**TO: DR B. WILSON, DIRECTOR OF NATURE CONSERVATION.**

**RE: CONSIDERATION OF A POSSIBLE DUCK SHOOTING SEASON IN THE SOUTH WEST AND EUCLA LAND DIVISIONS IN 1991.**

## 1. INTRODUCTION

### Scope

The purpose of this report is to provide (as requested on January 8th, 1991) technical advice on whether or not a recreational duck shooting season in the South West and Eucla land divisions of Western Australia would be acceptable, from the point of view of impact on duck numbers, in 1991.

Over the past three years or so there has been substantial debate in the local media concerning whether or not recreational duck shooting is an acceptable activity from ethical, emotional or "animal rights" points of view.

This report does not address those issues as they are considered to be matters which, to a large extent, fall outside this Department's areas of expertise and responsibility. In doing so, no reflection upon the possible validity or importance of points raised in that public debate is intended.

In accordance with past procedure, the report presents:

- a review of rainfall in the south west of Western Australia during 1990.
- water level data from a sample of south west wetlands.
- recent data concerning duck numbers.
- recommendations concerning the possible declaration of a duck shooting season in 1991.

As requested, the report also considers the subject of historical trends in duck numbers in south-western Australia.

A seperate memorandum will be presented concerning a possible shooting season in the Kimberley, North West and Eastern land divisions.

### Basis of Season Recommendations

Waterfowl numbers are determined by fecundity and survival. These, in turn, are strongly influenced by the availability of habitat, both during the breeding season and during the summer dry season.

In Australia, waterfowl habitat availability is largely determined by rainfall. It follows then, that prior rainfall should be a useful indicator of waterfowl numbers, and hence the ability of duck populations to sustain harvests. Recent studies in eastern Australia (Briggs and Holmes 1988) have indicated that this is the case.

Reliable estimates of waterfowl numbers at the end of each breeding season, i.e. shortly prior to the commencement of possible shooting seasons, cannot be achieved without very substantial expenditure on field surveys.

It is for the above reasons that annual recommendations concerning possible duck shooting seasons in the South West and Eucla land divisions of WA are based to a large extent upon an assessment of prior rainfall, together with measurements of water levels of a number of wetlands.

## 2. RAINFALL

1990 rainfall (Jan-Oct) in the five meteorological districts of the south west ranged from 17% below normal in the Central Coastal district to 1% above normal in the North Central district (Figure 1; data from Bureau of Meteorology monthly weather reviews of 1990).

For four of the five districts, rainfalls were higher (+10% to +27%) than in Jan-Oct of the previous year. In the South Coastal district the average rainfall was lower (-5%).

The most notable features of 1990 rainfall (see Figure 2) were:

i) The very high rainfalls recorded in the North Coastal, North Central and South Central districts (virtually all of the Wheatbelt) in January.

   Falls over most of the Wheatbelt exceeded 100mm. Forty three stations had the highest January falls on record. Narrogin reported 150mm in one day.

ii) The above average falls in the Central Coastal and South Coastal districts in February, March and April.

iii) The well below average rainfalls recorded in all five districts (i.e. the entire south west) during the period May-September.

   District average falls during May-October, when 74-86% of annual rainfall usually occurs, were 23-36% below normal, and in the lowest 20% of recorded values for this period (lowest 10% in the Central Coastal district).

## 3. WETLAND WATER LEVELS

As a consequence of very high rainfalls in January 1990, many wetlands which were dry or had low water levels at the beginning of the month filled or partially filled (Dept of CALM data and observations). Some wetlands overflowed and flooding was reported.

If, following the January inflows, rainfalls had been average during winter and spring 1990, waterfowl habitat availability during the spring breeding season (Halse and Jaensch 1989) and the summer dry period would have been relatively high.

However, south west rainfall during winter-spring 1990 was well below average. As a consequence, waterfowl habitat availability was (winter-spring), and is (summer-autumn), less than would otherwise have been expected.

The median water depth (which can be considered to be an index of waterfowl habitat availability) of 79 south-west wetlands monitored in September 1990 was 1.15m (that is, 50% of monitored wetlands were less than 1.15m deep and 50% were more than 1.15m).

Table 1. Median water depths of lakes monitored in September of each year, and the types of duck shooting seasons (Full, Restricted or Nil) subsequently declared. A shooting season was not declared in 88/89 due to a moratorium announced in 1987.

| Season Type | Year | Median Depth (metres) | No. of lakes in sample |
|---|---|---|---|
| FULL | 83/84 | 1.50 | 74 |
| | 84/85 | 1.10 | 74 |
| RESTRICTED | 89/90 | 1.10 | 79 |
| | 81/82 | 0.95 | 67 |
| | 82/83 | 0.85 | 74 |
| | 86/87 | 0.85 | 79 |
| | 85/86 | 0.65 | 75 |
| NIL | 87/88 | 0.50 | 79 |
| | 80/81 | 0.25 | 60 |
| Current Year | 90/91 | 1.15 | 79 |

This figure (1.15m) is near the highest median depth which has preceded a Restricted shooting season during the past ten years, and the lowest median depth which has preceded a Full shooting season (Table 1).

Statistical analyses (paired t-tests) indicate, in fact, that average water depths in September 1990 were not significantly different ($p=0.59$ and $p=0.43$) from those of either September 1984 (Full season) or September 1989 (Restricted season).

Similar relationships exist between depths recorded in November 1990 and Novembers of other years.

## 4. DUCK NUMBERS

### 4.1 Historical Trends in Abundance

Limited historical data are available concerning trends in duck numbers since first European settlement in Western Australia.

The following comments concerning long term trends in the abundance of game species of ducks in Western Australia have been gleaned from the literature.

Australian Shelduck (Tadorna tadornoides) and Maned Duck (Chenonetta jubata)

"Increases in the numbers of Maned Geese (Maned Duck) have recently been noted in numerous areas in the South-West. A farmer .. 8 miles west of Dangin informed me that a pair arrived on his property in 1952. In 1953 they were joined by a dozen more, and have since increased till the flock totalled about 60 individuals". " various duck shooters informed me that they had observed similar increases elsewhere in the district " (Sedgwick 1954).

"At one time regarded as a scarce visitor to this locality (Bibra Lake district), this species (Maned Duck) is increasing in abundance throughout the south-west of Western Australia" (Ford 1958).

"This species (Maned Duck has become a more or less regular visitor to the southern parts of the State, the numbers increasing in recent years" (Serventy and Whittell 1976).

The Atlas of Australian Birds (Blakers et al 1984) states "Comparison of the field and historical Atlases suggests that its (Australian Shelduck or Mountain Duck) range and abundance may have increased since European settlement particularly in the west (i.e. Western Australia) where it was recorded in only three 1 degree (lat/long) blocks in the Goldfields Region before 1950." During the field Atlas it

was recorded in ninety-eight 1 degree blocks covering much of the southern half of the State.

"The range of the endemic Maned Duck has expanded since European settlement. Comparison with the historical maps shows its spread into newly-cleared areas, specially in the .. south-west region (of WA)" .. "Improved pastures and farm dams have provided the Maned Duck with many new suitable pools of freshwater" (Blakers et al 1984).

"The most conspicuous appearance of a bird in the wheatbelt was the Maned Duck. Its arrival was noted in the early 1930s to 1950s" (Sanders 1991; based on the comments of eight interviewees).

"Another duck that has been greatly advantaged by the environmental changes in the wheatbelt is the Australian Shelduck. It has increased greatly in numbers since the early 1900s (Sanders 1991; six interviewees).

Pink-eared Duck (Malacorhynchus membranaceus)
"Although the Pink-eared Duck .. is likely to be found anywhere in the State, it was until fairly recently considered to be rare (Serventy and Whittell 1951) since only a few specimens had been collected (Whittell 1941; Serventy 1948). A slight increase in numbers was reported during 1952 (Serventy 1953) and subsequently it was recorded in relatively large numbers at various localities in the South-West (Ford 1957; Serventy 1958) indicating that the species had undergone a remarkable increase in abundance. Additional observations on the Pink-eared Duck demonstrate that the phase of relative abundance shows no indication of changing" (Ford 1962).

"Likely to be found anywhere in the State, but until 1952 it was one of our rarer ducks in the south-west. Since then it has become quite plentiful" (Serventy and Whittell 1976).

Australasian Shoveler (Anas rhynchotis)
"In WA, in contrast (with eastern Australia), the Atlases suggest that the species' (Australasian Shoveler) range and numbers may have expanded. There were reports from only four 1 degree blocks in WA and no breeding records in the 1901-50 period, increasing to 28 in 1951-76, including six breeding records" (Blakers et al 1984). Shoveler were recorded in 46 blocks in WA in the field atlas (1977-81).

Grey Teal (Anas gibberifrons)
"Numbers (referring to the Great Southern region) have declined over the last twenty years"..(Garstone 1974).

Pacific Black Duck (Anas superciliosa)
"The Pacific Black Duck .. seems to have declined in numbers in the wheatbelt since the environmental changes occurred in

the wetlands " (Sanders 1991; based on comments by seven interviewees).

All Species
The following quotes are from Sanders (1991). This author interviewed a number of long-term residents of the WA Wheatbelt concerning their recollections of changes to Wheatbelt wetlands and their flora and fauna over the past 60 years or so.

"The information in the oral histories on changes in the numbers of waterbirds is less conclusive than on changes in the numbers of other taxa".

"Pauley noticed a general decrease in duck numbers, with the exception of the Australian Shelduck .. and Maned Duck " .. "Aitken, however, feels that duck populations have not decreased but changes in the relative abundance of species have occurred".

"Excluding the Australian Shelduck and Maned Duck, the Grey Teal .. now appears to be the most abundant duck (five sources), whereas before environmental changes occurred the Pacific Black Duck was very abundant" (based on comments of two interviewees).

"Other species of duck that seem to have declined in numbers include the .. Australasian Shoveler (four interviewees) .. (and) Hardhead (Aythya australis) (two interviewees) .."

"Information contained in the transcripts indicates that the above mentioned species have suffered a general decline in numbers from the specific wetlands included in this project. It is not clear, however, if these species have moved to other wetlands or if their numbers have indeed decreased. Information is not available in the transcripts as to the status of the .. Chestnut Teal (Anas castanea)".

In considering information obtained from oral sources it should be borne in mind that other authors (Frohring et al 1988) have suggested that population and resource management analyses should treat historical information with great caution .

Conclusions concerning Historical Trends in Abundance
It can be concluded from the above that although some game species of ducks have apparently declined in numbers during this century due to loss and degradation of habitat, this has not been the case with all species.

Certain species - notably Australian Shelduck, Maned Duck and Pink-eared Duck, and perhaps Australasian Shoveler - have apparently increased in numbers since the first half of this century.

To what extent such increases may have offset apparent decreases in certain other game species is unknown. Trends in total duck numbers in the south west over the past 50 years or so are therefore also unclear.

In the absence of good data, authorities responsible for regulating duck hunting in Western Australia over the past two decades have adopted a cautious approach and based their recommendations on the presumption that total duck numbers have declined significantly.

## 4.2 Current Numbers of Game Ducks

### Background

Annual counts of duck numbers of a sample of south west wetlands were instituted in 1986. These counts have been conducted in March each year, towards the end of the dry season and at a time when waterbirds are generally congregated in a relatively small number of "permanent" wetlands (Jaensch and Vervest 1988a).

The intention is that these March counts will be used to monitor long term trends in the abundance of each of the eight game species of ducks (Lane 1981). The specifications of Full, Restricted and Nil seasons may then be modified periodically in the light of long term population trends, should this appear necessary (Lane 1985).

Since 1988, waterfowl surveys have also been conducted in November each year. Data from these counts may be of some use in assessing waterfowl abundance. However, these surveys are primarily intended to provide information on breeding, rather than abundance (Halse et al., 1990).

### Methods

The March counts are a joint project involving CALM and the Royal Australasian Ornithologists Union (RAOU) under contract to CALM. The RAOU coordinates ground surveys undertaken by a large team of volunteer observers. CALM research staff (2) conduct several days of aerial surveys, primarily of south west estuaries and some large inland lakes.

The first three years of the project were developmental. The number of waterbodies to be surveyed was not fixed (observers were encouraged to seek new important sites each year) and grew from 872 in 1986 to 1 398 in 1988. Different waterbodies were also surveyed each year, i.e., some waterbodies surveyed in one year were not surveyed in other, subsequent years (Jaensch and Vervest 1988b).

In 1989 the first three years' results were reviewed and a fixed set of wetlands to be counted each year for a further

three years (1989-91) was adopted. There have been some difficulties, however, in achieving coverage of all 1247 wetlands on the "master list". In March 1989 1113 (89%) were surveyed (Halse et al. 1989), and in March 1990 the total was 1075 (86%) (Halse et al., unpublished data).

Results

It is apparent from the foregoing that the data gathered to date need to be viewed cautiously.

What can be stated with confidence, however, is that the number counted in any one survey is only a (varying) proportion of the total population. Thus in March 1989 the total number of game ducks in the south west was certainly well in excess of the 271 361 counted (Table 2).

The total population size can only be guessed at due to the lack of an inventory of wetlands of this region. In the opinion of the CALM and RAOU officers coordinating the counts, the true population at the time of survey was at least 2x greater than the number counted, i.e. it is thought to have been in excess of half a million birds (see Halse et al 1990).

Table 2. Number of waterbirds (ducks, swans and coots) counted and waterbodies surveyed in south-western Australia in March each year, 1986-90. Data from Jaensch and Vervest 1988a, 1988b; Halse et al. 1990, and unpublished)

| Date of Survey | No. of Birds Counted | | No. Waterbodies Surveyed | | |
|---|---|---|---|---|---|
| | Game | Non-Game | Wetlands | Farm Dams | Total |
| 1986 | 82 775 | 43 023 | 373 | 499 | 872 |
| 1987 | 195 812 | 54 513 | 459 | 742 | 1 201 |
| 1988 | 179 146 | 50 175 | 580 | 818 | 1 398 |
| 1989 | 271 361 | 83 430 | 653 | 456 | 1 109 |
| 1990 | 101 324 | 40 410 | 621 | 454 | 1 075 |

In March 1990, the number of game ducks counted was 101 324, a figure well below (-63%) the number counted in March 1989. Several factors are likely to have contributed to this decline in the number counted.

Firstly, 1989 was a much drier year than 1988 (see Figure 1). Waterfowl breeding success would therefore have been

lower in winter-spring of 1989 than in winter-spring 1988. As a consequence, actual waterfowl numbers (as opposed to numbers counted) could be expected to be lower in March 1990 than March 1989. To some extent therefore, the large decrease in the number counted would have reflected a real decrease in game duck numbers on completion of breeding.

A second factor that would have contributed (though to what extent is uncertain, see Nicholls et al., 1984) to the March 1990 count being substantially lower than that of the preceeding year is the fact that a duck shooting season was held shortly prior to the 1990 count, but not shortly prior to the 1989 count. The number of game ducks killed during the Jan-Feb 1990 season has been guesstimated to be within the range 15 000 - 30 000 (Dept of CALM, unpublished).

It is interesting to note that, while game ducks counted decreased by 63%, the number of non-game waterfowl counted in March 1990 was also lower than in March 1990, by 52%. This suggests that factors other than hunting were responsible for much of the 1989-90 decrease in numbers of game ducks counted.

A third contributing factor was undoubtedly the exceptionally heavy rainfall which occurred over most of the Wheatbelt in January 1990, two months prior to the March 1990 count (see Figure 2). This unseasonal rain greatly increased waterfowl habitat availability in the Wheatbelt and many game ducks would have dispersed to those wetlands (see Ford 1958; Bekle 1983a, 1983b; Jaensch and Vervest 1988a). This dispersal of birds, both to unsurveyed wetlands within the survey area, and to wetlands east of the survey area, no doubt led to a smaller proportion of the total game duck population being counted than would have been the case if the January rainfalls had not occurred.

A clear implication of the above is that actual game duck numbers decreased to a lesser extent from March 1989 to March 1990 than did the number of game ducks counted.

Most recent data

Preliminary results from the November 1990 waterfowl count (the most recent count data available) have produced a total of 163 220 game ducks and 32 743 non-game waterfowl from 980 waterbodies. In November of the previous year, 126 150 game ducks and 21 607 non-game waterfowl were counted on 1 013 waterbodies (Halse et al., unpublished data).

A smaller percentage of actual populations is likely to be counted in November surveys than in March surveys, as birds are normally dispersed over a larger number of wetlands (more habitat is available) in spring than in autumn. Actual numbers in November 1990 would, therefore, have been well in excess of the 163 220 game ducks counted.

## 5. RECOMMENDATIONS CONCERNING A POSSIBLE DUCK SHOOTING SEASON IN THE SOUTH WEST AND EUCLA LAND DIVISIONS

During the past ten years or so, recreational duck shooting seasons in the south west of WA have been decided principally on the basis of two indices of waterfowl habitat availability - annual rainfall and wetland water levels. As explained above, waterfowl habitat availability has a strong influence on waterfowl numbers, and therefore on the ability of duck populations to sustain harvesting.

The general approach has been to declare Full shooting seasons when rainfall and water level data have indicated average or better than average conditions for waterfowl, Restricted seasons when data have indicated below average conditions, and Nil seasons when conditions have appeared to be particularly poor (a "tracking" harvest strategy, see Caughley 1977, pp197-8).

Rainfall and wetland water level data for 1990 suggest that conditions for waterfowl in 1990-91 have been (winter-spring breeding season) and are (summer-autumn dry season) below the long term average.

**It is therefore recommended that, if a duck shooting season is to be declared for the South West and Eucla land divisions in 1991, it be a RESTRICTED SEASON.**

This would be consistent with season declarations of recent years.

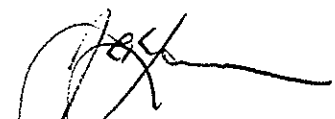
Under the standardised season procedures adopted in 1980 (Lane and Munro 1983), a Restricted Season in 1991 would have the following specifications.

| | |
|---|---|
| Opening Date: | Sunday 13th January 1991. |
| Opening Time: | 0600 hrs. |
| Closing Date: | Sunday 10th February 1991. |
| Closing Time: | 1915 hrs. |
| Daily Bag Limit: | 5 birds. |

If a season is to be declared, I will prepare additional recommendations proposing that several areas which were open to shooting in 1990 (e.g. western portion of Lake Muir; north end of Leschenault Inlet) be closed for the 1991 season.

I would also support moves to introduce a duck identification test for prospective duck shooting licence holders, and

a review of the use of lead shot for duck hunting. However, time does not permit these actions to be taken before a 1991 season. From the point of view of the long term survival of waterbird populations, it is not critical that either of these actions be taken before the next season is declared.



J.A. Lane
Principal Research Scientist
Leader, Waterbirds and Wetlands Research Program

January 14th, 1991.

[With revisions to January 16th, 1991. Revisions have been minor (typographical, explanatory, referencing, etc.). The report's recommendations remain unaltered.

A supplementary memorandum concerning the March 1989 and March 1990 counts of game ducks was prepared and forwarded on January 15th]

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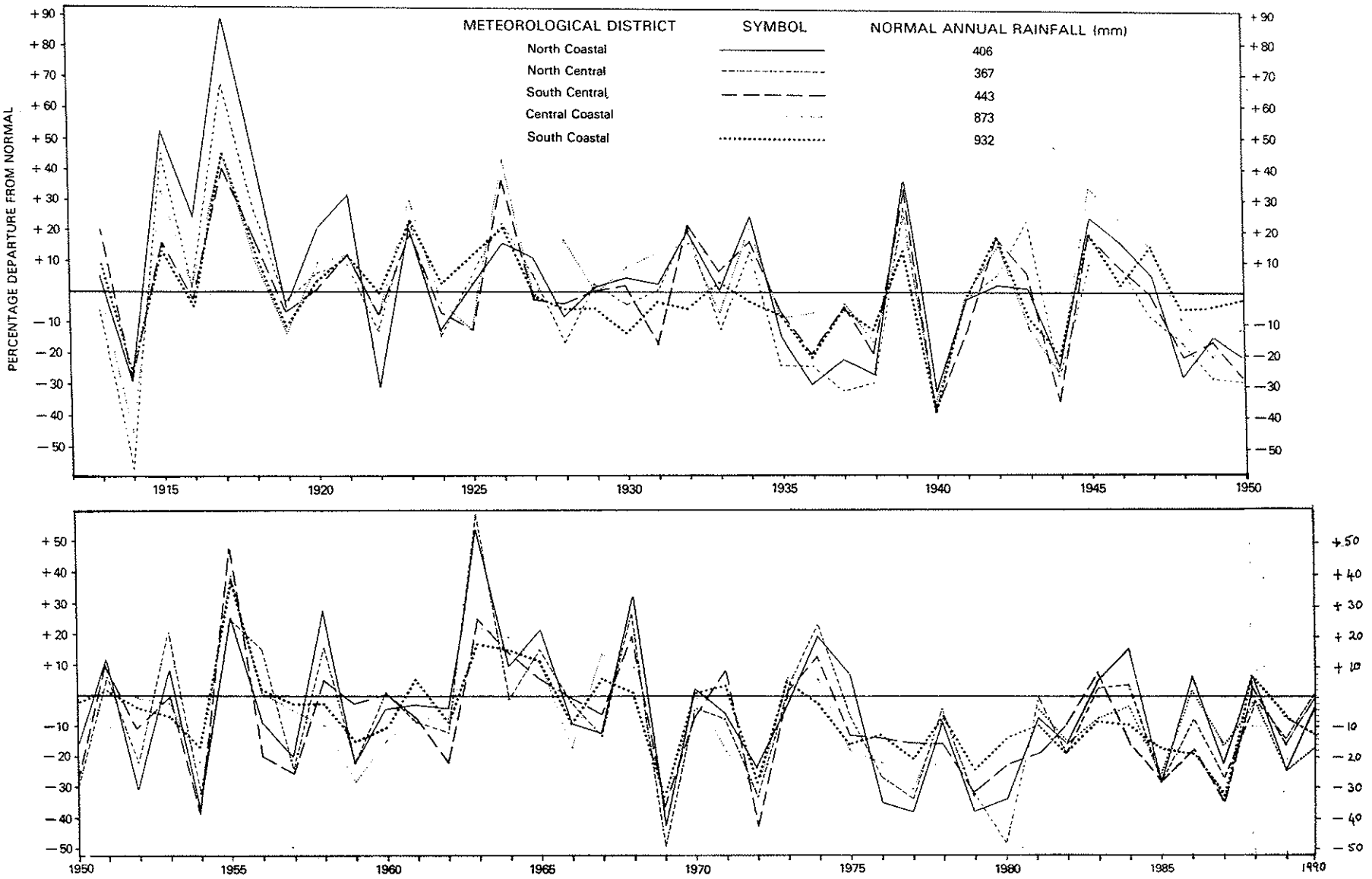


FIGURE 1. Rainfall recorded annually in each of the Meteorological Districts of the south-west, from 1913 to 1990 expressed as percentage departures from normal.

Percentage departures from normal for 1990 are based on January-October rainfall.

**Normal rainfalls for this period are 93-96% of annual totals.**

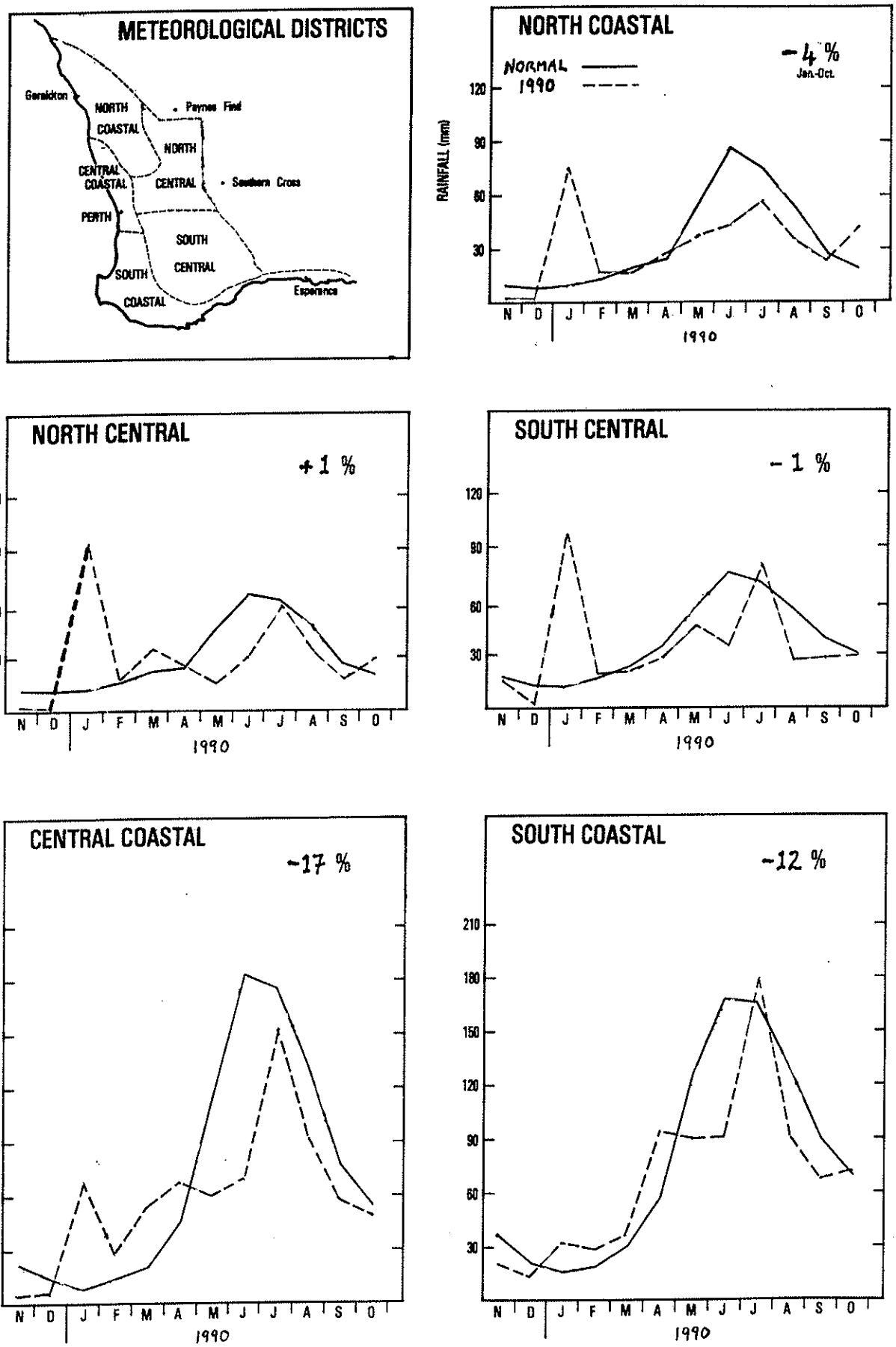


FIGURE 2

Rainfall recorded monthly in each of the five Meteorological Districts of the south-west, November 1989 to October 1990 and November to October Normal. Percentage departures from Normal (Jan.-Oct.) for each Meteorological District are also shown.

TO: DR B. WILSON, DIRECTOR OF NATURE CONSERVATION..

RE: CONSIDERATION OF A POSSIBLE DUCK SHOOTING SEASON IN THE KIMBERLEY, NORTH WEST AND EASTERN LAND DIVISIONS IN 1991.

Twelve month open seasons for the taking of game species of ducks were declared for the Kimberley, North West and Eastern Land Divisions each year from 1957 to 1987.

During that time it was not considered necessary or practicable to declare annual or occasional closed periods (as occur in the South West and Eucla land divisions) due to the vastness of the area concerned, the small number of inhabitants, the difficulty of access to breeding areas following rain and the unpredictability of rains over most of the area concerned.

In view of the above, and taking into account

* the small number of licensed shooters in the region (ranging from 184 in 1979/80, to 81 in 1980/81),

* the huge numbers of waterfowl on some lakes (e.g. 183 000 on Lakes Argyle and Gregory in 1986),

I recommend that, if a duck shooting season is to be declared in the Kimberley, North West and Eucla land divisions in 1991, then it have the same specifications as in past years.

TO: DR. B. WILSON, DIRECTOR OF NATURE CONSERVATION.

RE: ESTIMATES OF NUMBERS OF GAME SPECIES OF DUCKS.

Following our telephone conversation late yesterday afternoon concerning the significance of the lower count of game ducks in March 1990 than in March of the previous year, I believe I should add to the advice contained in the report forwarded yesterday.

Last week, following the Minister's request for the usual Departmental report, Stuart Halse prepared some estimates of the actual numbers of waterfowl in south-western Australia in March 1990, on the basis of the count data and estimates of available habitat.

His estimate of the total number of waterfowl (ducks, swans and coots) in the south west at that time is 819 000 birds; comprising 620 000 game ducks and 199 000 non-game waterfowl (of which 750 were exotic).

This may be compared with (subject to the qualification that the March 1990 estimate was arrived at through a more rigorous process) the guesstimate of Halse et al (1990) of ".. probably about 700 000 waterfowl (or twice the number counted in March 1990) in the south west in 1988/89".

As discussed yesterday, I do not believe that the decline in the number of game ducks counted from March 1989 to March 1990 is a scientifically valid basis for not declaring a duck shooting season in 1991.

J.A. Lane
Principal Research Scientist
Leader, Waterbirds and Wetlands Research Program
January 15th, 1991.

Reference

HALSE, S.A., JAENSCH, R.P., MUNRO, D.R. and PEARSON, G.B., 1990. Annual waterfowl counts in south-western Australia - 1988/89. Department of Conservation and Land Management Technical Report No.25, 43pp.

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