

QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 386

**STUDIES OF WATERFOWL (ANATIDAE) IN NORTH
QUEENSLAND. 1. INTRODUCTION, SPECIES,
DISTRIBUTION AND HABITAT**

By H. J. LAVERY, M.Sc.

SUMMARY

Ecological studies of waterfowl in tropical Queensland were undertaken from 1958 to 1964.

Fifteen of the 19 species of Anatidae indigenous to the Australian continent were sighted in north Queensland, mainly in the region between the two extremes of a limited lush wet coastal area and the widespread arid interior. Species were distributed as four groups: one common only on the coastal plains; one more common inland; one common in both regions; and one comprising vagrants in North Queensland.

Ten habitat types, each with characteristic physiographical features, provided waterfowl habitat similar to that reported from other parts of Australia; the commonest and most widely used were swamps (early in the year) and lagoons (later, as a result of the marked decrease in shallow-water areas during the prolonged annual dry season). Some species characteristically used combinations of other habitat types in the course of a year.

I. INTRODUCTION

Before 1957, publications on the ecology of native waterfowl in Queensland, which include the principal game-birds, were concerned mainly with distribution (*e.g.* MacGillivray 1914; McLennan 1917; White 1922; Thomson 1935; White 1946) and breeding (*e.g.* Campbell 1901; Barnard 1913; North 1914). Since 1958, studies of Anatidae, commenced during 1957, have been concentrated in that part of the State north of the Tropic of Capricorn, where most species had been recorded. Results will be presented in a series of papers with methods given under section headings; extension articles and subsidiary technical notes are presented separately (*e.g.* Roff and Lavery 1957; Marks and Lavery 1959; Lavery 1961*a*, 1961*b*, 1962, 1964*a*, 1964*b*, 1965*a*, 1965*b*, 1966*a*, 1966*b*, 1966*c*, 1966*d*; Lavery and Roff 1964).

II. SPECIES

Of the 19 species of Anatidae listed by Delacour (1954, 1956, 1959) as indigenous to the Australian continent, the 15 as follows were sighted in north Queensland; all except one (the chestnut teal) were taken for further study purposes.

Names used follow Delacour (1954, 1956, 1959) except the common names for the Dendrocygnini (see Lavery 1965a).

- Magpie goose (*Anseranas semipalmata* (Latham 1798))
- Grass whistling-duck (*Dendrocygna eytoni* (Eyton 1838))
- Water whistling-duck (*Dendrocygna arcuata australis* Reichenbach 1850)
- Black swan (*Cygnus atratus* (Latham 1790))
- Radjah shelduck (*Tadorna radjah rufitergum* Hartert 1905)
- Black duck (*Anas superciliosa rogersi* Mathews 1912)
- Grey teal (*Anas gibberifrons gracilis* Buller 1869)
- Chestnut teal (*Anas castanea* (Eyton 1838))
- Shoveler (*Anas rhynchos rhynchos* Latham 1801)
- Pink-eared duck (*Malacorhynchus membranaceus* (Latham 1801))
- Freckled duck (*Stictonetta naevosa* (Gould 1840))
- White-eyed duck (*Aythya australis australis* (Eyton 1838))
- Maned wood duck (*Chenonetta jubata* (Latham 1801))
- Green pygmy goose (*Nettapus pulchellus* Gould 1842)
- Australian pygmy goose (*Nettapus coromandelianus albigennis* Gould 1842)

Detailed plumage descriptions have been given by Gould (1848), Mathews (1915) and others. More recently, additional taxonomically important plumage descriptions have been provided of the downy young of the pink-eared and white-eyed ducks, and freckled duck by Firth (1955, 1964), of the magpie goose by Davies (1957) and of the Australian pygmy goose by Lavery (1964a). Delacour (1954, 1956, 1959, 1964) covered information on some other characteristics, including general distribution and habits.

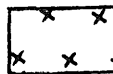
Key to Figures 1-3



Large concentrations, pairs, small flocks and isolated individuals



Pairs, small flocks and isolated individuals



Small flocks and isolated individuals

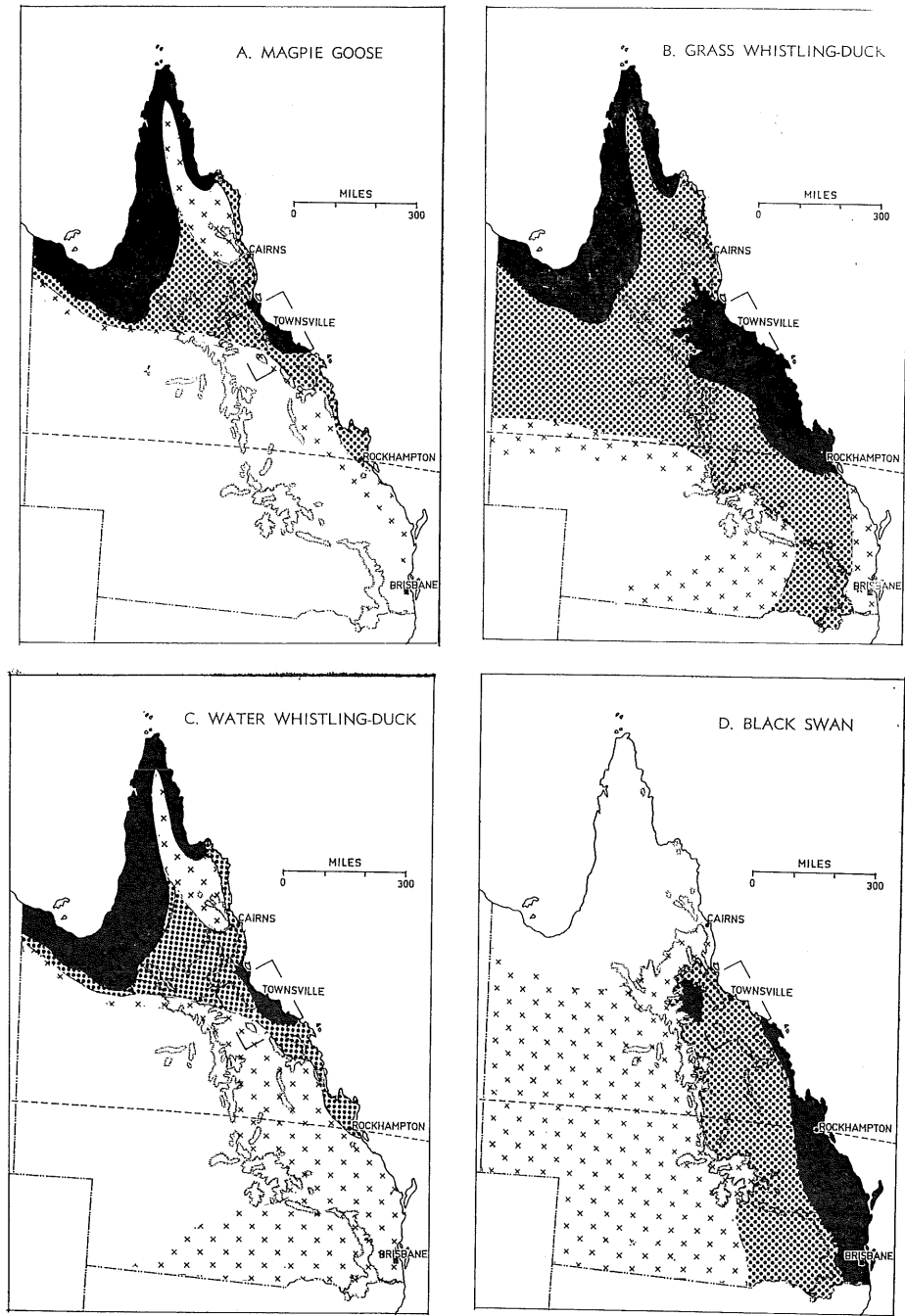


Fig. 1.—Present distribution of the magpie goose (*A. semipalmata*) grass whistling-duck (*D. eytoni*), water whistling-duck (*D. a. australis*) and black swan (*C. atratus*) in Queensland.

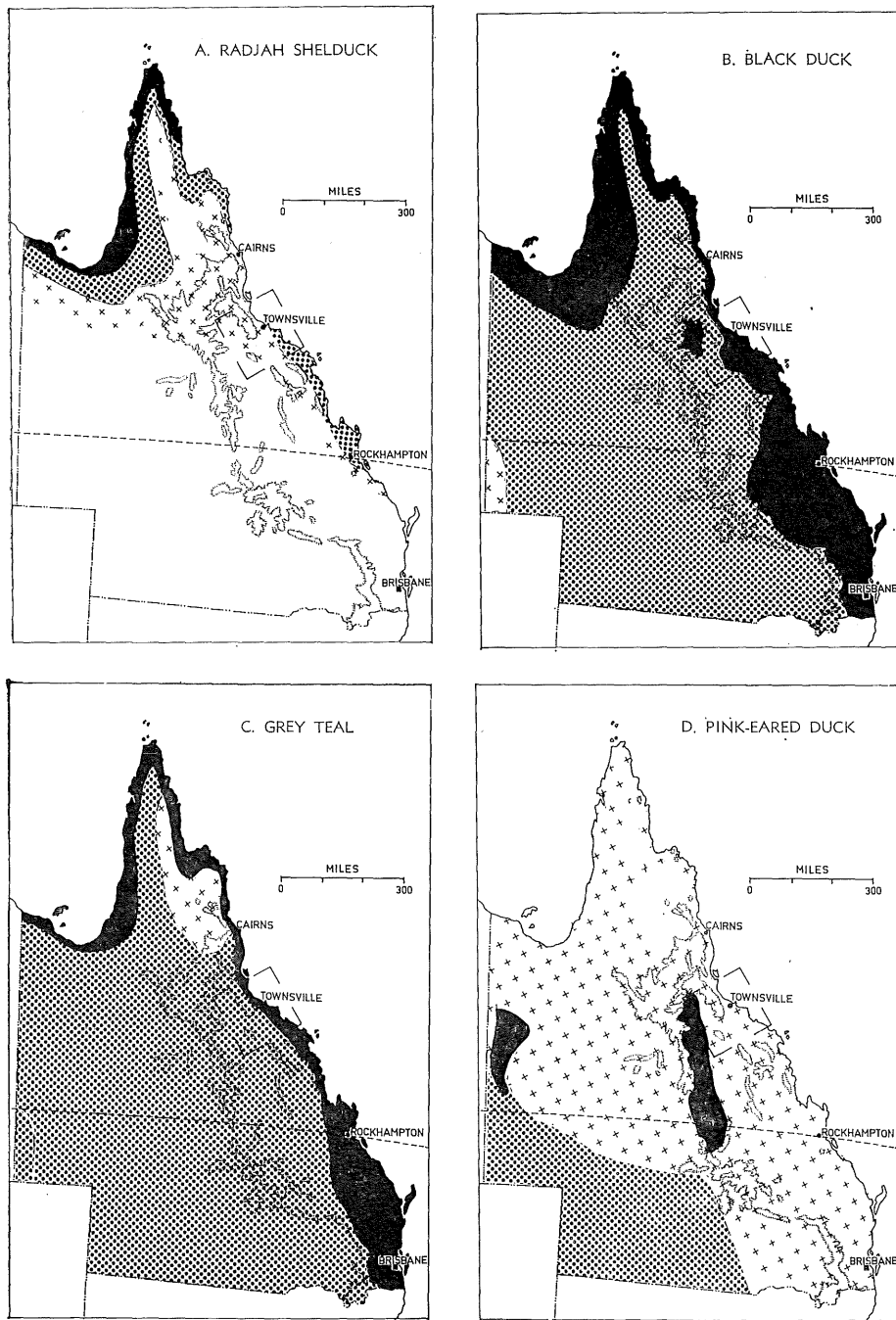


Fig. 2.—Present distribution of the radjah shelduck (*T. r. rufitergum*), black duck (*A. s. rogersi*), grey teal (*A. g. gracilis*) and pink-eared duck (*M. membranaceus*) in Queensland.

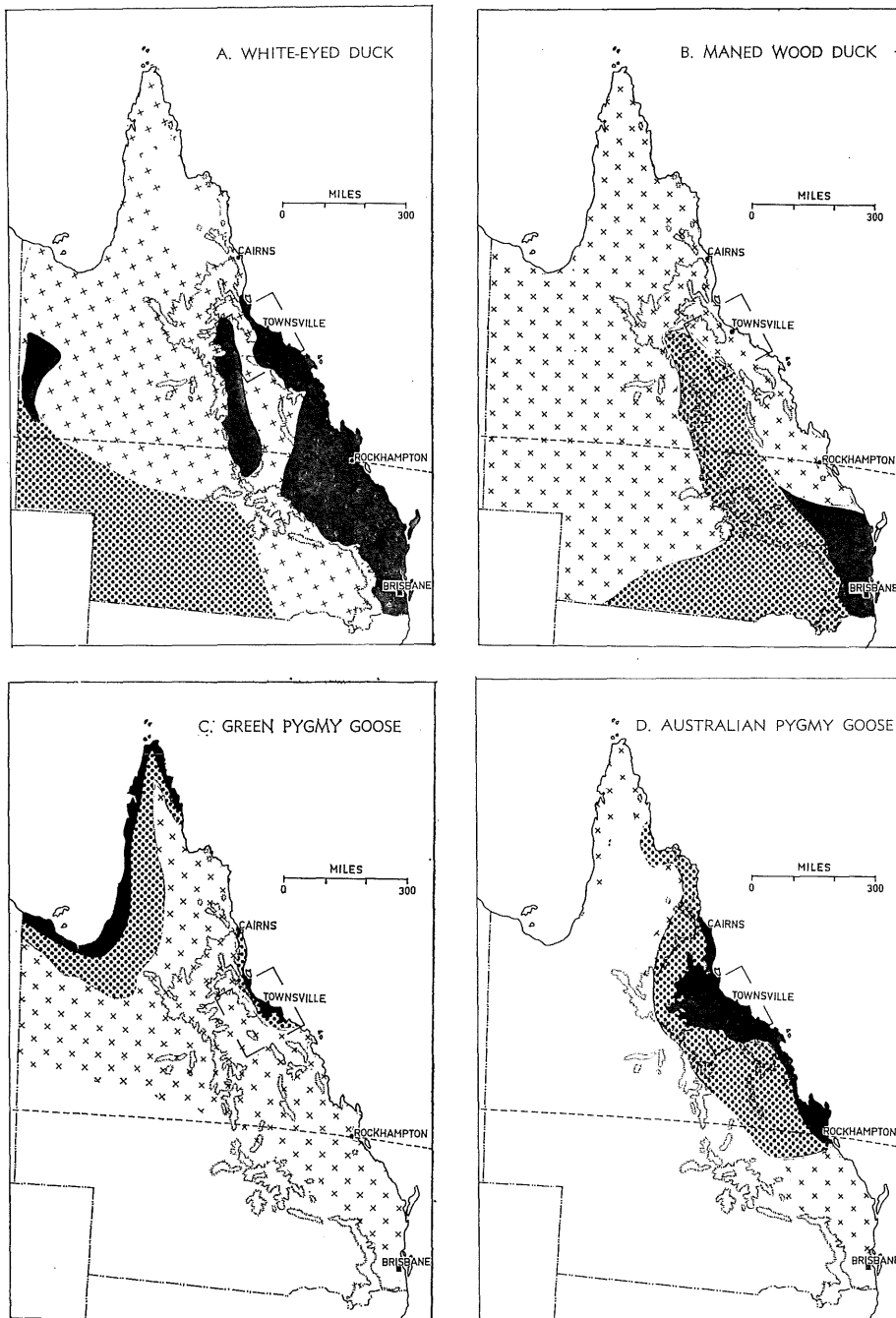


Fig. 3.—Present distribution of the white-eyed duck (*A. a. australis*), maned wood duck (*C. jubata*), green pygmy goose (*N. pulchellus*) and Australian pygmy goose (*N. c. albipennis*) in Queensland.

III. DISTRIBUTION

In north Queensland the 15 species are divisible into four groups: those found commonly only on the coastal plains (magpie goose, grass whistling-duck, water whistling-duck, radjah shelduck, green pygmy goose and Australian pygmy goose); those occurring more commonly in the inland region (grey teal, pink-eared duck, white-eyed duck and maned wood duck); those present in both regions at all times (black duck); and those seldom seen in either region. Members of the last group are here termed vagrants and occur mostly on the coastal plains (chestnut teal and shoveler) or inland (freckled duck) during midwinter months. The black swan, although occasionally common, was distributed more particularly on recently developed water conservation impoundments and is considered to be primarily a vagrant on coastal lands.

Distribution maps for the whole State are given for species common in north Queensland (Figures 1-3). Locality records of the remaining species, all vagrants in north Queensland, are given as follows.

Chestnut teal.—Rockhampton district—"Gracemere" (one bird, July 1958); Bowen district—"Caley Valley" (one, July 1960). Observations were made more often in southern Queensland.

Shoveler.—Rockhampton district—"Gracemere" (two birds, July 1958), "Fitzroyvale" (two, July 1958), near "Fitzroyvale" (20, July 1958), "Mt. Hedlow" (five, July 1958); Bowen district—"Caley Valley" (one in mid-July 1959, mid-July 1960 and August 1963, two in late July 1959, four in late July 1960); Townsville district—"Town Common" (two, March 1962). Shovelers were sighted more commonly in southern Queensland, one record ("Kipperene" in Redcliffe district, June 1958) being of a flock of approximately 200 birds.

Freckled duck.—Apart from one record at "Yarrowmere" in central north Queensland, June 1960 (Lavery 1961a), the freckled duck was not sighted in north Queensland during field surveys. Parts of a specimen were submitted by shooters from the Burdekin River, Charters Towers district, in August 1961.

The remaining four Australian Anatidae are of distinctly southern Australian distribution. Broadbent (1910) gave a single record of the musk duck (*Biziura lobata* (Shaw 1796)) from the Herbert River near Ingham, but current observations place its northernmost limit at Lake McKenzie, Fraser Island (Queensland Museum specimens 0.9335-7, 1962), to Yuleba, Meandarra, Undalla and Arubial in the Condamine River district of south Queensland (unpublished records, Queensland Department of Primary Industries).

IV. HABITAT

Intensive investigational work on habitat was confined for practical reasons to what will be referred to as the Townsville Study Region (as outlined in Figures 1-3). This is the region around Townsville (latitude $19^{\circ}18'S$, longitude $146^{\circ}49'E$), from Ingham extending 200 miles south-eastwards to Bowen and westwards to Powlathanga, approximately 100 miles inland across the Great Dividing Range, which was used to separate the region into Inland Study Area and Coastal Study Area. Much of the region has been described in detail by Christian *et al.* (1953) and is typical of most of the tropical north of Australia in that it has a wet season from November to April and cool dry and warm dusty seasons, with less than 20% of the annual rainfall for the remainder of the year (see Figure 4). The annual rainfall varies from approximately 60 in. on a small northern section of the Coastal Study Area and 40 in. on the remainder of that area to about 25 in. on the Inland Study Area. Temperatures and evaporation rates are moderately high throughout. Rainfall in the region was well below average from 1960 to 1963, reaching drought proportions in 1961; this was the general situation throughout Queensland (Commonwealth Bureau of Meteorology 1962). Soil factors contribute more towards the distribution of native vegetation communities than present climatic variations within the region (Perry 1953). Throughout, the most widespread form of land use is cattle grazing on native pastures;

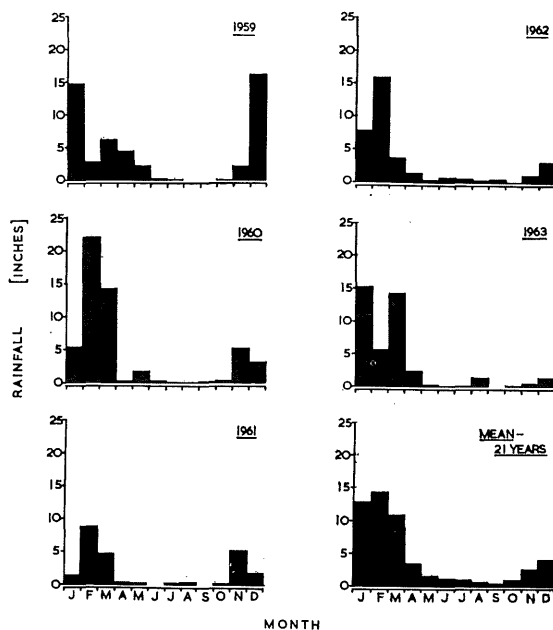


Fig. 4.—Monthly rainfall recorded at Garbutt, Townsville, Q.

TABLE 1
 CLASSIFICATION OF WATERFOWL HABITAT TYPES IN THE TOWNSVILLE STUDY REGION, NORTH QUEENSLAND

Habitat Type	Longevity	Water			Area (ac)	Distribution	Example
		Nature	Mobility	Depth (ft)			
Grassland	Permanent	..	..	..	> 100	Coastal; some inland	Stock holding yards, Oonoonba
Lake	Permanent	Fresh	Still	> 10	> 100	Inland	Reeves Lake
River	Permanent	Fresh	Running	> 10	> 5	Coastal and inland	Burdekin River
Lagoon	Permanent	Fresh	Still	approx.10	< 100	Coastal and inland	Horseshoe Lagoon, Giru
Bay	Permanent	Saline	Tidal	> 10	> 2	Coastal	Cleveland Bay
Tidal flat	Permanent	Saline	Tidal	< 10	> 2	Coastal	Ross River Estuary
Creek	Seasonal	Fresh	Running	< 10	< 5	Coastal and inland	Stony Creek, Stuart
Swamp	Seasonal	Fresh	Still	< 10	> 1	Coastal and inland	" St. Helliers," Cromarty
Meadow	Seasonal	Fresh	Still or flood	< 2	< 1	Coastal; some inland	Floodland at Oonoonba
Saltpan	Seasonal	Saline	Still	< 10	> 100	Coastal	Three Mile Creek, Townsville

agricultural pursuits are confined to the better alluvial soils. Available fresh-water resources are being used almost entirely for these purposes and increasing effort is being directed towards water conservation. Little use is made of saline areas.

The waterfowl habitat located within the study region was visited regularly and described according to the nature, mobility and depth of water, and area. Seasonal variations in habitat types and dispersal of species were recorded. Approximately 11,300 acres of grassland and wetland were found being utilized by waterfowl. The 161 sites involved were grouped (Table 1) as grasslands, lakes (Figure 5, top), rivers (Figure 6), lagoons (Figure 5, bottom), bays (Figure 7, top), tidal flats (Figure 7, top), creeks, swamps (Figure 8), meadows, and saltpans (Figure 7, bottom). These types are essentially the same as those described elsewhere in Australia by Frith (1959). Combinations of types, with one clearly predominant, were usual. Table 2 gives the frequency of occurrence of the various habitat types in the Inland and Coastal areas. The total habitat decreased in area by 84% from the end of the wet season to the end of the dry season (Table 3). There was less seasonal loss of habitat in the Inland Study Area than in the Coastal Study Area, with the presence in the Upper Burdekin River basin of three large lakes, otherwise uncommon in inland Queensland, contributing mostly towards this more stable situation. In other parts of the inland, where all permanent habitat types are uncommon, rainfall is low and more erratic, and soils are less water-retentive, greater seasonal loss of habitat was apparent.

TABLE 2
FREQUENCY OF OCCURRENCE OF WATERFOWL HABITAT TYPES IN THE
TOWNSVILLE STUDY REGION, NORTH QUEENSLAND

Habitat Type	Inland Study Area		Coastal Study Area	
	No. of Sites	Area (ac)*	No. of Sites	Area (ac)*
Grassland ..	**	**	8	200
Lake ..	3	1,225	..	..
River ..	6	35	6	100
Lagoon ..	14	35	35	560
Bay ..	..	..	1	2
Tidal flat ..	..	..	4	100
Creek ..	3	1	6	5
Swamp ..	11	1,265	60	7,675
Meadow ..	**	**	3	7
Saltpan ..	..	..	1	100

* Determined at commencement of dry season

** Some small areas present but poorly defined or inaccessible

TABLE 3

SEASONAL VARIATION IN WATERFOWL HABITAT TYPES
IN THE TOWNSVILLE STUDY REGION, NORTH QUEENSLAND

Habitat Type	Area (ac)	
	End of Wet Season (April)	End of Dry Season (November)
Grassland	200	200
Lake	1,225	620
River	135	75
Lagoon	595	310
Bay	2	2
Tidal flat	100	100
Creek	6	3
Swamp	8,940	430
Meadow	7	0
Saltpan	100	0

Artificial habitat, created by the construction of an increasing number of water conservation impoundments and corresponding in appearance to natural types—*e.g.* water supply dam to lake, weir to river (Figure 6, bottom), earth tank and ornamental pond to lagoon, earth dam (including waterfowl management area) and bore drain to swamp (Figure 8, bottom)—comprised 58% of the total available habitat. The majority of impoundments were earth dams for cattle watering sites and were of similar construction throughout the region. The largest single habitat was a 6,000-acre earth dam built at "Caley Valley" jointly as a stock watering and feeding area and waterfowl management area. After normal dry seasons less artificial than natural habitat remains (Table 4).

TABLE 4

SEASONAL VARIATION IN NATURAL AND ARTIFICIAL WATERFOWL
HABIT IN THE TOWNSVILLE STUDY REGION, NORTH QUEENSLAND

Habitat	Area (ac)		Percentage Decrease
	End of Wet Season (April)	End of Dry Season (November)	
Natural	4,725	1,420	70
Artificial	6,585	320	95

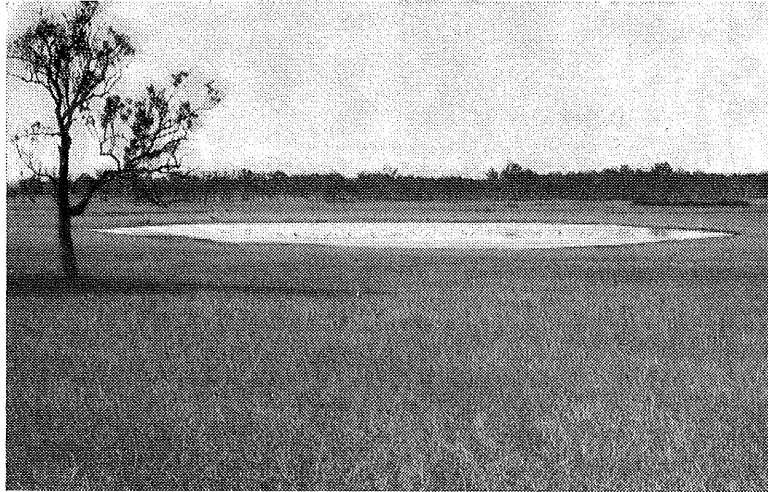


Fig 5. Habitat types: *top*, Lake on "Valley of Lagoons", Q., August 1959; *bottom*, Lagoon on Serpentine Creek near Woodstock, Q., June 1962.



Fig. 6.—Habitat types: *top*, river type, Burdekin River at Macrossan, Q., March 1961;
bottom, river type formed by Gleeson's Weir, Upper Ross River, Q., May 1960.

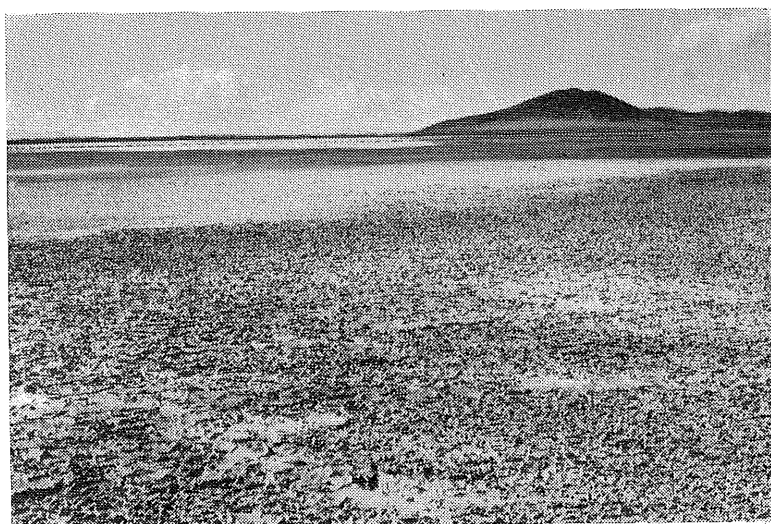


Fig. 7.—Habitat types: *top*, bay and tidal flat types. Cleveland Bay and Ross River Estuary near Townsville, Q., May 1960; *bottom*, saltpan at “Caley Valley” near Bowen, Q., July 1958.



Fig. 8.—Habitat types: *top*, swamp type at “Town Common”, Townsville, Q., February 1960; *bottom*, swamp created artificially by irrigation drain, Millaroo, Q., March 1961.

and freckled ducks were sighted on mixed-vegetation swamps and occasionally on other sites. The white-eyed duck occurred on the same habitat types as the water whistling-duck—deepwater areas dominated by waterlilies and submerged aquatic vegetation. The maned wood duck lived in small flocks on habitat types used also by grass whistling-ducks; occasionally the two species intermingled. The green pygmy goose occurred for the most part as small flocks on waterlily lagoons, usually in association with Australian pygmy geese; the latter birds also commonly inhabited rivers dominated by submerged aquatic plants, such as *Potamogeton* species, rather than emergent vegetation.

Most waterfowl habitat and waterfowl in north Queensland clearly were distributed in that broad sub-humid belt of which most of the region studied intensively is part. The wetter zone on the far north Queensland coast is an area of mountainous country with dense covering vegetation and deep-flowing streams; few waterfowl inhabited the limited types and restricted area of habitat thus available. At the other extreme, the arid inland zone has an erratic rainfall and rapidly evaporating wetlands; waterfowl were noted only when the seasonal habitat types were provided. Even within the intermediate sub-humid region, habitat changed markedly each season: swamps which were widespread after the wet season early in the year were replaced later by lagoons, and in some regions lakes, as the predominant habitat (Table 3). Since breeding of waterfowl requires shallow-water vegetation during the wet season (Lavery, unpublished), no species was, or could be, permanently resident on one habitat type; swamps and lagoons formed the most widely used annual combination of types, with others inhabited more commonly by a few species. The drastic restriction in overall available habitat also suggests that, despite the gregarious nature of the common indigenous tropical Australian Anatidae and the interspecific congregating of these flocks and individuals of species from inland areas on the major permanent sites in the course of each dry season, the warm dusty season from September to November is a period of stress, particularly in periods of prolonged drought, for sedentary waterfowl populations in north Queensland.

VI. ACKNOWLEDGEMENT

Permission was given by the Director, Queensland Museum, Brisbane, to examine reference collections; this assistance is gratefully acknowledged.

REFERENCES

- BARNARD, E. D. (1913).—Visit to Torilla Plains. *Emu* 13:90-3.
- BROADBENT, K. (1910).—Birds of the Cardwell and Herbert River districts (N.Q.). *Emu* 10:233-45.
- CAMPBELL, A. J. (1901).—"Nests and Eggs of Australian Birds". (Pawson Brailsford: Sheffield).
- CHRISTIAN, C. S., PATERSON, S. J., PERRY, R. A., SLATYER, R. O., STEWART, G. A., and TRAVES, D. M. (1953).—Survey of the Townsville-Bowen region, north Queensland, 1950. *C.S.I.R.O. Land Res. Ser.* 2:1-87.

- COMMONWEALTH BUREAU OF METEOROLOGY (1962).—*Annual Rainfall 1961 Australia*. (Government Printer: Melbourne).
- DAVIES, S. J. J. F. (1957).—The gosling of the magpie goose. *Emu* 57:354-5.
- DELACOUR, J. (1954).—"The Waterfowl of the World. Vol. 1." (Country Life : London).
- DELACOUR, J. (1956).—"The Waterfowl of the World. Vol. 2." (Country Life : London).
- DELACOUR, J. (1959).—"The Waterfowl of the World. Vol. 3." (Country Life : London).
- DELACOUR, J. (1964).—"The Waterfowl of the World. Vol. 4." (Country Life : London).
- FRITH, H. J. (1955).—The downy ducklings of the pink-eared and white-eyed ducks. *Emu* 55:310-2.
- FRITH, H. J. (1959).—Ecology of wild ducks in inland New South Wales. I. Waterfowl habitats. *C.S.I.R.O. Wildl. Res.* 4:97-107.
- FRITH, H. J. (1964).—The downy young of the freckled duck *Stictonetta naevosa*. *Emu* 64:42-7.
- GOULD, J. (1848).—"The Birds of Australia. Vol. 7." (London).
- LAVERY, H. J. (1961a).—A record of the freckled duck from north Queensland. *Emu* 61:244.
- LAVERY, H. J. (1961b).—Colour-strap banding of black swans. *Qd Agric. J.* 87:29-30.
- LAVERY, H. J. (1962).—Plumage stains on wild ducks in North Queensland. *Qd J. Agric. Sci.* 19:433-4.
- LAVERY, H. J. (1964a).—Downy young of the white-quilled pigmy-goose. *Emu* 63:422-3.
- LAVERY, H. J. (1964b).—Injuries to wild ducks. *Qd Agric. J.* 90:769.
- LAVERY, H. J. (1965a).—On the common names of the Australian Dendrocygnini. *Emu* 65:96.
- LAVERY, H. J. (1965b).—Queensland's remarkable colony of black swans. *Wildlife in Australia* 2:23-5.
- LAVERY, H. J. (1966a).—Pygmy geese in Australia. *Qd Agric. J.* 92:294-9.
- LAVERY, H. J. (1966b).—A wild hybrid in the genus *Anas* L. (Anatidae). *Qd J. Agric. Anim. Sci.* 23:329-31.
- LAVERY, H. J. (1966c).—The black duck in Queensland. *Qd Agric. J.* 92:452-6.
- LAVERY, H. J. (1966d).—Water storage provides homes for waterfowl. *Qd Agric. J.* 92:594-7.
- LAVERY, H. J., and ROFF, C. (1964).—Banding of wild ducks in south-eastern Queensland during 1957. *Qd J. Agric. Sci.* 21:265-73.
- MACGILLIVRAY, W. (1914).—Notes on some north Queensland birds. *Emu* 13:132-86.
- MARKS, E. N., and LAVERY, H. J. (1959).—Australian wild ducks as mosquito predators. *Aust. J. Sci.* 22:216-7.
- MATHEWS, G. M. (1915).—"The Birds of Australia. Vol. 4." (Witherby : London).
- MCLENNAN, W. (1917).—North Australian birds. *Emu* 16:205-31.
- NORTH, A. J. (1914).—"Nests and Eggs of Birds Found Breeding in Australia and Tasmania. Vol. 4." (Australian Museum : Sydney).
- PERRY, R. A. (1953).—The vegetation communities of the Townsville-Bowen region. *C.S.I.R.O. Land Res. Ser.* 2:44-54.
- ROFF, C., and LAVERY, H. J. (1957).—The banding of wild duck in Queensland. *Qd Agric. J.* 83:640-2.

- THOMPSON, D. F. (1935).—"Birds of Cape York Peninsula." (Government Printer: Melbourne).
- WHITE, H. L. (1922).—A collecting trip to Cape York Peninsula. *Emu* 22:99-116.
- WHITE, S. R. (1946).—Notes on the bird-life of Australia's heaviest rainfall region. *Emu* 46:81-122.

(Received for publication June 23, 1966)

The author is an officer of the Entomology Section, Division of Plant Industry, Department of Primary Industries, and is stationed at Animal Health Station, Oonoonba, Townsville.

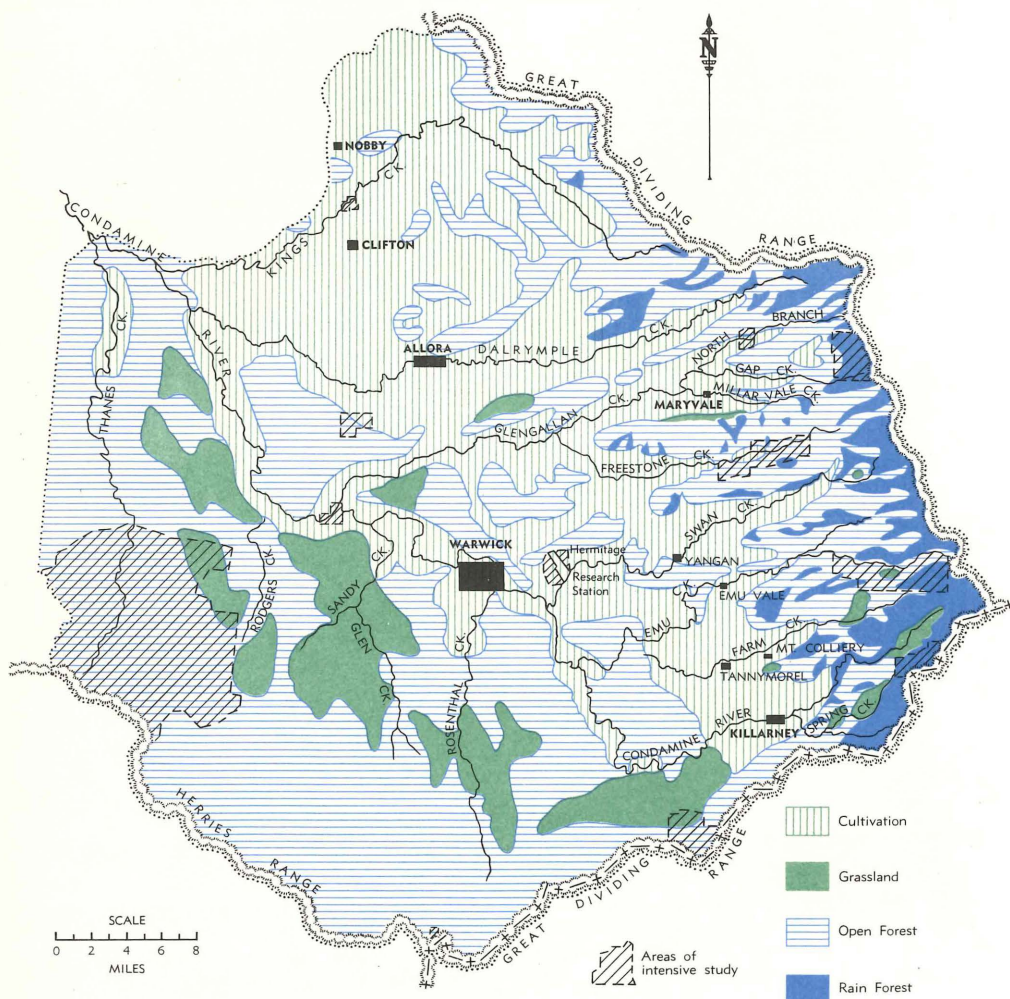


Fig. 1. The Warwick District fauna survey 1964-65. Map was drawn from aerial photographs and checked by ground and air traverses.