1984/43. Analyses of commercial mineral waters on sale in Tasmania

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Abstract

A survey of the composition of commercial mineral waters sold in Hobart shows that most are bicarbonate rather than chloride waters. The cations are usually calcium and magnesium while sodium and potassium tend to be in lower concentrations. Groundwater from carbonate-rich coastal sands and from bores and springs in several rock types at many locations throughout the State have similar compositions to the commercial waters.

INTRODUCTION

A collection of mineral waters sold commercially in Hobart was made as part of the display for 'Agview', held at Cressy in November 1983. The analyses given are of mineral waters found on shop shelves in Hobart at about that time. It is probably not a complete list of available waters, but it is likely the main lines are included.

Mineral water has become very popular over the last ten years or so and this no doubt explains the proliferation of brand names. For about the last two years the water has been mixed with fruit juices by some companies to broaden the range of products.

There is only one Tasmanian mineral water on the list. Chateau Lorraine winery at Cygnet used to bottle a mineral water but this has been discontinued and Schweppes is now bottling a product from the same area.

CHEMICAL CONSTITUENTS OF MINERAL WATERS

An examination of the analyses of the mineral waters shows that nearly all have high bicarbonate contents compared to chloride. The only exception is Gold Spring water from South Australia where the chloride concentration is some eight times greater than bicarbonate. Other characteristics of the waters are the fairly high concentrations of calcium and sometimes magnesium. In several of the waters the sodium content is quite low and in most of them the sum of sodium + potassium is less than the sum of calcium + magnesium concentrations. Sulphate is high in some waters, but high sulphate concentrations are usually accompanied by a low magnesium content.

ORIGIN OF MINERAL WATERS

Mineral waters are usually groundwater obtained from surface springs or bores, although some of the products in the past have been made up by adding salts to water. Some of the waters, although obtained from springs or bores, are treated by such processes as reverse osmosis to remove a proportion of the naturally occurring constituents. Many are artificially carbonated.

TASMANIAN WATERS WITH SIMILAR COMPOSITION

There are many examples of groundwater in Tasmania with similar compositions to those of the mineral waters sold commercially.

(a) Spear bores in coastal sands with a high shell fragment content often produce water with a high bicarbonate, calcium and magnesium composition but with relatively low sodium. Examples are shown in the accompanying table.

(b) Deep bores in rock also often produce similar water. Groundwater in Precambrian dolomite and Ordovician limestone would almost always have a high bicarbonate content, while in many areas the water from bores in Tertiary basalt is bicarbonate rich. Bicarbonate dominant (over chloride) water sometimes occurs in bores in other rock types such as Jurassic dolerite and Triassic, Permian and Cambrian sediments, as is indicated in the analyses. If a high sulphate water was required (such as S. Pellegrino Spa water), such waters occur in Tasmania, *e.g.* sample 12 in the list of analyses.

(c) Springs from carbonate rock areas are bicarbonate rich and examples given in the attached table are from springs with slightly elevated temperatures.

These are by no means a complete list of possible mineral waters in Tasmania but just a few examples to indicate the range of composition and location. With artificial carbonation there is little doubt that many waters in Tasmania would have similar taste to those sold commercially.

CONCLUSIONS

Most commercial mineral waters have a high bicarbonate content together with usually high calcium and magnesium and low sodium. Groundwaters from a number of locations throughout Tasmania have similar compositions and with artificial carbonation, taste is likely to be similar to many of the commercial products.

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Table 1. CHEMICAL ANALYSES OF AUSTRALIAN MINERAL WATERS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
pH													5.0		
Item (mg/l)															
HCO_3	350	352.8		1120	464	1450	216.3	360	nil	264		45	755	812.9	255
Cl	150	24.3	20	57	160	560	7.0	80	57	8.5	20	350	30	76.2	173
SO_4	55	33.3	2		29	31.3	7.4	90			48	75	2.3	3.2	42
SiO_2				75					75		26		70	13.0	6.0
Ca	110	123.0	90	109	82	197	17.9	70	109	74	110	40	90	65.5	17.9
Mg	9		70	83	72	134	19.3		83	73	54	45	75	79.8	11.0
Fe					0.05		trace				trace		0.04		0.4
Al															
K	4		5	6.3	3.3	12.5		30	6	10	12	60	4.5	10.5	8.5
Na	95	26.7	85	150	83	419	33.5	120	150	149	146	200	70	92.2	90
F											nil				

1. Schweppes Colebrook Spring, introduced 1984 (about $0.73 for 750 ml) (Tasmania).
2. Schweppes Sparkling mineral water (pre-Colebrook Spring) analysis reported as $Ca(HCO_3)_2$, $CaSO_4$, NaCl, $NaHCO_3$; cost $0.73 for 750 ml.
3. Coles Melbourne - Sparkling natural mineral water ($0.54 for 750 ml). Typical analysis.
4. Farmland - Sparkling natural mineral water ($0.65 for 750 ml). Typical analysis.
5. Deep Spring - Daylesford area, Victoria ($1.02 for one litre). Li = 0.02, typical analysis.
6. Mt Franklin Natural Sparkling mineral water, Victoria ($1.02 for 1250 ml).
7. Hepburn Spa - Daylesford, Victoria ($1.02 for one litre). Analysis reported as $Ca(HCO_3)_2$, $Mg(HCO_3)_2$, $NaHCO_3$, Na_2SO_4 and NaCl. Sparkling, natural mineral water.
8. Fabulous Sparkling mineral water ($0.50 for 750 ml). Typical analysis.
9. Mr Juicy Natural Sparkling mineral water, Kyneton, Victoria ($0.50 for 285 ml). Bicarbonate nil, alkalinity 1120 mg/*l*.
10. Dayl Spa, Lyonville near Daylesford (blend) ($0.99). Typical analysis.
11. Boon Spa Natural mineral water, Daylesford (Bicarbonate alkalinity 899).
12. Gold Spring Sparkling mineral water, South Australia ($0.95 for 750 ml) ($NO_3$ = 3.1).
13. Bisleri - Eganstown, Daylesford district ($1.50 for 750 ml) Li 1.5, NO_3(N) 0.03.
14. Calandra National Mineral Spring Water ($1.50) reported as $Ca(HCO_3)_2$, $CaSO_4$, NaCl, $NaHCO_3$.
15. Sostanza - Helidon district, South Queensland. Sparkling natural mineral water. Typical analysis (about $0.80 for 750 ml).

Table 2. CHEMICAL ANALYSES, NON-AUSTRALIAN MINERAL WATERS

	1	2	3	4	5	6	7
pH	7.29		6.25		6.0		
Item (mg/l)							
HCO_3	225.77	592.9		2656	979	3385.5	347.7
Cl	67.1	31.5		197.5	58.7	254.5	30.9
SO_4	560	13.9		113.2	44.5	141.2	51.4
SiO_2	11.2						
Ca	203.6	150.4		140	139.7	96	140.2
Mg	59.9	25.7		47.2	73.9	10.3	3.5
Fe	trace			0.1			
Al				0.57			
K	4.2	8.9		65	11.6	75	1.0
Na	44.2	19.7		888	122.8	1330	14
F	0.65				1.2	7.0	0.08

1. S. Pellegrino Spa - Milano Italy (1 hour drive from Milan). B trace, Li 0.22, Sr 3.1, NO_3 0.5, added CO_2. Temperature at source 26.1°C ($1.89 for 31 fl. oz).

2. Aqua Della Madonna from Castellammare di Stabia, Italy (Naples), "used by Navigators". Source temperature 13°C. H_2SiO_3 26.5 ($0.99 for 30 fl. oz).

3. Uliveto - Pisa, Italy. TDS at 180°C 1994 mg/*l*, total hardness (French degrees) 116.0 mg/*l*, conductivity 2909 µS/cm. $1.89

4. Radensca - Redinci, Yugoslavia. Sr 1.3, NH_4 3.0, Li 0.6, Mn 0.81, F 0.57, CO_2 4150, Br 0.66, NO_3 <0.1, Jodid (J^-) 0.23, HPO_4 0.4, HBO_2 14.6, H_2SiO_3 33.4.

5. Bodoit - France (St Galmier). Sparkling mineral water (about $1.50 for 890 ml). NO_3 16 mg/*l*.

6. Vichy - Celestino, France (about $1.50 for 900 ml). Natural mineral water, mineral salts 3681 mg/*l*, Zn 0.03, Cu 0.04, Pb 0.018, N 0.06, As 0.24.

7. Perrier - France. About $1.65 (typical analysis). N 3.6, Zn 0.2, Cu 0.013.

Table 3. CHEMICAL ANALYSES OF GROUNDWATER FROM HARD ROCKS

	1	2	3	4	5	6	7	8	9	10	11	12
pH	7.3	6.8	8.0	7.3	7.4	7.2	7.5	7.5	6.9	7.6	7.2	7.5
Item (mg/l)												
HCO_3	315	217	310	460	565	400	590	412	370	363	380	74
Cl	85	91	80	100	56	234	280	225	200	51.3	51	60
SO_4	<5	<5	45	37	15	21	66	32	<2.0	2.1	25	455
SiO_2	35	71	64	47	48	55		23	15	16.8	11	31
Ca	53	39	50	66	64	103	220	60	154	108.3	100	107
Mg	66	37	42	48	51	64	18	46	17	34	28	45
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	trace	0.03	nil	<0.1	1.0	<0.1	nil
Al		<0.2		<0.2	<0.2	trace		nil	<0.2		<0.2	nil
K	3.8	3.1	5.8	1.6	1.5	1	3.3	8	7		2.5	4.0
Na	44	41	81	100	68	73	110	98	75	40	322	67
TDS	410	416	580	670	620	819	1090	666	870	530	470	874

1. Tertiary basalt water, L. Cole, Moltema
2. Tertiary basalt water, E. Carey, Latrobe
3. Jurassic dolerite water, Bowman, Hamilton Plains
4. Jurassic dolerite water, P. Ellis, Campania
5. Jurassic dolerite water, R. Magnus, Woodbridge
6. Triassic sediments water, J.T. Bevan, Colebrook
7. Permian sediments water, Michael Brown, Glenfern
8. Permian sediments water, M. Byers, Tunnack
9. Cambrian sediments water, B. Smith, Montagu
10. Precambrian dolomite water, F.H.C. Fenton, Broadmeadows
11. Precambrian dolomite water, D. Marthick, Mella
12. Permian sediments water, P.A. Byrne, Baden.

Table 4. CHEMICAL ANALYSES OF WATER FROM COASTAL SANDS

	1	2	3	4	5	6	7
pH	7.7	7.7	7.3	7.4	7.7	7.6	7.7
Item (mg/l)							
HCO_3	350	300	320	305	245	430	280
Cl	77	42	89	120	61	115	83
SO_4	9.7	8.9	20	13	17	46	12
SiO_2	5.6	<5	7	13	5.9	16	<5
Ca	95	77	88	60	70	120	90
Mg	9.3	7.5	10	18	6.2	14	12
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Al	-						
K	2.2	1.2	3.1	3.1	3.2	3.8	
Na	50	24	39	50	34	78	48
TDS	480	350	460	480	360	620	410

1. Western end of Peggs Beach
2. Macquarie Heads area
3. Dolphin Sands
4. Greens Beach
5. Bellingham (Arnold)
6. Seven Mile Beach
7. Currie - King Island

Table 5. CHEMICAL ANALYSES OF SPRING WATER

	1	2	3	4
pH	7.5	7.2	6.8	7.0
Item (mg/l)				
CO_3		137		
HCO_3	240		910	500
Cl	27	29	53	60
SO_4	12	7	7	<5
SiO_2	18	9	11	16
Ca	63	47	170	110
Mg	13	26	93	34
Fe	<0.1	0.6	<0.1	0.2
Al	<0.2		<0.2	<0.2
K	1.2	16	1.8	2.9
Na	12		27	33
TDS	260		830	520

1. Kimberley
2. Hastings
3. Pulbeena
4. Mella