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ASSOCIATION OF *CARISTIUS* SP. (PISCES: CARISTIIDAE) WITH A SIPHONOPHORE, *BATHYPHYSA CONIFERA*.—While fishes are often seen in association with gelatinous zooplankton (Mansueti, 1963), little is known about these associations. It is difficult to determine whether the fishes are simply orienting toward a drifting object or if the association is a form of symbiosis. However, some fishes have clearly adapted to associate with gelatinous zooplankton: juveniles of *Tetragonurus* spp. hide in salp bodies and feed on pieces of their host (Janssen and Harbison, 1981); *Nomeus* sp. associates with, and eats pieces of, the Portugese man-of-war, *Physalia physalis* (Jenkins, 1983). Nearly all such associations have been observed close to the sea surface, but one has been implied from the co-occurrence in trawls of the rare bythitid fish, *Thalassobathia pelagica*, with the rare jellyfish, *Stygiomedusa fabulosa* (Harbison et al., 1973); and Robison (1983) reported the myctophid, *Stenobrachius leucopsarus*, and the bathylagid, *Leuroglossus stilbius*, in association with mesopelagic siphonophores (*Apolemia* sp.). Here we report observations made from a submersible of *Caristius* sp. in association with the cystonect siphonophore, *Bathyphysa conifera*. The behavior and stomach contents of the fish indicated that *Caristius* sp. probably steals food from, and eats pieces of, its siphonophore host.

The following observations were made during JOHNSON-SEA-LINK I dive 2148, 7 Aug. 1987, Veatch Canyon, 39°56.20′N, 69°38.12′W, at 168 m, bottom depth at 432 m, approx. 2200 h Eastern Daylight Time. We observed a vertical "string" that extended out of sight both up and down, with an associated thickened mass; the ensemble was at first assumed to be a large siphonophore that had captured something. As we approached while videotaping, the string contracted, revealing that it was indeed a siphonophore; however, it became evident that the associated object was not prey, but a fish

Fig. 1. *Caristius* sp., USNM 289479, 63 mm SL, photographed alive soon after capture.

Fig. 2. Drawing made from video of *Caristius* sp., USNM 289479, 63 mm SL, in association with a siphonophore, *Bathyphysa conifera*. Note that the fish is swimming upside-down.

swimming freely about the siphonophore. The fish swam from the pneumatophore to the other end of the stem of the siphonophore and was so closely applied that it could have been in contact. The large, fan-like pelvic fins of the fish (Fig. 1) remained directed towards the siphonophore, and always with either head down or ventral surface up (Fig. 2), it kept the siphonophore between itself and the submersible. When we attempted to collect the associated animals, the fish stayed with the siphonophore until the latter was halfway into one of the collecting cans. Then, the fish moved away about a body's length, but continued to face the siphonophore. We aborted the attempt to collect the siphonophore and pursued the fish, which swam off using pectoral-fin flapping, and eventually captured it. On return to the surface, the fish was photographed (Fig. 1) while still alive, and then preserved in 10% buffered formalin.

The fish, later identified as *Caristius* sp., 63 mm SL, was deposited in the USNM (289479). The coloration indicates that it is probably a juvenile. Because the taxonomy of the Caristiidae is in a state of confusion, with two disputed genera and only a few limited studies of species, we were unable to identify the specimen to species. The siphonophore was identified from the videotaped records as *B. conifera* by the fact that the extended tentacles clearly were unbranched (i.e., bear no tentilla), the only cystonect known to show this feature.

The stomach contents of the captured fish, together with six other specimens from trawls (also identified as *Caristius* sp.; 38–136 mm SL; depths 0–1557 m) in the collections of the IOS, have been examined. The captured fish had pieces of the hyperiid amphipod, *Parathemisto*

gaudichaudi, and fragments of the myctophid, *Ceratoscopelus maderensis* (identified from otoliths). The stomachs of four of the six IOS specimens (depths 0–795 m) contained identifiable remains including a *Cyclothone microdon* (33 mm SL), a *Bathylagus* sp. (33 mm SL), fish scales and other fish remains, "shrimps," copepods, a salp, and a chaetognath. There were also pieces of various siphonophores including the anterior and posterior nectophores of *Chelophyes appendiculata,* a prayid nectophore, a (?)*Vogtia* nectophore, and an abylid gonophore. In two stomachs a variety of nematocysts were found. One contained many holotrichous anisorhizas that probably came from a calycophoran or physonect siphonophore (Purcell, 1984), while the other had the distinctive birhopaloide nematocysts of *Apolemia* sp. (Carre and Carre, 1973), a meso/bathypelagic siphonophore (Pugh, 1974).

Based on our in situ observations and analysis of stomach contents, we conclude that *Caristius* sp. associates with siphonophores, steals prey from them, but also eats their parts, or the whole animal in the case of the smaller calycophoran species. The fish remains in the stomach of our specimen were probably initially captured by the *B. conifera.* While the diet of *B. conifera* is unknown, other cystonect species feed almost exclusively on fishes (Purcell, 1981a, 1981b). Many of the prey eaten by the other specimens of *Caristius* sp. examined could have been first caught by siphonophores. For example, the chaetognath and salp may have been taken from an *Apolemia,* which includes them in its diet (Purcell, 1981a). The amphipod *Parathemisto,* however, may have been gleaned from the surrounding waters for we observed it on many occasions attacking and eating siphonophores. It is possible that the siphonophore gains some protection from such attacks by the presence of the fish.

The morphology of *Caristius* sp. indicates that the fish it eats are probably stolen from siphonophores. *Caristius* sp. is not shaped like a typical pelagic piscivore, but has a truncate body and fan-like fins, more characteristic of fishes that maneuver around objects.

Our observations suggest that *B. conifera* was little disturbed by the presence of *Caristius* sp., for when we first approached, it was still extended in its "fishing" posture. As well as exploiting the siphonophore for captured prey, our observations indicate that *Caristius* sp. will use the siphonophore as a shelter, for the fish abandoned the *B. conifera* only when it was nearly captured.

There is evidence for association of at least four fish species with gelatinous zooplankton in the deep sea (Harbison et al., 1973; Robison, 1983; and the present observations). As submersibles become more available for midwater studies, it is most likely that other examples will be found.

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