down and feathers, and the appearance of the various comfort movements corresponded almost exactly with that described for the Mallard by McKinney (1965). 'Dashing and diving' in water, which in Mallard appears at 13 or 14 days, was first noted in the Blue Ducks at 16 days, so it is possible that development was slightly slower at this age.

At walking, running and swimming the Blue Ducklings were as adept as any waterfowl, at jumping and climbing they were superior to most dabbling ducks. They climbed using their chins rather than their toes as perching ducks do, indeed their claws were not especially sharp. By six days they were jumping five or six inches straight up and at ten days, nine inches. In jumping, their chestnut under-tails became particularly obvious, and it seems likely that both their leaping abilities, and the flash of colour as they moved, have adaptive value in the wild where they must negotiate rock-strewn pools, their cries often

drowned by the thundering water around them.

Acknowledgements

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The drawings of the downy young and the juvenile bird were prepared by Robert Gillmor.

Summary

This paper deals with the captive rearing of a brood of Blue Duck *Hymenolaimus malacorhynchos* in New Zealand and England. The duckling is not without dorsal spots as has been previously stated and, indeed, a possible sex-linked colour difference in these structures was discovered. Development in feathering, weight and bill length was slower than in ducks which breed at higher latitudes. Feeding, preening, vocalization, locomotion and social behaviour are described. Excellent jumping abilities and the vivid undertail colouring are considered adaptive to the wild situation.

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