GONAD MEASUREMENTS AND OTHER PARAMETERS FROM CHESTNUT TEAL *ANAS CASTANEA* COLLECTED IN THE GIPPSLAND LAKES REGION, VICTORIA

There is little information available regarding the timing or extent of the breeding season in Chestnut Teal *Anas castanea*. A recent reviewer, recognising the paucity of detail, suggested that the species might show regional differences in the timing of breeding though the season itself was considered basically regular (Frith 1982). This note presents some details of gonad measurements and other parameters from birds collected in the Gippsland Lakes region of Victoria between July 1971 and July 1973.

The study area has been described elsewhere (Norman & Mumford 1982): rainfall totals used below are from the East Sale meteorological station (38°06′S, 147°08′E), some 5 km from Lake Wellington. The Teal were collected on or around Lake Wellington (N = 69), near Lake Reeve (43) and on Sale Common (6). Sampling was attempted at approximately four-weekly intervals. Birds were shot and injected in the abdominal cavity with 10% formal saline; gonads were later removed and stored. Testes were roll-dried on filter paper, weighed and measured; sections were prepared (5-8μ) and stained using haematoxylin and eosin. Stages of spermatogenesis were assigned to each testis (left testes examined, right when left damaged) following Braithwaite & Frith (1969), and the maximum diameters of five seminiferous tubules were obtained using a calibrated microscope-eyepiece. The diameters of the five largest ovarian follicles were measured using dial calipers. Body weights were taken from each undamaged bird, which was sexed and aged using cloacal and plumage characteristics. Most birds were also examined for the presence of moult using the RAOU system, and wing wear was scored following Braithwaite & Norman (1974). Food details included here are from gizzards of individual birds examined during the previous study. Except where indicated, Student's *t*-tests and correlation coefficients have been used below and significance levels of 0.05 accepted. Only Teal classified as adults are considered below.

Average tubule diameters for adult male Chestnut Teal collected during each visit are shown in Figure 1, and are compared with monthly rainfall totals at E. Sale during the study period. The data do not show an obvious, regular cycle. Indeed, though tubule diameters were high at the start of the program in July 1971 the decrease to December 1971 was slight. Later records were generally of smaller tubule diameters and in the period July 1972 to January 1973 reproductive activity, as demonstrated by the presence of sperm (stages 4 and 5) in testes examined, was reduced (present in 14.7% of the 34 males examined, compared with 65.4% for the 26 examined from July 1971 to January 1972). The few birds collected in June and July 1973 had spermatogenically active testes and increased tubule diameters. However, there were no significant differences between samples. Average paired weights of testes fluctuated from visit to visit, but again without displaying a marked cycle or significant differences. Weights were higher in earlier samples and then declined, a second peak was reached in September 1972 following which weights generally decreased before rising again in June 1973. Attempts to relate testes parameters with local rainfall totals, for periods of 10, 20 or 30 days preceding individual sample collections, using simple correlations were unsuccessful.

Comparison of paired testes weights with tubule diameters showed a highly significant relationship ($r = 0.860$, $p<0.001$, $N = 64$) and, as indicated in Figure 2 and Table I (which also gives details for various gonad dimensions), the more active testes were considerably heavier ($p<0.001$) and had larger tubule diameters ($p<0.001$) than testes showing minimal spermatogenesis. Correlations improved with the use of logarithmic transformations. Testes lengths also increased with testes weights (Fig. 2) and, as in other correlations, the significant relationship held for left ($r = 0.937$, $p<0.001$, $N = 61$) or right ($r = 0.928$, $p<0.001$, $N = 62$) testes. Both left and right testes lengths were significantly larger ($p<0.001$) in testes with sperm than in those that were not active. Tubule diameters also correlated significantly with increasing testes length (for left length, $r = 0.903$, $p<0.001$, $N = 58$; for right, $r = 0.837$, $p<0.001$, $N = 59$). No testis parameter showed any significant relationship with the numbers of body tracts in moult or with the proportion of animal material in gizzards, and analysis of variance failed to show relationships between wing wear and gonad measures.

Body weights of adult males (mean = 683 g, sd = 63.2, range 562-816 g, N = 67) varied between visits but there were no marked changes noted, nor were there any relationships detected between body weight and the paired testes weights, seminiferous tubule diameters or body moult. However, the birds with active testes (stages 4 and 5) had significantly lower body weights ($p<0.05$) than those that showed minimal activity (stages 1-3). Testes sizes (individual length or weight, or paired testes weights) showed a highly significant cor-

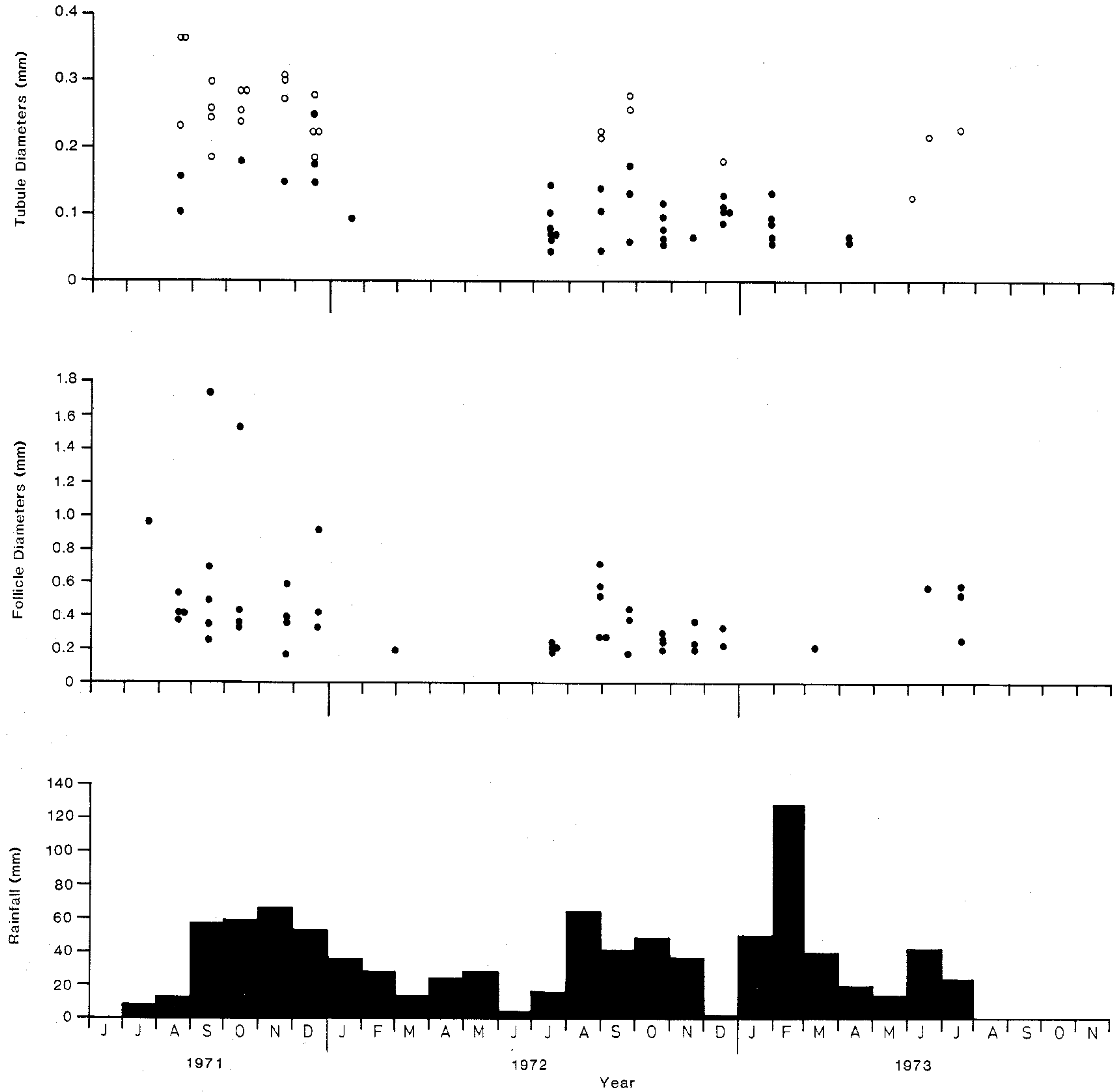

Figure 1. Seminiferous tubule diameters and ovarian follicle diameters of Chestnut Teal, Gippsland Lakes, Victoria. Spermatogenically active testes are indicated by 0. Also shown are monthly rainfall totals for East Sale.

relation with average seminiferous tubule diameters, thus providing a ready estimate of increases in tubule sizes sectioning. Woodall (1981) found the same relationship in the Redbilled Teal *A. erythrorhyncha*, and in the Chestnut Teal active testes (with sperm) were also generally distinguishable using testes weights.

Details for the diameters of ovarian follicles measured during this study are summarised in Figure 1. As in the males, no defined cycle is apparent and the variations between samples were not significant. Mean diameters were higher in September 1971 and 1972, and were generally lower thereafter. Body weights (mean = 593 g, S.D. = 146, range 505-766 g, N = 50) were also variable, displaying no significant differences between visits. However, body weight increased significantly with increases in ovarian follicle diameter ($r = 0.519$, $p<0.001$, $N = 45$). No significant relationships were

TABLE I

Comparison of gonad and other details from adult male Chestnut Teal with spermatogenically inactive and active testes.

	Inactive					Active				
	x̄	S.D.	min.	max.	N	x̄	S.D.	min.	max	N
Body weight (g)	697	62.8	569	816	39	660	62.4	562	755	24
Testis length - left (cm)	1.35	0.52	0.72	2.89	34	2.78	0.42	1.80	3.52	24
- right (cm)	1.39	0.55	0.82	3.06	35	2.62	0.47	1.64	3.55	24
Testis weight - left (g)	0.31	0.48	0.03	2.40	39	2.01	0.93	0.39	4.04	25
- right (g)	0.35	0.64	0.03	2.85	39	1.84	0.96	0.34	4.53	25
Paired testes weight (g)	0.67	1.10	0.06	5.25	39	3.86	1.77	0.72	8.57	24
Tubule diameters (mm)	0.10	0.05	0.04	0.25	39	0.25	0.06	0.12	0.36	25
Number of body tracts in moult	12.56	2.21	7.00	15.00	39	11.04	3.66	2.00	15.00	25

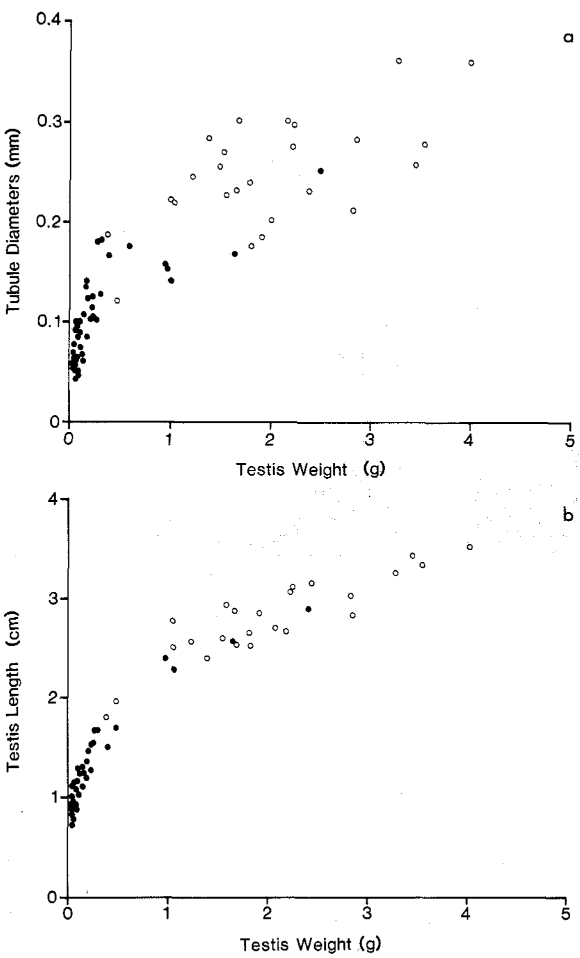

Figure 2. Interrelationships of various testes parameters: (a) left testes weights compared with tubule diameters; (b) left testes lengths compared with respective weights. Active testes are shown by open symbols.

detected between follicle diameters and wing wear, body moult or percentage of animal food, or between body weight and animal material or body moult.

Data presented here suggested that at least some male Chestnut Teal in and around the Gippsland Lakes region were capable of egg fertilisation from June to December, though not necessarily for every intervening month sampled during this study. Thus the presumptive breeding seasons in the area for the study period, June to December, incorporates that previously given by North (1901-14) as the 'usual' season, i.e. August to December. However, since the average tubule diameters, and testes weights, and the proportion of males showing sperm production were all lower in the samples collected from July to December 1972 than in those shot in the same period in 1971, there may be seasonal variation in the extent of breeding. Certainly information from nest boxes elsewhere in Victoria (Norman, unpubl.) suggest that breeding periods may be modified by local conditions, rather than regions as proposed by Frith (1982). Whilst no testes parameters showed a relationship with rainfall totals, local rain in the autumn and winter of 1972 was some 150 mm less than average, and spring rainfall almost 60 mm below average. In this regard too, numbers of Chestnut Teal at an intertidal, non-breeding habitat, Corner Inlet, increased gradually though variably from October onwards, reaching maxima from April to June (Norman 1983), a period in which it proved impossible to obtain samples around the Gippsland Lakes.

Few non-reproductive parameters measured during this study showed significant relationships. Thus though females in other *Anas* species are known to increase the intake of invertebrates in the diet (e.g. Krapu 1981; Serie & Swanson 1976) during egg formation, the proportion of animal material in the Chestnut Teal diet did not vary significantly with changes in follicle size. Perhaps this reflected the utilisation of gizzard analyses rather than oesophageal contents which are now recognised as providing a less-biased sample of the foods ingested (Swanson & Bartonek 1970). Body moult too, which was present in some tracts on most birds examined, showed no association with gonad condition. However, females with larger ovarian follicles showed significantly increased body weights, a reflection possibly of food reserves which are elevated at the onset of egg-laying (Harris 1970). In contrast, body weights of males were significantly lighter when testes showed increased spermatogenesis, perhaps a consequence of increased energy demands whilst being actively involved with courtship behaviour, brood care and pair-bond maintenance (Krapu 1981).

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