

In mid April I collected some final instar larvae at the University. They pupated in a few days and emerged by the first week of May. I observed adults on the wing in Woodlands until mid May. In Sydney the flying period is from October to April.

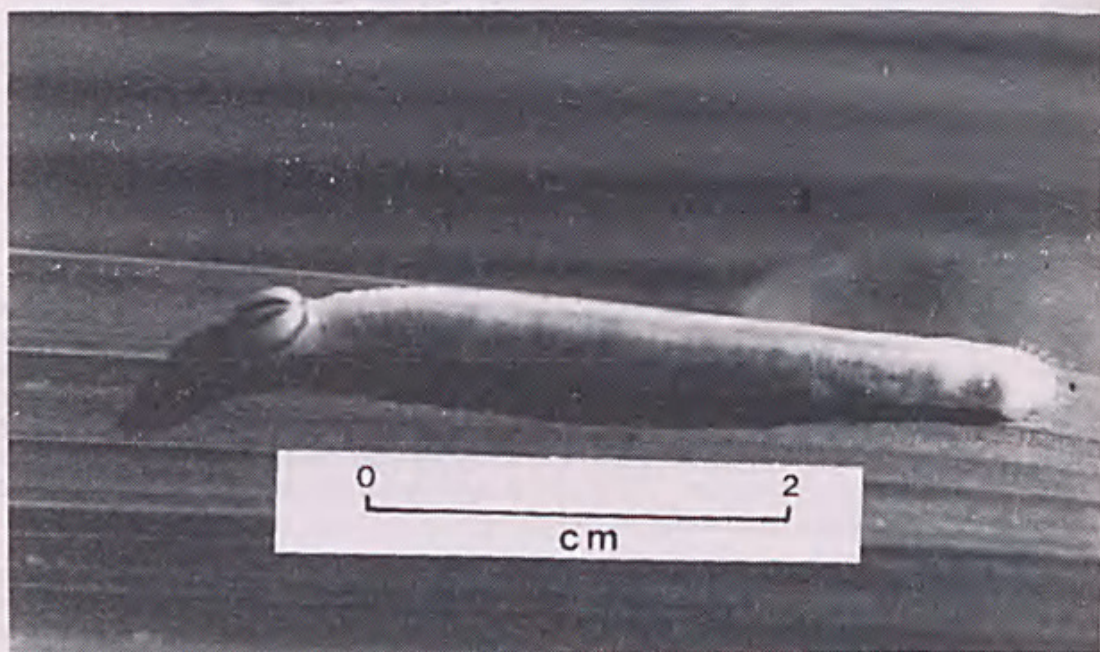


Figure 2. Larva of *Cephrenes augiades sperthias* (final instar).

It is very likely that *C. a. sperthias* was introduced to Perth on palms imported from Queensland or New South Wales by plant nurseries from which the palms would have been distributed to gardens throughout the metropolitan area.

In the South-West of Western Australia there is an indigenous representative of the sub-family Hesperinae, which is similarly marked to male Orange Palmdarts; however this form, *Taractrocera papyria agraulia* (the Western Grassdart), is much smaller and there should be no confusion. The mature larvae of Orange Palmdarts are pale bluish or greenish in colour, and construct shelters by joining adjacent palm leaves with strong strands of silk. The larvae pupate within these shelters and are surrounded by a white waxy powder.

If you find evidence that *C. augiades sperthias* occurs in your district could you please contact me at 11 Birchwood Ave., Woodlands or telephone 446 2335.

#### ACKNOWLEDGEMENT

Mr. Gordon Smith of the Botany Department of the University of Western Australia identified palms on the University Campus.

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#### EFFECTS OF UNSEASONABLE RAINS IN JANUARY 1982 ON WATERFOWL IN SOUTH-WESTERN AUSTRALIA II. RECORDS OF LATE BREEDING FROM INLAND LOCALITIES.

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#### ABSTRACT

Following heavy unseasonable rains in January 1982, records from newly flooded areas in inland south-western Australia detailed late breeding activity in Grey Teal (*Anas gibberifrons*), Pink-eared Duck (*Malacorhynchus membranaceus*) and to a much lesser extent in Pacific Black Duck (*Anas superciliosa*). Large concentrations of ducks were



observed on their normal winter breeding grounds. Duck shooters reported the widespread occurrence of Grey Teal with enlarged gonads, a characteristic indicative of waterfowl in breeding condition. Successful breeding was verified by later evidence of clutches of eggs and by several reports of broods of these species.

## INTRODUCTION

The influence of the January 1982 rains on waterfowl inhabiting summer refuges along the coastal plain, has already been discussed (Bekle, 1983). A decrease in overall bird numbers occurred in the Perth region; however, it may be shown that the responses of these several species differed. This paper examines the corresponding build-up of waterfowl in inland breeding areas, and in particular, subsequent reports of unseasonable breeding activity.

Serventy and Marshall (1957) have previously examined the physiological effects of plentiful unseasonable rains on various forms of birdlife. Their data included both field and laboratory investigation in connection with two autumn breeding episodes in south-western Australia. Serventy and Marshall showed that the gonads (i.e. testes or ovaries) of many species enlarged after cyclonic rains in March 1953 and February 1955. Accounts of unseasonable nestings supported the histological evidence of gonad response to rainfall. Similar observations of occasional autumn breeding in Western Australia include those published by Carter (1924), Serventy (1946), Carnaby (1954), Robinson (1955) and Sedgwick (1955).

For a better understanding of how the reproductive physiology of Australian waterfowl is affected by the environment, Braithwaite (1974) examined activities and processes of captive birds. Important differences were revealed in the physiological responses of Pacific Black Duck and Grey Teal to environmental stimuli. In contrast to the Pacific Black Duck, Grey Teal are not affected by daylength, but respond readily to rainfall and hydrological changes. That the Grey Teal is a highly successful opportunistic breeder, nesting whenever rainfall and rising water-levels make conditions suitable, has been recorded by other authors. Serventy and Marshall (1957) noted that the Teal's pre-egg-laying display period is considerably shortened in comparison with that of other ducks: in 1955, ten days after stimulating rains, a shelled egg was found in the oviduct of a bird at Lake Dumbleyung.

## EFFECT OF THE JANUARY 1982 RAINFALL ON WETLANDS

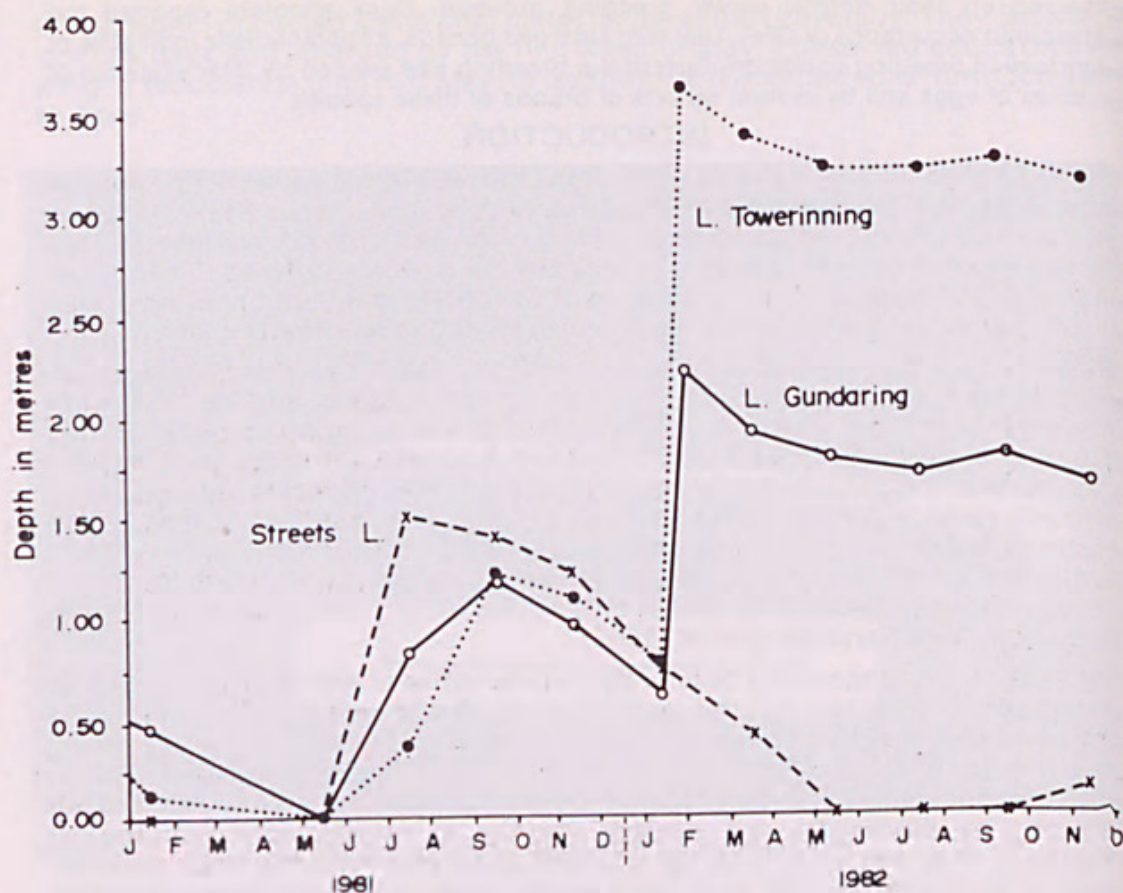
Typically, the inland wetlands of south-western Australia are shallow expanses of seasonally flooded habitat, and represent the normal winter-spring breeding grounds of many different species of waterfowl, including Grey Teal and Pacific Black Duck. The exceptionally high rainfall of January 1982 caused some areas in the lower south-west to receive more than 200 mm of rain in less than three days; this unseasonable weather pattern is described in greater detail in Bekle (1983). Due to the enormous quantity of water deposited by these January rains, extensive flooding resulted throughout most of the South Central (Agricultural) District, as defined by the Bureau of Meteorology, extending roughly between Beverley, Cranbrook and Lake Grace (locations given in Bekle, 1983).

Floodwaters subsided by early February; however the heavy runoff resulted in dramatic increases in the depth of wetlands from January to March, causing many lakes to fill or overflow. Information on lake water-levels (obtained from Lane and Munro, 1983) is used in Figure 1 to show how lakes in three widely separated areas were affected by the flooding. Lakes to the north, such as Streets Lake in Moora, did not receive significant runoff, and therefore benefited only slightly from the rains; any increase in depth was offset by high evaporation rates. Nearer to the flooding, lakes in areas such as Wagin (e.g. Lake Gundaring) — which are normally dry by January or February — were filled to depths of up to two metres or more. A much greater rise in water-level was recorded further south at Lake Towerinning (+ 2.86 metres), situated in the upper reaches of the Blackwood River catchment.

## RECORDS OF UNSEASONABLE BREEDING

The heavy rainfall and flooding caused a dispersal of waterfowl from summer refuges to revitalised wetlands. Reports from various observers indicated that ducks had re-appeared at numerous wetlands (e.g. dams, swamps, lakes and flooded river flats) in the area between Mandurah and Gnowangerup (W.A. *Bird Notes*, March 1982).





**Figure 1.** Showing the effect of heavy rainfall in January 1982 on the depths of three lakes from different locations in the south-west. Streets Lake (Moora), apparently unaffected by the rains, decreased in depth, while Lakes Gundaring (Wagin) and Towerinning (West Arthur) showed dramatic increases in water-levels. This graph was constructed by using data on lake depths, extracted from Lane and Munro (1983).

Evidence of sexual activity among waterfowl, in response to the unseasonable rains, was collected from various sources such as the Western Australian Department of Fisheries and Wildlife, but in particular, from members of the Western Australian Field and Game Association. A limited duck shooting season had been declared in the south-west of the State from 10 January to 21 February 1982; this coincidence enabled widely distributed observations by duck shooters to be collected.

Only three days after the rains, reports were received of breeding activity in Grey Teal. Upon dissection female birds were found to have enlarged ovaries, with yolk-laden follicles (up to about 20mm in diameter). In a female bird's active ovary, the cluster of pedunculated follicles in various stages of maturity (containing the germ cell or ovum), produce a characteristic "bunch of grapes" appearance to the naked eye. In the domestic hen, the whole process from ovulation till laying takes about 24 to 27 hours (Thomson, 1964); a similar length of time could be expected to apply for ducks, such as Grey Teal.

On 24 January, Grey Teal with enlarged, yellowing ovaries, were being shot on Cook's farm at Moora, and Lakes Walbyring (or Mud Hut) and Dulbinning at Narrogin. Comparatively little rain was received from 20 to 22 January at Moora (38mm) and water-levels were receding, whereas, lakes at Narrogin (150mm) were full after the rains. Limited duck shooting occurred south of Narrogin due to extensive flooding in the region. Reports of a few Grey Teal with enlarged ovaries were also received from Yealering and from the nearby upper reaches of the Avon River.

On 3 February (14 days after the rains) at a small swamp, about 18 kilometres south-west of the Arthur River townsite, Mr R. Jaensch discovered a Grey Teal nesting in the hollow of a flooded paperbark (*Melaleuca* sp.). The nest was found to contain six eggs, which possibly were a still incomplete clutch. The usual pattern for egg laying is for a bird to lay an egg each morning until the clutch is complete, but this is not invariable; in Grey Teal, clutches are from 8 to 12 in number (Serventy and Whittell, 1976).



On 7 February, reports were once again received from Cook's farm at Moora of Grey Teal with active ovaries. Wetlands between Wagin and Katanning were reported to be in full flood, and supporting huge concentrations of Grey Teal. Near Wagin at Lake Gundaring, shooters noted large flocks of Grey Teal with birds numbering in their thousands. There was no evidence of any pairing or sexual activity in that area, but a survey at Kwobrup Swamp near Katanning revealed that all Grey Teal present were paired off (*W.A. Bird Notes*, March 1982). Reports of Grey Teal with enlarged ovaries at Lake Dulbinning, were also received from Katanning. Nearby on 14 February a Grey Teal with a fully formed egg contained within the oviduct, was shot at a creek which flows into Lake Ewlymartup. A week later in the same general area, a Grey Teal egg was discovered by the water's edge. The egg was intact and still presumed to be fresh because it sank when immersed in water. Such eggs found in unlikely areas that were definitely not nest sites are known as "dump eggs". Possible explanations for these eggs include: a female bird disturbed by shooters unable to return to her nest, an inexperienced layer, or environmental conditions which no longer suited breeding.

By 21 February, which marked the end of the open season for duck shooting, no more reports of female Grey Teal with active ovaries had been received.

The Pink-eared Duck is a similar nomadic, opportunistic breeder, but is also known to breed later, preferring receding water-levels (Frith, 1967). As it is protected, direct physiological evidence of breeding following the January 1982 rains was more difficult to obtain. On 24 January, a single bird with enlarged ovaries was accidentally killed at Yealering. Two weeks later, Mr G. Pearson (Department of Fisheries and Wildlife) shot two female birds in a similar condition on the Coblinine River, near Lake Dumbleyung.

Later observations by Mr J.A.K. Lane (Department of Fisheries and Wildlife) confirmed that the breeding cycle was completed by some pairs of Grey Teal and Pink-eared Duck, and at least one pair of Pacific Black Duck. On 16 March, two families each of Grey Teal and Pink-eared Duck (two and five ducklings) were sighted at Lake Toolibin, forty kilometres east of Narrogin. Nearby, Lake Walbyring supported two more families of Grey Teal (eight and twelve ducklings).

A little farther south, where the flood-producing rains were heaviest, broods of Grey Teal, Pink-eared Duck and Pacific Black Duck were reported in April and May (*W.A. Bird Notes*, June 1982). On 10 May, several Grey Teal families with fairly large ducklings or "flappers" were seen at Lake Towerinning, west of the Arthur River (tributary of the Blackwood). A few days later, a single family each of Pink-eared Duck and Pacific Black Duck was recorded at Gnowangerup (Reserve 26264).

### CONCLUSION

It was shown in Bekle (1983) that some species left coastal wetlands in response to unseasonable precipitation in January 1982; similarly, the breeding activities of various species in inland locations also responded to these rains. There was strong evidence of physiological response and attempts at breeding by Grey Teal and Pink-eared Duck, while Pacific Black Duck showed very little reaction. This paper quoted widespread reports of Grey Teal showing signs of breeding immediately after the rains. Without a closer network of observers in the large area affected by flooding, it was not possible to be more definite about the full geographical extent of breeding.

### ACKNOWLEDGEMENT

I gratefully acknowledge the assistance received from members of the Western Australian Field and Game Association, in particular, Mr R. Motteram and Mr B. Kneebone. Mention must also go to Mr J.A.K. Lane and Mr G. Pearson (Department of Fisheries and Wildlife) and Mr R. Jaensch for use of their personal observations. Final thanks are expressed to Dr J. Gentilli for helpful discussion during the preparation of this paper, and to Dr P.H. Armstrong who also commented on the manuscript.

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#### NOTES ON REPRODUCTION IN CAPTIVE *MENETIA GREYII* (LACERTILIA: SCINCIDAE)

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*Menetia greyii* Gray is a common, litter-foraging lizard with a distribution over much of Australia. Even so, very few published data are available concerning its reproductive biology. Although the incubation periods recorded here were obtained under laboratory conditions and may not be consistent with those in the field, all other measurements should be typical. Measurements of weight were achieved using balance-scales calibrated in 0.1 grain (= .0065 gram).

On 14 December 1982 a gravid female (SVL = 32mm; weight immediately following laying = .487gm) was collected at Lort River, W.A. (33°45'S, 121°15'E) and retained until oviposition was observed on 23 December. The clutch consisted of 3 eggs of varied size and weight (see Table 1). I have recorded two clutches of 2 eggs, and a field deposition site containing 4 eggs; Jenkins and Bartell (1980) recorded four clutches of 3 eggs in the A.C.T. Therefore, 2 or 3 eggs probably constitute a typical clutch for this species. The 4 eggs uncovered in the field may be the result of two females utilizing the one site.

To avoid desiccation, the eggs were placed in a plastic container on dampened vermiculite immediately after weighing and measuring. To allow observation with minimum disturbance, 'cling wrap' was pulled tight over the top of the container. This complete unit was then placed inside an aquarium with a 60 watt incandescent lamp where temperature was monitored with a thermometer and regulated with a room-airconditioner thermostat at 28°C ± 4°.

On 24 December it was evident by their increase in breadth that all 3 eggs had absorbed moisture and were therefore fertile (my previous experience at laboratory incubation showed that infertile eggs are subject to desiccation immediately after laying). On 27 January Egg B appeared badly desiccated but was not removed. It hatched after 46 days' incubation followed five hours later by Egg C. Egg A hatched after 49 days' incubation.

Hatchlings were weighed and measured as soon as they cleared the egg-case (see Table 1). Their colour and pattern was the same as in adults.



Bekle, Hugo. 1983. "Effects of Unseasonable Rains in January 1982 on Waterfowl in South-western Australia II. Records of Late Breeding from Inland Localities." *The Western Australian Naturalist* 15(6), 126–130.

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