

# A DESCRIPTION OF THE MADAGASCAR TEAL *ANAS BERNIERI* AND AN EXAMINATION OF ITS RELATIONSHIPS WITH THE GREY TEAL *A. GRACILIS*

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*The Madagascar Teal is one of the least known of all ducks. Recent studies, and the capture of live adults for a captive breeding programme, have allowed the first accurate description of the species and analysis of morphological and genetic relationships with its closest relative, the Grey Teal.*

**Keywords:** *Madagascar Teal, Description, Plumage, Grey Teal, Genetic Distance, Threatened Species*

The Madagascar or Bernier's Teal *Anas bernieri* is considered to be a member of the austral teal and, in particular, a close relative of the Australasian Grey Teal *A. gracilis* (Ripley 1942, Delacour & Mayr 1945, Johnsgard 1978, Livezey 1991). The Madagascan endemic, however, is only poorly known and an accurate comparison between this and related forms has proved difficult, few wild birds having been seen and little preserved material being available (Rand 1936, Ripley 1942, Livezey 1991). The Teal has been represented rarely in publications and is often mis-drawn, eg depicted with a dark cap (Madge & Burn 1988, del Hoyo *et al.* 1992) and with wing patterns similar to the Grey Teal (Madge & Burn 1988). Delacour (1929, 1956) maintained the only captive specimen of *A. bernieri*, a female, in 1929 describing it as an erythristic, reddish brown, form of the Grey Teal.

Almost unknown for a century after its type description in 1860 (Hartlaub 1860), the Madagascar Teal was 'rediscovered' in 1969 (Andriamampianina 1976, Salvan 1970). In 1970, the first concentrations were found at lakes, notably Bemamba and Masama, near the village of Ambireny on the west coast of Madagascar (Salvan 1970, King 1978, Scott & Lubbock

1974). The live Teal was photographed at close range, for the first time in July 1988 near Ambireny (D. Halleux, *in litt.*) and the first behavioural observations were made in July and August 1992 at Bemamba (Green *et al.* 1994). The first young were observed in February 1997 at Lake Ambaratamaty, near Masoarivo (R. Lewis, *in litt.*).

In July 1993, during the west coast dry season, four male Teal were trapped at Bemamba in order to initiate a captive breeding programme at the Jersey Wildlife Preservation Trust (JWPT) (Young *et al.* 1993). These birds were photographed extensively in the hand immediately after capture, and basic measurements taken.

In July and September 1995, further Teal, comprising two males and two females, were captured at Bemamba and exported to the JWPT (Taylor *et al.*, unpublished).

The capture of these eight birds, and another male that was later released, has allowed accurate comparisons to be made between the Madagascar Teal and its near relatives. Feathers taken from one specimen and several other austral teal species have been used for the extraction of DNA to analyse further relationships between this and other austral teal.

**Table 1. Mean bill and wing measurement (mm) of Madagascar Teal *Anas bernieri* and Grey Teal *A. gracilis*.**

	MALE		FEMALE	
	<i>bernieri</i>	<i>gracilis</i> *	<i>bernieri</i>	<i>gracilis</i> *
	(n=7)	(n=10)	(n=2)	(n=7)
BILL	36 (34-40)	38 (36-40)	37.5 (36-39)	36 (34-38)
WING	209 (205-216)	208.5 (200-2150)	201 (199-203)	197 (193-202)

\* New Zealand (Marchant & Higgins 1990).

## Method

Captured Madagascar Teal were measured and extensively photographed in the field before preparation for export. All weights, taken with a 1.5 kg Pesola Balance, presented were taken at capture. One male and one female first year Grey Teal were photographed in the hand at Otorohanga, New Zealand; dimensions and weights of this species have been taken from the literature.

Genomic DNA was extracted from a single feather quill from single individuals of *A. bernieri*, Chestnut Teal *A. castanea*, Brown Teal *A. chlorotis*, Auckland Island Teal *A. aucklandica*, Campbell Island Teal *A. nesiotis* and Green-winged Teal *A. crecca* (used as an outgroup), and two individuals of *A. gracilis*. Feathers of *A. castanea*, *A. crecca* and one of *A. gracilis* were from captive birds in the U.S.A. The other *A. gracilis* feather and samples of *A. chlorotis*, *A. aucklandica* and *A. nesiotis* were from captives in New Zealand.

The entire mitochondrial ND2 gene (1041 base pairs) was amplified and sequenced for all of the samples except the New Zealand *A. gracilis* for which 523 base pairs were determined. Extractions, PCR amplifications, and sequencing reactions were completed as described in Johnson & Sorenson (*unpublished*). Primers for amplification and sequencing included L5219, L5758, H5766 and H6313. Phylogenetic relationships of these taxa were

inferred from a maximum parsimony analysis in PAUP 3.1 (Swofford 1993). Support indices (Bremer 1988; the minimum number of additional steps required in a tree without a given node) were determined for each node by finding the shortest tree(s) inconsistent with topological constraints generated by Tree Rot (Sorenson 1996).

## Results

### Description of Madagascar Teal

For comparison with Grey Teal, the description follows Marchant & Higgins (1990). Measurements and weights are presented in **Tables 1 & 2**, respectively.

### Adult

The crown, cheeks, neck and body are a soft reddish-brown. Feathers are pale-edged giving a spotted appearance to the body while longer feathers on the flanks and scapulars look scaled. The head is of uniform coloration, spotting here is very fine.

The back, rump and tail are a little darker than the body, feathers having narrow pale edges. Flight feathers are dark brown, appearing black from a distance, the speculum is glossy black with trailing edge tipped white (**Figure 1**). There is a large white area on the greater coverts. The underwing is grey with pure white

Table 2. Mean adult weights (g) of Madagascar Teal *Anas bernieri* and Grey Teal *A. gracilis*.

	MALE	FEMALE
<i>A.bernieri</i> *	382 (320-405) n=7	375 (365-385) n=2
<i>A. gracilis</i> **	524.7 (500-547) n=10	420 (376-499) n=7

\* Dry season, July-September, Lake Bemamba 1993, 1995.

\*\* New Zealand (Marchant & Higgins 1990).

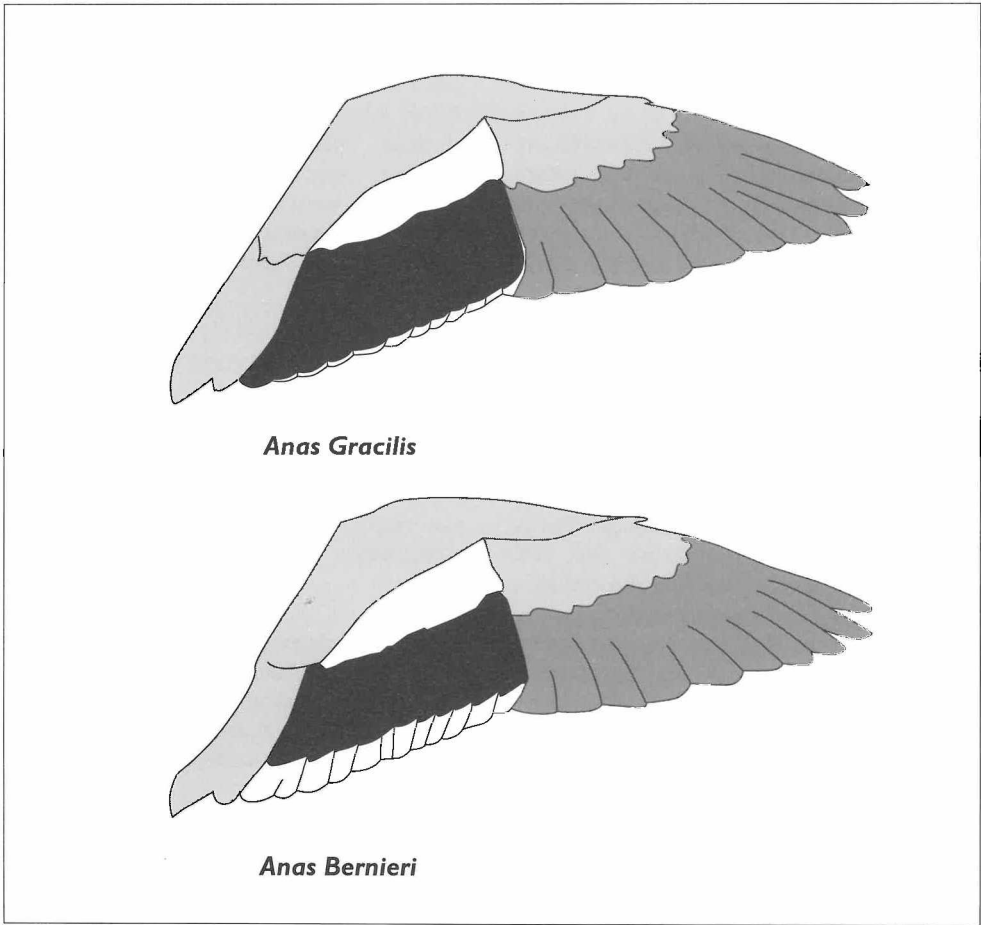


Figure 1. Upperwing pattern of the Madagascar Teal *Anas bernieri* and Grey Teal *A. gracilis*.

axillaries, the white trailing edge to the speculum remaining conspicuous (**Figure 2**). There is no white in the centre-wing (*contra* Madge & Burn (1988)).

The overall appearance, particularly if viewed from a distance, is of a uniformly plumaged, reddish-brown duck. The diagnostic black and white wing pattern is conspicuous in flight. There are no seasonal differences in plumage and sexes appear similar.

#### Juvenile

One juvenile was captured and photographed at Lake Ambaratamaty, February 1997 (R. Lewis, *in litt.*). This bird, approximately five weeks old, closely resembled the adult.

#### Bare parts

Iris is a rich chestnut in both sexes. The upper mandible is greyish pink, the nail is darker, the centre appearing black. Legs are greyish pink, not always as bright as the bill, and the webbing grey.

The bill of the juvenile is grey with flesh pink edging to the upper mandible. Eye colour is similar to the adult.

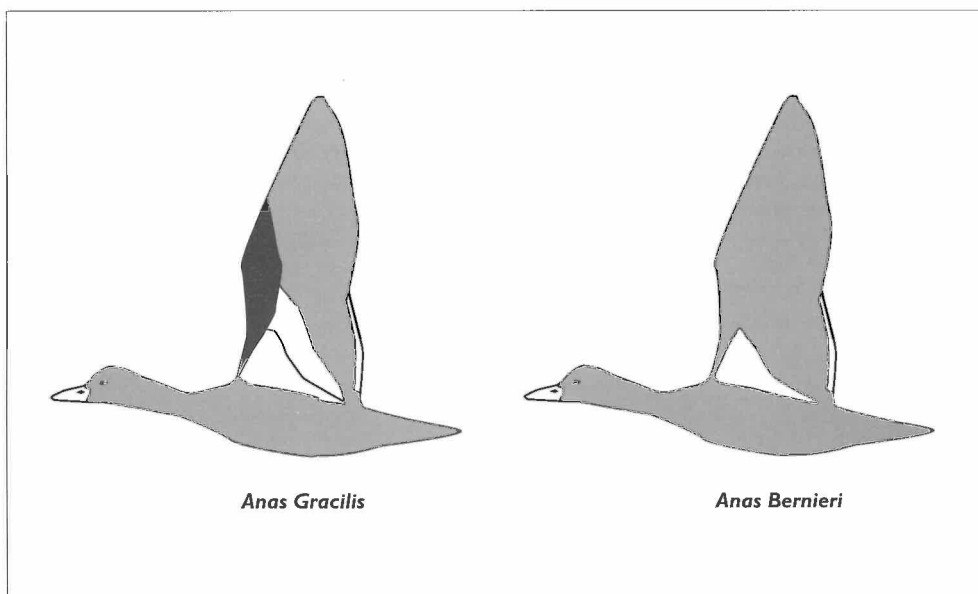
The webbing appears reduced (Young *et al.* 1993) but this may not be a significant difference.

#### Differences between sexes

There is no obvious dimorphism and sizes are similar (see **Tables 1, 2**). The slope of the forehead of the male is more acute than that of the female (**Figure 3**); however, whether this appearance is caused by skull shape, as in Sunda Teal *A. gibberifrons* (see Ripley 1942), or a product of the feathering, is not obvious. When handled, or under other stress, the difference in head shape is less obvious. Wild Grey Teal in New Zealand, sexed by behaviour and calls, showed a similar difference of head shape (H.G. Young, *pers. obs.*).

#### Genetic relationship between *A. bernieri* and *A. gracilis*

Parsimony analysis of ND2 sequences (**Figure 4**) yielded a single shortest tree of length 130 with a consistency index of 0.90. Identical sequences for *A. gracilis* and *A. castanea* (sampled from captive sources in the U.S.) is consistent with the results of Sraml *et al.* (1996), in which two wild-caught individuals of each species were sequenced and found to be identical for 309 base pairs of the mitochondrial cytochrome b gene.



**Figure 2.** Underwing patterns of Madagascar Teal *Anas bernieri* and Grey Teal *A. gracilis*.

Table 3. Percent sequence divergence between different teal taxa (Kimura 1980).

1	A. bernieri	-					
2	A. gracilis	3.9	-				
3	A. castanea	3.9	0.0	-			
4	A. aucklandica	6.0	5.9	5.9	-		
5	A. nesiotis	6.0	5.9	5.9	0.9	-	
6	A. chlorotis	5.6	5.4	5.4	0.9	1.0	-
7	A. crecca	6.6	5.8	5.8	7.5	7.4	7.2
							-

Discussion

The two teal species are similar in general appearance and size, limited data (all weights are from the dry season), however, suggest that the Madagascar Teal is not as heavy. Plumage and bare part colouring are not alike, the Grey Teal being uniformly grey with bluish-grey bill and legs, while the appearance of the Madagascar Teal supports Delacour's (1956) description of it as an erythristic form of Grey Teal. The iris, bright red in the Grey Teal (this may, however, be variable, see Lawler & Briggs 1989) is chestnut in the Madagascan species and the patterning of both the upperwing and underwing is very different and distinctive.

The genetic distances recorded between species analysed (Table 3) confirms the close relationship between *A. bernieri* and *A. gracilis*. These geographically separated species show a greater degree of divergence than the widely sympatric, yet more morphologically distinct, *A.*

*gracilis* and *A. castanea*.

Two further grey teal species not yet analysed. The Sunda Teal and the Andaman Island Teal *A. albogularis*, are considered close relatives of *A. bernieri*, *A. gracilis* and *A. castanea* (examination of the plumage of captive Sunda Teal has shown wing patterns almost identical to the Grey Teal). The widely dispersed grey teals are obviously relatively distinct from the brown teals of New Zealand and sub-antarctic islands *A. chlorotis*, *A. aucklandica* and *A. nesiotis*; however, the monophyly of the austral teal has not been tested thoroughly and would require further outgroups.

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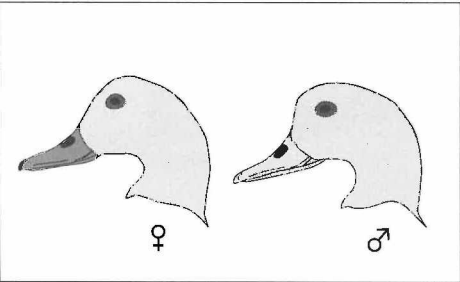
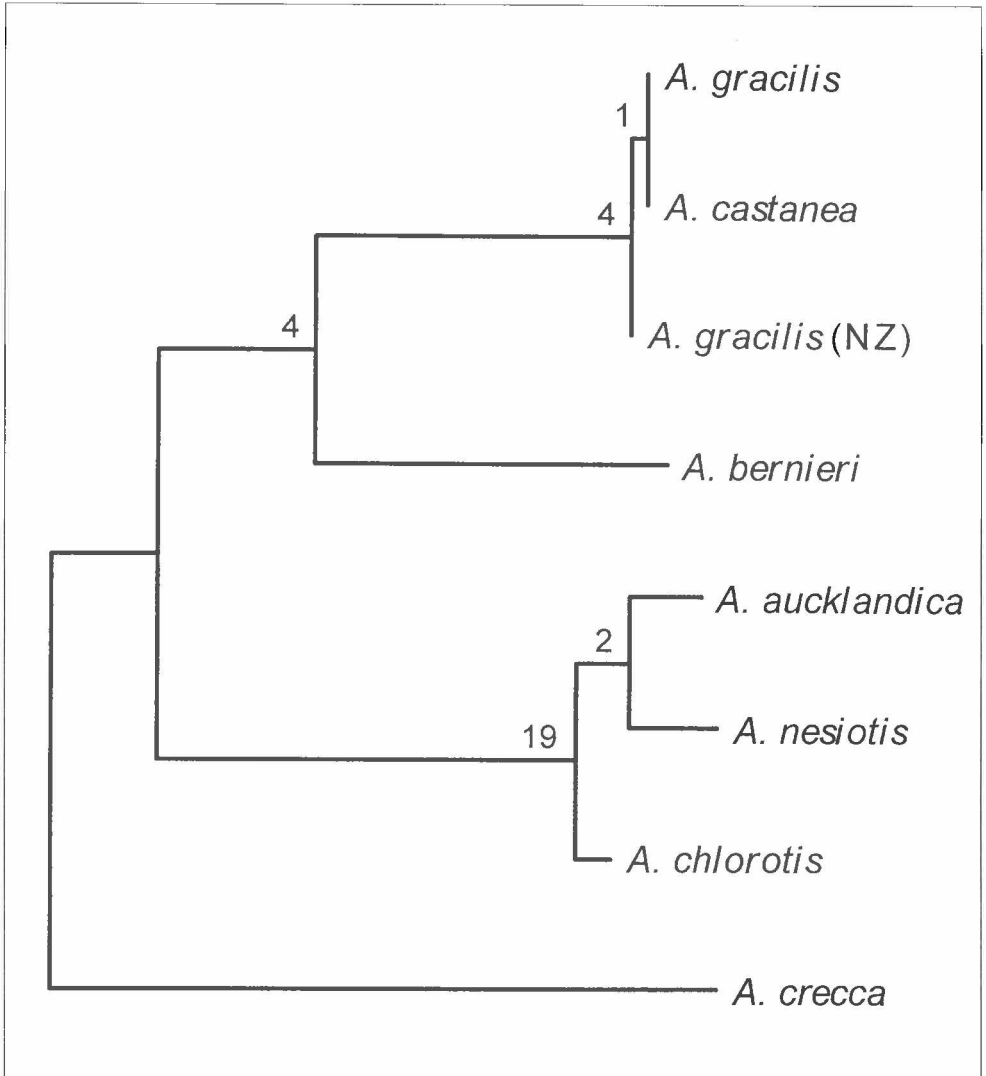


Figure 3. Head shape of male and female Madagascar Teal *Anas bernieri*.



**Figure 4.** Single most parsimonious tree relating mitochondrial ND2 sequences for austral teal. Tree rooted with *Anas crecca* as outgroup. Branch lengths are proportional to the number of changes inferred along each branch. Support indices (the number of additional steps in the shortest tree(s) without given node) are shown above each node (Bremer 1988).

#### References

- Andriamampianina, J. 1976. Madagascar. In: Smart, M. (Ed.). *Proceedings International Conference on the Conservation of Wetlands and Waterfowl, Heiligenhafen, Federal Republic of Germany, 2-6 December 1974*. IWRB, Slimbridge: 125-126.
- Bremer, K. 1988. The limits of amino acid sequence data in angiosperm phylogenetic reconstruction. *Evolution* 42:795-803.
- Delacour, J. 1929. Bird notes from Cleres. *Avicult. Mag.* 7:2:24-27.

- Delacour, J. 1956. *The Waterfowl of the World 2. Country Life*, London.
- Delacour, J. & Mayr, E. 1945. The family Anatidae. *Wilson Bull.* 57:4-54.
- del Hoyo, J., Elliot, A. & Sargatal, J. (Eds.). 1992. *Handbook of the Birds of the World*, Vol. 1. Lynx Edicions, Barcelona.
- Green, A.J., Young, H.G., Rabarisoa, R.G.M., Ravonjariisoa, P. & Andrianarimisa, A. 1994. The dry season diurnal behaviour of Madagascar Teal *Anas bernieri* at Lake Bemamba. *Wildfowl* 45:124-133.
- Hartlaub, G. 1860. Systematische Uebersicht de Vogel Madagascars. *Journ. F. Ornith.* 8:173.
- Johnsgard, P.A. 1978. *Ducks, Geese and Swans of the World*. Nebraska University Press, Lincoln.
- Kimura, M. 1980. A simple method for estimating evolutionary rate of substitutions through comparative studies of nucleotide sequences. *J. Mol. Evol.* 17:111-120.
- King, W.B. 1978. *Red Data Book*, 2. Aves. IUCN, Morges.
- Lawler, W.G. & Briggs, S.V. 1989. Eye colour in Grey Teal. *Corella* 13(3):86-87.
- Livezey, B.C. 1991. A phylogenetic analysis and classification of recent dabbling ducks (tribe Anatini) based on comparative morphology. *Auk* 108:471-507.
- Madge, S. & Burn, H. 1988. *Wildfowl: An Identification Guide to the Ducks, Geese and Swans of the World*. Christopher Helm, London.
- Marchant, S. & Higgins, P.J. 1990. *Handbook of Australian, New Zealand and Antarctic Birds*. Vol 1:Part B. Oxford University Press.
- Rand, A.L. 1936. The distribution and habits of Madagascar birds, summary of field notes on the Mission Zoologique Franco-Anglo-Américaine à Madagascar. *Bull. Am. Mus. Nat. Hist.* 72:143-499.
- Ripley, S.D. 1942. A review of the species *Anas castanea*. *Auk* 59:90-99.
- Salvan, J. 1970. Remarques sur l'évolution de l'avifauna malgache depuis 1945. *Alauda* 38:191-203.
- Scott, D. & Lubbock, J. 1974. Preliminary observations on waterfowl in Western Madagascar. *Wildfowl* 25:117-120.
- Sorenson, M.D. 1996. *TreeRot*. University of Michigan Press, Ann Arbor.
- Sraml, M., Christidis, L. & Collet, C. 1996. Molecular relationships within Australian waterfowl (Anseriformes). *Australian J. Zool.* 44:47-58.
- Swofford, D.L. 1993. *PAUP:Phylogenetic Analysis Using Parsimony. Version 3.1*. Illinois Natural History Survey, Champaign, Illinois.
- Young, H.G., Safford, R., Green, A., Ravonjariisoa, P. & Rabarisoa, R.G.M. 1993. Survey and capture of the Madagascar Teal *Anas bernieri* at Lac Bemamba, Madagascar July-August 1992, July 1993. *Dodo J. Jersey Wildl. Preserv. Trust* 29:77-94.