

THE PERSISTENCE OF DRIFT PUMICE, FROM THE 1962 SOUTH SANDWICH ISLANDS ERUPTION, IN SOUTHERN AUSTRALASIAN WATERS

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(With one text figure)

ABSTRACT

Drift pumice from the 1962 South Sandwich Islands eruption was observed to persist in Southern Australasian waters five and a half years after its eruption and over four years after its first appearance in these waters. Mostly fine pumice gravels and sands have been stranded since early 1965. Regular surface plankton hauls in Mercury Passage, east Tasmania, in the past two years indicated a number of influxes of the pumice into eastern Tasmanian waters. It is postulated that these influxes probably largely represent material recycled from earlier strandings, although some pumice may have arrived from continuous indirect drift. As yet there is no evidence to discount the possibility of circum-antarctic circulation of some of the pumice, before stranding.

Large amounts of pumice liberated by submarine volcanism in the vicinity of the South Sandwich Islands in March 1962 (Gass, Harris and Holdgate, 1963) were subsequently carried eastwards by the West Wind Drift System and distributed on southern Australasian coasts by 1964 (Sutherland, 1964, 1965; Simpson, 1965; Coombs and Landis, 1966). This note deals with further information on the initial distribution of the pumice along the Australian coast, and evidence of its persistence in southern Australasian waters.

Australian strandings of the pumice were first observed in Tasmania in late December 1963, a few months earlier than any reports previously received from the Australian mainland. However, A. D. Wadsley (pers. comm., 28 October 1965) states that he "found large pieces of pumice in and around the Torquay area during Xmas 1963-New Year's Day 1964 holiday period, coinciding with the time at which they were noticed on the west coast of Tasmania and considerably earlier than the report from Port Campbell, Victoria." Similarly, the previous earliest record of the pumice stranding on the Western Australian coast was in July 1964, but further data and samples forwarded by G. Kendrick and D. Merrilees, Western Australian Museum, indicate that some of the pumice washed up as early as March 1964. This Western Australian material may have been derived from the initial wave of pumice intruding into south-

eastern Australian waters, while the heavy influx about mid 1964 was probably brought up from the south by strong southerly winds. In view of the discussion on the origin of past strandings of pitch on the south-eastern Australian coast (Sprigg, 1961) it is perhaps also worthwhile recording the presence of rare pieces of pitch amongst the pumice strandings on the north-west coasts of Tasmania in 1964.

Finer grained gravels and sands with sporadic larger pieces became the dominant pumice material washing up on Australian coasts by early 1965 (Sutherland, 1965) and further such strandings have been noted more recently. Thus, copious pumice gravel was observed washing ashore on 3 April 1965, half a mile north of Cape Martin, South Australia (D. Wolfe, pers. comm.). A fresh heavy deposit of fine pumice, up to an inch or two thick was noted on the southern Victorian coast in mid-October 1965 (A. D. Wadsley, pers. comm.), while fresh sparser pumice gravel was noted by one of the authors at Port Campbell in mid-January 1967. Similar strandings were present at a number of places on the western Victorian coast at about the latter time, although they were generally absent from the eastern Victorian coast (D. J. Taylor, pers. comm.) and this distribution appears compatible with the normal summer surface water circulation through Bass Strait (Vaux and Olsen, 1961). In Tasmania new strandings of fine pumice were noticed at Reidle Bay and Darlington on Maria Island, Spring Bay, Marion Bay, Eaglehawk Neck, South Arm, and other south-eastern Tasmanian beaches during the months of August, September and October 1966, and in mid-January 1967. There were similar strandings on the west coast of Tasmania at Point Hibbs in May 1965 (D. Duncan, pers. comm.) and south of the Pieman Heads in late January-early February (A. P. Bravo, pers. comm.) 1967 and at Trial Harbour in early November 1967 (A. J. Dartnall, pers. comm.). These presumably only represent some of the pumice influxes on the Tasmanian coast since the beginning of 1965, as widespread and systematic visiting of beaches was not attempted. Periodic influxes of pumice gravels and sands were reported from south-western and southern beaches in Western Australia through to South Australia in

July and early November 1966, and in about mid-January and mid-July 1967, while pieces much larger than usual were stranded on south-western beaches recently during August and September 1967 (D. Merrilees and G. Kendrick, pers. comm.). On examination, samples of pumice from a number of the above mentioned strandings and the South Sandwich Islands pumice were identical. Recent strandings of fine pumice were reported on the south coast of New Zealand (C. A. Landis, pers. comm.) and although samples have not yet been obtained for examination it is likely that they also represent the South Sandwich Islands pumice. Thus, a stranding at Mason Bay, Stewart Island on 7th January 1967 has been described as follows (Barlow, 1967); "There was a morning when the beach held an immense bridal-veil—miles of it. The receding tide had left behind an elaborate lace frill, flounce upon flounce, formed by millions of less-than-sago sized grains of pumice".

A detailed record of the occurrence of pumice in the surface waters of Mercury Passage, between the mainland of Tasmania and Maria Island, east Tasmania, was compiled by A. M. Olsen during surface plankton studies carried out over a period from September 1965 to July 1967. The sampling was either weekly or monthly over a day and night. The results (Table 1, fig. 1) indicate the presence of pumice at each plankton station with a positive sign and its absence with a negative, while double positives indicate the presence of particularly abundant pumice. Pumice was not detected in Mercury Passage on only five of the forty-four plankton sampling operations, namely 25/xi/65, 25/x/66, 16/xi/66, 5/xii/66, and 13/iv/67. In all the other sampling runs pumice was found at some, or all, of the plankton stations with particularly abundant pumice being found on 23/xii/65 and 30/xii/65. These results clearly demonstrate the continued presence of drift pumice in these waters some four years after reaching Macquarie Island and some three and a half years after its initial sighting on the sparsely populated west Tasmanian coast. The reports of new strandings on previously listed south-eastern Tasmanian beaches correspond with the presence of considerable quantities of pumice in plankton hauls in Mercury Passage. From these data it can be inferred that pumice influxes occurred (70% or more appearances in plankton tows) in early November 1965 and early December 1965 to early March 1966, becoming particularly abundant in late December 1965; late June 1966 to mid-September 1966; early October 1966; early February 1967; and mid to late June 1967. Similarly, obvious absences of drifting pumice can be inferred (i.e., pumice recovery from 30% or less of the plankton hauls on sampling runs) in late September, mid-October, and early to late November 1965; in late April, late September, early and late October, and mid-November to late December 1966; and in mid-March to early April 1967.

The southern coast of Tasmania is under the influence of the West Wind Drift System during both the summer and winter and therefore is not subject to the same influence of winter/summer surface water mass reversals as is northern and western Tasmania (Vaux and Olsen, 1961). Thus presumably much of the pumice appearing here

represents material derived from lower latitudes working northwards, particularly so during the winter circulation. The summer influxes however, may contain some material that has worked further northwards and is being returned down to this south-eastern Australian area. Some of the pumice, possibly a considerable proportion, presumably represents re-cycled material from earlier strandings. This is probably true for many of the sporadic larger pieces found amongst the fine material as some of these show only immature growths of barnacles, and hence have not been continuously afloat. Particularly heavy pumice deposits were recorded following the initial arrival of the pumice at Heard Island (Budd, 1964) and Macquarie Island (Simpson, 1965) and probably much of this material has since progressively washed off and floated elsewhere.

The persistence of the South Sandwich Island drift pumice in Australian waters indicates that its dispersion continues some five and a half years after its eruption. This extensive volume of pumice was probably all from the initial eruption in 1962, although the possibility of further ejections from the volcano cannot be discounted. The complete pattern of the pumice dispersion is not clearly known, but much of the material swept eastwards from its source appears to be dispersing into higher latitudes. Calculations based on the arrival times of the initial pumice front at various places in the Southern Ocean gave an average speed of travel of about 18 miles per day (Sutherland, 1965). On these figures the pumice front carried by the West Wind Drift System would circumnavigate the Southern Ocean by about September 1964, and reappear in Australasian waters by about December 1965, providing that there was continued passage of material past the South American land mass. Observations on floating objects in the Southern Ocean (Deacon, 1960), would seem to support the possibility of circumnavigation by some of the pumice. Certainly, pumice was particularly abundant in the plankton hauls from Mercury Passage in late December (Table 1), but whether this was partly due to additional re-cycled material from the initial pumice front taking a longer indirect course or to the arrival of pumice recirculated around the Southern Ocean is debatable without further evidence. In any event, the persistence of the pumice in Australian waters provides additional confirmation as to the length of time such material can remain buoyant and the extent to which it can disperse over oceanic waters.

ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance of numerous persons who kindly supplied information on, and samples of, the pumice drifts. In particular, they would like to thank Messrs. G. Kendrick and D. Merrilees of the Western Australian Museum, Dr C. A. Landis, Otago University, New Zealand, Dr A. D. Wadsley, C.S.I.R.O., Melbourne, Victoria, Mr D. J. Taylor of Melbourne, Mr A. J. Dartnall and Miss E. Aves, Tasmanian Museum, Hobart, Mr D. C. Wolfe, Fisheries Division, Tasmanian Department of Agriculture, Hobart, and Mr I. B. Jennings, Chief Geologist, Tasmanian Department of Mines, Hobart.

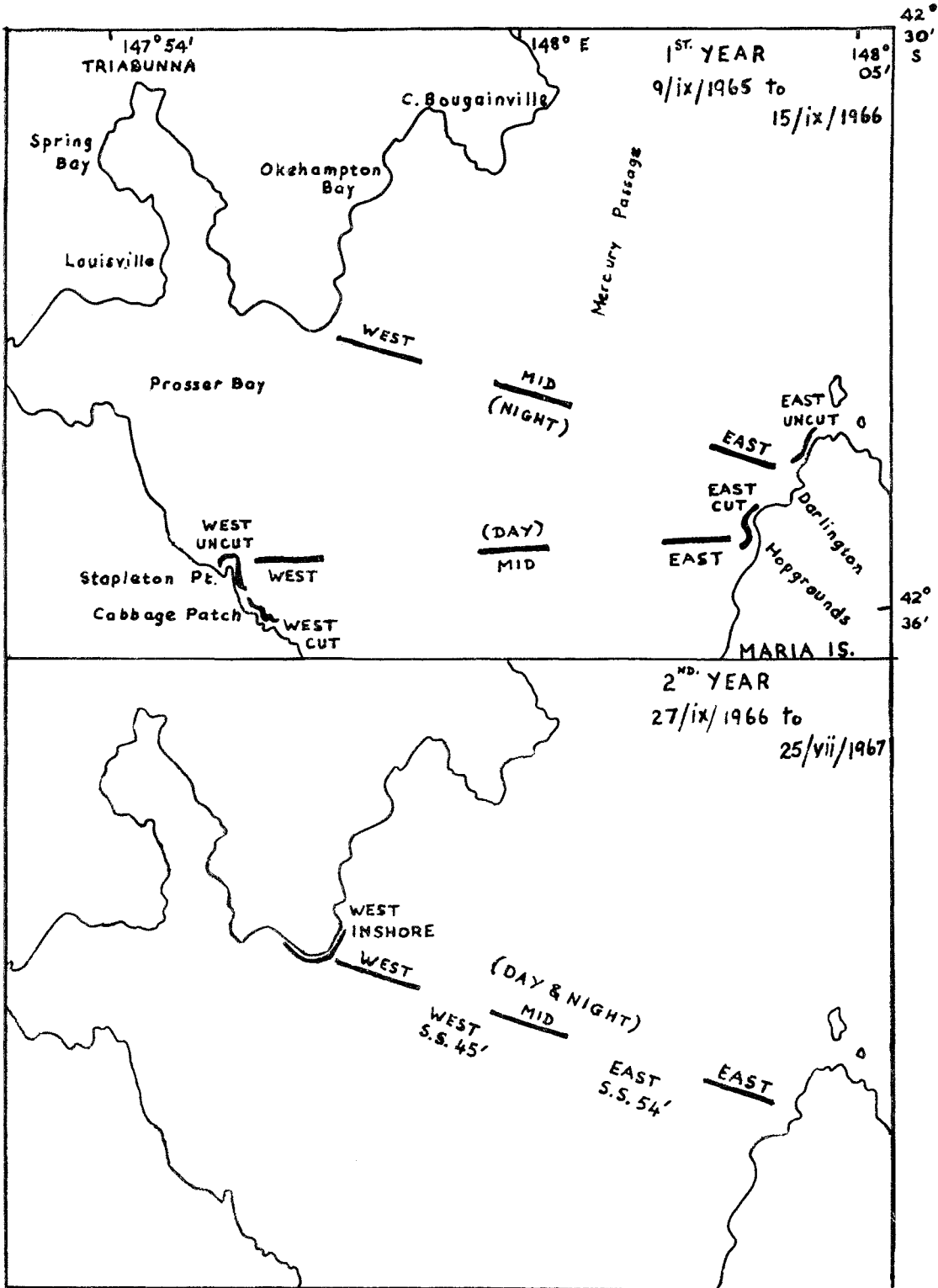


FIG. 1.

TABLE 1. OCCURRENCE OF PUMICE AT PLANKTON STATIONS IN MERCURY PASSAGE, E. TASMANIA

Date	Day							Night		
	West	West	Trans Passage			East	East	Trans Passage		
	Uncut	Cut	West	Mid	East	Uncut	Cut	East	Mid	West
9. 9.65	+	-	-	+	+	-	NO	NO	NO	NO
WEEKLY—										
22. 9.65	-	-	-	-	-	-	+	-	-	+
5.10.65	-	-	-	+	+	+	-	-	+	-
13.10.65	-	-	-	-	+	+	-	-	-	-
19.10.65	-	-	-	+	+	+	+	+	+	-
27.10.65	-	+	+	+	+	+	+	-	-	-
3.11.65	+	+	-	+	+	+	+	+	+	+
10.11.65	+	+	-	-	-	-	-	-	-	-
18.11.65	-	-	-	-	+	+	+	-	-	-
25.11.65	-	-	-	-	-	-	-	-	-	-
3.12.65	+	+	+	+	+	+	+	-	-	-
9.12.65	+	+	+	+	+	+	+	+	+	+
15.12.65	+	+	-	+	+	+	+	+	+	+
23.12.65	++	++	++	++	++	++	++	-	-	-
31.12.65	+	+	+	+	+	+	++	+	+	+
MONTHLY—										
20. 1.66	-	-	+	+	-	+	+	+	+	+
9. 2.66	+	+	+	+	+	+	+	+	+	-
9. 3.66	+	+	+	+	+	+	+	+	+	+
21. 4.66	-	-	-	+	+	-	-	-	-	-
25. 5.66	-	+	-	+	+	+	+	+	+	-
21. 6.66	+	+	+	+	+	+	+	+	+	+
26. 7.66	-	-	-	-	+	+	+	+	-	+
18. 8.66	-	+	+	+	+	+	+	+	+	+
15. 9.66	+	+	+	+	+	+	+	+	+	+

First year Plankton Tows 9/9/1965 to 15/9/1966.

NO — Not Occupied.

	Kelp Beds			Location		
West Uncut	Stapleton Point	
West Cut	Cabbage Patch	
East Cut	Hopgrounds, Maria Island	
East Uncut	Darlington, North Maria Island	

ADDENDUM

Drift pumice, similar in appearance to the South Sandwich Islands material, has washed ashore on the Juan Fernandez Archipelago, off South America, since August 1965 (Baker, 1967). This appears to indicate the passage of South Sandwich Islands pumice across the southern Pacific, driven by the West Wind Drift into the northerly flowing Humbolt Current.

Date	Day						Night					
	West Insh	West	West SS	Mid	East SS	East	East	East SS	Mid	West	West Insh	
WEEKLY—												
27. 9.66 ..	—	—	—	—	—	—	—	+	—	—	—	—
7.10.66 ..	+	+	+	+	—	+	NO	NO	NO	NO	NO	NO
12.10.66 ..	—	—	—	—	—	—	+	+	—	—	—	—
18.10.66 ..	+	+	—	+	—	+	+	—	—	—	—	—
25.10.66 ..	+	—	—	—	—	—	—	—	—	—	—	—
31.10.66 ..	+	—	—	—	—	—	—	—	—	—	—	—
10.11.66 ..	+	+	—	+	—	+	—	—	+	+	—	—
16.11.66 ..	—	—	—	—	—	—	—	—	—	—	—	—
21.11.66 ..	+	—	—	+	—	+	—	—	—	—	—	—
29.11.66 ..	—	—	—	—	—	+	—	—	—	—	—	—
5.12.66 ..	—	—	—	—	—	—	—	—	—	—	—	—
12.12.66 ..	—	—	—	+	—	—	+	—	—	—	—	—
19.12.66 ..	—	—	—	—	—	+	—	+	—	—	—	—
MONTHLY—												
10. 1.67 ..	—	—	—	+	—	+	+	—	—	+	—	—
8. 2.67 ..	+	+	—	+	—	+	+	+	+	+	+	+
15. 3.67 ..	+	—	—	—	—	+	—	—	+	—	—	—
13. 4.67 ..	—	—	—	—	—	—	—	—	—	—	—	—
7. 5.67 ..	—	—	—	—	—	+	+	—	—	—	—	—
21. 6.67 ..	+	+	+	+	+	+	+	+	+	—	—	—
25. 7.67 ..	+	—	—	+	+	+	+	—	—	—	—	—

Second Year Plankton Tows (modified programme) 27/9/1966 to 25/7/1967.

NO — Not Occupied.

Kelp Beds	Location	
West Inshore	.. Black Point Area	} Mercury Passage Tows
West West Mercury Passage	
West SS West Sub Surface (44 ft. depth)	
Mid Mid Passage	
East SS East Sub Surface (55-57 ft. depth)	
East East Surface	

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