tion of the zooid and the method of protruding the tentacles, Borg's[3] paper should be consulted.)

The body wall in cyclostomes comprises an epidermis (lined by a peritoneum), calcareous layer and cuticle. The skeletal calcareous layer is perforated by "pseudopores"[5], filled with living tissue. It has been supposed[2,3] that these permit gaseous diffusion through an otherwise impermeable wall. Borg[3] even noted the paucity of pseudopores in the vicinity of the terminal membrane, which must be sufficiently permeable to gases to render the pores superfluous. The gonozooid, which contains large numbers of developing embryos, bears about twice as many pseudopores per unit area of surface as the normal zooid. It seems clear that this must be to satisfy the high oxygen requirements of the embryos, which can obviously be met only by diffusion, because here there is no polypide to promote circulation.

A recurring evolutionary trend in the Cheilostomata is the protection or elimination of the frontal membrane found in *Bugula* and other genera classified as Anasca. In the Ascophora, the front wall of the zooid is calcified and the hydrostatic function of the frontal membrane is performed by the ascus, a thin-walled sac opening directly to the exterior, into which water can flow as a decrease in coelomic volume forces out the tentacles (for diagrams, see ref. 6). In addition to its role as a compensation sac, the ascus may be the principal respiratory organ in ascophorans. The rhythmic movements withdrawing and protruding the tentacles will keep emptying the ascus and refilling it with fresh, oxygenated water.

The frontal wall of ascophorans also often contains pseudopores. They may permit gaseous exchange to some extent, but this is probably not their primary function. Unlike cyclostomes, most ascophorans deposit secondary calcification on the outside of the initial skeletal layer. How this is achieved, remotely from the epidermis, has never been satisfactorily explained, but the tissues in the pseudopores are clearly involved. Thus, when the pseudopores are restricted to the margin of the zooid, secondary calcification spreads from the margin centripetally (producing a pleurocyst); when they cover the primary wall, secondary calcification takes place all over the surface (producing a tremocyst) (for diagrams see ref. 6).

It is concluded that anascans and non-calcified Polyzoa have no diffusion problem; in cyclostomes it is met by pseudopores, varying in frequency of occurrence, which permit diffusion of oxygen from outside. In the ascophorans, pseudopores are again present, but often only at the margin of the zooid, and they seem to fulfil a different function; the ascus is perfectly adapted as an efficient respiratory organ, and the behaviour of the organism seems to ensure that it does so.

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Diurnal Activity of Hermatypic Gorgonians

THE natural food of gorgonians, or any other soft corals, inhabiting coral reefs is unknown, but net photosynthesis to respiration ratios from 2 to 5 have been reported for isolated colonies of five species of Caribbean reef gorgonians in laboratory experiments[1,2]. This photosynthesis is attributed to the dinoflagellate symbionts living in the gastrodermal cells of these and other so-called hermatypic corals. There is also evidence that members of the gorgonian family Xeniidae in the Red Sea draw most of their nutrition from this photosynthesis[3]. Observations reported here suggest that gorgonians from Caribbean reefs may also depend for nutrition on their algal symbionts.

Table 1. NUMBER OF GORGONIAN COLONIES WITH EXPANDED OR CONTRACTED POLYPS IN DIFFERENT CONDITIONS OF LIGHT

	Bright sun (noon ±1 h)	Twilight (7 p.m. ±1 h)	Night (9–10 p.m.)	Cloudy day (noon ±1 h)
Polyps expanded	166 (81)	85 (57)	100 (44)	427 (85)
Polyps contracted	39 (19)	63 (43)	129 (56)	73 (15)

Numbers in parentheses are percentages of all colonies observed in the specified condition.

Equipped with self-contained underwater breathing apparatus and with a hand-tally in either hand, I observed every gorgonian I could find in six patches of corals on reefs less than 7 m deep off the upper Florida Keys during 3 weeks in June 1966. I made these observations in full sunlight, in complete overcast, in twilight and at night. I counted gorgonian colonies whose polyps were expanded on one tally and colonies whose polyps were contracted on the other. The few colonies which were partially expanded were not counted.

Table 1 shows the pooled results of these observations. The polyps of these hermatypic gorgonians on these reefs tend to be expanded during the day and contracted at night. No attempt was made to make such counts for individual species, but my impression was that the sea fans, *Gorgonia*, seldom varied from this condition, while the abundant members of the genus *Pseudopterogorgia* seldom showed this trend but tended to be expanded at night and contracted in the daytime.

In the same conditions of light, I collected plankton over the reefs with a 20 mesh/cm net of 25 cm diameter towed within 1 m of the sea surface from a skiff travelling at 1–3 knots. None of the tows lasting 20 min in daylight caught more than twenty or thirty organisms, but the net became clogged and the 50 ml. collecting jar overflowed with plankton within 5 min during every night tow.

Close-up moving pictures of several gorgonian species taken on the reef in bright sunlight and at night by artificial light show (*a*) the trend of gorgonian polyps other than those of *Pseudopterogorgia* to be expanded in the daytime and contracted at night and (*b*) the paucity of visible plankton in daytime and its abundance at night. Stony corals such as *Montastrea cavernosa* and *Diploria clivosa* seem to be mostly contracted in daytime, but at night they are expanded and actively catching and ingesting swarming zooplankton.

The fact that the polyps of most gorgonian species I have observed expand in the daytime when zooplankton is scarce and when conditions are right for photosynthesis leads me to suggest that many of these species on shoal Caribbean reefs may draw most of their nutrition from the photosynthesis of their algal symbionts. The predominantly contracted state of these polyps at night when zooplankton is abundant suggests that these gorgonians do not feed extensively on zooplankton.

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Overwintering in *Pemphigus bursarius* (L.)

ALTHOUGH many aphids overwinter in the egg stage, several species can overwinter in the adult stage as parthenogenetic morphs (*Aphis pseudobrassicae* Davis[1],