Organic Matter in Sea Water of Palao, South Sea

by

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With 3 text-figures.

It is so far known that the sea water decreases its pH during the storage in dark room owing to the respiration of plankton organisms. This decrease of pH, however, continues until after the death and decay of plankton due to the biological oxydation of organic matter produced by the dissolution of plankton. The organic matter in such a case is called by ATKINS "respirable organic matter."*

In the present work the respirable organic matter in the sea water of Palao, South Sea, was estimated at the following three stations.

St. 1; Mangrove swamp near the laboratory of the Palao Tropical Biological Station.

St. 2; Rebugoru Passage in Iwayama Bay.

St. 3: Open sea off barrier reef of Palao Port.

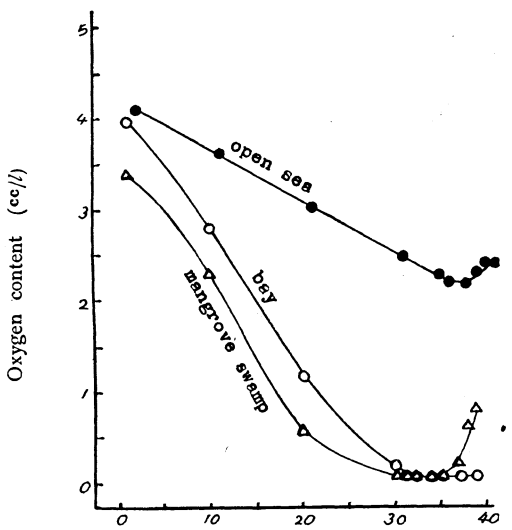
The water was sampled about 20 litres always in daytime from the surface of the sea (except third observation) and the bottles were at once covered with black clothes. In laboratory the bottles were stored air-tight and placed in dark room. The water was sampled from the bottle through a siphon at intervals of a few days and oxygen content was determined by ordinary WINKLER's method and pH value was determined colorimetrically. After taking water, the space, resulted at the top of bottle, was filled up with liquid paraffin.

The results of the first observations on the sea water of the three stations are shown in the following table and graph. The water of the mangrove swamp and the bay consumed all oxygen in the bottles during about one month, while the water of open sea consumed but a little, i. e. it reached to the minimum of 2.2 cc/ℓ after 36 days. After the consuming power was exhausted, the oxygen content in bottles showed a slight increase, probably owing to the invasion from without.

* ATKINS, W. R. G. 1921. Jour. Mar. Biol. Assoc., Vol. 12, pp. 772–748.

Duration of storage		Date of estimation (1935)	O_2 (cc/l)			pH			Water temp. in bottle
Bay and mangrove swamp	Open sea		Mangrove swamp	Bay	Open sea	Mangrove swamp	Bay	Open sea	
1 days	2 days	Jul. 4	3.4	4.0	4.1	8.05	8.20	8.25	
10 "	11 "	" 13	2.3	2.8	3.6	8.00	8.10	8.20	27.4 C
20 "	21 "	" 23	0.6	1.2	3.0	7.80	7.95	8.10	26.7 C
30 "	31 "	Aug. 2	0.1	0.2	2.5	7.60	7.70	8.10	28.1 C
31 "	32 "	" 3	0.1	0.1	—	7.60	7.70	—	28.4 C
32 "	33 "	" 4	0.1	0.1	—	7.60	7.65	—	28.2 C
34 "	35 "	" 6	0.1	0.1	2.3	7.55	7.60	8.10	28.3 C
35 "	36 "	" 7	0.1	0.1	2.2	7.55	7.60	8.07	28.3 C
37 "	38 "	" 9	0.2	0.1	2.2	7.50	7.60	8.00	28.7 C
38 "	39 "	" 10	0.6	—	2.3	below 7.5	—	8.00	27.7 C
39 "	40 "	" 11	0.8	0.1	2.4	below 7.5	7.50	8.10	27.2 C
40 "	41 "	" 12	—	—	2.4	—	—	8.05	28.2 C

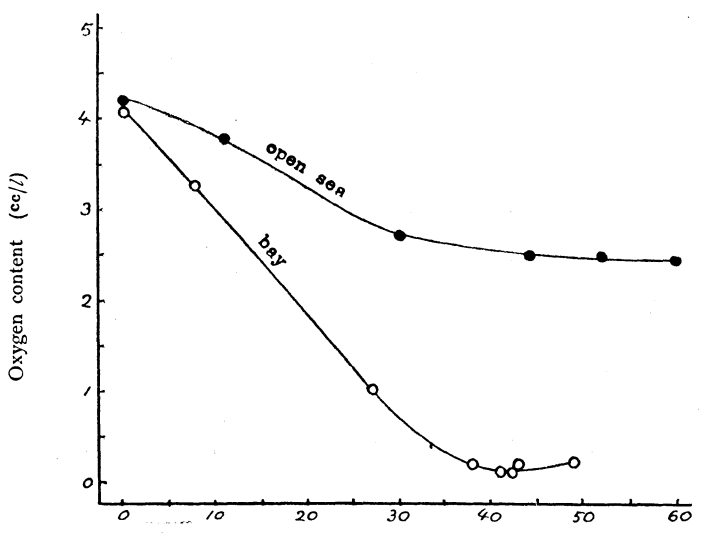
Water was sampled on Jul. 2. at open sea and on Jul. 3. at bay and mangrove swamp.



The second observations made on the water of the bay and the open sea, showed similar results, namely the organic matter is richer in the bay than in the open sea.

Duration of storage		Date of estimation (1935)	O_2(cc/l)		pH		Water temp. in bottle
Bay	Open sea		Bay	Open sea	Bay	Open sea	
		Sept. 11		4.1		8.35	
		" 14	4.2		8.30		
8 days	11 days	" 22	3.3	3.8	8.30	8.30	29.6 C
27 "	30 "	Oct. 11	1.0	2.7	8.10	8.25	27.5 C
38 "	41 "	" 22	0.2	—	—	—	—
41 "	44 "	" 25	0.1	2.5	8.00	8.15	28.5 C
42 "	45 "	" 26	0.1	—	7.97	—	—
43 "	46 "	" 27	0.2	—	7.95	—	27.5 C
49 "	52 "	Nov. 2	.2	2.5	7.75	8.05	27.6 C
58 "	61 "	" 11	—	2.5	—	8.05	28.2 C

Water was sampled on Sept. 11. at open sea and on Sept. 14. at bay.

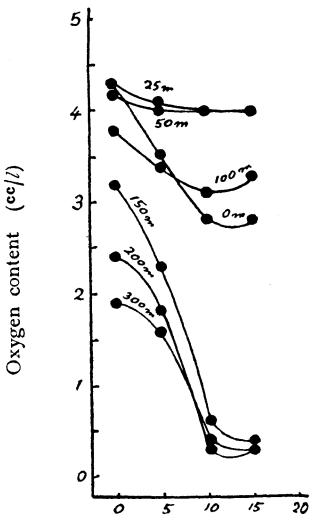


ATKINS, having made observations at Plymouth, reported that the change of pH value of sea water during storage was usually most rapid in the coastal region and decreased in rapidity seawards.

The third observations were made vertically (0, 25, 50, 100, 150, 200, and 300 metres) in the open sea, sampling about 500 cc of water from each depth. From the below table and graph it can be seen that the waters

of 25 and 50 metre layers show least consumption, i. e. only 0.3–0.2 cc/l after 15 days, accompanying no change of pH. The water of layers deeper than 150 metres showed a remarkable consumption, e. g. the water of 150 metres consumed oxygen of 2.8 cc/l by 15th day, and pH decreased more than 0.59. These results do not approximate to those of ATKINS in which the richest layer of organic matter was found to be in 20–25 metre depth.

Duration of storage	Date of estimation (1936)	O_2(cc/l)							pH							Water temp. in bottle
		0 m	25 m	50 m	100 m	150 m	200 m	300 m	0 m	25 m	50 m	100 m	150 m	200 m	300 m	
	Sept. 21	4.3	4.3	4.2	3.8	3.2	2.4	1.9	8.37	8.37	8.35	8.27	8.09	8.00	7.95	
5 days	" 26	3.5	4.1	4.0	3.4	2.3	1.8	1.6	8.33	8.35	8.35	8.25	8.05	8.00	7.95	29.4 C
10 "	Oct. 1	2.8	4.0	4.0	3.1	0.6	0.3	0.4	8.20	8.35	8.35	8.15	7.78	7.75	7.50	28.7 C
15 "	" 6	2.8	4.0	4.0	3.3	0.4	0.3	0.3	8.12	8.35	8.35	8.15	below 7.5	below 7.5	below 7.5	27.4 C



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摘　　要

南洋パラオの海水の有機物

南洋パラオに於て紅樹林澤、灣内、外洋の三地點より海水を採水、密閉して暗室に保存、數日毎に可呼吸有機物による酸素消費及 pH の低下の度を則定せる結果、前二地點の表面海水は殆ど一ケ月にして酸素を全く消費し盡したるも外洋表面海水は 36 日保存後尙 22cc/l の酸素を含有し居るを認めたり。又外洋の水深 300 米までの各層の海水に就ては 25 及 50 米の海水は最も消費力强く、150 米以深の海水は極めて微弱なる消費力を示せり。