Clearly, the introduction of a "foreign" element in an established community can disturb its structure sufficiently to have a noticeable effect upon the pyramid of numbers. We suggest that communities showing marked deviations from the expected size-frequency distribution (in which the number of individuals tends to vary inversely with size) have probably been subject to some external disturbance, the nature of which might be revealed through study of the anomalous size class or classes (*3*).

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3. This work was supported by National Science Foundation grant 3223 through the University of Michigan.

23 February 1960

Uptake of Glucose from Solution by the Solitary Coral, Fungia

Abstract. The removal of glucose from solution in sea water by the coral, *Fungia*, has been followed with D-glucose-C^{14}. From 15 to 37 percent of the sugar in 200 ml of solution is taken up per hour from concentrations of 1 to 40 mg/liter. This rate of uptake provides sufficient material to account for the maintenance metabolism of the coral at sugar concentrations of 3.75 to 7.25 mg/liter.

The observations to be reported were made using D-glucose-C^{14} added to the sea water in which individual corals were maintained. The concentration of labeled material was estimated at suitable intervals by evaporating 0.5 ml samples on planchets and counting with a thin-window Geiger tube. Each determination was made in quintuplicate. Although self-absorption in dried sea water samples is considerable, dilution curves indicated a linear relation between the counting rate and the concentration of labeled glucose.

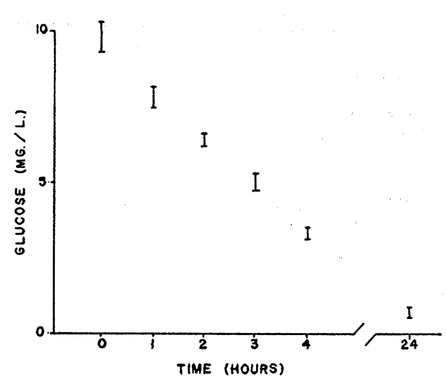

Fig. 1. Disappearance of sugar.

Fig. 1 illustrates the disappearance of added sugar in a typical set of observations. The volume of the solution was 200 ml. Uptake occurred in the same fashion in the presence of streptomycin (50 mg/liter). The rate of disappearance in darkness was comparable to that observed in diffuse sunlight. The radioactivity in 200 ml of solution maintained as a blank did not change over a 24 hour period.

The radioactive carbon which disappears from solution during a 4 hour period can be recovered in a sodium hydroxide digest of the animal. After 24 hours, a portion of the C^{14} remaining in the sea water diffuses from an acid to a base medium in a diffusion chamber, suggesting the presence of $C^{14}O_2$. Thus *Fungia* is apparently capable of removing glucose from solution at low concentrations and using it as a source of energy.

Table 1 lists the observed rate of uptake at various initial concentrations of glucose. The volume in each case is 200 ml of solution. A concentration of 1 mg/liter probably does not represent a lower limit for effective uptake but is rather a limit imposed by the specific activity of the labeled sugar. At this concentration, the observed rate was 5.3 ± 0.68 count/min.

It is of interest to consider whether this process is potentially significant as a source of nutrients for the animal. Animals were kept in darkness, and oxygen consumption was determined by the Winkler method. Individuals ranged in wet weight from 21.4 to 48.0 gm, and oxygen consumption ranged from 0.11 to 0.22 ml per individual per hour at a temperature of 26°C (0.047 ± 0.015 ml/gm hr). These figures imply that the equivalent of 0.15 to 0.29 mg of carbohydrate per hour must be acquired by an individual to support maintenance metabolism.

From the observations presented in Table 1, we may assume a rate of removal of 20 percent per hour for the carbohydrate present in 200 ml of sea water. An ambient concentration of 3.75 to 7.25 mg/liter is thus sufficient to account for the observed oxygen consumption. No figures are available for naturally occurring concentrations of carbohydrate for waters near Oahu. Lewis and Rakestraw (*1*) reported concentrations of an unidentified carbohydrate as high as 7.9 mg/liter in filtered sea water samples from coastal lagoons near San Diego. Their determinations for more open waters are considerably lower.

Table 1. Removal of glucose from sea water by *Fungia*.

Initial concn. of glucose (mg/liter)	Amount removed in first hour (%)	Amount removed (mg)
1.0	15*	0.03
1.0	28*	.06
1.0	25*	.05
1.0	20*	.04
4.0	29	.23
4.0	31	.25
4.0	37	.30
4.0	25	.20
10.0	30	.60
10.0	16	.32
10.0	23	.46
10.0	22	.44
40.0	16	1.28
40.0	22	1.46

* Calculated from determinations after 2 hours.

Values reported for total dissolved organic material (*2, 3*) are approximately 5 mg/liter for open water. Unfortunately, our information concerning the character of this dissolved organic material is modest (*4*). However, we need not limit our speculations to the carbohydrate fraction of this material since many invertebrates are capable of removing amino acids from dilute solution (*5, 6*). Unpublished observations indicate that this is also true of *Fungia*.

If we assume that the naturally occurring carbohydrate in sea water is utilizable and is taken up at the rate observed for glucose, *Fungia* can obtain sufficient material to account for maintenance metabolism in selected locations. If we make similar assumptions concerning all the dissolved organic material, a favorable location need not be stipulated. Information to support these assumptions is not available. However, the hypothesis that dissolved organic material may provide a significant fraction of the food of aquatic animals deserves further investigation (*7*).

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7 March 1960