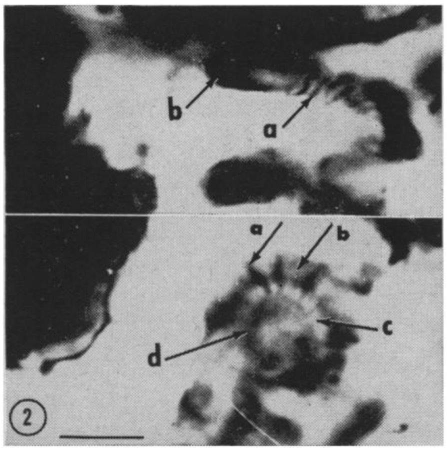

Fig. 2. Loci of adenosine triphosphatase in stalks. Incubation time, 15 minutes. (Top) Lateral view of upper coil of loosely wound stalk. (Bottom) Anterior view of coil of tightly wound stalk. *a*, Cortical helix; *b*, sheath of spasmoneme; *c*, spasmoneme canal; *d*, spasmoneme. Magnification marker at lower left, 5μ.

in three changes of tap water, and dehydrated in 80-percent ethyl alcohol for 1 minute, in 95-percent for 2 minutes, in 100-percent for 3 minutes, and were finally cleared rapidly in xylol and mounted in Clarite.

After 15 minutes' incubation with ATP as substrate, prominent fibers appear along the longitudes of contracted heads (Fig. 1). Some of these course in furrows along their entire length, while others seem to bend to join opposite fibers at the peristome, thereby forming characteristic arcades. The area between these fibers is dotted with numerous granules which presumably are mitochondria. In some cells, other, more delicate, fibers course around the latitudes. These become more prominent after 30 minutes, and together with the longitudinal fibers, give the pellicle an over-all basket-weave appearance. The peristomial shelf contains another fiber which follows a flat spiral beneath the adoral ciliary membranes. The cilia, which form the membranes, are also positive. A similar pellicular net of longitudinal, latitudinal, and spiral fibers were described by Entz (*13*), who used conventionally fixed and stained materials. They are the myonemes of the head and impart its characteristic motility.

Another fiber associated with an adenosine triphosphatase winds around the stalk as a helix in the outer membrane of the spasmoneme sheath (Fig. 2, *a*). It has the same order of activity as the myonemes in the head, as it becomes prominent after 15 minutes of incubation, and presumably is a structural embellishment of these. This cortical helix resembles one figured by Faure-Fremiet (*14*), and may be analagous to the helix in sperm tails (*15*). The sheath which surrounds the spasmoneme (Fig. 2, *b*) appears densely positive in many individuals after 15 minutes. The spasmoneme canal is always negative (Fig. 2, *c*), whereas the spasmoneme (Fig. 2, *d*) displays only moderate activity in the shorter incubation periods.

It should be mentioned that the spasmoneme usually appears darkened in occasional individual stalks of control preparations, therefore making it difficult to evaluate cytochemically. I believe this darkening to be the result of hydrolysis of tightly bound endogenous substrate because the spasmoneme of steamed vorticellids is lightened to its inherent refractility.

The adenosine triphosphatase associated with myonemes is highly specific since the latter appear most intensely when ATP is used as substrate. The enzyme does not attack AMP, betaglycerophosphoric acid, glucose-1-phosphate, or fructose-1,6-diphosphate. Only slight visualization occurred with adenosine diphosphate.

All myonemes may be seen by phase-contrast microscopy of the living organism. Longitudinal and latitudinal myonemes and the granules between them appear in compressed heads. When the stalk is actively contracting or relaxing, striae appear along its entire length. I believe these to be identical with the cortical helix. Such demonstration confirms the reality of the structures found cytochemically.

The evidence presented indicates that the myoneme is intimately associated with a specific adenosine triphosphatase and thereby is provided with the equipment necessary to make up the free energy deficit incurred in the contractile process. It is suggested that the detailed morphology of myonemal systems as revealed cytochemically may serve to provide further biochemical basis to demonstrate and confirm taxonomic relationships (*16*).

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Penetration of Lead by the Wood Piddock *Martesia striata*

Abstract. An attack by *Martesia striata* Linnaeus on the lead sheathing of a power cable is described. This is the third such attack recorded and all have occurred in Florida waters. A guide for describing future attacks is recommended with the hope that the specific conditions under which attacks occur can be learned.

On 15 August 1959 an electrical power cable extending 1060 feet across Boca Ciega Bay beside the Treasure Island Causeway, St. Petersburg, Fla., shorted out. The cable had been placed in service during the spring of 1953 and had no previous history of malfunction. After the cable was raised it was found that the protective sheathing of a section about 4 feet long, approximately 200 feet from the west shore of the bay, had been damaged. The sheathing consisted of an outside layer of asphalt-impregnated jute over a closely coiled wrapping of heavy steel armor wire over a second layer of asphalt-impregnated jute which surrounded a tube of pure lead that had an outside diameter of about 55 mm and walls 3 mm thick. A three-conductor, paper-insulated cable lay inside the lead tube.

In the damaged section (at a depth of about 8 feet) the steel wires had rusted, snapped, and exposed the layers beneath. In some areas the jute had been eliminated, and the lead sheath beneath was exposed. There was no evidence of abrasion or oxidation on the lead surface. It was found, however, that the exposed lead was both pocked and riddled with small holes in each of which could be seen a small molluscan shell. It is not known whether the jute layer was penetrated before the lead, or whether any exposed areas of lead were not attacked.

The mollusks proved to be young pholadids, *Martesia striata* Linnaeus (*1*). The specimens appeared to be identical with *Martesia funisicola*

Bartsch and Rehder (*2*) (described from a specimen which had also bored into a lead-sheathed power cable). Turner (*3*) has synonymized *M. funisicola* with *M. striata* and has stated (*4*) that she considers the specimens from the lead sheaths to be abnormal; probably because they had been boring in such hard material.

The greatest diameter of any of the holes in the section of attacked lead sheathing available to us (125 mm long; 180 mm circumference) is about 6 mm, at a depth of about 2 mm in the lead. These findings are comparable to those of Snoke and Richards (*5*) for an attack they reported. Five of the ten borings in this section had completely penetrated the sheathing. All these attacks were concentrated in a 215° arc of the sheath, but supposedly there were other sections which were completely attacked.

The present report constitutes the second verified record of *Martesia striata* boring into lead. A third record (*5*) is probably attributable to this species. All three attacks have occurred in Florida waters: Boca Ciega Bay, St. Petersburg; Ortega River, Jacksonville (*5*); and Lake Worth, West Palm Beach (*2*). All three attacks were upon the lead sheathing of power cables, and, at least in the Boca Ciega Bay and Ortega River attacks, occurred in the same type of cable (after the outer steel wrapping had rusted through). The type of cable sheathing attacked is presumably in service in *Martesia* inhabited waters in other areas, and it is surprising that there are no other records of attacks on these cables. The conditions in Boca Ciega Bay are turbid ones, and there is considerable silting in the causeway area (Florida Power Corporation diver's report). The salinity is usually moderately high (estimated at 25 to 32 per mil, based on determinations made at various points in the bay) although during rainy seasons it may be much lower (1959 had the highest recorded rainfall on record for St. Petersburg, although the rainfall for August of that year, 9.54 inches, was close to the 45 year average, 9.16 inches). Lake Worth conditions probably approximate those in Boca Ciega Bay. The Ortega River attack probably occurred under turbid conditions and at a low degree of salinity (*7*).

In the event of future attacks, certain data should be recorded in order to facilitate the determination of the specific conditions under which attacks occur. The following information would be most useful: locality, general locality description, date, depth, salinity, turbidity, temperature, weather conditions, nature of bottom, position on bottom of attacked section, surface nature of lead (oxidized, clean, and so on), thickness of lead, position of individual penetrations, density of attack, and whether other substances were penetrated before the lead was reached.

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7. Personal observations (V.G.S.).

23 December 1959

Physiological Measurements on a Live Whale

Abstract. Temperature, respiration, and electrocardiographic measurements were made on a stranded 45-ft. finback whale. This proved to be a practical means of getting physiological information on the large cetaceans.

The stranding of a 45 foot finback whale (*Balaenopterus physalus*) on a Provincetown, Mass., beach provided a fortuitous opportunity to make multiple temperature, respiration, and electrocardiographic measurements. We know of no other such measurements on large, live cetaceans. The whale died after 36 hours.

The whale was entirely exposed at low tide. It breathed at a steady rate of about once every 20 seconds. The animal lay mostly on its left side and appeared to breathe primarily with its right lung: only the right blow hole opened. It was clear that only a partial inspiration was possible due to the overlying bulk of the animal. At high tide the whale was almost completely afloat. It was then pressed against the beach by a slow swimming motion of its tail. Its breathing while partially submerged was slower and more regular, with intervals ranging from 90 to 120 seconds. When we have observed the same species at sea, it generally breathed six to eight times at intervals of half a minute and then sounded for 5 to 8 minutes.

Samples of the expired air were taken with a syringe held 6 to 8 inches inside the blow hole during expiration. Gas analysis of three samples showed that they contained 1.42, 1.50, and 1.66 percent CO_2 and 19.22, 19.30, and 19.22 percent O_2, respectively (RQ of 0.8 to 0.9). The gas samples were taken near the end of expiration (which lasted about 2 seconds), so they would more nearly represent alveolar air. The apparently poor utilization of the inspired air coupled with the rapid, shallow breathing indicate pulmonary insufficiency and suggest that anoxia contributed to the whale's death.

Temperature distribution in the blubber was determined with a thermistor-tipped hypodermic needle. The skin temperature during low tide was uniformly cold (10° to 14°C), over all of the animal except the dorsal fin. This was warm to the touch and had a temperature of 23°C on the thin trailing edge. The sea temperature was 6°C, and the air varied between 6° and 10°C. The temperature in the blubber increased linearly with distance from the surface, reaching values of 27° to 31°C at the point of maximum penetration of the needle (15 cm).

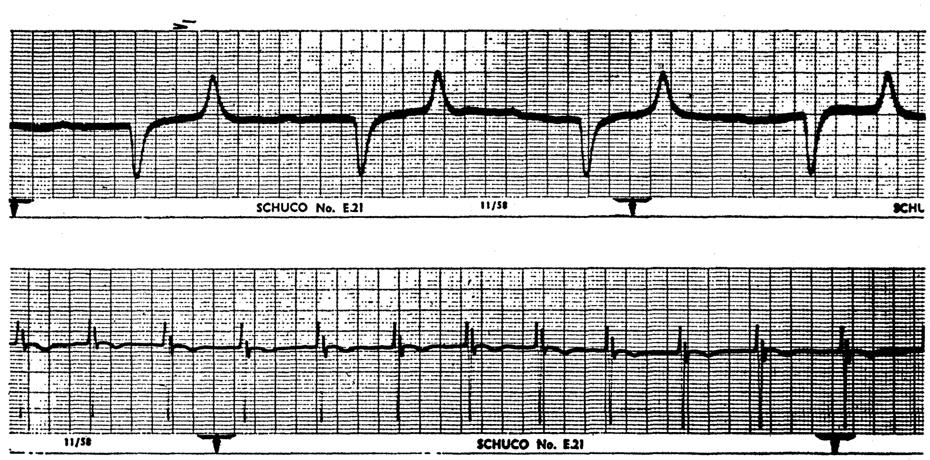

Fig. 1. Electrocardiogram of finback whale (top) and of man (bottom).