QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 519

STUDIES OF WATERFOWL (ANATIDAE) IN NORTH QUEENSLAND. 3. HARVESTS

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SUMMARY

The total harvest of waterfowl by shooting in north Queensland during 1963 was an estimated 70,000 birds.

At all times and in most localities the preferred black duck (*Anas superciliosa rogersi* Mathews) was the species taken, predominantly because of habits, availability including accessibility, and suitability as sport and food. Harvesting was assessed to have had no effect on the total black duck population in north Queensland because of proportions taken and numbers remaining, and species' and shooters' habits.

Other species were taken only secondarily in small numbers and, with the possible exception of vagrant species, in small proportions.

During 1952–1963 total annual harvests varied greatly, from none in years of extreme drought and flooding to 100,000–150,000 birds in years immediately following widespread flooding when populations were largest and dispersed.

I. INTRODUCTION

Native waterfowl have been hunted in Queensland for sport, and to a lesser extent for food and as pests, for many years.

Concurrent with long-term biological studies of the waterfowl species occurring in Queensland north of the Tropic of Capricorn, the opportunity was taken to collect data on harvests there. The occurrence of large populations of northern species in a tropical environment (see Lavery 1966*a*) provides a fundamentally different duck shooting situation from southern Queensland, where little information on harvests remains available.

Most duck shooting in north Queensland has occurred at the two main waterfowl regions—the coastal plains of western Cape York Peninsula (Gulf country), and the sub-humid eastern zone 200–300 miles in width overlying the Great Dividing Range from the Tropic of Capricorn to the upper Burdekin River and including the coastal plains around Rockhampton and Townsville (Eastern region).

For many years shooting was by individuals and small parties in the Eastern region, while larger groups often travelled considerable distances for more extended periods to renowned waterfowl localities in the Gulf country.

In recent times organized concentrated hunting activities have been in the Eastern region at eight swamps adjacent to large towns, from Ingham south to Bowen and west to Powlathanga (Figure 1). Water impoundments have been constructed at six of these areas to provide increased wetland habitat. Each shooter is allocated, or selects, a suitable site at which to build a hide of vegetation for use during a year, and an adjacent area of water is cleared of surface vegetation so that decoys may be set out. Equipment taken into the hide includes gun (usually a 12-gauge automatic shotgun), ammunition (usually 12-gauge cartridges of standard sizes 4, 5 or 6), and decoys, all of which are transported in a

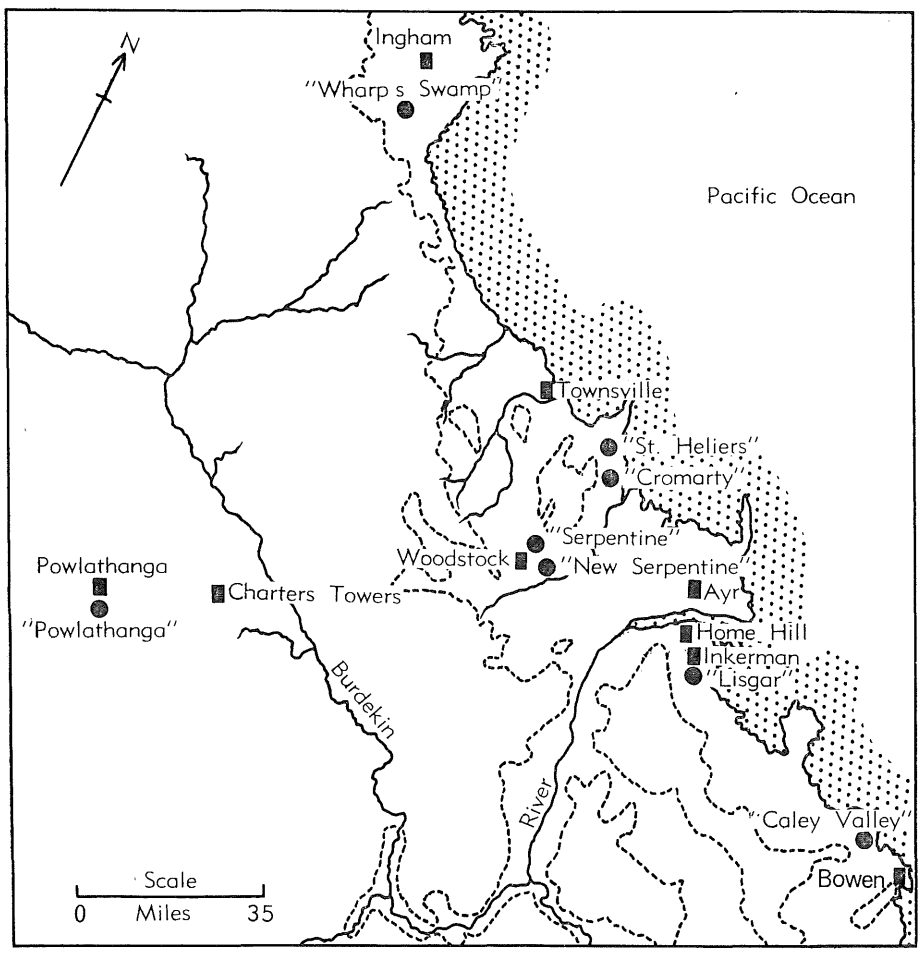

Fig. 1.—Distribution of organised duck shooting localities (●) in north Queensland, 1959–1963; dotted line divides inland country from coastal plains along the 600 ft above-sea-level contour.

flat-bottomed punt; larger boats are seldom used because shooters avoid deeper lagoons and rivers inhabited by estuarine crocodiles (*Crocodylus porosus* Schneider). Retriever dogs are used by some shooters. Most shooting is on a relatively few Saturday afternoons.

Current laws allow a limit of 15 birds to be taken per person per 24 hours throughout the year in most of that part of the State west of the Great Dividing Range, and during open seasons declared annually for eastern coastal districts and Darling Downs. At present, of the 15 species of Anatidae occurring north of the Tropic of Capricorn (see Lavery 1966*a*), the following may be taken legally:

Grass whistling-duck (*Dendrocygna eytoni* (Eyton))

Water whistling-duck (*Dendrocygna arcuata australis* Reichenbach)

Black duck (*Anas superciliosa rogersi* Mathews)

Grey teal (*Anas gibberifrons gracilis* Buller)

Pink-eared duck (*Malacorhynchus membranaceus* (Latham))

White-eyed duck (*Aythya australis* (Eyton))

Maned wood duck (*Chenonetta jubata* (Latham)).

The taking of chestnut teal (*Anas castanea* (Eyton)) and musk ducks (*Biziura lobata* (Shaw)) was disallowed from 1960, and of shovelers (*Anas rhynchotis rhynchotis* Latham) from 1962.

II. METHODS

During 1959-1963 all birds carried through the single exit at "Caley Valley" were counted and random samples were dissected for information on sex and age. In 1963 total numbers of each species shot also at "Lisgar" were recorded by committee members of the Lisgar Gun Club, and the numbers of each species taken by approximately one-half of the shooters at "New Serpentine", "Serpentine", "Cromarty" and "St. Heliers" were determined by interviewing shooters and examining wherever possible the birds harvested.

Numbers of shooters and periods of hunting activity were obtained from the audited records of Bowen Gun Club, Lisgar Gun Club and Townsville Gun Club, which controlled all shooting at the above six areas, and from Queensland Ambulance Transport Brigade, Ingham and Charters Towers, which organized all shooting at "Wharps Swamp" and "Powlathanga" respectively.

Harvest "leakage", resulting from non-collection of shot birds under typical hunting conditions, was determined during 1960 and 1962-1963 by testing the ability of various shooters to find in the course of a day every bird shot down by them. The resultant estimated leakages were minimal since the attempts at recovery usually exceeded normal efforts. Moreover, no account was taken of birds that were not quickly affected by shot; for this, leakage was compared with the incidence of previously injured birds as determined by post-mortem examinations of random samples taken throughout north Queensland during 1959-1963.

TABLE 1

NUMBERS AND HARVEST PERCENTAGES OF EACH WATERFOWL SPECIES TAKEN AT "CALEY VALLEY", Q., 1959–1963*

Species	Year								Period	
	1959		1960		1962		1963		1959–1963	
	Number	Percentage of Annual Harvest	Number	Percentage of Annual Harvest	Number	Percentage of Annual Harvest	Number	Percentage of Annual Harvest	Number	Percentage of Harvest
Black duck	2,774	85·6	2,549	67·9	3,055	70·6	4,924	96·3	13,302	80·9
White-eyed duck	187	5·8	696	18·5	339	7·8	37	**	1,259	7·7
Grey teal	70	2·2	373	9·9	403	9·4	80	1·6	926	5·6
Water whistling-duck	193	6·0	125	3·3	515	11·9	52	1·0	885	5·4
Grass whistling-duck	7	**	4	**	7	**	12	**	30	**
Maned wood duck	3	**	2	**	10	**	3	**	18	**
Shoveler	3	**	5	**	Nil	—	1	**	9	**
Green pygmy goose	4	**	Nil	—	Nil	—	2	**	6	**
Pink-eared duck	1	**	1	**	1	**	Nil	—	3	**
Magpie goose	Nil	—	Nil	—	Nil	—	2	**	2	**
Chestnut teal	Nil	—	1	**	Nil	—	Nil	—	1	**
Totals	3,242		3,756		4,330		5,113		16,441	

* Excluding 1961. ** <1·0%.

TABLE 2

ESTIMATED NUMBERS AND HARVEST PERCENTAGES OF EACH WATERFOWL SPECIES TAKEN AT "LISGAR" AND AT FOUR TOWNSVILLE GUN CLUB AREAS, Q., 1963

Species	Locality									
	"Lisgar"		"New Serpentine"*		"Serpentine"*		"Cromarty"*		"St. Heliers"*	
	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total
Black duck	205	78·8	563	86·2	1,064	76·1	506	93·5	90	52·3
Water whistling-duck	29	**	84	12·9	272	19·5	13	**	81	47·1
White-eyed duck	12	**	Nil	—	25	**	Nil	—	1	**
Grass whistling-duck	Nil	—	4	**	21	**	13	**	Nil	—
Grey teal	8	**	Nil	—	Nil	—	Nil	—	Nil	—
Maned wood duck	6	**	2	**	Nil	—	Nil	—	Nil	—
Magpie goose	Nil	—	Nil	—	16	**	Nil	—	Nil	—
Pygmy goose (sp.?)	Nil	—	Nil	—	Nil	—	9	**	Nil	—

* Samples of shooters: "New Serpentine" 6 of 11; "Serpentine" 17 of 33; "Cromarty" 7 of 30; "St. Heliers" 7 of 7 (173 shooters' days).

** < 12·0%.

Records of waterfowl harvested during 1952-1963 by a group averaging five shooters at "Serpentine" were examined and checked against the more extensive data obtained in 1959-1963 at "Serpentine" and elsewhere.

Direct counts of waterfowl present (using X10 binoculars) at "Caley Valley" in 1959-1963 and at "Serpentine" in 1963 were made before shooting commenced. Population movements during counting often caused difficulties, but despite limited facilities accuracy increased with experience.

Hunting activity in north Queensland other than at the eight swamps in the Eastern region, particularly elsewhere in the Eastern region and in the Gulf country, was determined by field observations and from recoveries of birds banded as part of movement studies (Lavery 1966*b*, 1970). Recoveries considered were those by shooting after at least one wet season during which banded birds were permitted to disperse throughout north Queensland, and were from 1,384 individuals of six game-bird species and 111 individuals of four other waterfowl species trapped, banded and released in the Eastern region and near Mt. Isa during 1958-1962.

III. RESULTS

Numbers and harvest percentages of species taken at "Caley Valley" during 1959-1963, and at "Lisgar" and the four Townsville Gun Club areas in 1963, are presented in Tables 1 and 2. Sex and age of black ducks and water whistling-ducks taken at "Caley Valley" and "Serpentine" in 1963 are given in Table 3; compositions did not vary significantly from those smaller numbers taken at the same time of year at other areas and by other means, e.g. trapping.

TABLE 3

SEX AND MATURITY OF BLACK DUCKS AND WATER WHISTLING-DUCKS TAKEN FROM SHOOTERS' BAGS AT "CALEY VALLEY" AND "SERPENTINE", Q., 1963

Species	Males			Females		
	Adults	Birds-of-the-year	Total	Adults	Birds-of-the-year	Total
Black duck	21	187	208	24	157	226*
Water whistling-duck ..	16	29	45	13	27	40

* Includes 45 birds not aged.

Duck shooting activities at "Caley Valley" during 1959-1963 and at the other seven organized areas in the Eastern region in 1963 are illustrated in Tables 4 and 5. Figure 2 compares shooting activities at "Caley Valley" in 1959-1963 and "Wharps Swamp", "Cromarty", "Serpentine" and "St. Heliers" in 1963. Monthly variation in mean numbers of waterfowl taken per shooter per day at "Caley Valley" during 1959-1963 is shown in Table 6; there was no apparent monthly variation in sex and age ratios of samples of black ducks and water whilstling-ducks shot. No effective shooting was detected anywhere in north Queensland in 1961, many of the few remaining inhabited areas being fauna sanctuaries or otherwise protected.

TABLE 4

DUCK SHOOTING ACTIVITIES AT "CALEY VALLEY", Q., 1959–1963

Year	No. of Days of Shooting	No. of Shooters' Days
1959	13	388
1960	13	530
1961	Nil	Nil
1962	13	452
1963	13	516

TABLE 5

DUCK SHOOTING ACTIVITIES AT SEVEN ORGANIZED AREAS IN NORTH QUEENSLAND, 1963

Locality	No. of Days of Shooting	No. of Shooters' Days
"Lisgar"	2	90
"New Serpentine"	9	93
"Serpentine"	10	165
"Cromarty"	5	74
"St. Heliers"	7	22
"Wharps Swamp"	5	606
"Powlathanga"	7	472

TABLE 6

MONTHLY VARIATION IN MEAN NUMBERS OF WATERFOWL TAKEN PER SHOOTER PER DAY AT "CALEY VALLEY", Q., 1959–1963

Month		Mean No. of Birds Per Shooter Per Day
July		10·27
August		8·17
September		6·93
S.E.		±0·415
Necessary differences for significance	⩾5%	1·44
	>1%	2·17

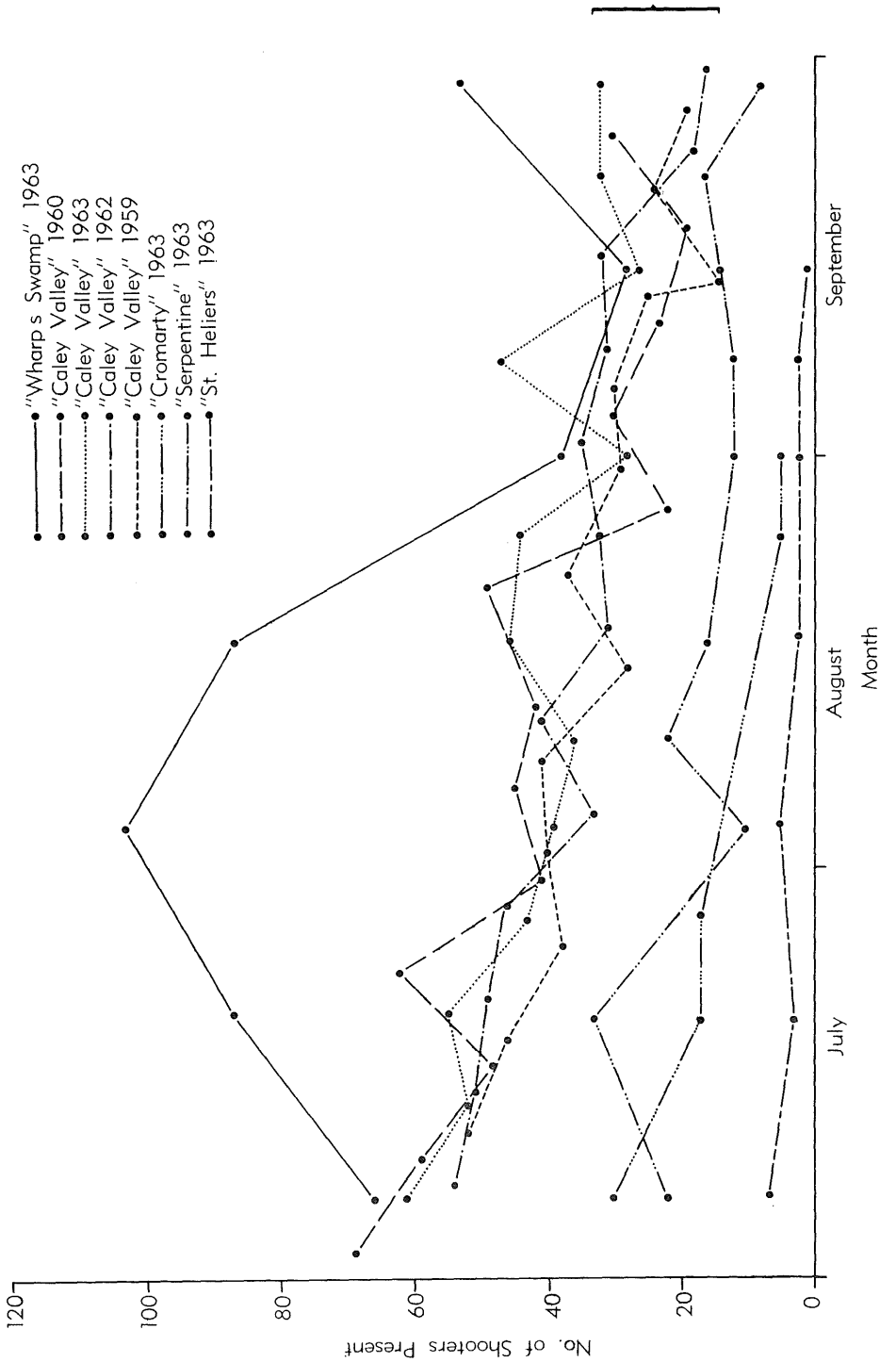

Fig. 2.—Monthly shooting activities at "Caley Valley" in 1959–1963 and "Wharps Swamp", "Cromarty", "Serpentine" and "St. Heliers" in 1963.

Estimated harvest leakage is given in Table 7. Injured birds rarely survived, as indicated by infrequent occurrence (Table 8) and by laboratory cage holdings which resulted in few consequent recoveries; accordingly it was not possible to assess the extent of this additional leakage, here considered to be minor. Harvest leakage was not lessened significantly at organized areas where shooters still remained considerable distances apart (mean density "Caley Valley" 1963 was approximately one shooter per 100 acres of waterfowl habitat).

TABLE 7

CUMULATIVE TOTALS OF GAME-BIRD SPECIES RECOVERED AND LOST, AND CONSEQUENT HARVEST LEAKAGE, BY VARIOUS SHOOTERS IN NORTH QUEENSLAND, 1959–1963

Species	No. of Birds Recovered After Being Shot	No. of Birds Lost After Being Shot	Leakage (%)
Grass whistling-duck ..	96	16	14
Water whistling-duck ..	335	80	19
Black duck	225	37	14
Grey teal	134	19	12
White-eyed duck	46	7	13
Maned wood duck	45	5	10
Totals	881	164	16

TABLE 8

INCIDENCE OF PREVIOUSLY INJURED BIRDS IN HARVESTS FROM NORTH QUEENSLAND, 1959–1963

Species	No. of Birds Examined	No. of Birds Injured Prior to Date of Harvesting	Incidence (%)
Grass whistling-duck ..	799	5	0·6
Water whistling-duck ..	829	10	1·2
Black duck	1,129	4	0·4
Grey teal	424	Nil	Nil
Pink-eared duck	2	Nil	Nil
White-eyed duck	118	1	0·8
Maned wood duck	70	Nil	Nil
Totals	3,371	20	0·6

The mean daily harvest per shooter per year at "Caley Valley" during 1959-1963 and at "Serpentine" during 1952-1963, and overall State rainfall, are given in Table 9.

TABLE 9

MEAN DAILY HARVEST PER SHOOTER PER YEAR AT "CALEY VALLEY" AND "SERPENTINE", AND OVERALL STATE RAINFALL, Q., 1952–1963

Year	Mean Daily Harvest per Shooter		Overall State Rainfall*
	"Caley Valley"	"Serpentine"	
1952**	no records	19·4	Average
1953		Nil	Above average: local flooding
1954		20·6	Above average
1955		16·3	Above average
1956		14·2	Above average
1957		18·9	Below average
1958		8·6	Below average
1959	8·4	9·2	Below average
1960	7·1	9·7	Below average
1961	Nil	Nil	Below average; widespread drought
1962	9·6	5·1	Average
1963	9·9	9·4	Below average

* From Queensland Department of Agriculture and Stock Annual Reports (1951–1954) and Commonwealth Bureau of Meteorology Rainfall Summaries (1955–1964).

** Widespread floods 1950; below average rainfall 1951.

TABLE 10

PROPORTIONS OF TOTAL BLACK DUCK POPULATIONS HARVESTED AT "CALEY VALLEY" AND "SERPENTINE", Q., 1959–1963

Locality	Date	Pre-shoot Count	Bag Count	Harvest Leakage (16% rate)	Percentage of Black Ducks Shot
"Caley Valley"	11.vii.59	5,000–8,000	521	99	8–12
	22.viii.59	2,000–3,000	106	20	4–6
	20.ix.59	1,500–2,500	128	24	6–10
	24.ix.60	1,000–2,000	109	21	6–13
	7.vii.62	2,500–3,500	371	71	13–18
	4.viii.62	3,000–4,000	164	31	5–6
	11.viii.62	4,000–5,000	279	53	7–8
	1.ix.62	600–900	134	26	18–27
	8.ix.62	400–600	152	29	30–45
	6.vii.63	4,500–5,500	804	153	17–21
	3.viii.63	2,500–3,500	332	63	11–16
	7.ix.63	2,500–3,500	130	25	4–6
"Serpentine"	6.vii.63	900–1,100	260	50	28–34
	20.vii.63	1,300–1,700	217	41	15–20
	10.viii.63	400–600	93	18	18–28
	14.ix.63	900–1,100	182	35	20–24
	21.ix.63	400–600	50	10	10–15

The percentages of black duck populations harvested and killed at "Caley Valley" during 1959-1963 and at "Serpentine" in 1963 are given in Table 10. The only other harvest proportion determined was for the water whistling-duck at "Caley Valley" in 1962, when most birds were taken (total harvest 515 (see Table 1)) from a resident flock of 2,500–3,500 birds; with some 16% leakage (Table 7), the estimated proportion then killed was approximately 19–26%.

Relative distribution of shooting activities and harvests elsewhere in north Queensland compared with the eight organized areas in the Eastern region is shown by recoveries of waterfowl banded throughout 1958-1962 (Table 11).

TABLE 11

RECOVERIES OF WATERFOWL BANDED THROUGHOUT NORTH QUEENSLAND, 1958–1962, AND SHOT THERE, 1959–1963

Species	No. Banded	No. Recovered			Percentage of Surviving Birds Recovered After First Wet Season
		At Eight Organized Areas in the Eastern Region	Elsewhere in North Queensland		
			Coastal Plains	Inland	
Grass whistling-duck ..	476	Nil	11	2	2·9
Black duck	530	26	28	5	11·4
Grey teal	335	2	3	1	1·8
Others*	154	Nil	Nil	Nil	Nil
Totals	1,495	28	50		5·4

* Magpie goose, 8; water whistling-duck, 9; black swan (*Cygnus atratus* (Latham)) 100; white-eyed duck, 4; maned wood duck, 30; green pygmy goose, 1; Australian pygmy goose (*Nettapus coromandelianus albipennis* Gould), 2.

IV. DISCUSSION

Distribution of band recoveries was the only practical method of obtaining any measure of waterfowl harvest for the whole of north Queensland. Based on 28 bands recovered at the eight organized duck shooting areas compared with 50 bands from elsewhere in north Queensland (Table 11), the data indicate that approximately one-third of the waterfowl harvest of north Queensland during 1963 occurred at the eight organized areas of the Eastern region where most of the reported investigations were conducted.

Both these data, and those in Tables 1 and 2, show that the black duck was the predominant species harvested by duck shooters. Reasons for this included its widespread distribution and utilization of habitat types accessible to shooters (Lavery 1966 *a,* and Figure 1); its relative abundance, particularly as large flocks during winter months (Lavery 1970); its relatively large size,

suitability of flight speed and height, and other habits, for a game-bird (Lavery 1966*a*), and preference also as a food.

Proportionally large harvests of black ducks occurred when populations of this species were naturally smaller (Table 10); many birds had moved elsewhere to deeper waters including, notably, many fauna sanctuaries (see Lavery 1970) and numbers of shooters were lowest (Figure 2). The total harvest of black ducks was never observed to exceed more than a maximum 45% of the individuals present at one place and time, and was generally much less (Table 10). Throughout north Queensland during 1959-1963, only 11% of banded black ducks were recovered by shooting (Table 11), with 6% being the most recovered in one season (1959). Shooting during 1959-1963 was unlikely to have had any effect on the total black duck population size in north Queensland for several other reasons, including the following: the continuing predominance and widespread distribution of the species, including its ability to use saline habitat types, inaccessible to shooters, near coastal shooting areas (Lavery 1966*a*); the nomadic habits of many black ducks throughout Australia, particularly during the open season period (Downes 1954; Frith 1963; Lavery 1966*b*, 1970), such that only part of a population could be shot at one locality; the widely spaced distribution of major shooting areas even in one region (Figure 1), and of shooting days (Figure 2); the non-coincidence of proportionally large harvests at different localities at the same time and at the same locality at different times (see, for example, Table 10), supported by different shooting activities at different localities within one open season (Figure 2); the lack of shooting in a severe drought year (1961) when black ducks still occurred but were concentrated and comparatively accessible to shooters; similarly, the lack of shooting (close season) at such times when populations annually might be more prone to be affected by shooting, viz. during breeding, at ultimate drought refuges (Lavery 1970); the lack of discrimination by shooters concerning sex and age of bird taken (Table 3); and the continued ability of shooters to take the preferred species (see, for example, Table 1).

Except where black ducks were relatively unavailable, little interest was evinced in other species (Table 1) which often were present in large numbers. These species often had quite different habits from black ducks, especially during the later part of the open season when black ducks would have been less readily available. Thus, for example, grass whistling-ducks formed a significantly large part of the total harvest only away from the organized areas because of the perennial habit of these birds of congregating during the day at a few small areas, usually renowned fauna sanctuaries, and dispersing from these nocturnally over wide areas as feeding flocks (Lavery 1967) readily accessible to small numbers of shooters. At this time also, the water whistling-duck and white-eyed duck characteristically inhabited deep water areas and the grey teal saline areas that were not preferred as shooting localities. No evidence was available to indicate a decline in numbers of these from shooting. Other waterfowl species taken from relatively large populations were the protected magpie goose (*Anseranas semipalmata* (Latham)) and green pygmy goose (*Nettapus pulchellus*

Gould), the latter taken mainly in error, as were the little grebe (*Podiceps ruficollis* (Vroeg)), great crested grebe (*Podiceps cristatus* (L.)), little black cormorant (*Phalacrocorax sulcirostris* (Brandt)) and coot (*Fulica atra* L.), for example.

The small numbers of the distinctive shoveler and chestnut teal taken (see, for example, Table 1) may have represented larger proportions of the total north Queensland population of these species, which, however, were merely vagrant from breeding populations in southern Australia (Lavery 1966*a*).

The total harvest of waterfowl in north Queensland during 1963 may be assessed broadly as follows:

	No. of Birds Harvested	No. of Shooters' Days
" Caley Valley "	5,113 (Table 1)	516 (Table 4)
" Lisgar "	260 (Table 2)	90 (Table 5)
Townsville Gun Club areas (4)	2,764 (Table 2)	173 (Table 2)
Totals	8,137	779

Therefore mean number of birds harvested per shooters' day at six areas in Eastern region .. .. = 10·4

Total number of shooters' days at the eight areas in Eastern region .. .. = 2,038 (Tables 4 and 5)

Therefore estimated number of birds taken at all eight areas in Eastern region* .. .. = 21,195

Harvest leakage for eight areas in Eastern region .. .. = 16% (Table 7)

Estimated total harvest for eight areas in Eastern region .. $= 21{,}195 \times \frac{100}{84} = 25{,}232$

Band recovery rate at eight areas in Eastern region compared with elsewhere in north Queensland $= \frac{28}{78}$ (Table 11)

Therefore estimated total harvest of waterfowl in north Queensland during 1963† .. .. $= 25{,}232 \times \frac{78}{28} = 70{,}289$

* At the atypical " Wharps Swamp " (see Figure 2), similar harvest success as illustrated in Table 6 was achieved by taking more birds in August than in July (R. Yeldham, Secretary, Q.A.T.B., Ingham, *in litt.* 10.x.63), a result of the later immigration and concentration of waterfowl at deeper water coastal areas (Lavery 1970); the higher rainfall zone of north Queensland where " Wharps Swamp " is located is relatively small (Lavery 1966*a*) and mostly fauna sanctuary (Roff 1962). Drought conditions prevailed during 1961 and shooting activities at all eight areas were not permitted by the organizers.

† There was no evidence that year-round shooting west of the Great Dividing Range contributed disproportionately to the total annual harvest (Table 11); for the most part the wet conditions, inaccessibility and breeding by waterfowl deterred inland shooters prior to the coastal open season period, while birds later were in insufficient numbers to attract shooters.

Furthermore, if "Caley Valley" harvests in 1959-1963 (Tables 1 and 4) were representative of success throughout north Queensland, as these appear approximately to be (Table 9), total annual harvests can be estimated, again broadly, as follows:

$$1959 \quad 70{,}289 \times \frac{3{,}242}{5{,}113} \times \frac{516}{388} = 59{,}271 \text{ birds}$$

$$1960 \quad 70{,}289 \times \frac{3{,}756}{5{,}113} \times \frac{516}{530} = 50{,}270 \text{ birds}$$

$$1962 \quad 70{,}289 \times \frac{4{,}330}{5{,}113} \times \frac{516}{452} = 67{,}953 \text{ birds}$$

Gun Club memberships and general observations indicate that total shooting activity at the eight organized areas did not alter significantly between 1952-1958 and 1959-1963. Table 9 data suggest that slightly more than twice as many waterfowl were taken in 1952-1957 (1953 excluded), when abnormally high rainfalls occurred, as in 1958-1963 (1961 excluded), when annual rainfalls were below average. Largest harvests thus coincided for the greater part with extended periods of above-average rainfall with few birds taken in extreme flood times (1953) due to inaccessibility to waterfowl habitat by shooters and erosion damage to the predominantly artificial habitat. For the effect of shooting activity of previous years, available data indicate that while harvests from 1952-1957 were larger the better rainfall conditions would not have inhibited breeding as did the drought (Lavery unpublished) and thus more birds would have been available; moreover, there was no detectable decline in populations available to shooters generally at "Serpentine" for 35 years and prior to other droughts.

V. ACKNOWLEDGEMENTS

The assistance of landholders, shooters and shooters' organizations in providing data is gratefully acknowledged.

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(Received for publication June 3, 1969)

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