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Chemical and Biological Features of Tasmanian Salt Lakes

P. De Deckker[A] *and W. D. Williams*[B]

[A] Research School of Pacific Studies, Australian National University, Box 4, Canberra City, A.C.T. 2601.
[B] Department of Zoology, University of Adelaide, P.O. Box 498, Adelaide, S.A. 5001.

Abstract

The chemistry and biota of 10 saline lakes in Tasmania were investigated. Sodium and chloride were the dominant ions. The fauna was most similar to that of salt lakes in the Corangamite region of western Victoria.

Introduction

The fauna of salt lakes was formerly regarded as more or less cosmopolitan (e.g. Macan 1963), but this view is no longer sustainable. There are, for example, many differences between the faunas of Australian salt lakes and of salt lakes elsewhere (cf. Williams 1981*a*). It is also apparent that regional differences exist in Australia, as indicated by faunal comparisons between salt lakes in south-western Western Australia (Geddes *et al.* 1981), south-eastern South Australia (De Deckker and Geddes 1980), and the Corangamite region of western Victoria (e.g. Williams 1981*b*). The full extent of regional differences and the nature of regional affinities in Australia have yet to be determined, for there is little information on salt lakes outside these three regions.

One region of salt lakes not yet comprehensively investigated lies in the midlands of eastern Tasmania. A description of salient chemical and biological features of these lakes forms the basis of the present paper. Many have previously been investigated by Buckney and Tyler (1976) and some (five) by Fulton (1976), but Buckney and Tyler were mainly concerned with the inorganic chemistry of the lakes and provided only cursory biological notes, and Fulton's work seems basically to have been a by-product of an examination of the lakes for fish (the mesh aperture of his nets was not disclosed). The lakes were sampled by us on 24 and 25 October 1981, *viz*, in spring, a time considered most propitious for collecting the fauna.

The position of the lakes is indicated in Fig. 1. All lakes except one sampled by Buckney and Tyler (1976) and noted by them as having salinities near or in excess of 3‰ were visited. All others in the area considered likely to be saline were also visited. The lakes are the only series of inland saline lakes in Tasmania, and as such constitute a unique set of relic ecosystems of limited number in that State. Unfortunately, many clearly marked on 1:50 000 maps have been drained. Others face similar threats. One important locality (Township Lagoon) serves as a rubbish tip.

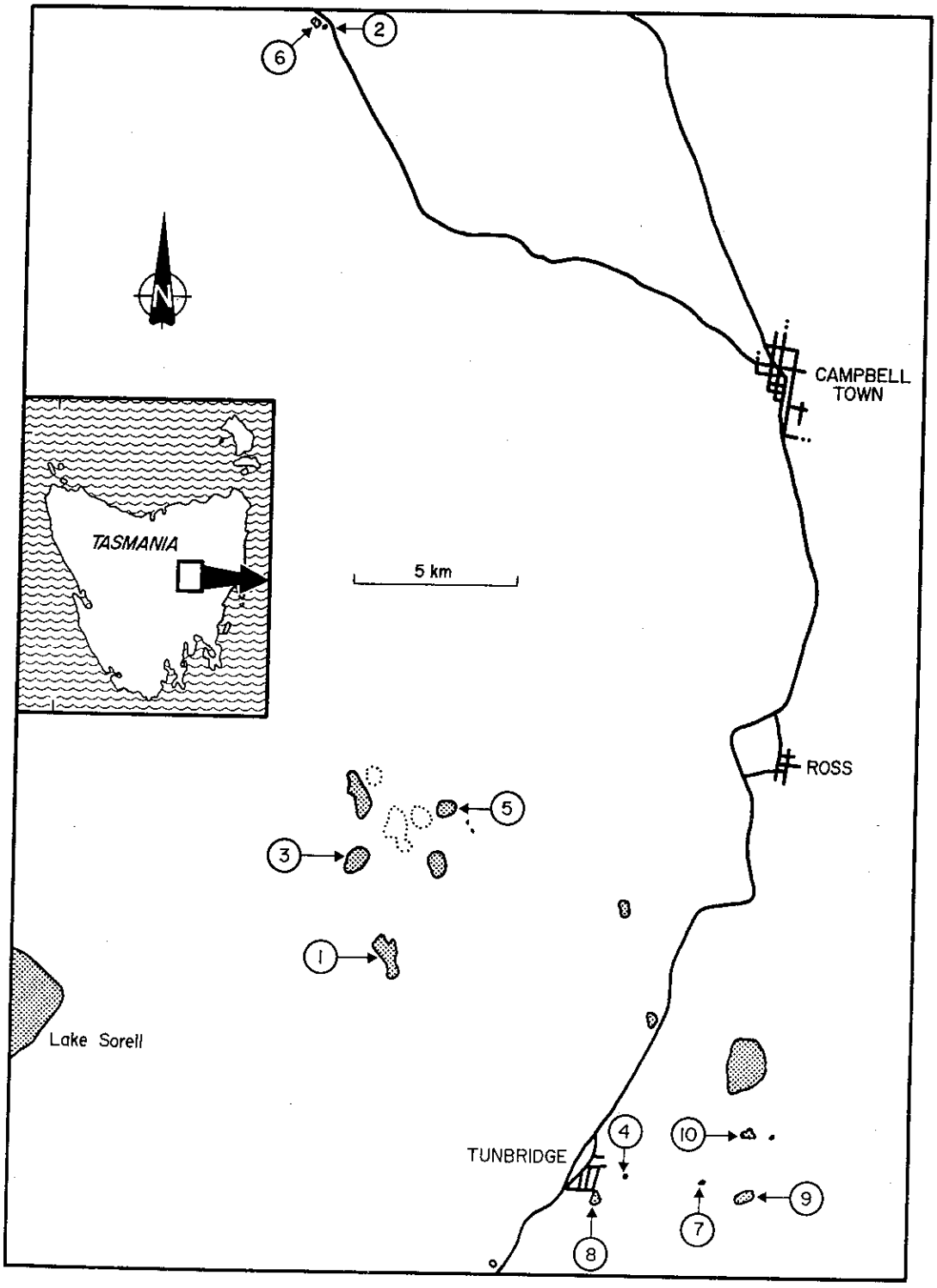

Fig. 1. Position of Tasmanian lakes (*1–10*) investigated.

Methods

Biological samples were obtained by nets (1-mm and 63-μm mesh aperture), or by direct removal, and water samples by filling black plastic bottles at the water's edge. Standard analytical techniques were used to determine major ions.

Results

Results of the chemical analyses are indicated in Table 1. Those for the biological determinations are presented in Table 2.

Table 1. Chemical composition of lakes investigated

Locality names are those of the Nomenclature Board, and also correspond to those used by Buckney and Tyler (1976) and Fulton (1976)

Locality index No.	Locality name	Salinity (‰)	pH[A]	Concentration as percentage equivalent of cation sum							
				Na^+	K^+	Ca^{2+}	Mg^{2+}	CO_3^{2-}	HCO_3^-	Cl^-	SO_4^{2-}
1	Bells Lagoon	4·0	8·2	77·0	1·0	11·4	10·5	0·0	16·9	82·9	0·0
2	Campbell Town 2	11·6	10·2	93·0	0·3	1·3	5·4	1·4	3·9	92·8	0·2
3	Bar Lagoon	16·2	9·3	70·7	0·1	11·6	17·6	0·4	2·6	95·9	0·3
4	Tunbridge No. 2	17·7	8·5	58·4	0·2	12·7	28·8	0·1	0·6	95·4	3·4
5	Folly Lagoon	18·0	10·1	72·8	0·7	8·0	25·7	0·3	0·7	96·9	2·6
6	Campbell Town 1	19·3	10·0	91·0	0·5	0·6	7·9	1·0	3·3	95·0	0·3
7	Tunbridge No. 2a	38·1	9·3	65·2	0·1	10·0	24·7	0·1	0·2	93·5	5·9
8	Township Lagoon	41·1	8·5	73·0	0·1	3·0	23·9	0·1	1·5	96·2	2·5
9	Glen Morey Saltpan	154·2	7·6	82·9	0·0	0·7	16·4	0·0	0·3	98·5	1·2
10	Mona Vale Saltpan	191·1	7·1	82·3	0·0	1·7	16·0	0·0	0·1	99·5	1·4

[A]Measured in the laboratory.

Discussion

The chemical results need little comment. As Buckney and Tyler (1976) and Fulton (1976) found, only two of the lakes are highly saline (salinity >100‰), and Na^+ and Cl^- dominate the ions. In ionic composition, therefore, the lakes are similar to almost all mainland lakes, though the relatively large concentrations of Mg^{2+} are noteworthy. These may be attributed to the occurrence of Jurassic dolerite and related rock types near the lakes. Likely sources of at least some of the Na^+ and Cl^- ions are underlying glaciomarine sediments typical of the Parmeneer Group of Upper Carboniferous to Triassic age.

Although Table 2 records all taxa collected from the lakes, the taxa of greatest interest are the crustaceans and the mollusc. Other fauna are both less diverse and less abundant and, because taxonomic resolution is low, less interesting. As elsewhere in Australia, salt lakes in Tasmania are dominated by crustaceans, almost all of which are endemic to Australia and involve in particular many different species of ostracod.

Several of the Tasmanian species of Crustacea occur across southern Australia, but there are also degrees of difference from the biota of mainland lakes, which seem unlikely to reflect only differences in sampling efforts. Of species common to both Tasmanian salt lakes and all three groups of mainland salt lakes studied thus far, the most notable are *Haloniscus searlei*, *Daphniopsis pusilla*, *Calamoecia clitellata* and the two species of *Austrochiltonia*. Species common with the South Australian and Victorian groups of lakes (but not the Western Australian) are *Mesochra baylyi*,

Diacypris spinosa, *D. dietzi*, *Mytilocypris praenuncia*, *Parartemia zietziana* and the mollusc *Coxiella striata*.

Table 2. Biota recorded in 10 Tasmanian salt lakes
+ Present. Salinity (‰) of each locality is given in parentheses

Taxon	Presence at index locality No.									
	1 (4·0)	2 (11·6)	3 (16·2)	4 (17·7)	5 (18·0)	6 (19·3)	7 (38·1)	8 (41·4)	9 (154·2)	10 (191·1)
Anostraca										
Parartemia zietziana Sayce							+		+	+
Cladocera										
Daphnia carinata King	+									
Daphniopsis pusilla Serventy	+		+	+	+	+	+	+		
Daphniopsis sp.		+				+				
Copepoda										
Mesochra baylyi Hamond		+	+		+	+		+		
Microcyclops sp. 1		+		+	+	+				
Microcyclops sp. 2			+							
Boeckella triarticulata Thomson	+	+	+	+	+	+				
Calamoecia clitellata Bayly			+				+	+		
Ostracoda										
Diacypris spinosa De Deckker		+		+	+	+		+		
D. dietzi (Herbst)			+		+		+	+		
Mytilocypris tasmanica McKenzie	+									
M. praenuncia (Chapman)			+		+	+		+		
Mytilocypris sp. (juvenile)		+								
Australocypris robusta De Deckker					+		+	+		
Cypricercus salinus De Deckker		+		+						
Sarscypridopsis aculeata (Costa)				+						
Amphipoda										
Austrochiltonia subtenuis (Sayce)	+				+					
A. australis (Sayce)			+							
Isopoda										
Haloniscus searlei Chilton			+					+		
Rotifera										
Brachionus plicatilis Müller		+	+							
Mollusca										
Coxiella striata Reeve					+					
Insecta										
Corixidae (juvenile)		+		+	+					
Culicidae (larvae)			+							
Chironomidae (larvae)	+			+						
Sternopriscus sp. (Dytiscidae)				+						
Oecetis sp. (Trichoptera)	+									
Oligochaeta			+							
Turbellaria					+					
Flora										
Ruppia megacarpa Mason			+					+		
Lamprothamnium papulosum (Wallr.)			+		+			+		
Charophyte							+			

Using several criteria, the fauna of the South Australian lakes is distinctive from that in the Victorian lakes (De Deckker and Geddes 1980). The question that now arises is whether the Tasmanian fauna can be distinguished from the fauna of the Victorian and/or South Australian lakes. In this regard, the absence of several species

found in the South Australian lakes (notably *Parartemia cylindrifera*, a number of species of *Diacypris*, polychaete species and foraminiferans) does indicate that the Tasmanian fauna is different from the South Australian one. Many species of the Victorian lakes are also absent in Tasmania. However, most of the species frequently found in ephemeral, shallow and saline waters of the Victorian group of lakes are present (cf. Geddes 1976). Additionally, *Cypricercus salinus* is common to both the Victorian and Tasmanian faunas. Of the two species found only in the Tasmanian lakes, one (*Mytilocypris tasmanica*) is endemic to Tasmania, but the other (*Microcyclops* sp. 1) is of somewhat dubious status; D. Morton (personal communication), who examined the cyclopoid material, regards it as a new species, but notes that it is rather similar to two other species of *Microcyclops*, one of which occurs in saline waters elsewhere.

On balance, the affinities of the Tasmanian salt-lake fauna lie with the fauna of the Victorian lakes; the Tasmanian salt-lake fauna seems essentially an impoverished Victorian one. A more rigorous comparison involving the determination of coefficients of faunal similarity is not attempted in this paper. Such a comparison is better delayed until current investigations of the fauna of salt lakes in the Eyre and Yorke Peninsulas of South Australia, north-western Victoria, and western New South Wales are complete. A more comprehensive analysis can then be made.

Most of the Tasmanian salt lakes are known to dry out each summer. However, the persistence of *Haloniscus searlei* and *Coxiella striata* in the area indicates that at least some of the lakes regularly contain water for considerable periods, if not all year. These localities probably act as refuges and local sources of faunal replenishment for the more ephemeral waters in the area.

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