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PERTH

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1981 REVIEW OF RAINFALL AND WETLANDS IN THE SOUTH-WEST OF WESTERN AUSTRALIA

BY

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1981 REVIEW OF RAINFALL AND WETLANDS IN THE SOUTH-WEST OF WESTERN AUSTRALIA

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ABSTRACT

An account is given of the biological principles involved in decisions concerning duck-shooting seasons in the south-west of Western Australia.

The conditions for waterfowl which prevailed during 1981 are described through the use of rainfall statistics and data obtained from the Department's wetland monitoring programme.

Rainfall was generally average over central and northern areas of the south-west during 1981. Rainfall in southern areas, however, was generally below to much-below-average, although south coastal areas from Augusta to Albany received average falls.

Unusually heavy falls were recorded in North Coastal, North Central and Central Coastal Districts in May, and average falls were recorded in all Districts except the South Central in June and August. Falls were generally below average in March, April, July, September and October.

Wetlands in central and northern areas of the south-west showed substantial increases in depth from 1979 and 1980 to 1981. Most also exceeded 1978 levels. Many important waterfowl sites which were dry in November 1980 contained 1.00 metres or more in November '81, and some were more than 2.00 m deep.

Wetlands in southern areas also showed some improvement on levels for the preceding 2-3 years however the increases were generally not as great as those of wetlands further north. Water levels of some gauged wetlands were still lower than those recorded in 1978.

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Water levels of gauged wetlands of the south coast from Albany to Esperance were similar to or below those of 1980. All were below 1979 levels, some markedly so.

Summarizing, 1981 saw a substantial (and in some cases, dramatic) improvement in the condition of wetlands in central and northern areas of the south-west to pre-1978 levels; a less substantial but significant improvement in the condition of wetlands in southern areas; and a further, slight deterioration in conditions on the south coast from Albany to Esperance.

As a result of the improved conditions for waterfowl during 1981, a Restricted duck-shooting season was declared for the summer of 1981-82.

I INTRODUCTION

This publication has been prepared for the duck-shooting community, and for others who share an interest, either professional or amateur, in the management of waterbirds and wetlands in Western Australia. The aims of the document are twofold:

i) To briefly explain the biological principles upon which decisions concerning duck-shooting seasons in the south-west of the State are based, and

ii) To describe, by the use of graphs, table and diagrams, the conditions for waterfowl which prevailed during the 12 months prior to determination of the 1982 duck-shooting season.

The report relates only to the south-west of the State, that is, the South West and Eucla Land Divisions. A continuous open season applies in the remainder of the State due to the vast areas and very small number of inhabitants involved and to the difficulty of access to most breeding areas following rain. The report gives little attention to the eastern half of the Eucla Land Division (i.e. the Nullarbor Plain) as rainfall in this area is generally less than 250 mm per annum and wetlands are virtually non-existent.

II RAINFALL, WETLANDS AND WATERFOWL BREEDING

Rainfall in the south-west of Western Australia is markedly seasonal. On average, approximately 70% of the total annual rainfall occurs during the months May to September, with 35% being recorded during June and July. As a consequence the

wetlands (swamps, lakes, rivers, etc.) of the south-west show marked seasonal variations in water area and depth, with water levels rising during the wetter months of winter and spring and then falling during summer and autumn when little rain occurs and evaporation rates are high.

Waterfowl breed when conditions are most favourable, that is, when food and water are most abundant. In the south-west of W.A. this occurs during spring and early summer, when water levels reach their peak and warm weather accelerates the growth of aquatic plants and animals.

Nest construction and egg-laying may commence as early as June and continue until November or even December. For most species, however, peak nesting activity occurs during August and September. Broods of ducklings are most commonly seen from September to November and the great majority of young birds are flying by January. Waterfowl numbers are thus at a peak early in the New Year. This is when duck-shooting seasons are held.

III DUCK SHOOTING SEASONS

Duck-shooting seasons are confined to January - March each year in order to minimise their impact on duck populations. This can be explained as follows:

Game-species of ducks are highly fecund, that is, they are capable of producing large numbers of offspring each year, provided conditions are favourable. Single broods of five or more ducklings are a common sight during spring and early summer. Consequently, at the end of each successful breeding season, duck numbers are swollen by the addition of new birds. As the summer-autumn dry season progresses, and conditions for waterbirds deteriorate, many birds die due to a variety of natural causes such as lack of food or water, predation and disease. Such deaths are referred to collectively as "natural mortality". First-year birds in particular have a high rate of natural mortality, largely due to lack of experience in locating adequate resources. By holding the shooting season early in the year one is able to minimise the impact on duck populations since a significant proportion of the ducks killed are birds which would normally die from natural causes before the next breeding season. Thus shooter-induced mortality is timed to replace natural mortality, rather than add to it. It follows that, upon completion of breeding, the sooner the shooting season is held, the less the effect on the number of birds surviving to the following breeding season. The later the season, or the longer it extends, the greater the effect on numbers surviving to breed.

IV VARIATIONS IN RAINFALL AND CONDITIONS FOR BREEDING

Rainfall, of course, varies from year to year, and as a consequence so does the availability of water for breeding purposes. Thus in years of average or better-than-average rainfall, conditions for waterfowl breeding are usually good and the number of young produced is high; whereas, in years of exceptionally low rainfall, little surface water is available and production is greatly reduced.

Duck-season decisions must take these variable conditions into account. In Western Australia the practice now is to declare FULL SEASONS when conditions for breeding have been average or better-than-average, RESTRICTED SEASONS when conditions have been poor, and NO SEASONS when conditions have been particularly poor for a number of years. The principal objective of this system is to ensure that shooting does not cause a serious reduction in the size of the breeding stock during dry years or periods of prolonged drought. Specifications for FULL, RESTRICTED and NO SEASONS are as follows:-

	FULL SEASON	RESTRICTED SEASON	NO SEASON
Opening Date	2nd weekend in January	2nd weekend in January	-
Opening Day	Saturday	Sunday	-
Opening Time	6.00 PM	6.00 AM	-
Season Length	10 weeks	4 weeks	-
Bag Limit	10 birds of any game species	5 birds of any game species	-

V ASSESSMENT OF CONDITIONS

Prior to 1978 conditions for waterfowl breeding were assessed each year through ground and aerial surveys of important waterfowl sites. Water levels were recorded as dry, low, half full, high or full. Notes were also made of waterfowl numbers and, where possible, waterfowl breeding activity.

In 1977 the authors decided that a more precise system of evaluation was required and so undertook a programme of installation of depth gauges on selected wetlands. Gauges were installed on 27 wetlands from November 1977 to December 1978 and again in 1979 and 1980, and on 28 wetlands in 1981. Ten more are proposed for 1982. This will complete the gauging programme.

The wetlands which have been gauged are distributed throughout the south-west of the State, mainly south of a line through Dongara, Merredin and Esperance. Most are Wetland Nature Reserves (including Game Reserves) vested in the Western Australian Wildlife Authority and managed by the Department of Fisheries and Wildlife. These depth gauges permit precise monitoring of water levels and thus allow more meaningful comparisons of conditions to be made from one season to another. The gauges also make it possible to determine average rates of water loss during the annual dry season and thus enable us to forecast "dry-out" dates for individual wetlands or groups of wetlands each year.

A lack of pre-1978 data prevents us from being able to make precise comparisons of present-day water levels with those of earlier years. How then does one judge the normality, or otherwise, of present-day conditions? Since wetland condition and rainfall are intimately related we have turned to annual rainfall data for this purpose.

VI USE OF RAINFALL DATA IN ASSESSMENT OF CONDITIONS

Annual District Average rainfall data for Western Australia are available* from as early as 1913. These data provide a convenient means for examining long-term trends in annual rainfall in each of the five Meteorological Districts of the south-west, and over the south-west of the State as a whole. They thus enable us to assess the degree of abnormality of rainfall in particular years or groups of years, from 1913 to the present. By this means we are able to consider how typical or atypical present conditions may be, when viewed over a long period of time, in this case 69 years.

District Average rainfall data do have one disadvantage however. By averaging rainfall over each Meteorological District, they fail to reveal the "patchiness" of rainfall within a District. This problem can be overcome through the use of data from individual weather stations to produce maps of rainfall distribution, as will be seen later in this report.

VII CONCLUSION

As discussed above, controls on duck shooting in the south-west of Western Australia are considered necessary to protect game species from over-exploitation, particularly during dry years and periods of prolonged drought. These controls are achieved principally through the restriction of shooting to Full,

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*From the Commonwealth Bureau of Meteorology, Department of Science and Environment.

Restricted or No Seasons, as appropriate. Rainfall data and wetland monitoring data are now used as a basis for determining the type of season to be declared each year.

The data contained in the remainder of this report (Figures 1-38, and Table 1) were presented to the November 1981 meeting of the W.A. Wildlife Authority's Bird Committee to assist members of that Committee in their consideration of the proposed 1982 duck-shooting season.

Following the Bird Committee meeting, the Minister for Fisheries and Wildlife, Mr Gordon Masters, announced a Restricted duck-shooting season in the South-West and Eucla Land Divisions of the State. The full text of the Minister's media release was as follows:

> The Minister for Fisheries and Wildlife, Mr Gordon Masters, has declared a 1982 duck shooting season for the South West and Eucla land division.
>
> Mr Masters said today that despite continuing drought conditions in the South West and specially along the south coast he had decided that a restricted duck shooting season should be declared for next year.
>
> The season would open at 6 am on Sunday, January 10, and would close at 11.59 pm on Sunday, February 7.
>
> The daily bag limit is five birds of a declared game species, with no bag limit on the Mountain Duck.
>
> "I am confident that sporting shooters planning expeditions during the season will observe the bag limit to minimise shooting pressure on game ducks," Mr. Masters said.
>
> "It is important that breeding stocks are maintained for future seasons.
>
> "I look forward to the day when, with a return to more normal rainfall and wetland conditions, it will be possible to declare a full duck shooting season once again."
>
> The Minister said that while district rainfall averages in 1981 were, in most cases, higher than those recorded in 1979 and 1980, none exceeded the long-term average.
>
> "While this resulted in improved wetlands conditions in the central and northern areas of the south-west, there was a less substantial improvement in southern areas, and a further slight deterioration in conditions on the south coast from Albany to Esperance."
>
> Mr Masters said the decision to place no bag limit on Mountain Ducks was taken because numbers had built up

considerably, to nuisance levels, and a reduction of the total population of the species was desirable.

The South-West and Eucla land divisions cover most of the agricultural areas of the State south of Kalbarri and east of Eucla.

For the rest of the State - Kimberley, North-West and Eastern land divisions - Mr Masters has declared a continuing open season with a daily bag limit of ten ducks of a declared game species.

ACKNOWLEDGEMENTS

We would like to thank members of the West Australian Field and Game Association Inc. for the valuable contribution which they have provided by assisting in the monitoring of gauged wetlands of the south-west. We would also like to thank the Commonwealth Bureau of Meteorology for supplying rainfall data, Ms Rhonda Dwyer and Mr Don Smart of the Department of Lands and Surveys' Cartographic Branch for preparing the illustrations, Dr Andrew Burbidge for commenting on the manuscript, and Technical Officer Grant Pearson for his assistance in the monitoring programme.

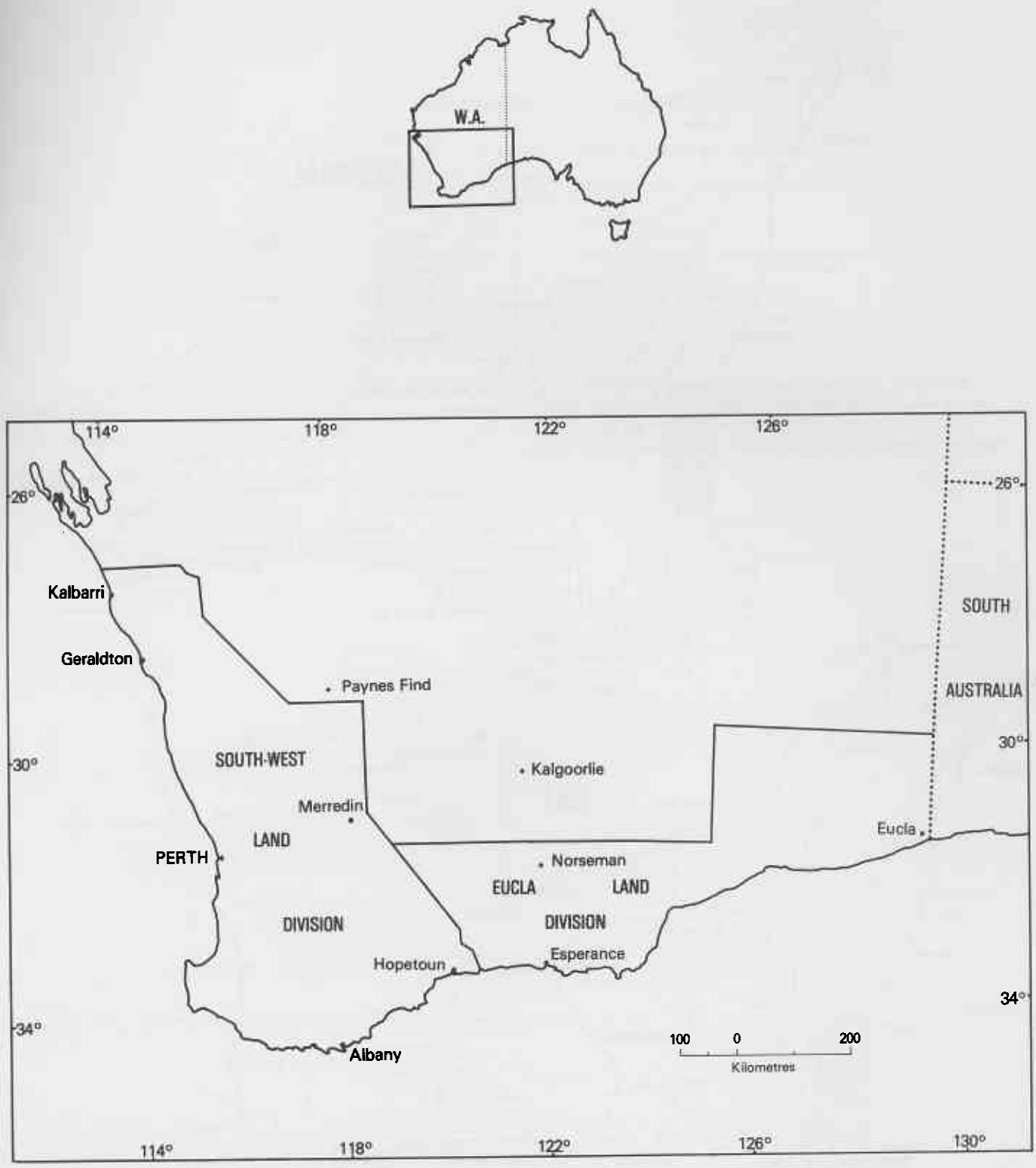


FIGURE 1. Boundaries of the South-West and Eucla Land Divisions.

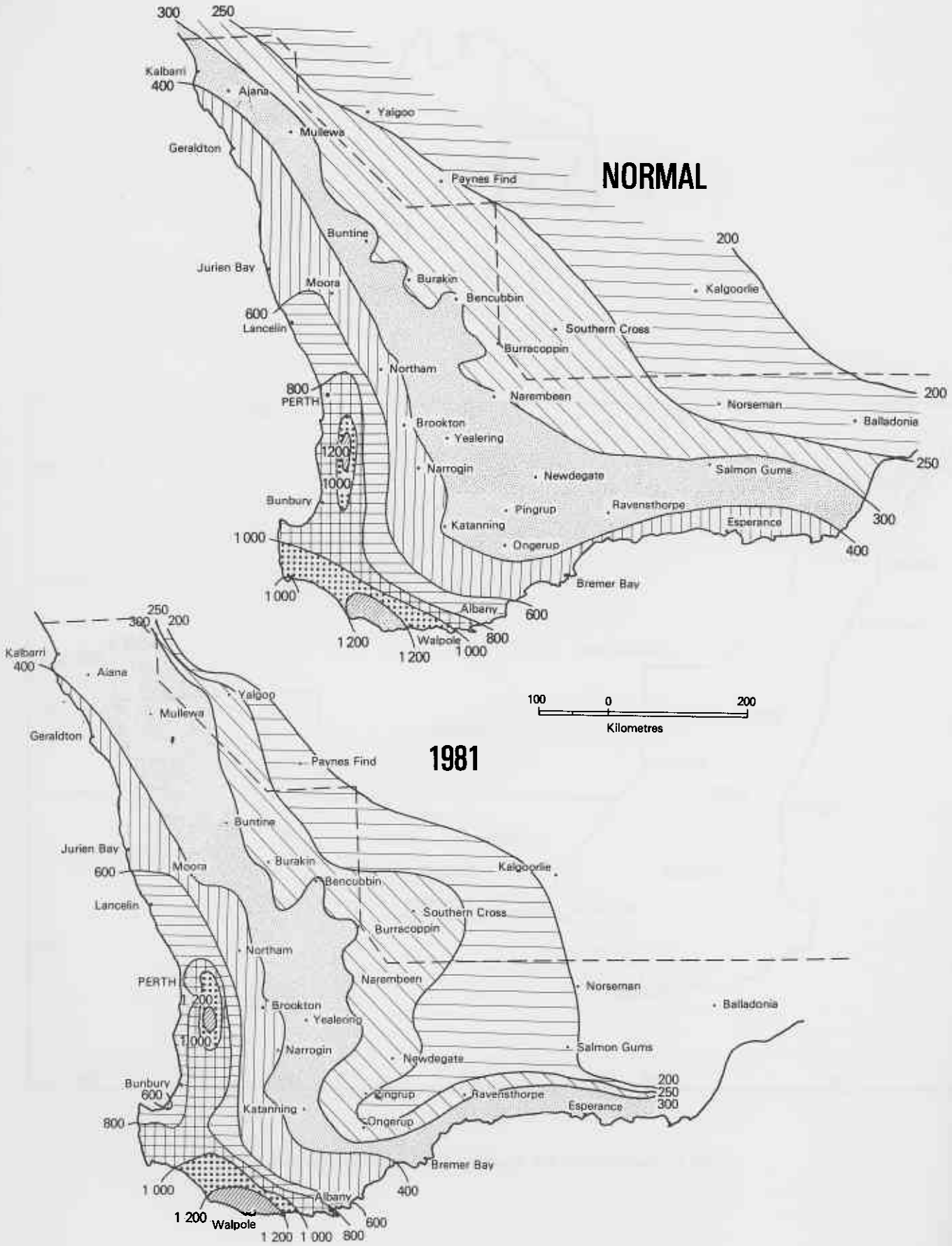


FIGURE 2 Rainfall recorded (mm) in the south-west of Western Australia, Jan.-Oct. 1981 and Jan.-Oct. Normal

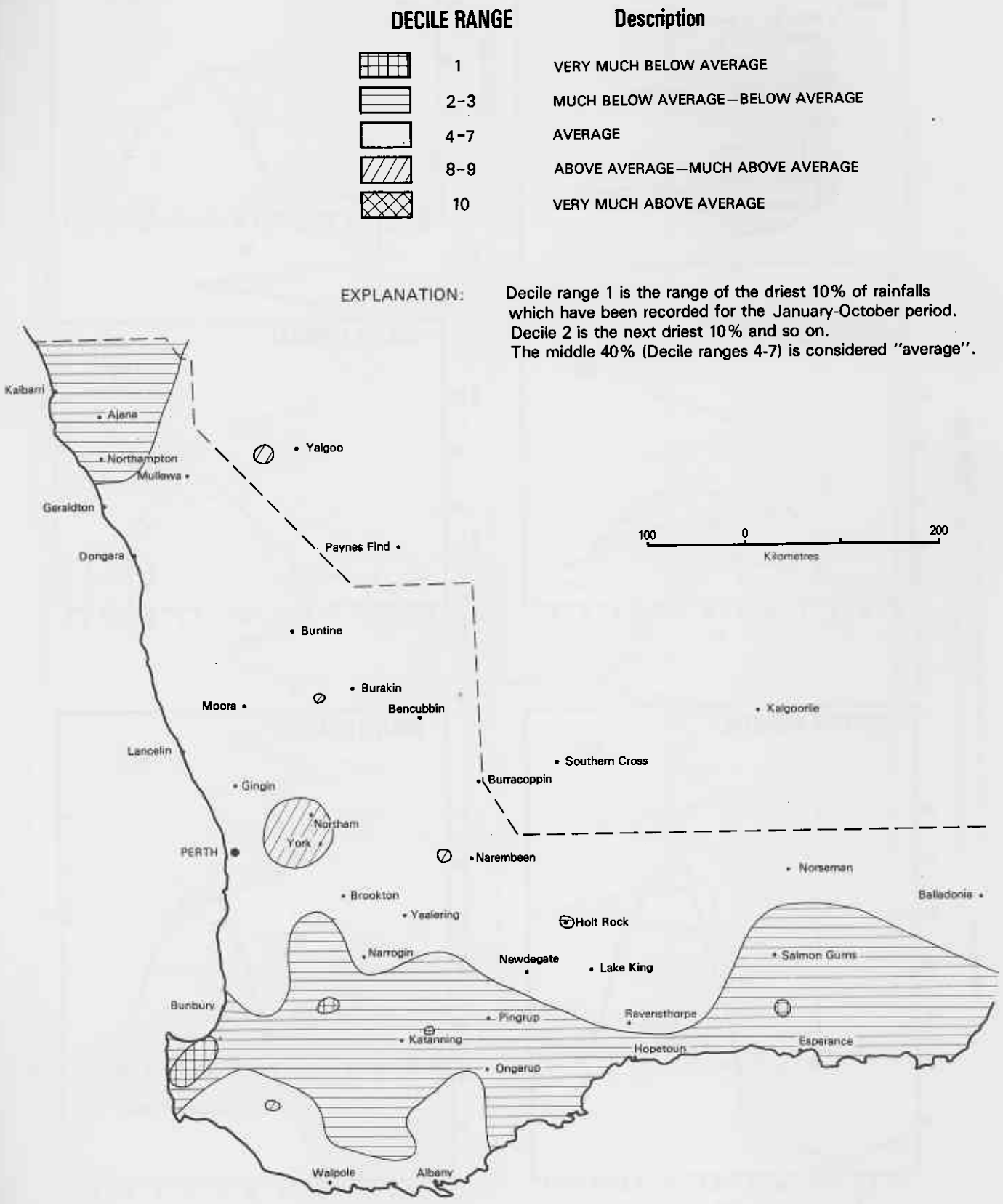


FIGURE 3. Distribution of Decile Range numbers of rainfall, Jan.-Oct. 1981

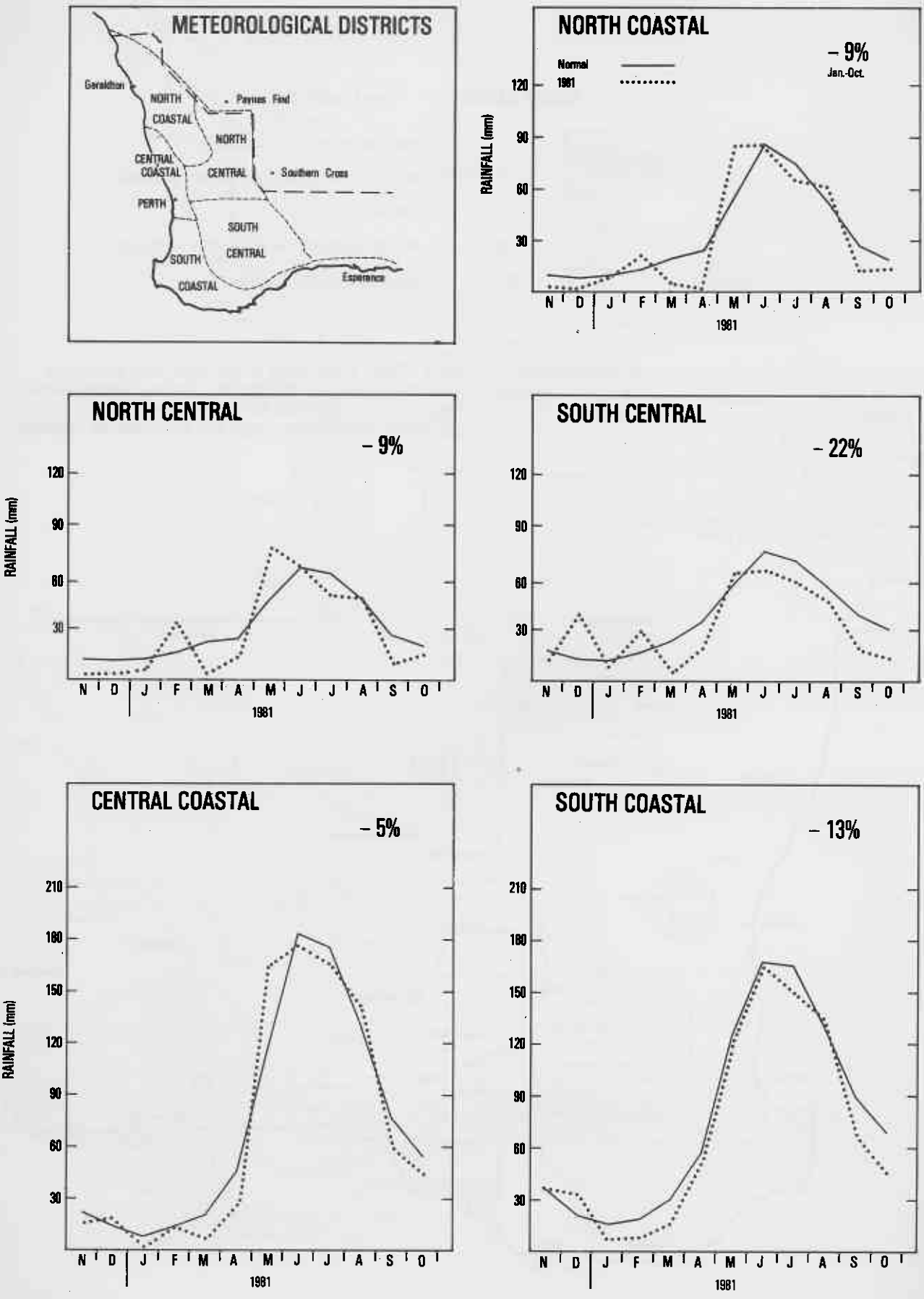


FIGURE 4

Rainfall recorded monthly in each of the five Meteorological Districts of the south-west, November 1980 to October 1981 and November to October Normal. Percentage departures from Normal (Jan.-Oct.) for each Meteorological District are also shown.

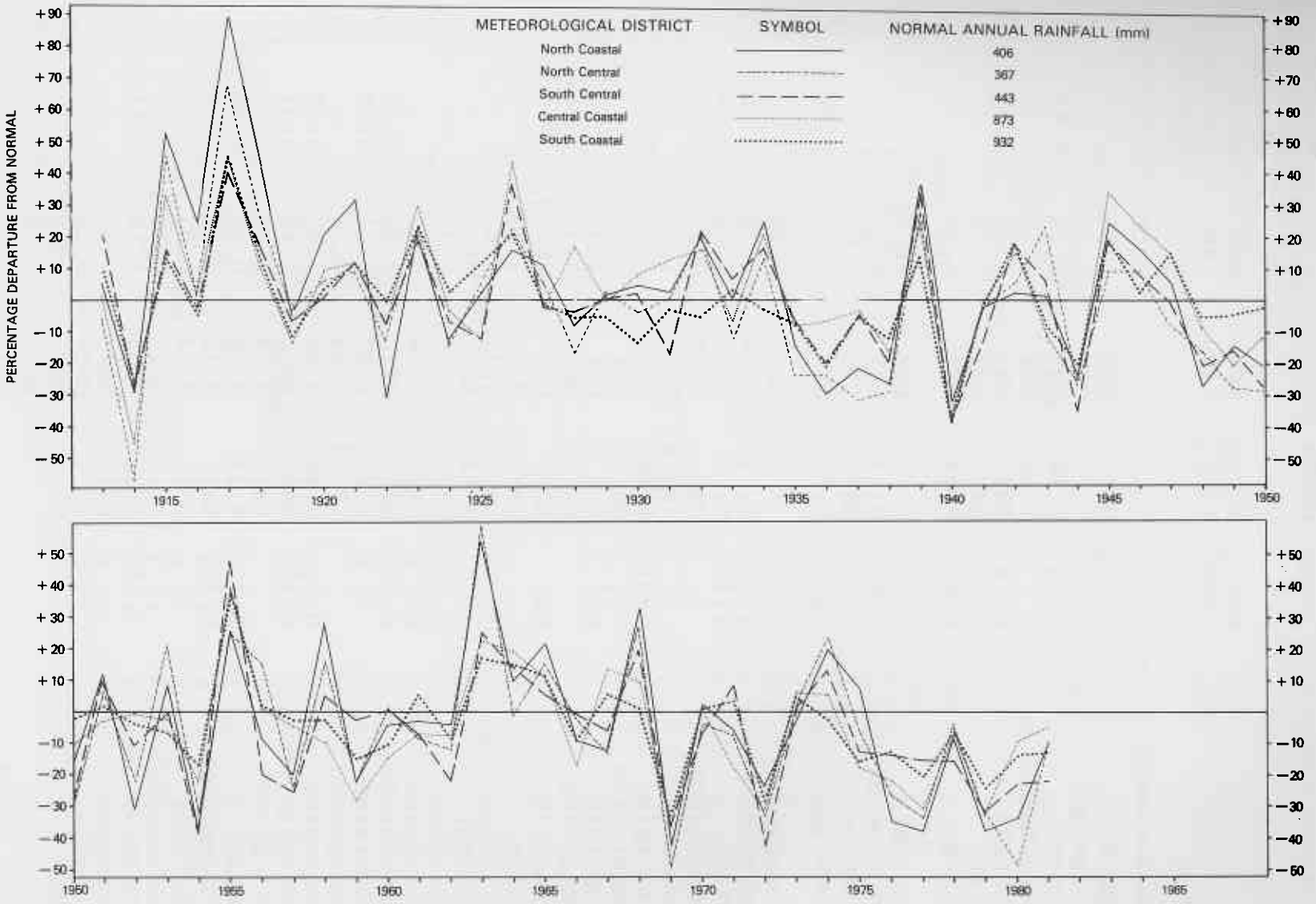


FIGURE 5 Rainfall recorded annually in each of the Meteorological Districts of the south-west, from 1913 to 1981, expressed as percentage departures from normal.

Percentage departures from normal for 1981 are based on January-October rainfall.
Normal rainfalls for this period are 93-96% of annual totals.

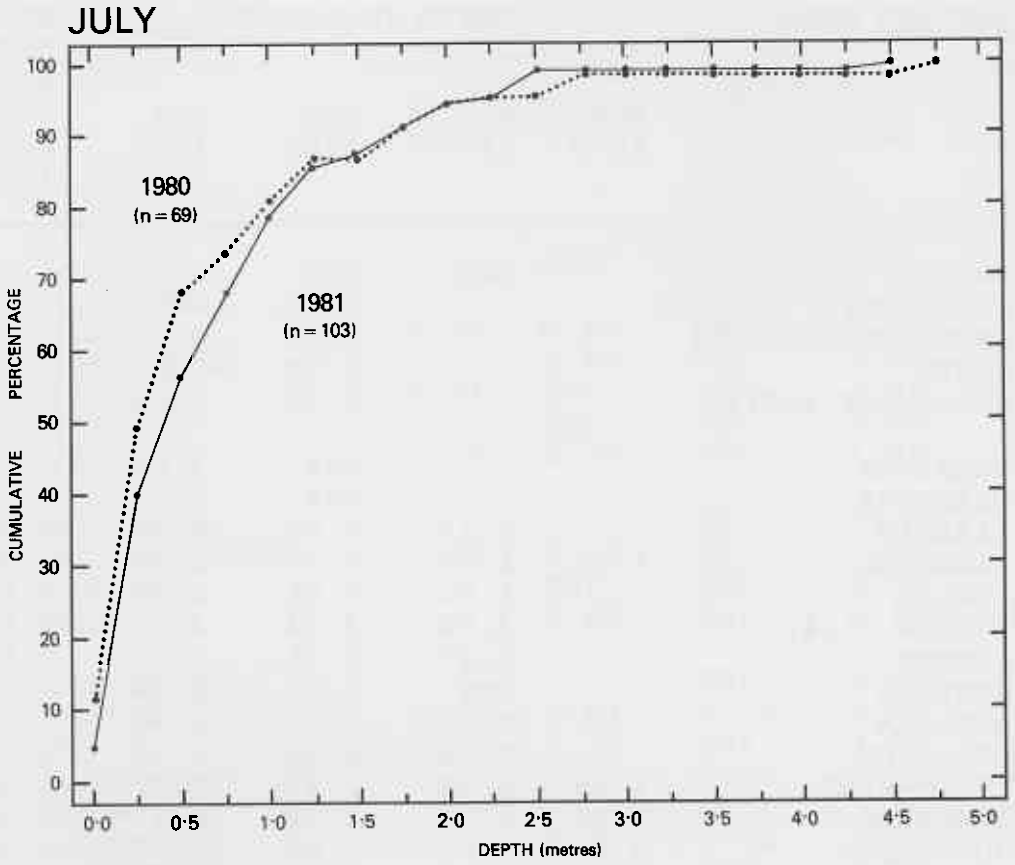
WETLAND No.	WETLAND NAME	DEPTH (metres) NOV 1978	NOV 1979	NOV 1980	NOV 1981	MAXIMUM RECORDED NOV-JAN DEPTH DECREASE (metres)
1	LOGUE		DRY	DRY	1.55	-
2	CAPAMAURA			DRY	0.70	-
3	EGANU	1.78	0.20	DRY	2.28	0.43
4	PINJARREGA		1.10	DRY	2.14	-
5	STREETS	0.04	DRY	DRY	1.21	-
6	HINDS		DRY	DRY	1.00	-
7	NINAN	0.25	0.23	DRY	1.96	-
8	MOLLERIN			DRY	<0.01	-
9	WALYORMOURING	0.03	0.03	DRY	0.51	-
10	CAMPION		DRY	DRY	0.65	-
11	NOONYING		0.85	DRY	1.18	0.38
12	DOBADERRY			DRY	0.49	-
13	BEVERLEY	1.65	0.63	0.24	1.70	0.50
14	MEARS	1.74	0.72	DRY	1.00	0.54
15	NONALLING*		DRY	0.88	0.75	0.43
16	BROWN		<0.16	DRY	1.46	-
17	YEALERING	1.67	0.56	0.32	1.94	0.56
18	DULBINNING		DRY	DRY	0.70	-
19	TOOLIBIN	DRY	DRY	DRY	1.35	-
20	WALBYRING		DRY	DRY	0.37	-
21	TAARBLIN	DRY	DRY	DRY	<0.08	-
22	BOKAN		DRY	0.02	0.39	-
23	LITTLE WHITE		DRY	0.47	0.81	-
24	KWOBRUP		0.14	DRY	DRY	-
25	COYRECUP	1.00	DRY	<0.13	0.35	-
26	CASUARINA	DRY	DRY	<0.49	0.90	-
27	COOMELBERRUP	0.53	DRY	DRY	0.36	0.32
28	COBLININE		0.91	1.27	1.21	0.39
29	DUMBLEYUNG		<0.13	0.13	0.25	-
30	GUNDARING	0.82	0.48	0.67	0.95	0.48
31	PARKEYERRING	0.49	DRY	<0.10	0.60	0.41
32	FLAGSTAFF		DRY	0.14	0.26	-
33	WARDERING	0.82	0.24	0.66	0.99	0.40
34	QUEEREARRUP	0.34	DRY	0.30	0.57	0.34
35	MARTINUP		DRY	0.24	0.33	-
36	WEST ARTHUR 5456			DRY	0.80	-
37	TOWERINNING	1.69	0.81	0.54	1.10	0.51
38	KONDININ		0.20	DRY	0.62	-
39	GOUNTER			DRY	0.10	-
40	ACE			DRY	<0.02	-
41	PALLARUP			DRY	<0.07	-
42	KENT 29020			DRY	DRY	-

TABLE 1 : November depths of monitored wetlands; 1978-1981. Refer to Figure 38 (fold-out map at end of report) for wetland locations.

*Nonalling Lake's outlet was "dammed" prior to winter of 1979.

WETLAND No.	WETLAND NAME	DEPTH (metres) NOV 1978	NOV 1979	NOV 1980	NOV 1981	MAXIMUM RECORDED NOV-JAN DEPTH DECREASE (metres)
43	BRYDE		DRY	DRY	DRY	-
44	CAIRLOCUP			DRY	DRY	-
45	GNOWANGERUP 26264			0.07	DRY	-
46	CAMEL			0.19	DRY	-
47	CRANBROOK 25812			0.20	0.06	-
48	ENEMINGA			DRY	3.00	-
49	CRACKERS			DRY	0.05	-
50	KARAKIN		0.55	0.82	0.98	0.82
51	WANNAMAL	1.14	1.15	1.24	1.23	0.80
52	YURINE		1.01	0.66	2.20	0.60
53	GINGIN 31241		2.08	2.14	2.07	0.60
54	BAMBUN		2.27	2.31	2.32	0.50
55	NAMBUNG		DRY	0.07	0.49	-
56	MUNGALA		0.10	0.12	0.70	
57	CHANDALA		0.74	0.82	0.70	0.44
58	CHITTERING	1.39	1.38	1.45	1.31	0.45
59	JANDABUP	1.35	1.25	1.22	1.27	0.39
60	JOONDALUP	3.01	2.87	2.88	2.92	0.35
61	THOMSONS	0.94	0.17	0.86	0.90	0.44
62	FORRESTDALE	0.92	0.30	0.79	0.93	0.42
63	MURRAY 24739			0.57	0.32	0.57
64	HARVEY 12632			1.16	1.08	0.51
65	BOYUP BROOK 18239			<0.05	DRY	-
66	UNICUP			0.60	0.64	0.35
67	MUIR		0.14	0.17	0.52	-
68	BYENUP	2.40	2.27	2.14	2.38	0.29
69	TORDIT-GARRUP	3.15	2.91	2.75	2.88	0.29
70	POORGINUP	0.55	0.53	0.55	0.54	0.23
71	WARRINUP			0.21	0.12	-
72	KWORNICUP		0.41	0.26	0.39	0.33
73	PLANTAGENET 25386		0.73	0.48	0.41	0.73
74	ALBANY 27157			1.10	0.84	0.23
75	PLEASANT VIEW		2.20	1.52	1.15	0.28
76	MOATES		4.44	4.51	4.32	0.46
77	JERDACUTTUP		2.41	1.30	0.62	0.38
78	SHASTER		1.04	0.17	0.20	0.37
79	GORE		1.72	1.35	1.32	0.30
80	SHARK		2.40	2.25	2.29	0.25
81	WARDEN		1.53	<0.84	0.66	0.32
82	MULLET			0.57	0.53	0.35

TABLE 1 CONT'D...



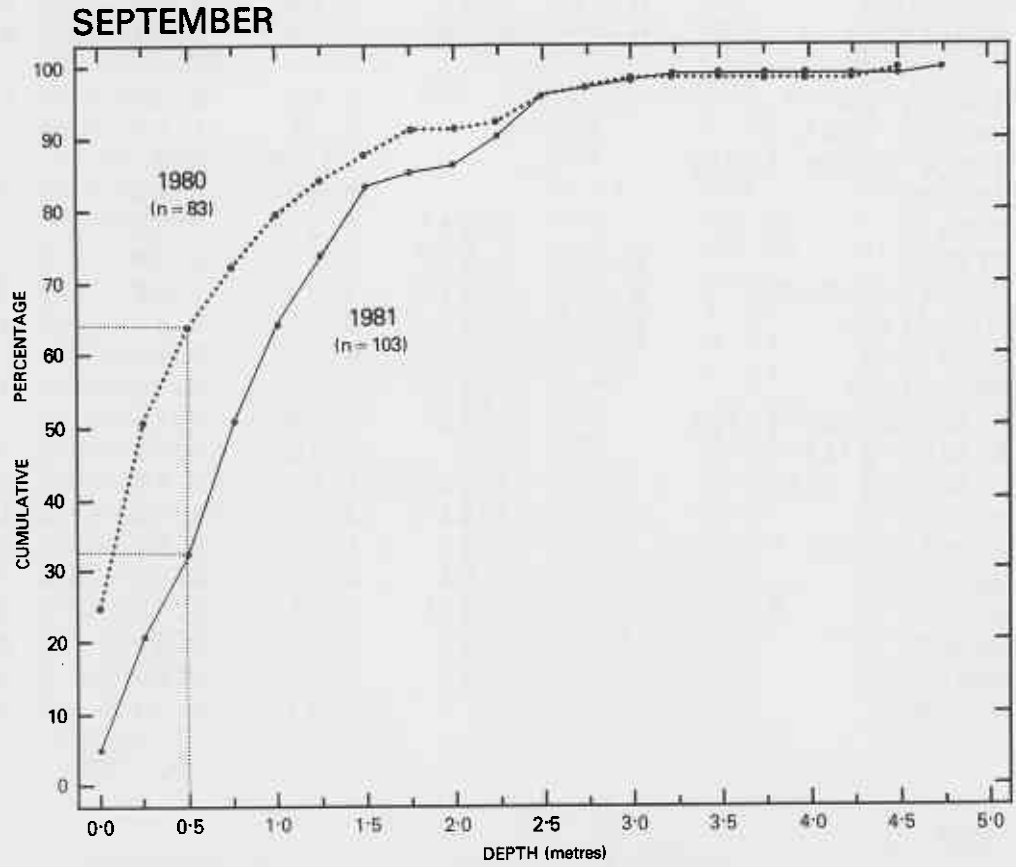
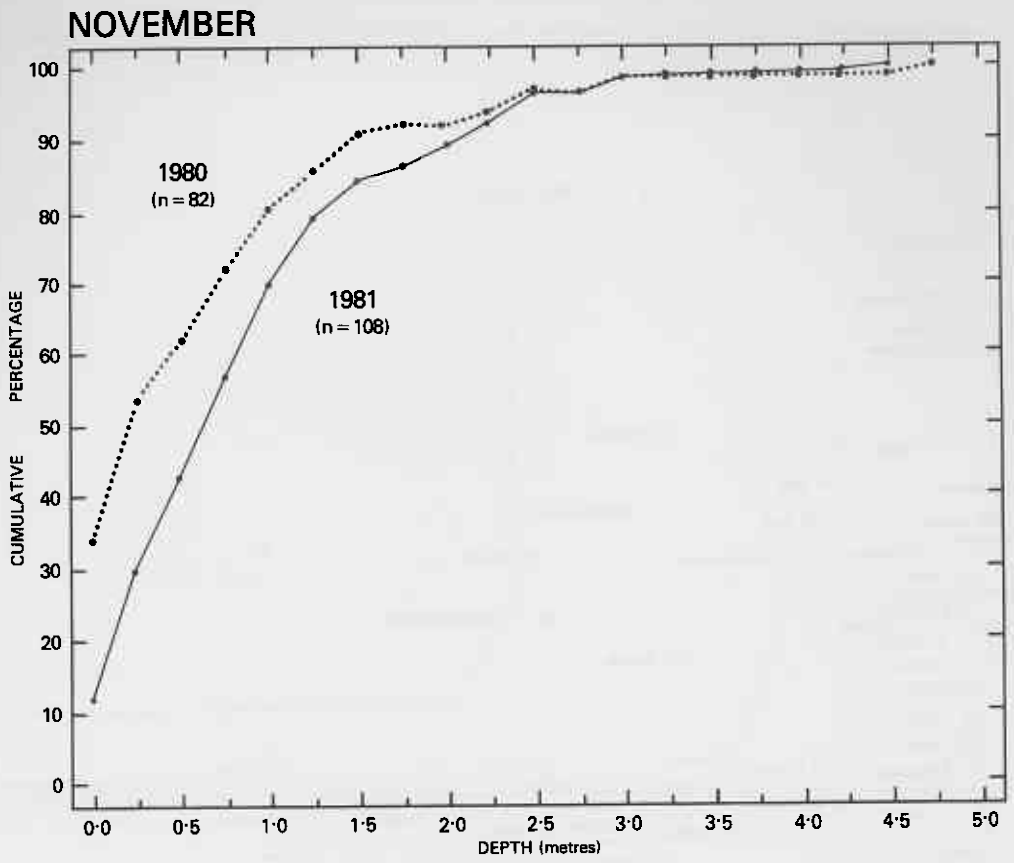


FIGURE 6

CUMULATIVE PERCENTAGES OF WETLAND DEPTHS. "n" is the total number of wetlands monitored.

This figure shows, for example, that in September 1980 64% of monitored wetlands had depths of less than 0·5 m, whereas in September 1981, only 32% were less that 0·5 m deep. Thus conditions overall were "wetter" in September 1981 than September 1980. Similar comparisons can be made for July and November.



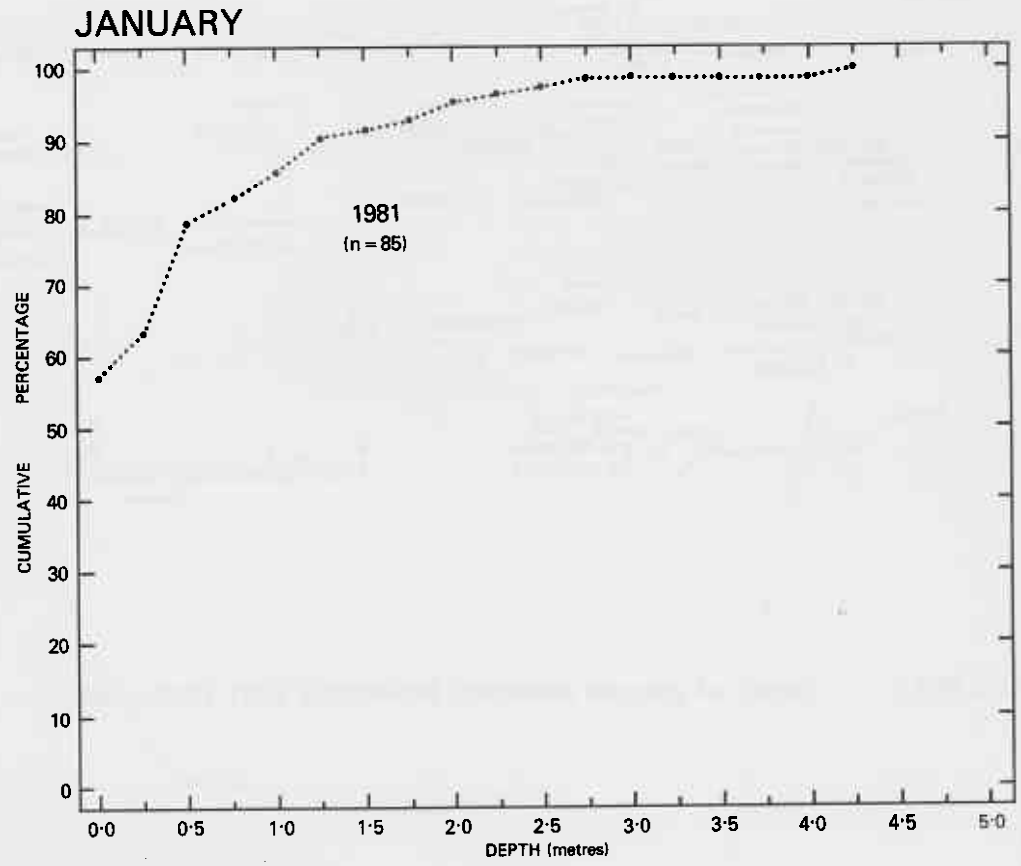


FIGURE 6 CONTD

FIGURE 7. Depth of gauged wetlands, November 1981 (first week)

FIGURE 8. LAKE LOGUE (Wetland No. 1)

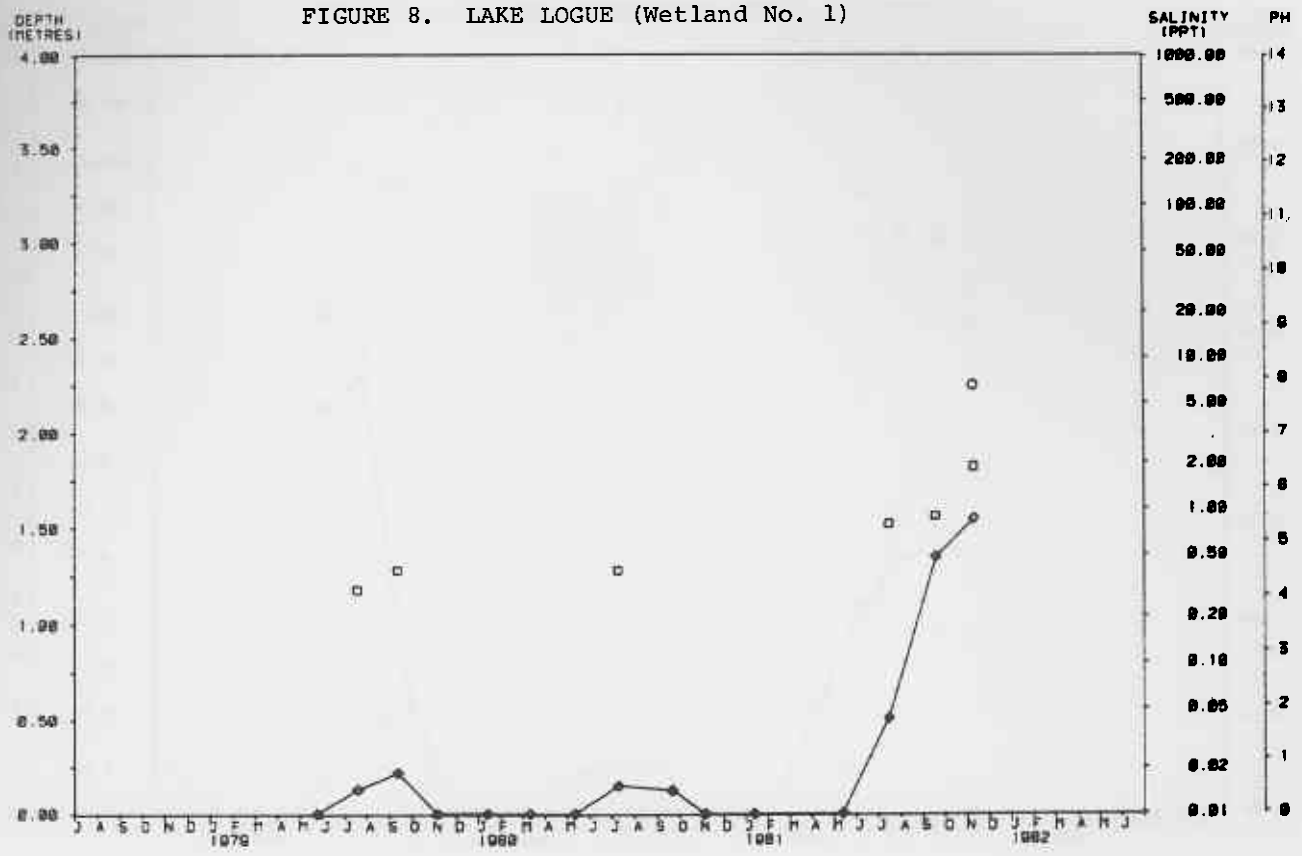
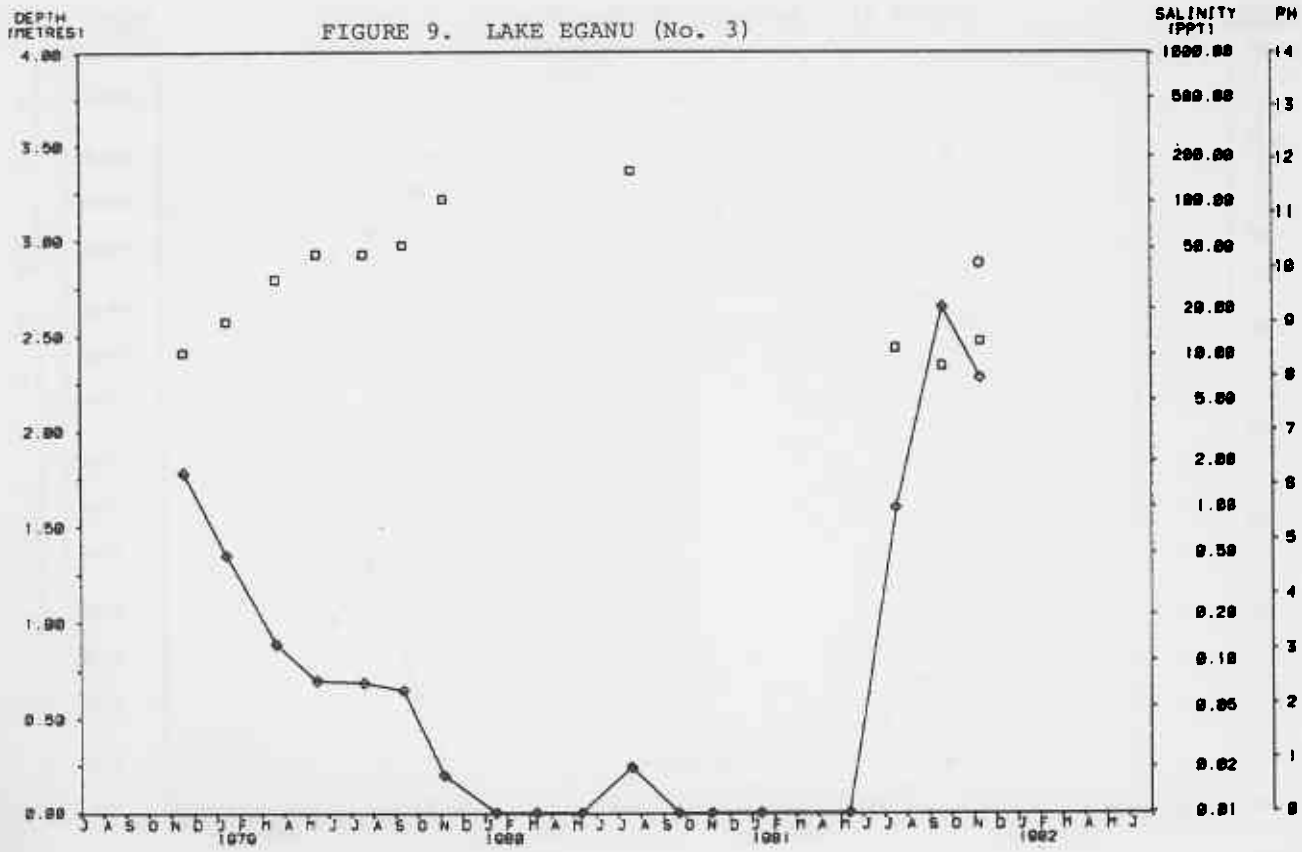


FIGURE 9. LAKE EGANU (No. 3)



◇ DEPTH □ SALINITY ○ PH FACTOR

VA DEPT.FISHERIES +WILDLIFE
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FIGURE 10. LAKE PINJARREGA (No. 4)

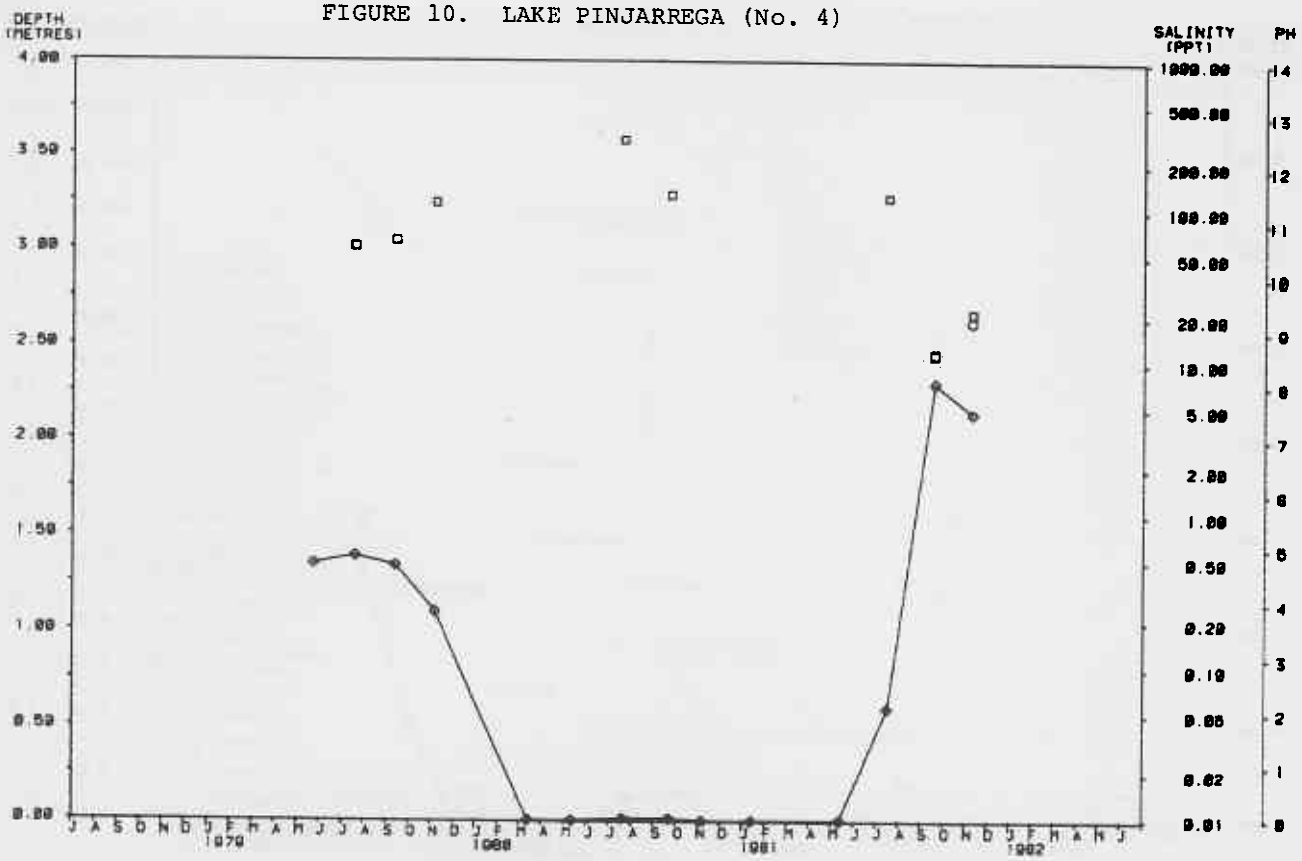


FIGURE 11. LAKE HINDS (No. 6)

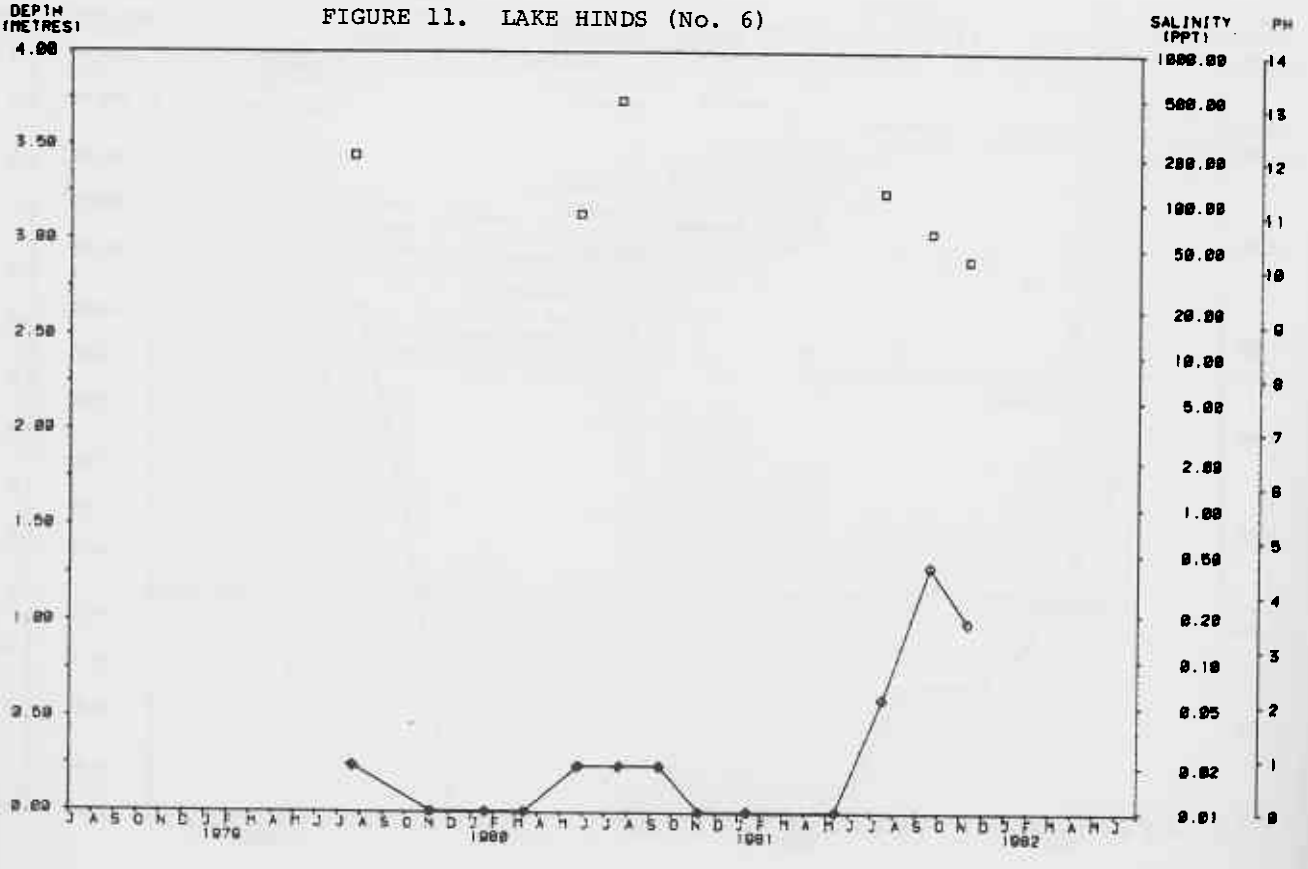


FIGURE 12. LAKE NINAN (No. 7)

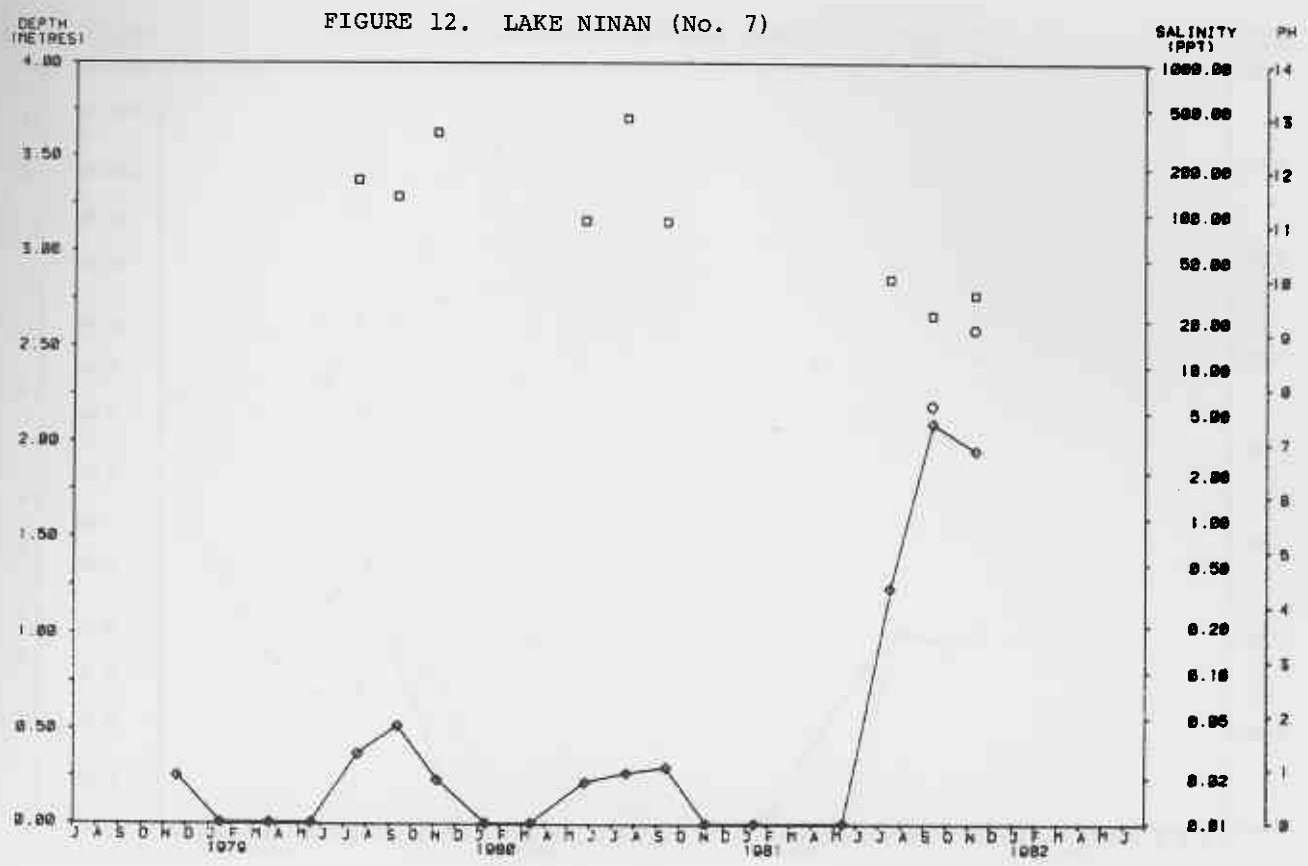
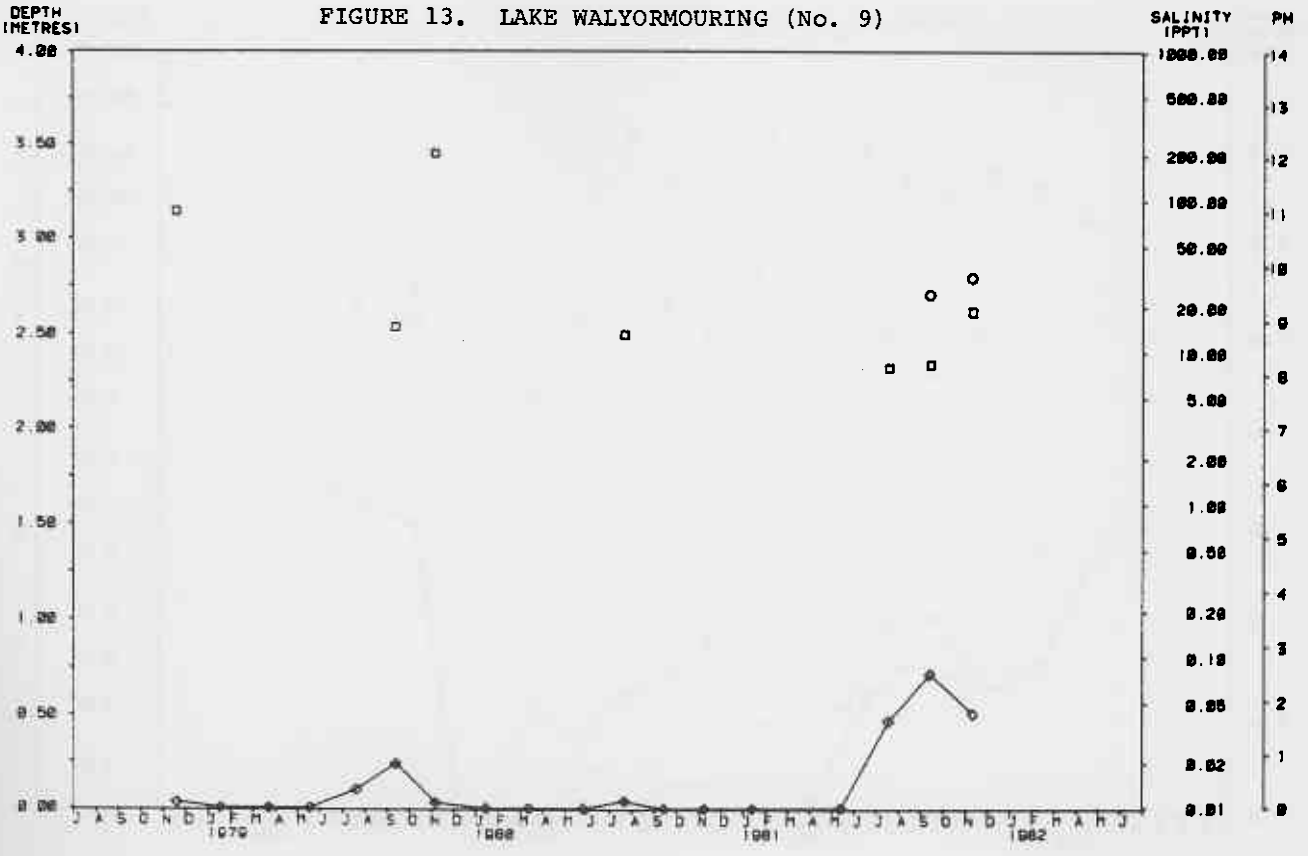


FIGURE 13. LAKE WALYORMOURING (No. 9)



○ DEPTH □ SALINITY ○ PH FACTOR

VA DEPT. FISHERIES + WILDLIFE
WATERBIRD RESEARCH

FIGURE 14. LAKE NOONYING (No. 11)

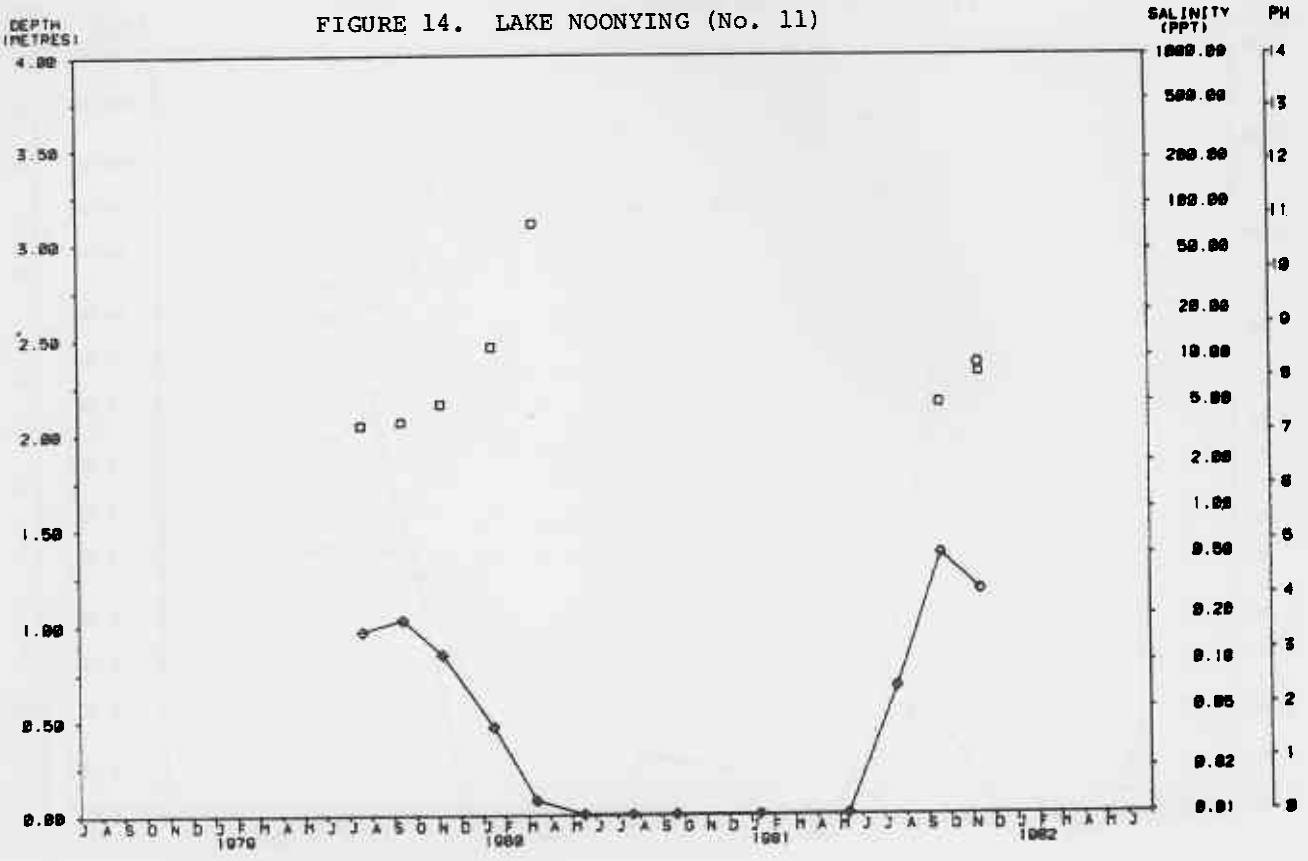
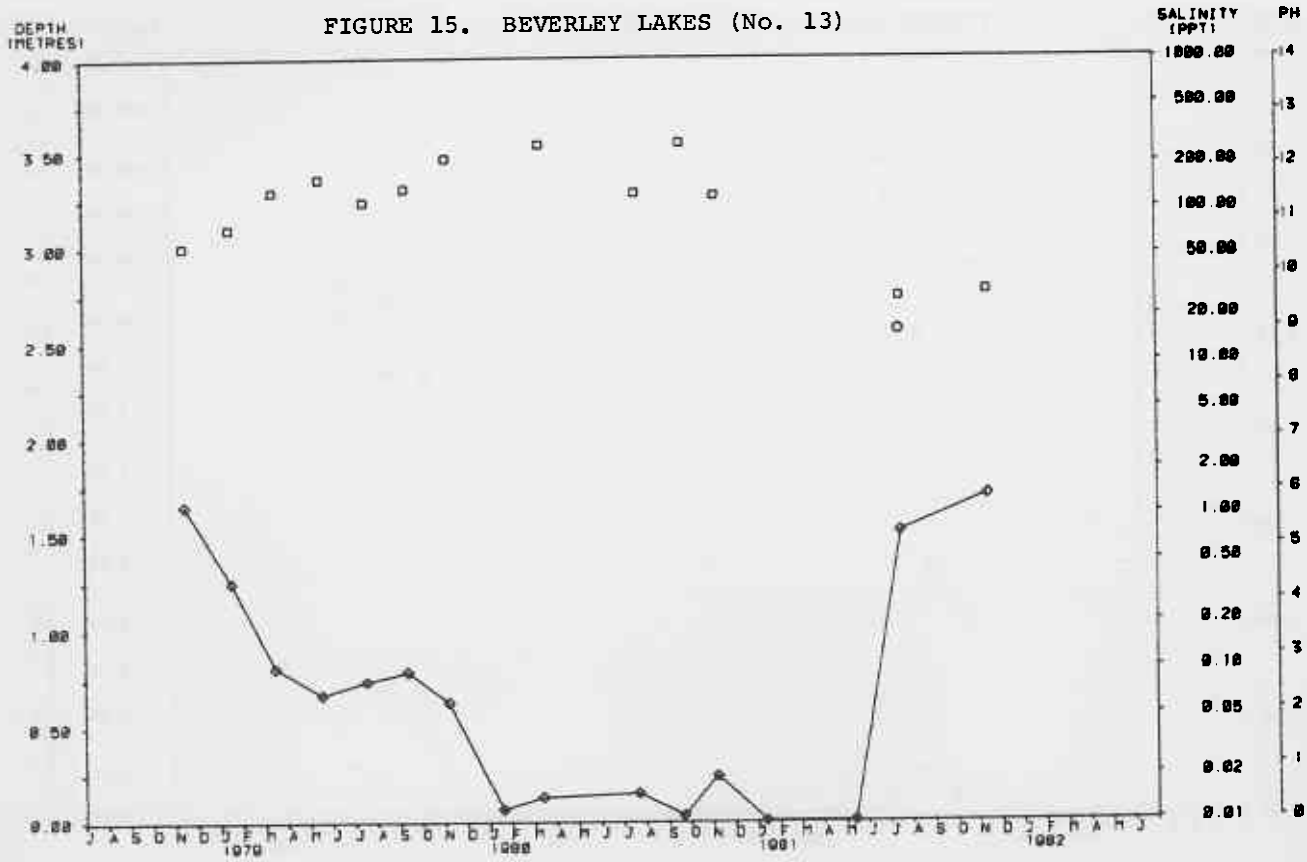


FIGURE 15. BEVERLEY LAKES (No. 13)



◇ DEPTH □ SALINITY ○ PH FACTOR

WA DEPT. FISHERIES + WILDLIFE
WATERBIRD RESEARCH

FIGURE 16. LAKE MEARS (No. 14)

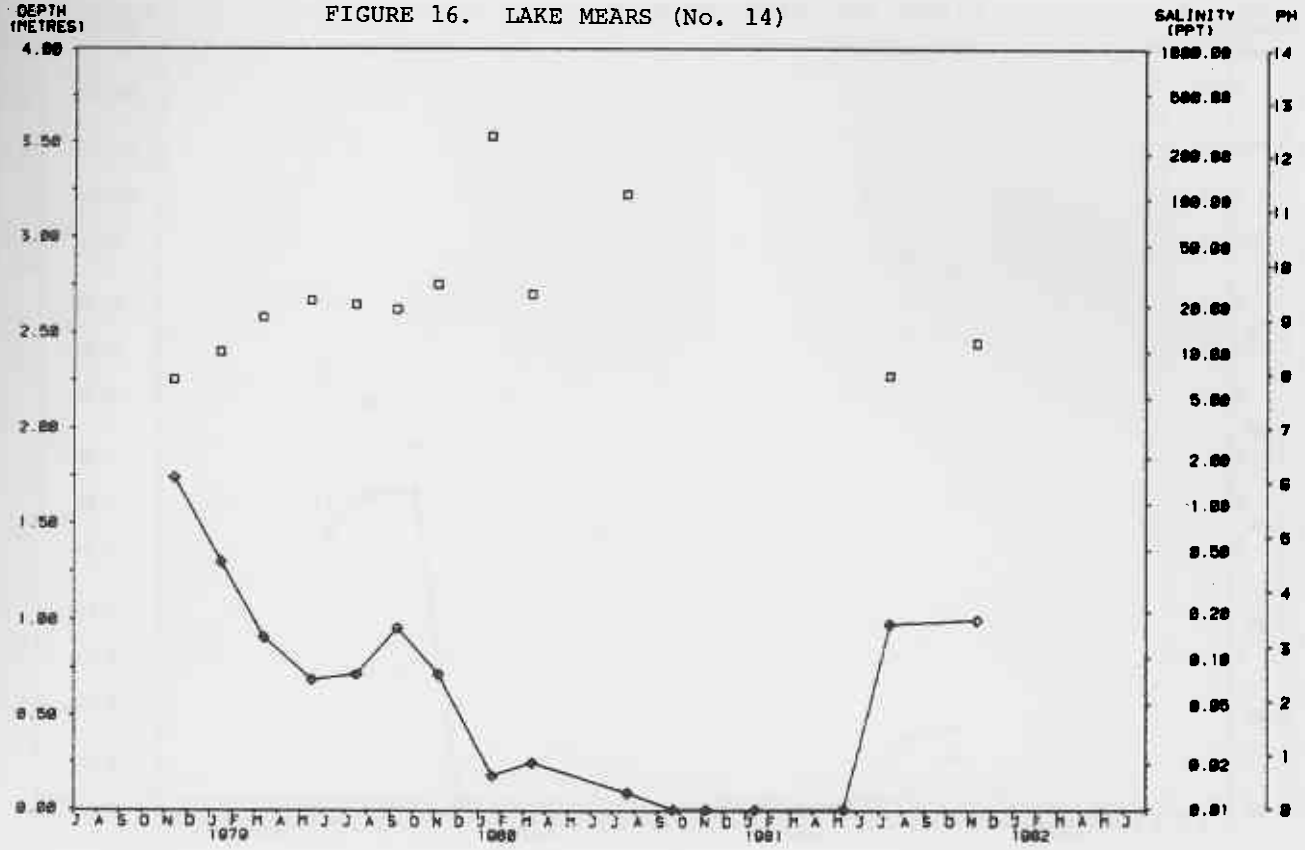
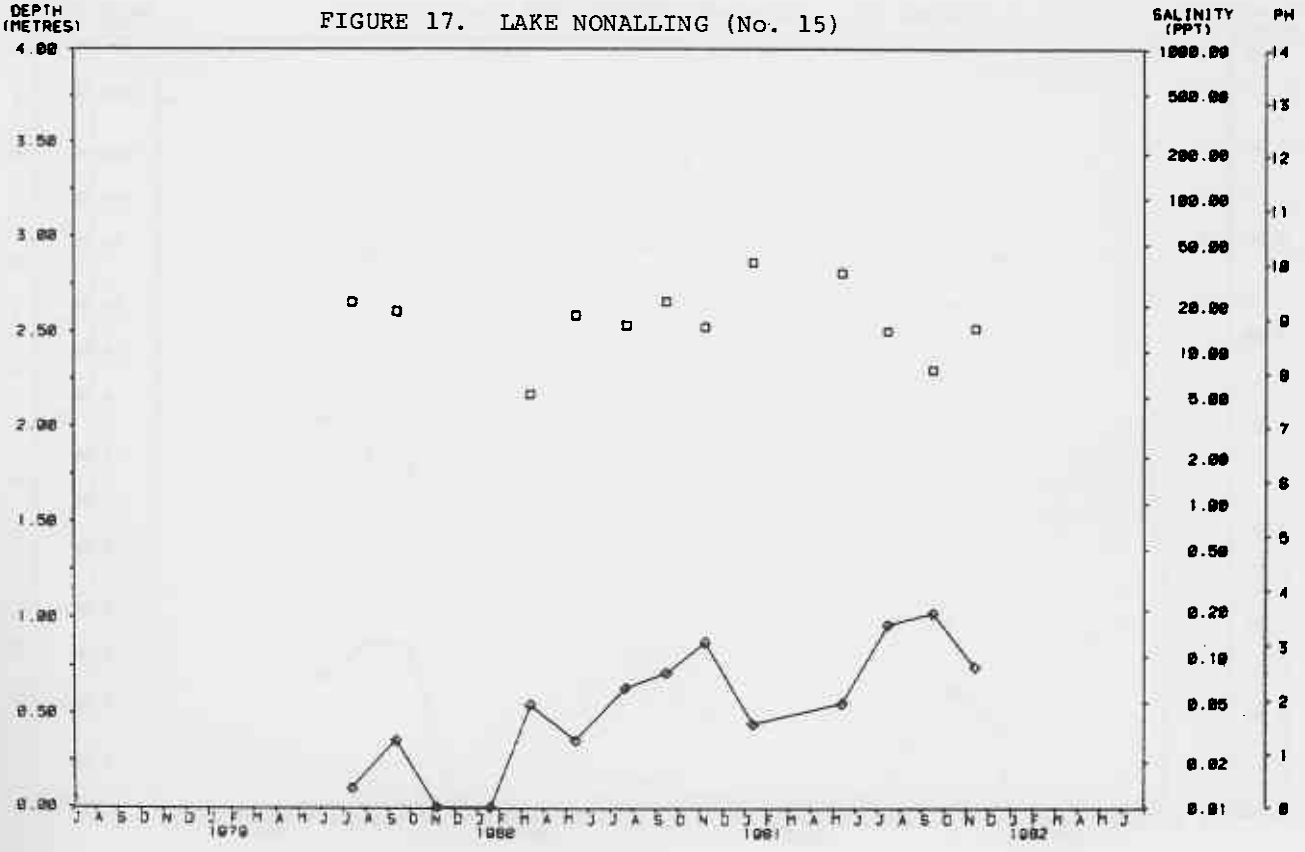


FIGURE 17. LAKE NONALLING (No. 15)



◇ DEPTH □ SALINITY ○ PH FACTOR

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FIGURE 18. LAKE BROWN (No. 16)

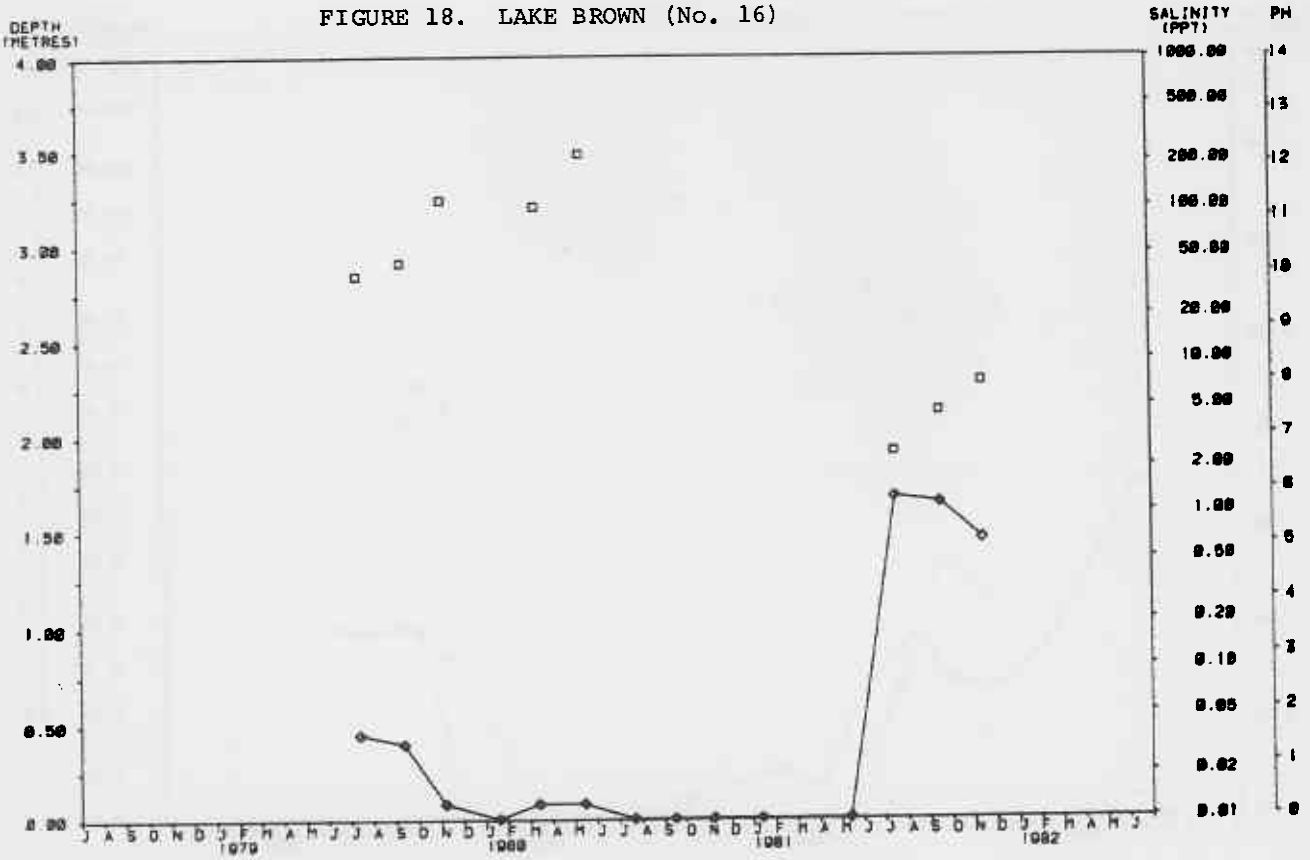


FIGURE 19. LAKE DULBINNING (No. 18)

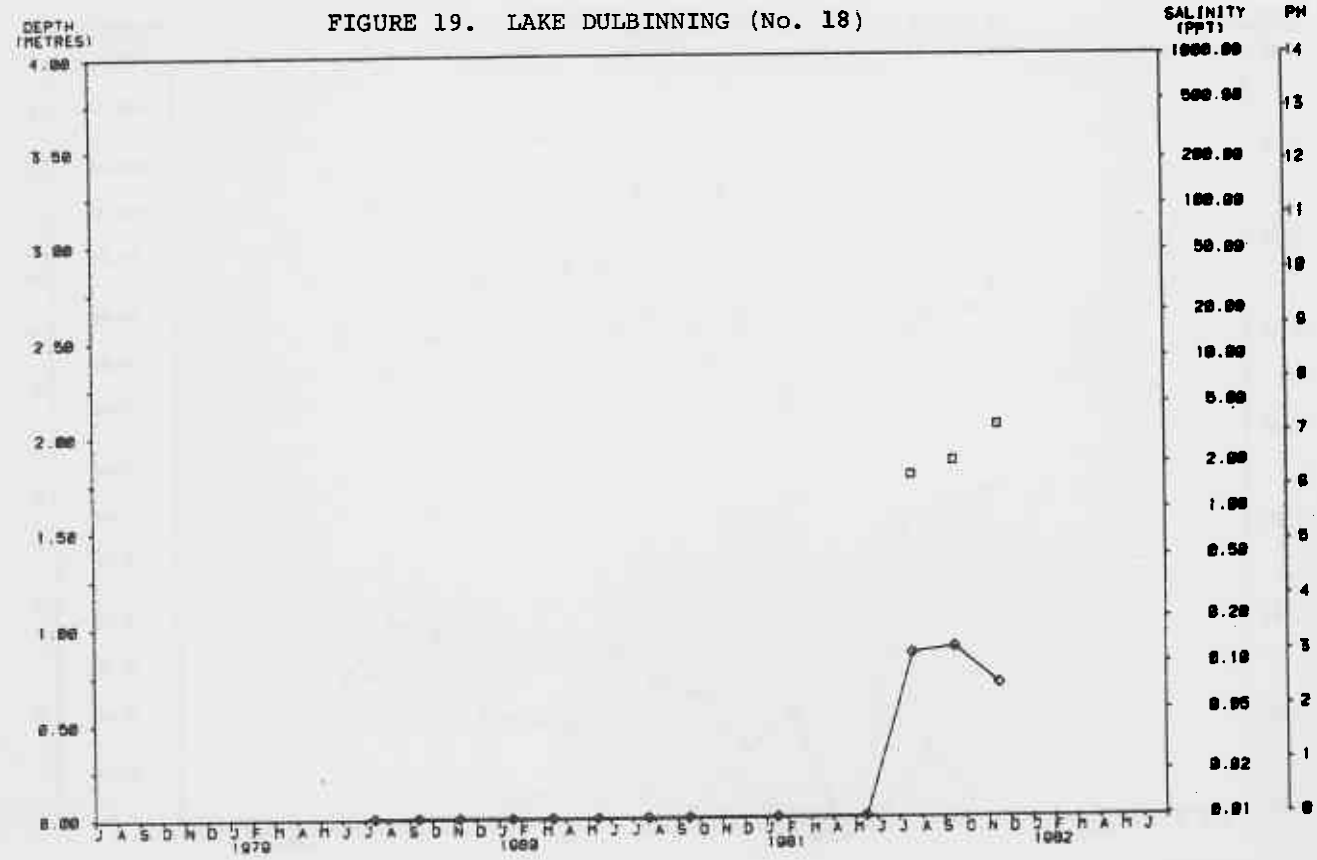


FIGURE 20. LAKE TAARBLIN (No. 21)

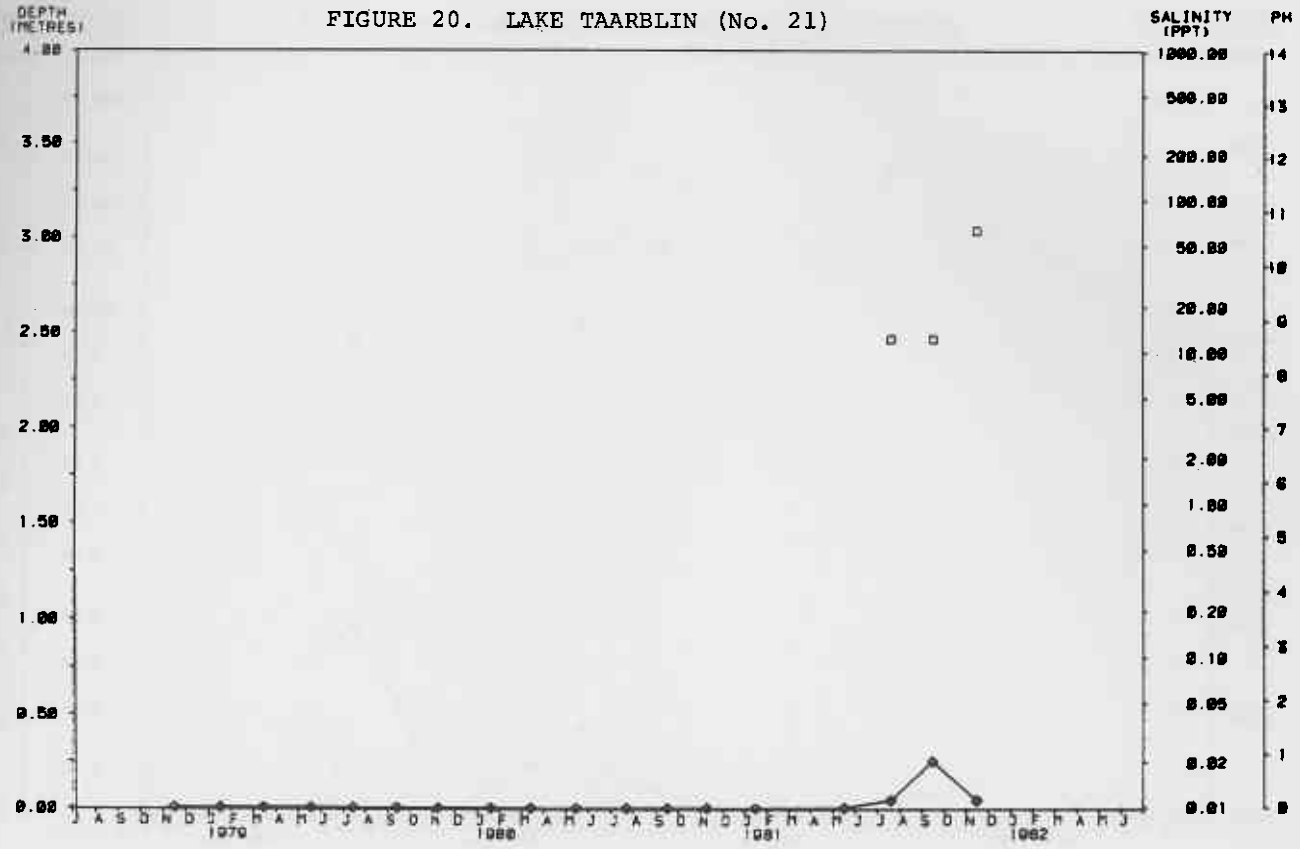
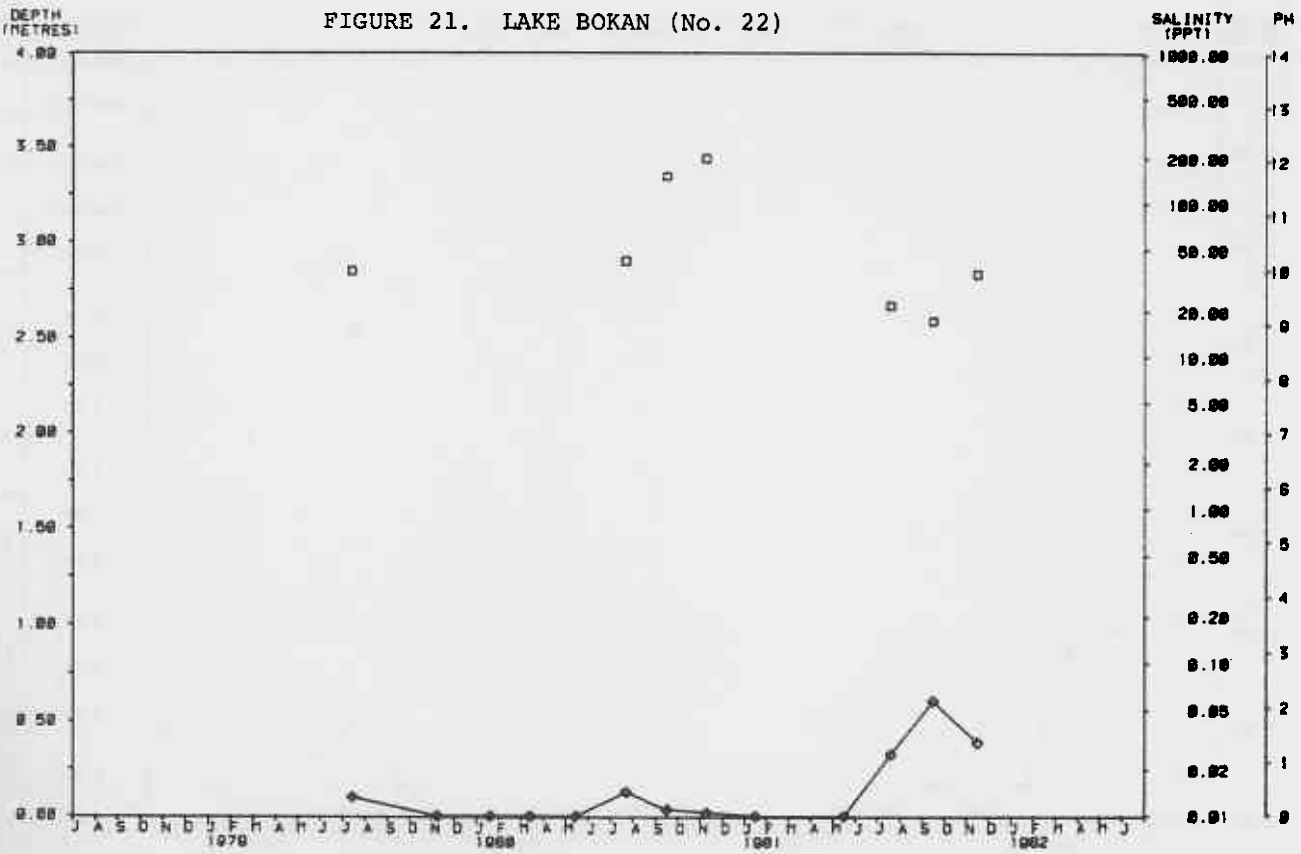


FIGURE 21. LAKE BOKAN (No. 22)



◇ DEPTH □ SALINITY ○ PH FACTOR

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FIGURE 22. LITTLE WHITE LAKE (No. 23)

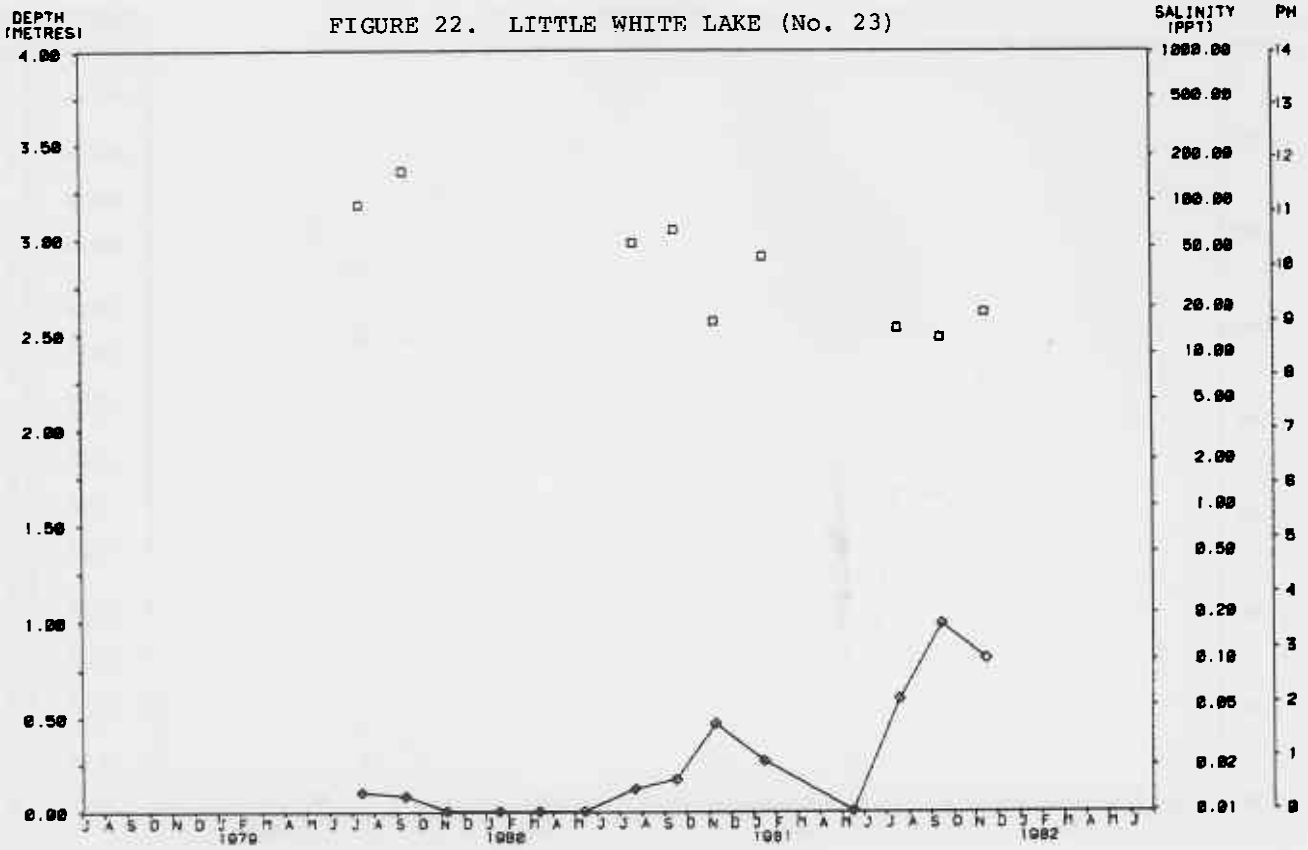

FIGURE 23. LAKE COYRECUP (No. 25)

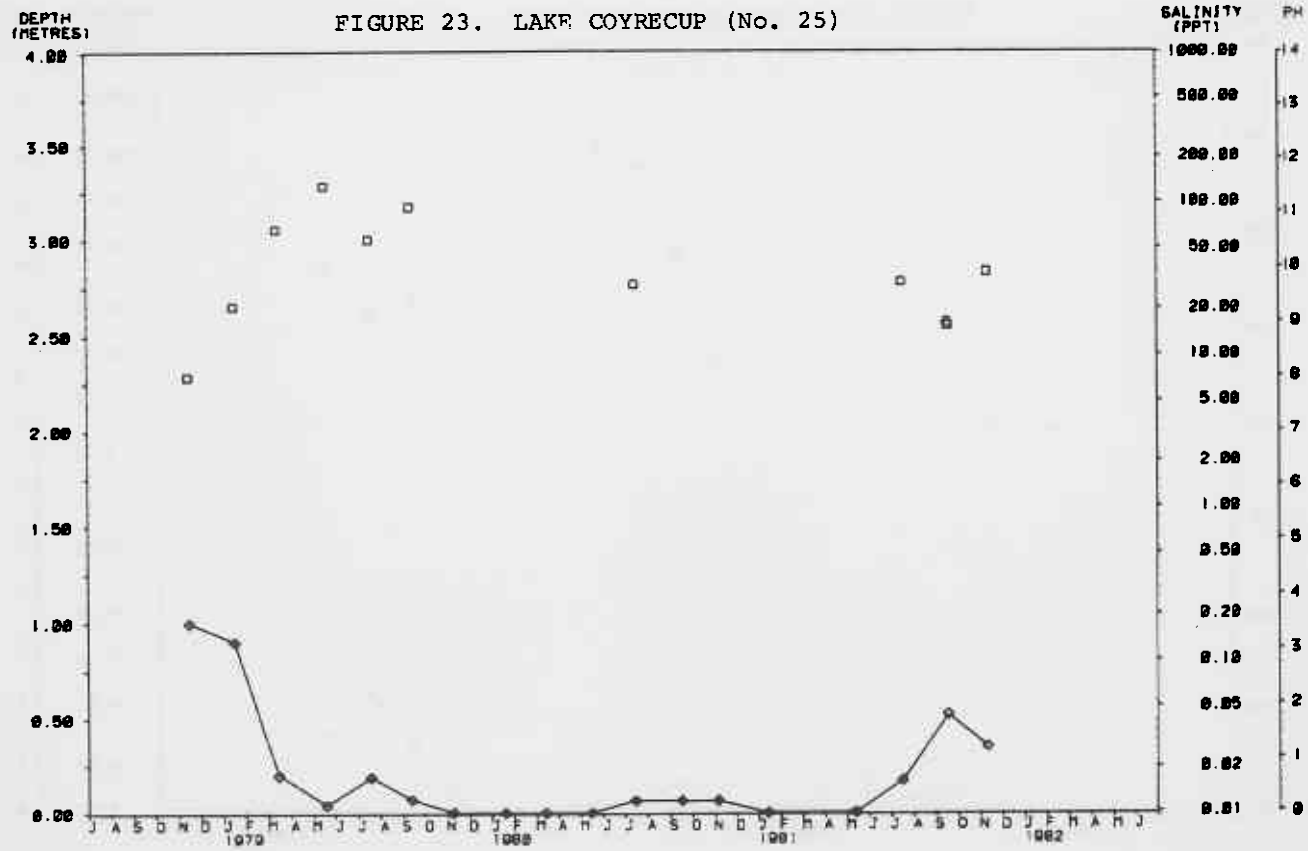

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FIGURE 24. LAKE CASUARINA (No. 26)

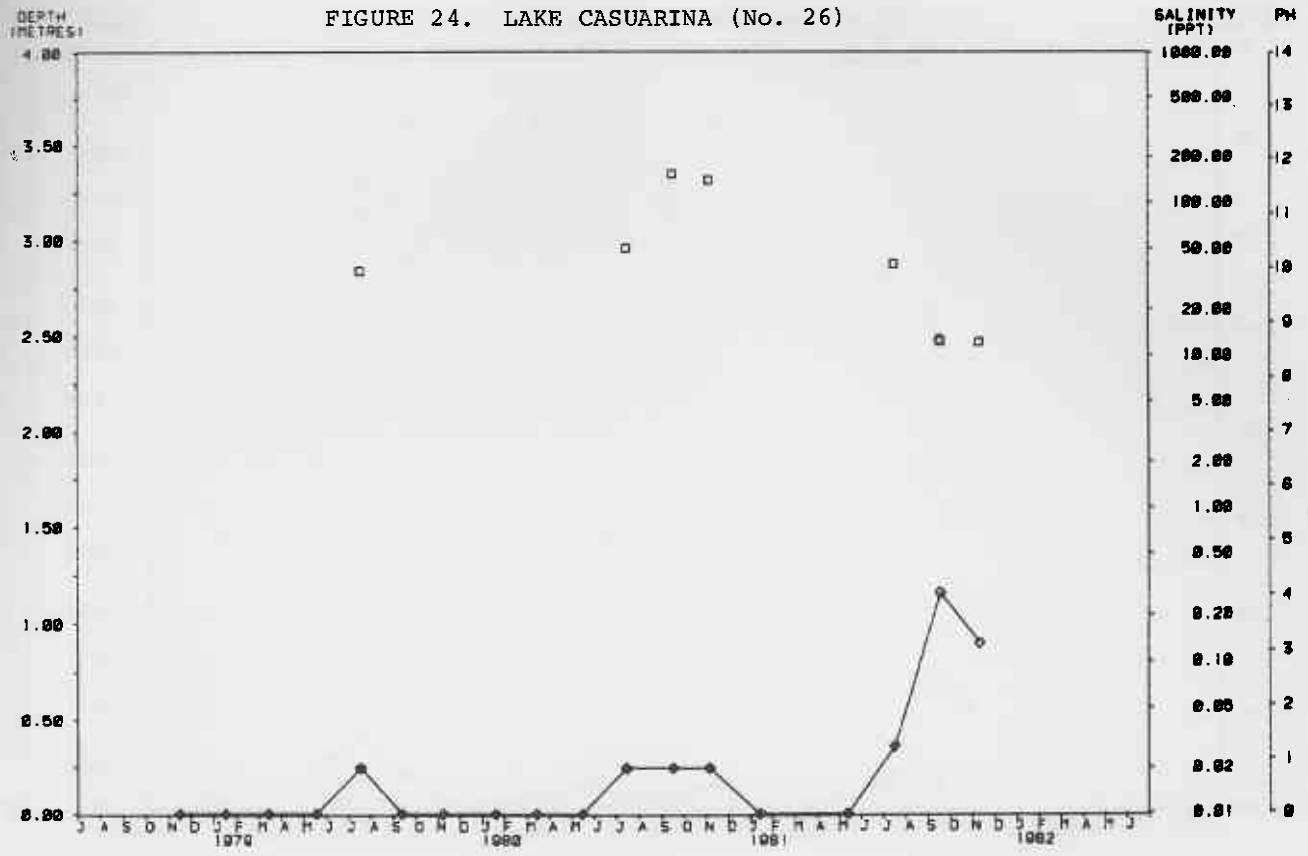

FIGURE 25. LAKE COOMELBERRUP (No. 27)

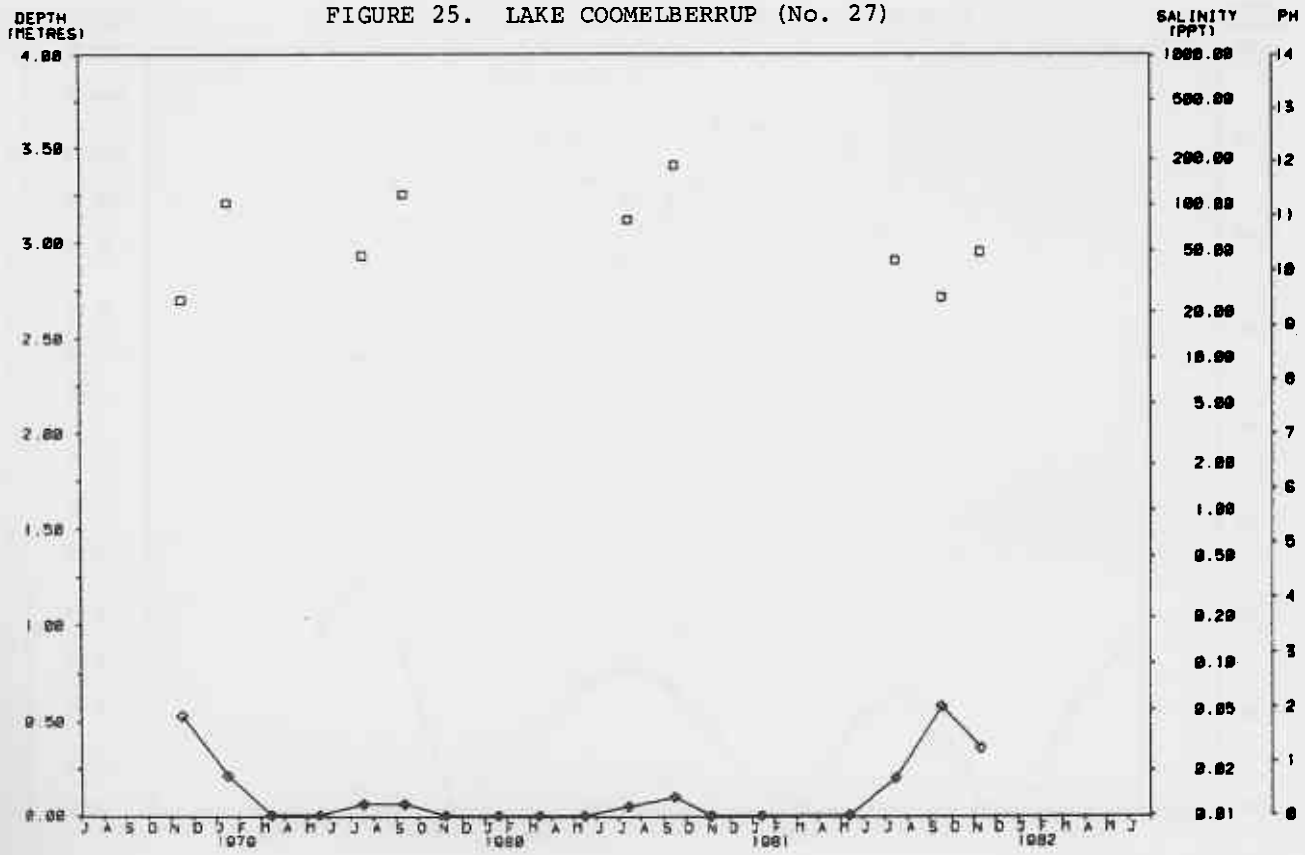

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FIGURE 26. LAKE DUMBLEYUNG (No. 29)

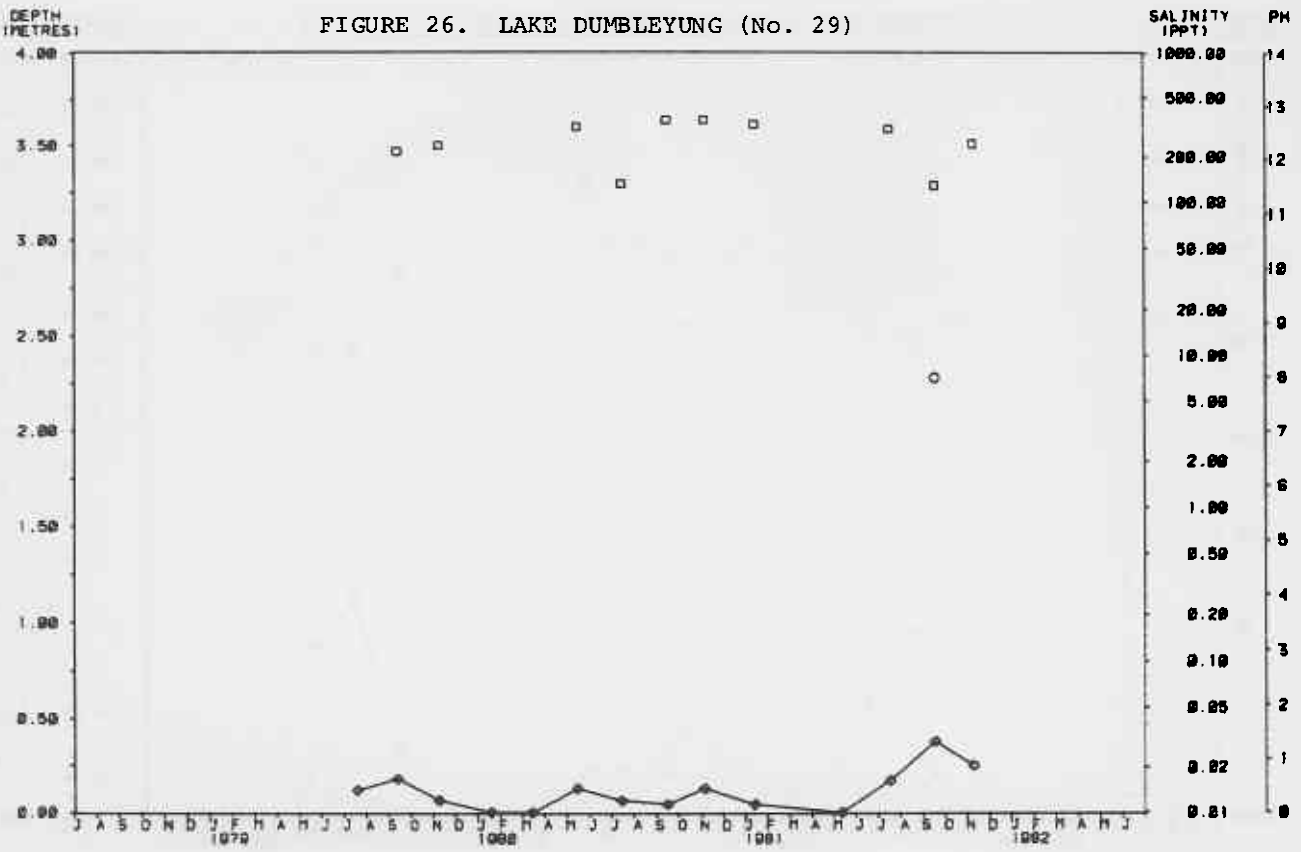

FIGURE 27. LAKE GUNDARING (No. 30)

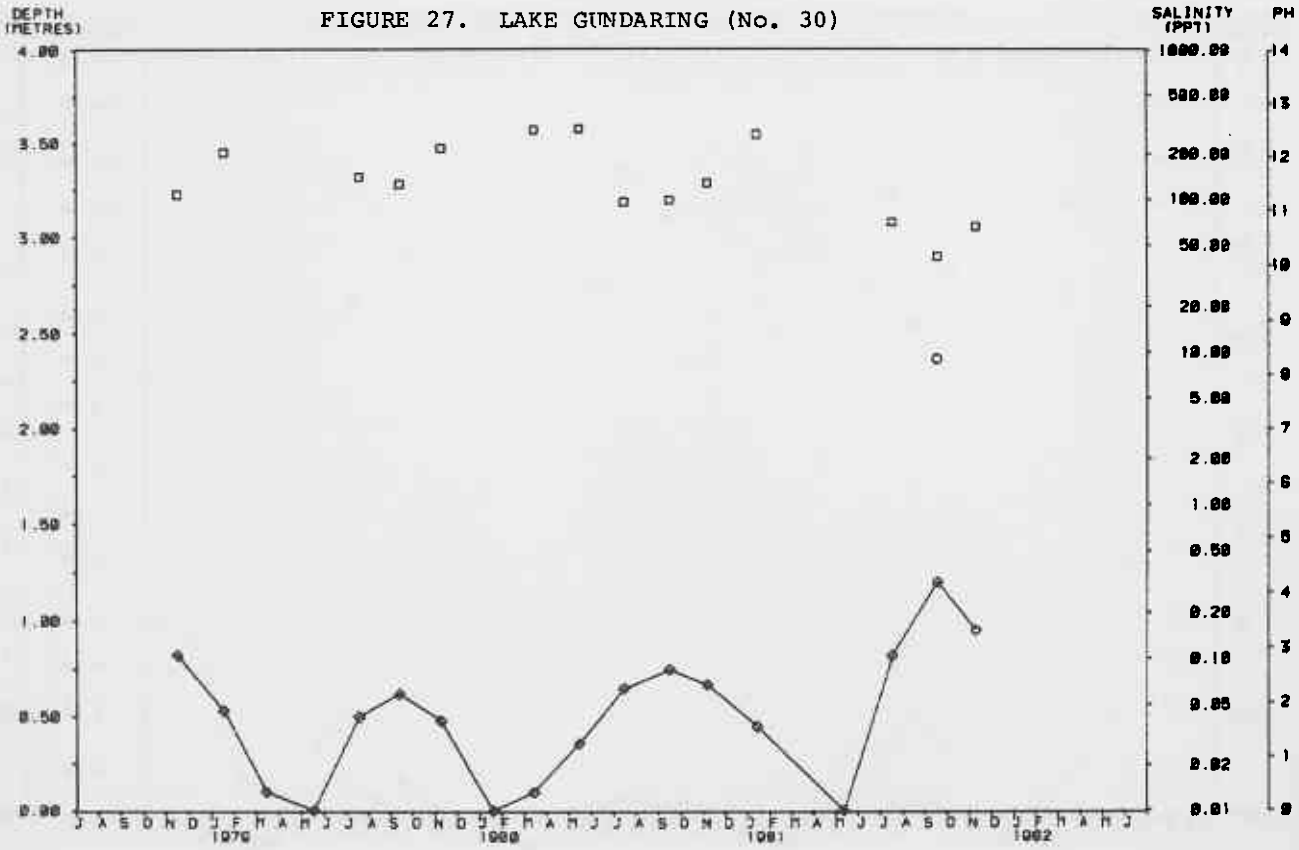

FIGURE 28. LAKE PARKEYERRING (No. 31)

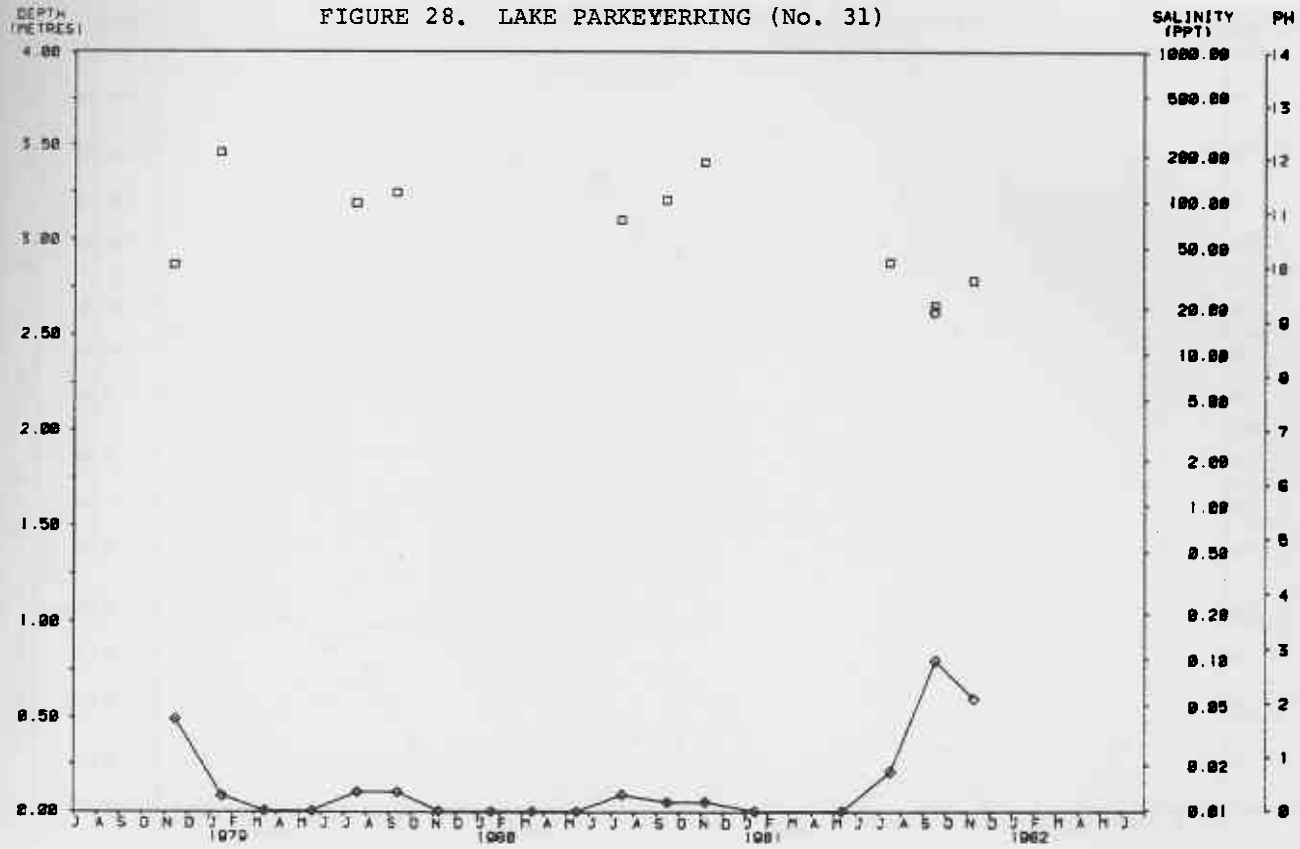

FIGURE 29. LAKE FLAGSTAFF (No. 32)

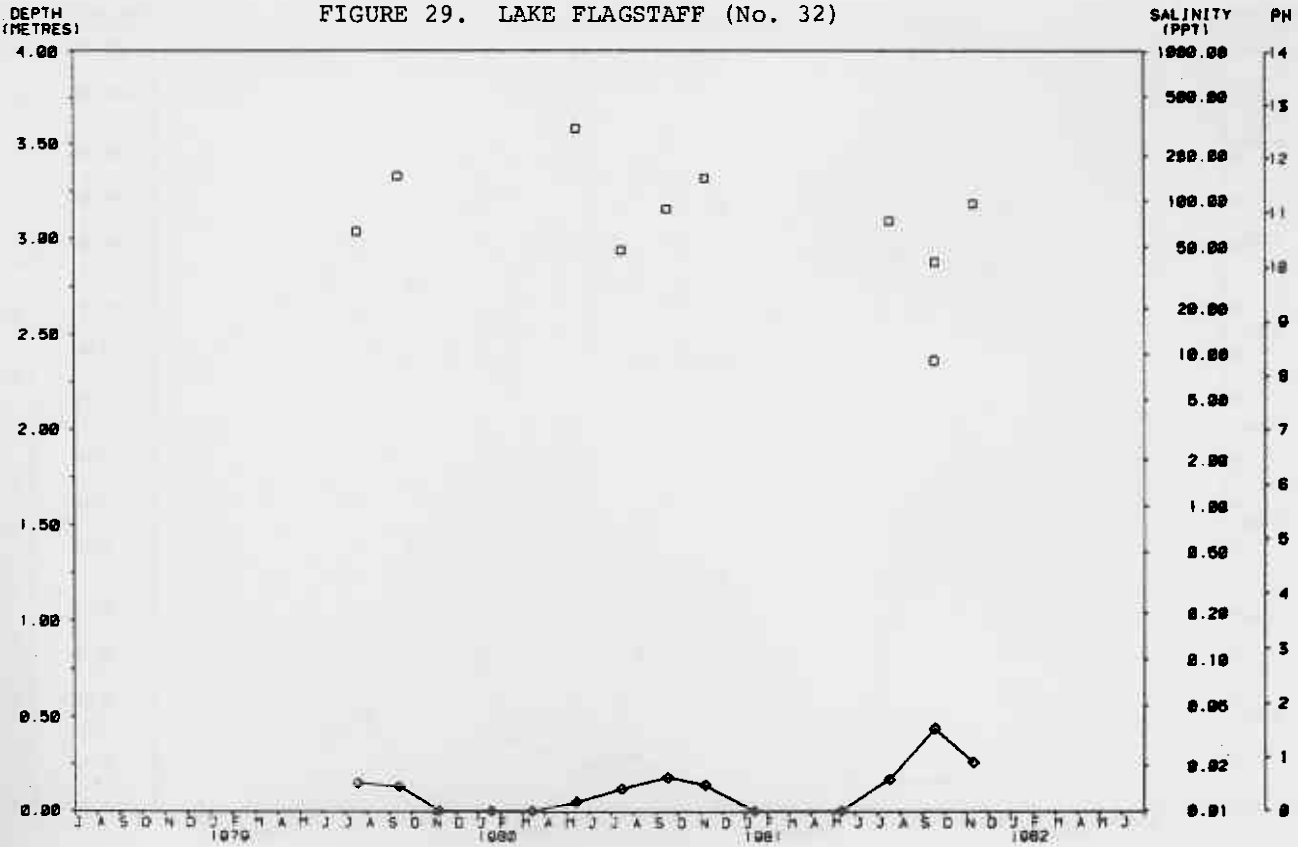

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FIGURE 30. LAKE QUEEREARRUP (No. 34)

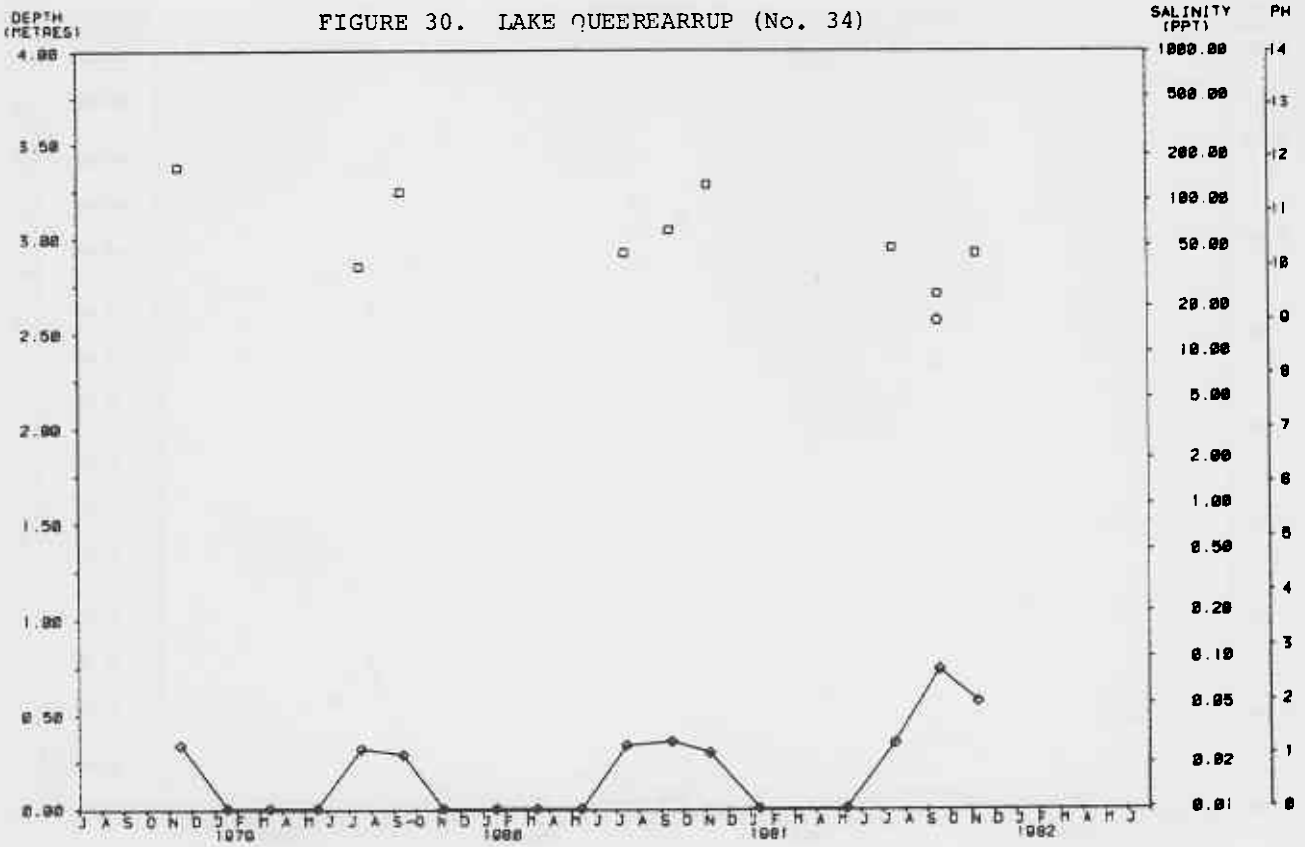

FIGURE 31. LAKE MARTINUP (No. 35)

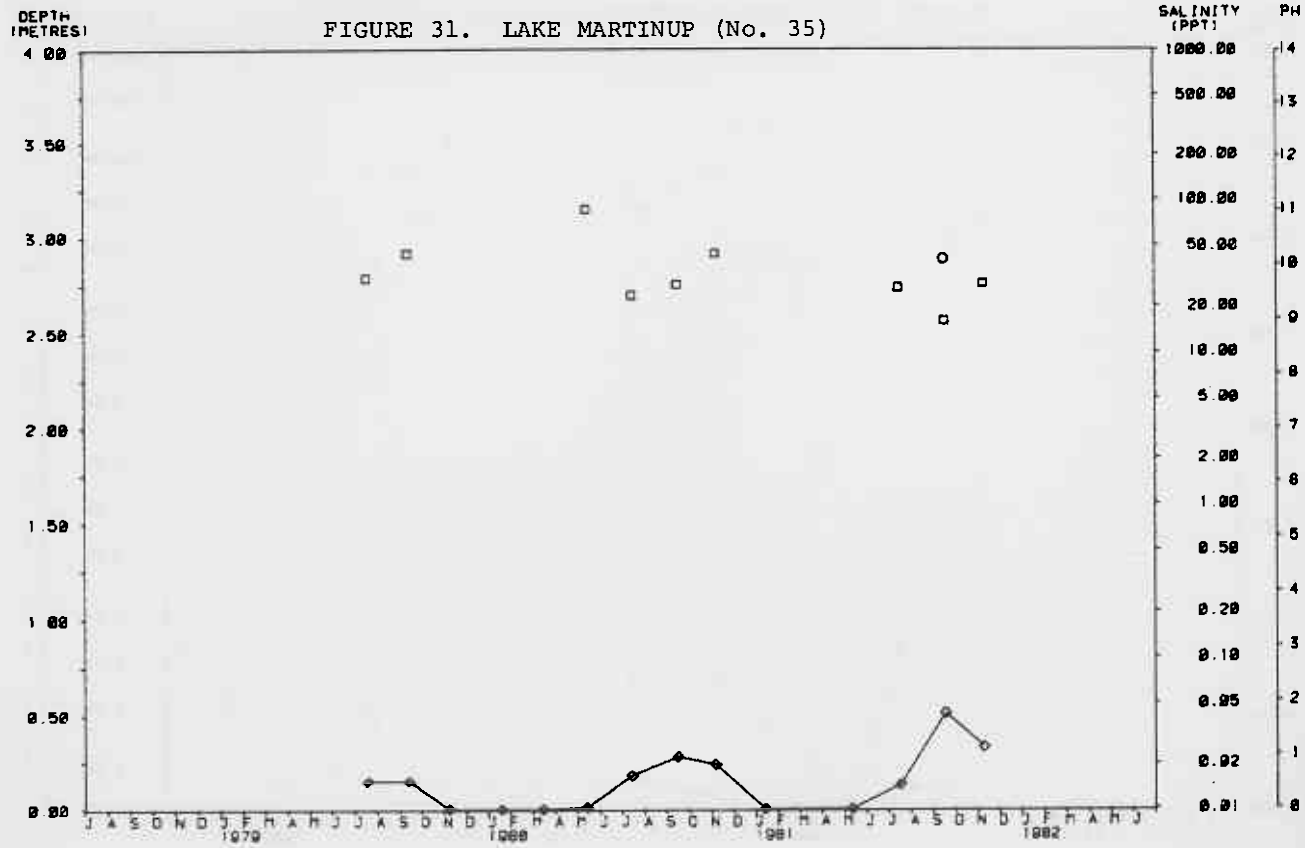

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FIGURE 32. LAKE TOWERINNING (No. 37)

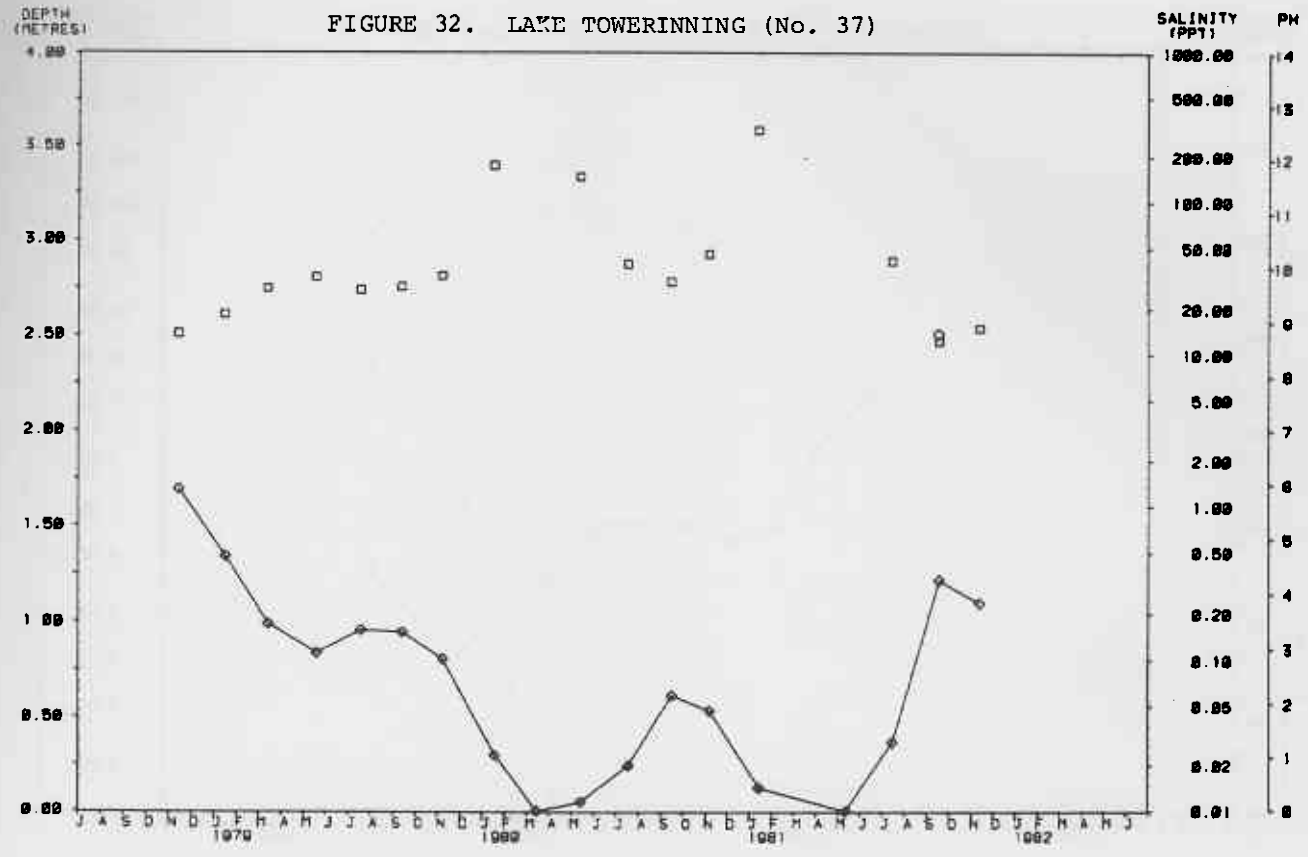
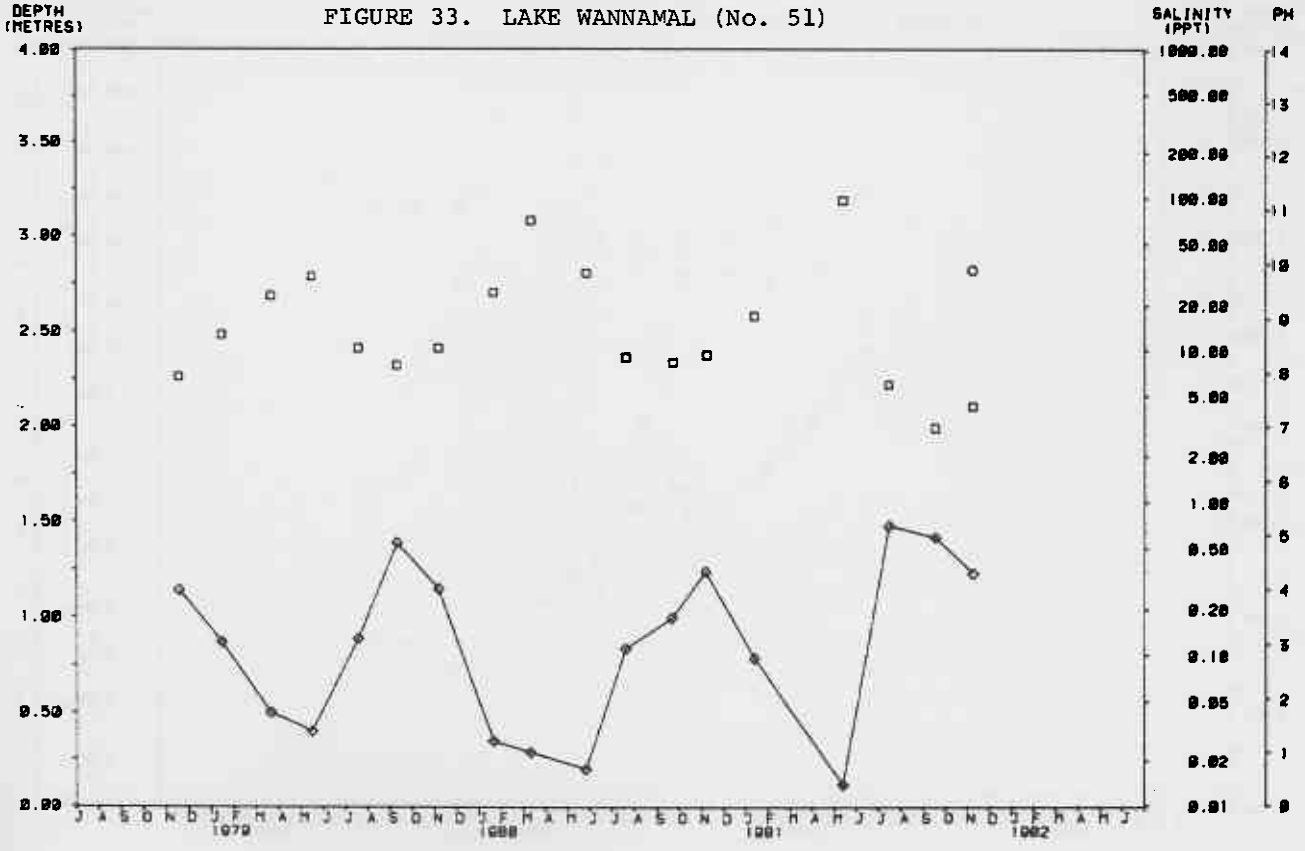


FIGURE 33. LAKE WANNAMAL (No. 51)



◇ DEPTH □ SALINITY ○ PH FACTOR

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FIGURE 34. LAKE PLEASANT VIEW (No. 75)

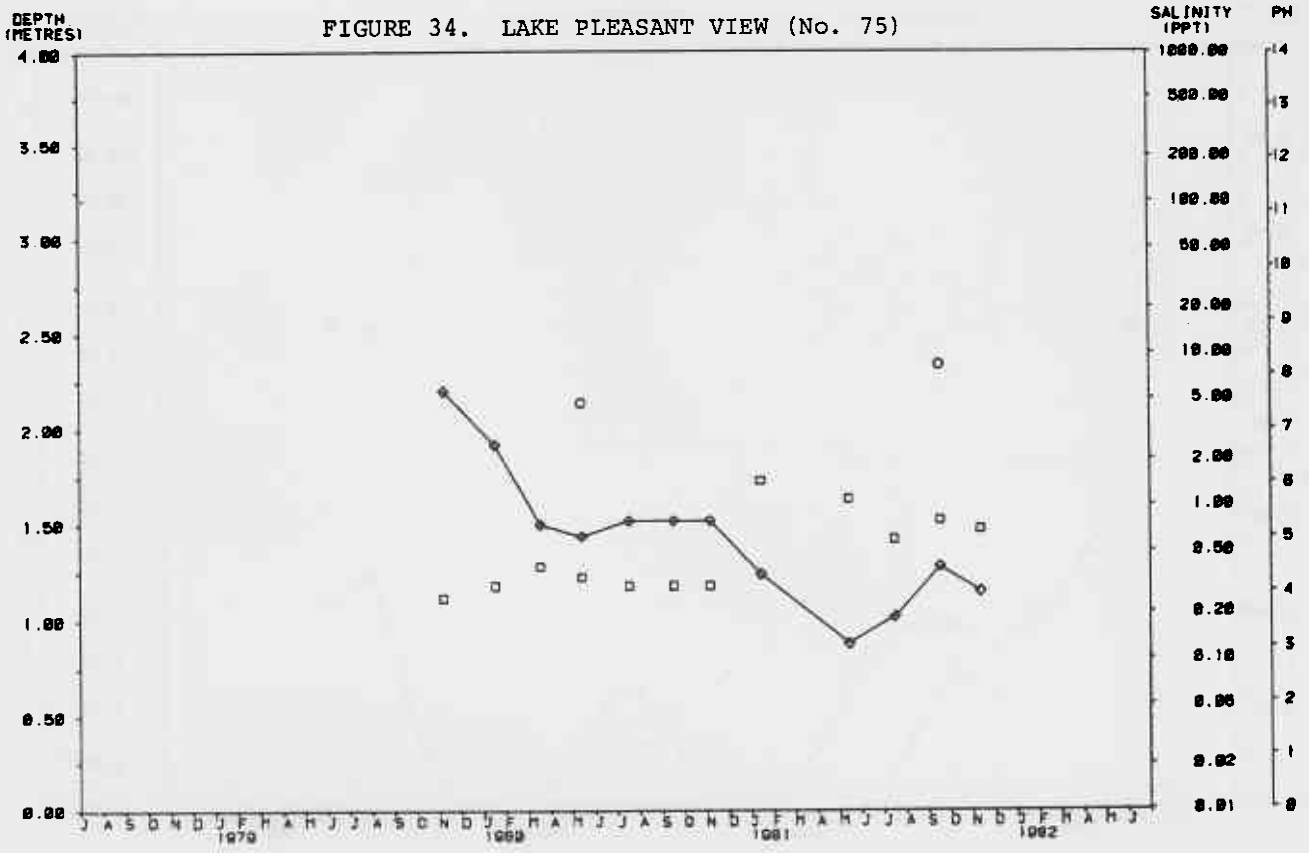
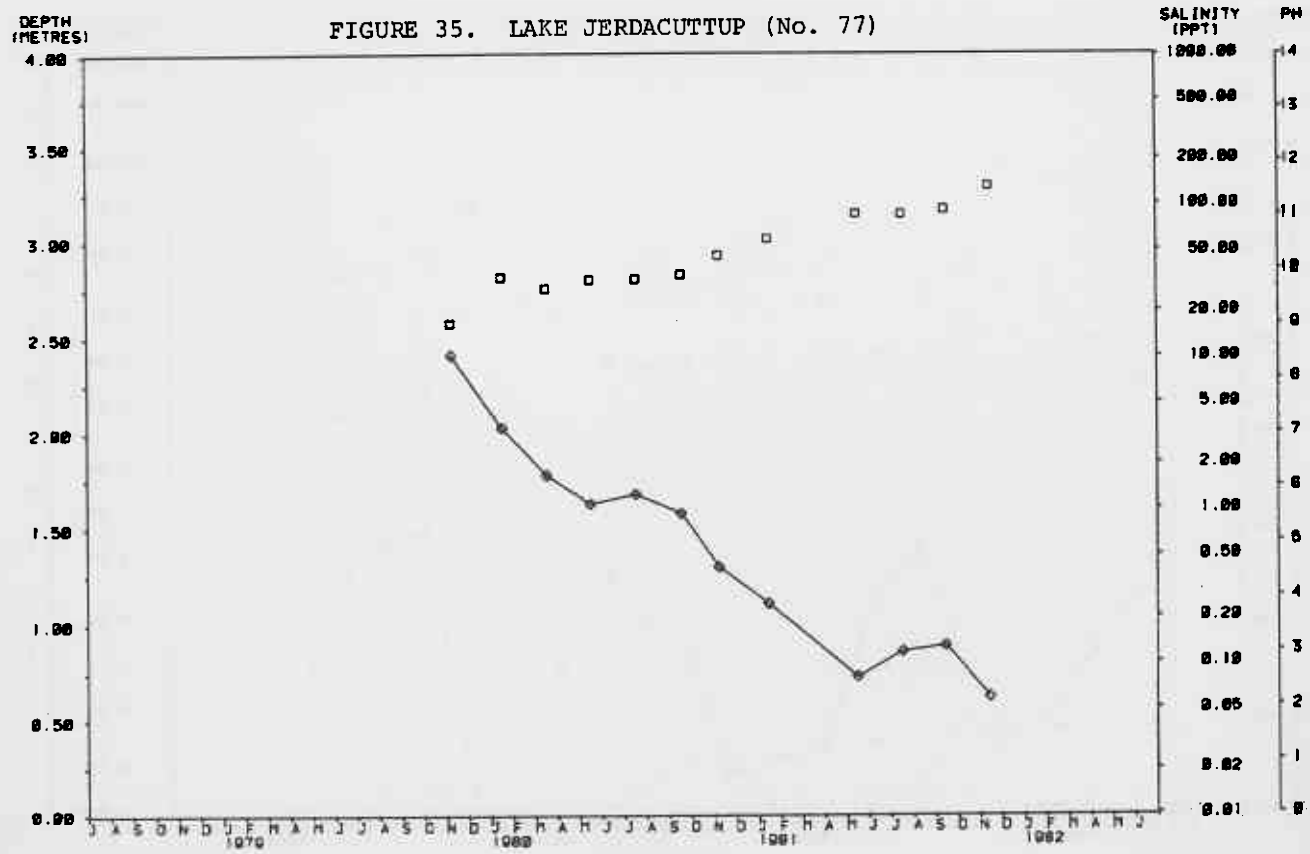


FIGURE 35. LAKE JERDACUTTUP (No. 77)



◇ DEPTH □ SALINITY ○ PH FACTOR

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FIGURE 36. LAKE SHASTER (No. 78)

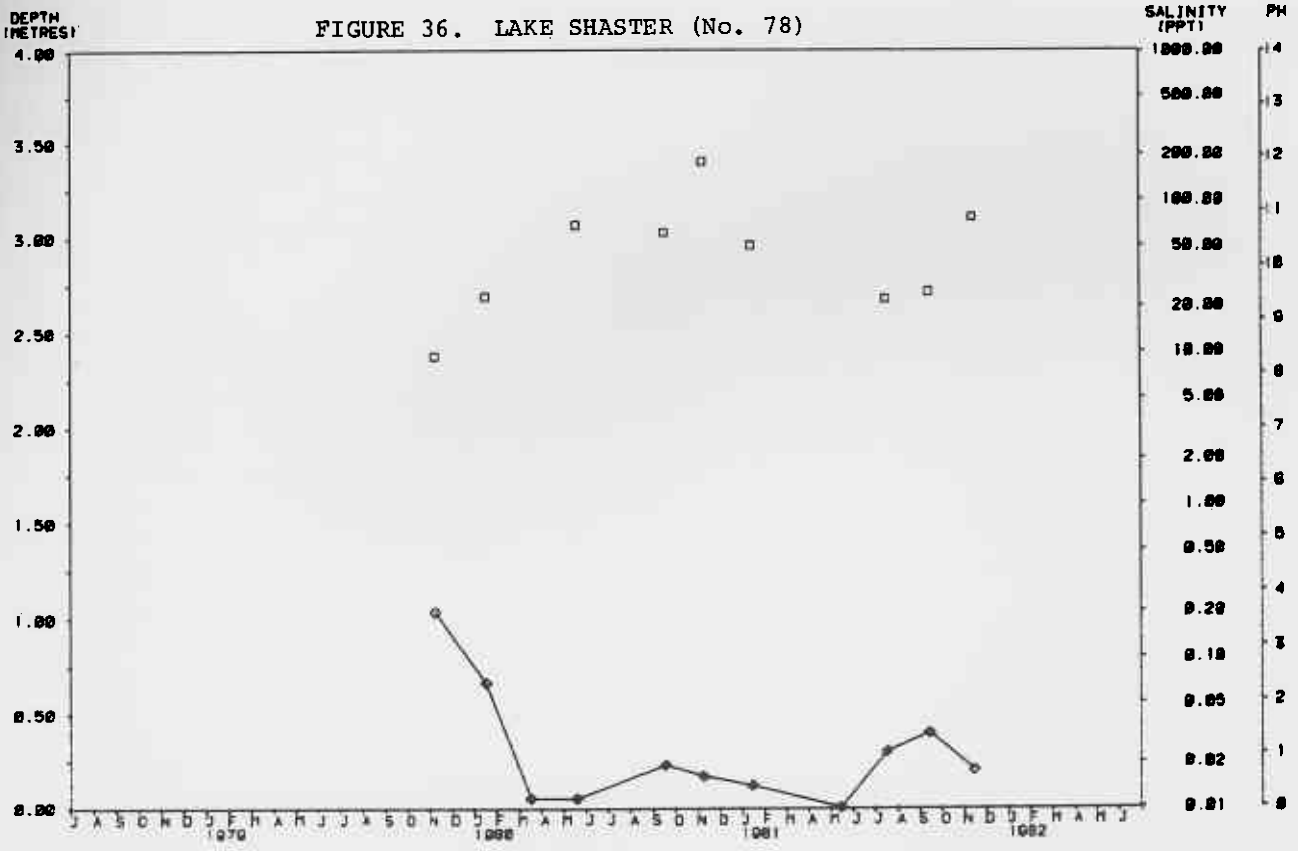
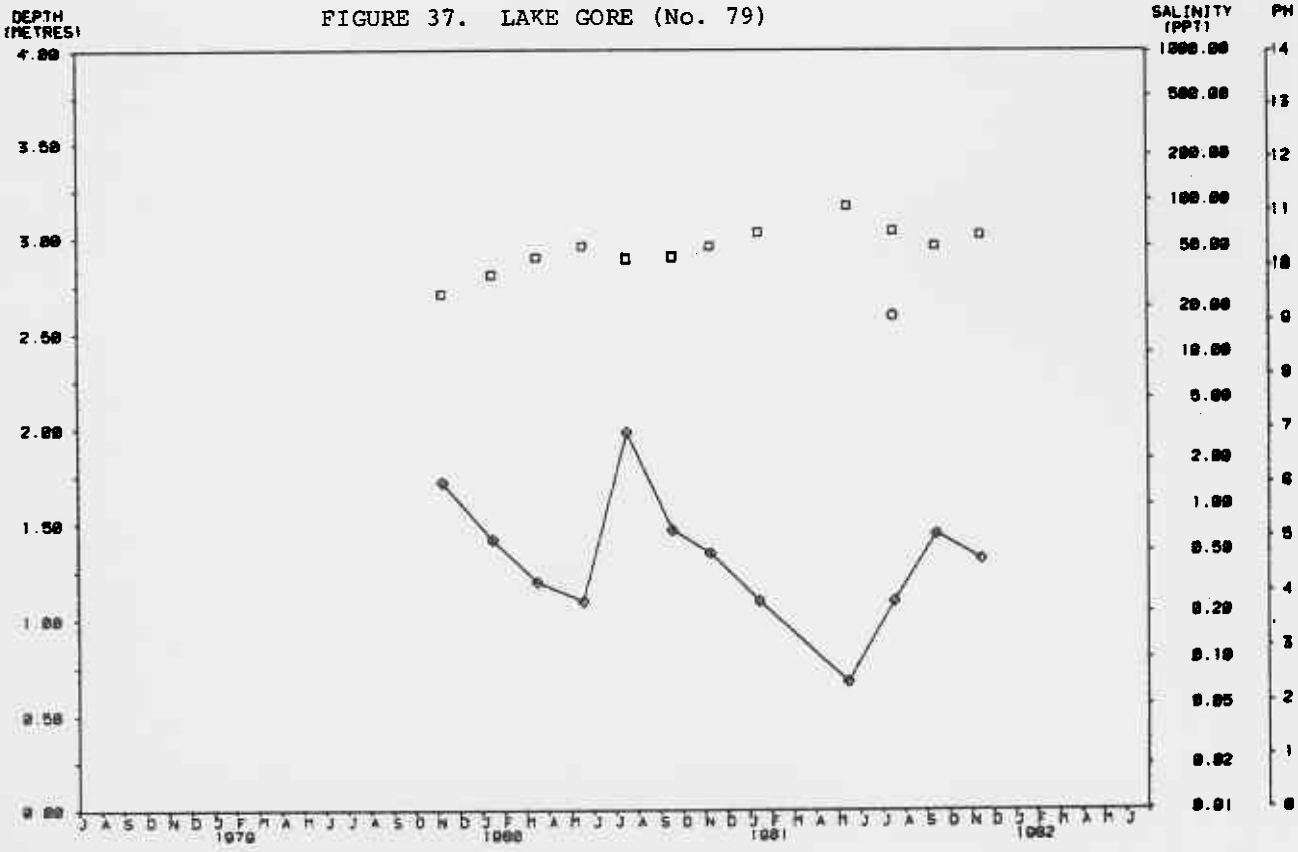


FIGURE 37. LAKE GORE (No. 79)



◇ DEPTH □ SALINITY ○ PH FACTOR

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WATERBIRD RESEARCH

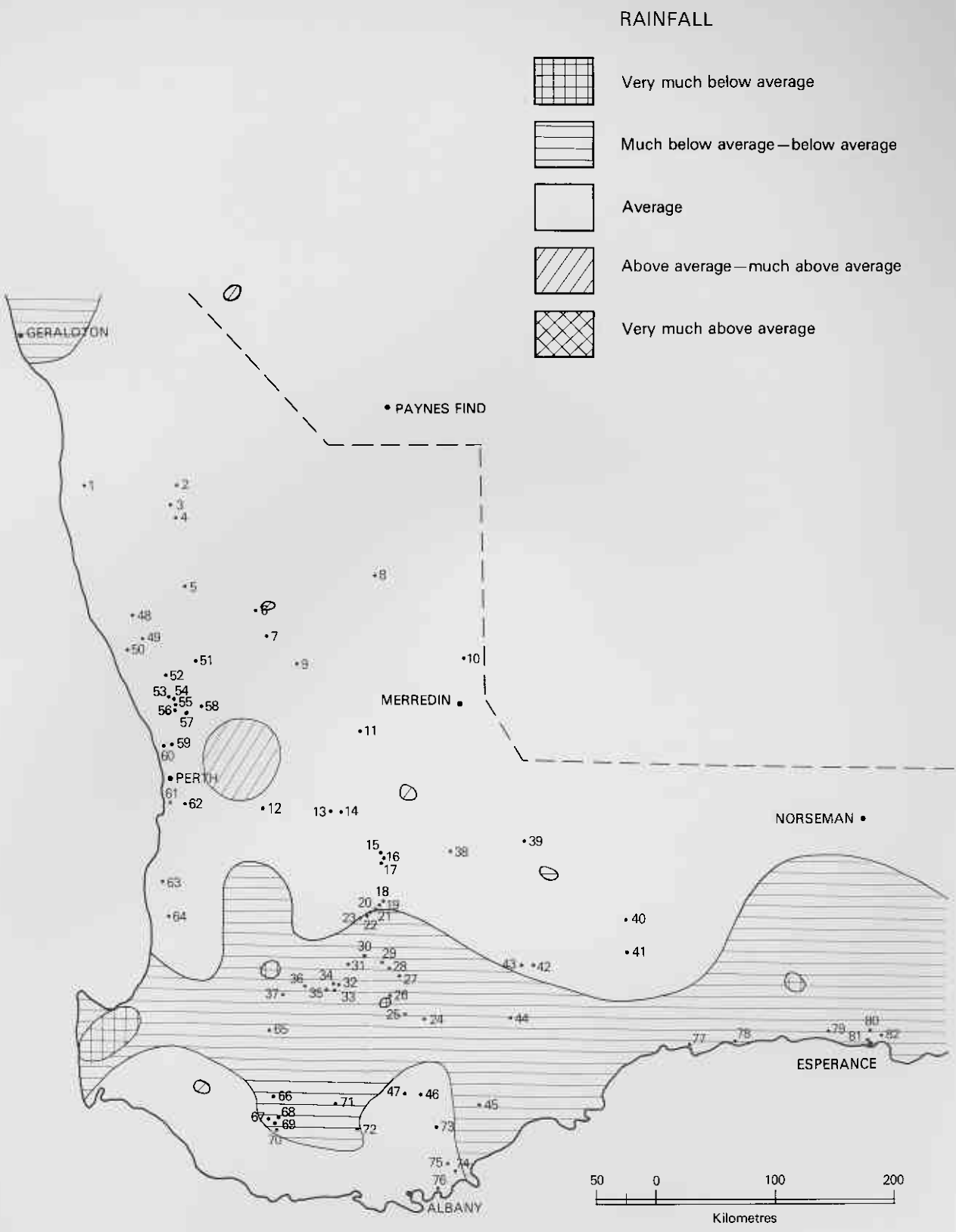

FIGURE 38 Location of gauged wetlands in relation to rainfall distribution (Jan.-Oct. 1981)