REVIEW OF THE PARASITES AND OTHER SYMBIONTS OF CNIDARIANS, ESPECIALLY SCYPHOZOANS, INCLUDING A LIST OF THE PARASITES OF ALL KNOWN FISH SYMBIONTS OF MEDUSAE

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INTRODUCTION

The importance of coelenterates in marine ecology is just now beginning to be recognized. Many animals make use of coelenterates as an alternative food source or as shelter and protection. Many of these organisms are known to have symbiotic relationships with Cnidarians, but little is known of the importance of these relationships. In this report, the literature of parasitic and symbiotic associations of Cnidarians, in particular Scyphozoans, is reviewed. A list of all the known fish symbionts and their parasites has also been compiled in the hope that it can be used as a reference to aid in the determination of the possible identities of newly discovered cnidarian parasites and further, to provide a starting point for investigating possible links in parasite life cycles.

Protozoan

There are only a few records of unidentified protozoans associating with Scyphozoans. Neill (1935) reports an apostome ciliate on Rhizostoma sp. and an unknown amoebae on Haliclystus octoradiatus. Protozoan associates and parasites of other Cnidarians are also poorly known, but many are reported for freshwater hydrozoans (Lauckner, 1980).

Cnidaria

Larval actions of the genus Peachia are known to be parasites of several schyphozoans. Thiel (1976) lists some cnidarians associating with Scyphozoans and comments on their nature and Lauckner (1980) reviewed the literature. More recently, McDermott et al. (1982) reviewed the literature and reported on the association of Peachia parasitica with Cyanea capillata. Other associates include: P. hastata with Cyanea capillata, P. hilla with Catostylus mosaica, Peachia sp. with Chrysaora sp. and P. quinquecapitata with Phialidium gregarium.

Spaulding (1972) determined that P. quinquecapitata is an obligate parasite of the Pacific hydromedusa Philidium gregarium, but the status of the others remains uncertain. The early development of the larvae takes place inside the gastrovascular cavity, but it is the later juvenile stage, which appears to live on and consume the gonads, which is suspect of parasitic behavior. According to McDermott et al. (1982), the anemones are usually attached to the Subumbrellar regions of the host, but were also found embedded in its tissues.

Trematoda

Dollfus (1960, 1963) and Rebecq (1965) have listed and described a number of larva trematodes from Cnidarians. Only a few members of the family Lepocreadiidae are known with any details. Unencysted metacercariae of Lepocreadium setiferoides were reported to experimentally infect Chaysaora quinquecirrha by Stunkard (1972), and its life cycle was partially worked out by Martin (1938). He found that the snail, Nassa obsoleta, was the first intermediate host and contained the developing rediae and cercariae. The cercaria encysted in annelids of the genus Spio and in Procerodes warreni, a turbellarian. The adults were found in young flounder and the sand dab (Fundulus?). Stunkard (1972) reported secondary intermediate hosts, including the Medusa, Chrysaora, Polydora spionids and a few turbellarians. He also reported the winter founder Pseudopleuronectes americanus as a possible definitive host.

Another lepocreadiide, Neopechona (=Lepocreadium) pyriforme, is somewhat better known. Stunkard (1967) reported unencysted metacercaria occurring naturally in hydromedusae of Bougainvillia carolinensis, Gomonemus vertens and in the Scyphozoan Chrysaura quinquecirrha. He also experimentally infected these medusae and the scup Stenotomus chrysops yielded adults (1968, 1969,

1974). The life cycle and morphology was determined by Stunkard (1969). He found the snail Anachis avara served as the first intermediate host where rediae develop in the haemocoal. Cercaria are ophthalmotrichocercus and develop in the hemal sinuses, while the metacercaria are found unencysted in hydrozoans, scyphozoan medusae and in the ctenophore Mnemiopsis leidyi. Laukner (1980), in his review of Parasiting Cnidarians, reported that Stunkard experimentally infected the Scyphizoan Pelagia noctiluca, but I do not know of any reference made by Stunkard to this species. Similarly, Phillips (1972) indicates that Aurelia aurita was found to be another secondary host when in fact, Stunkard (1969) reported that it was unaffected by the metacercaria. Stunkard (1969) suggests that medusae serve as paratenic hosts since the metacercarae are unencysted and grow slowly, but he does not suggest other possible secondary hosts. Stunkard (1967, 1968, 1969, 1974) suggests that the scup, Stenotomus chrysops may be the definitive host since he obtained adults from experimentally infected specimens. The rudder fish, Palinuricthys perciformis, is one of the earliest known definitive hosts (Linton, 1940; Stunkard, 1969). Interestingly, heavy natural infections of the anthozoan Nemopsis bachei have been found (Stunkard, 1974). Other possible definitive hosts include Peprilus triacanthus (Linton, 1940), Peprilus paru (Linton, 1940; Nahhas and Cable, 1964) and Peprilus alepidotus (Sogandares-Bernal and Hutton, 1960), but the taxonomy is confused and these may represent other species (of Lepocreadium). The fact that Stunkard (1969) is of the opinion that the specimens reported from Peprilus paru and P. alepidotus are different species is made more confusing because it is now known that P. alepidotus is a junior synonym for P. paru (Horn, 1970). More recently adults have been reported from the Atlantic Scad Trachurus trachurus trachurus (Gaeuskaia and Kovaleva, 1980). Since Peprilu triacanthans and P. paru are both known to be common symbionts of medusae, particularly Chrysaura

quinquecirrha, and Trachurus trachurus trachurus is known to be symbiotically associated with a number of Scyphozoans, excluding Chrysaora, it is very tempting to point to them as the main definitive hosts. This matter must remain unresolved, however, until more can be learned of the Lepocreadiide parasites.

Other miscellaneous trematode parasites include Pharyngora bacillaris (=Opechona) of which unencysted metacarcaria are found in the Ctenophore Mnemiopsis leidyi (Zebour, 1916; Martin, 1945; Stunkard, 1969) and in various hydromedusae. Adults are found in the mackeral Scombrus scombrus and the whiting Gadus merlangus (Nicoli, 1910). Interestingly, Gadus merlangus is known to associate with a number of medusae (Monsueti, 1963). Phillips (1972) reports a small unidentified trematode taken from the hydromedusae Eutima variabilis as the only record of a trematode from medusae in the Gulf of Mexico.

Cestoidea

Lauckner (1980) reviewed the literature on cestode parasites of cnidarians and it appears that most of these associations involve tetraphyllidean plerocercoid larvae. Dibothriorhynchus dinoi has been reported in the mesoglea of Stomolophus meleagris and Lichnorhita sp. from Brazil (Vannucci Mendes, 1944). Moestata and McConnaughery (1966) reported another unencysted Plerocercoid Ouwensia catostyli from another rhizostome medusae Catostylus ouwensi from New Guinea. Lauckner (1980) points out that this is very similar if not identical to the larva reported from the rhizostome Acromitus rabanchatu from India by Southwell (1921). Another very similar larva, designated as Ouwensia n. sp., was reported in the rhizostome Stomuluphus meleagris by Phillips (1972) and Phillips and Levine (1973). They reported heavy infestations in 100 percent of all medusae over 30 mm in diameter in the Gulf of

Mexico. The larva use an inverted scolex to grasp host tissue to engulf while burrowing rapidly. They were most heavily concentrated in the lappets along the bell margin. Some extruded their anterior ends out through small pores to the exterior. In the heaviest infestations the larvae are found in clumps of up to ten individuals in burrows along the bell margin. Some pathology is evident in the presence of small inflamed lesions in these areas, which are susceptable to bacterial infection.

Phillips (1972) and Phillips and Levine (1973) also describe the burrowing behavior of the larva and indicate that penetration is initiated by tactile stimulus. These larva are most interesting because of the ease with which they can be maintained in the laboratory. They can be kept best at 7-16°C and will live in salinities ranging from 10 ‰ to 37 ‰. They can be kept equally well in seawater agar or host tissue. In the agar medium, however, they will leave the gel periodically and initiate a searching behavior. Phillips (1972) additionally points out the possibility that fish symbionts of Stomolophus may serve as intermediate hosts. (I would think more probably as definitive hosts). It is also pointed out that Stomolophus has a very wide distribution, from Brazil to the Chesapeake Bay in the Atlantic, from South America to the California coast in the Pacific, and that specimens have been examined for parasites only in the Gulf. It would be very interesting to determine if Ouwensia occurs throughout the host range.

Copepoda

Very little information is available on the few associations occurring between hapacticoid and cyclopoid copepods. Literature was reviewed by Lauckner (1980) and the associations are thought to be semiparasitic. The cyclopoid copepod Pseudomacrochiron stocki was reported on Chrysaora

(=Dactylometra) quinquecirrha (Reddiah, 1969), while Paramacrochiron sewelli and P. rhizostome were found on the medusae Lichnorhiza malayensis and Rhizostoma sp., respectively, (Reddiah, 1968) in Indian waters. Sewellochiron fidens associates with Cassiopea xamachana in Puerto Rico (Humes, 1969) and Paramacrochiron japonicum is found with Thysanostoma thysanura in Japan (Humes, 1970). Nitocra medusae is the only known harpacticoid copepod known to associate with a medusae. More than 1,000 individuals of both sexes were found on a single small specimen of Aurelia. Groups of ten to thirty copepods inhabited small pits in the exumbrellalar surface (Humes, 1953). The details and nature of these associations are unknown.

Amphipoda

Lauckner (1980) provides an extensive review of the literature on the association of the hyperiid Hyperia galba with medusae. Dahl (1959a,b) found that Hyperia galba is a true ectoparasite of the scyphozoan Cyanea capillata and other medusa. Adults are typically found on the subumbrella and manubrium (Figure 1) where they feed on epidermal tissue (White and Bone, 1972). Because young instars lacking swimming appendages are found throughout the gastrovascular system, it is thought that the females deposit their brood within the manubrium from where the host's digestive activities can disperse them throughout the system. Importantly, these young instars are conspicuously absent from plankton and have experimentally been found to be incapable of independent life (Brusca, 1976; Laval, 1965). Hyperia gelba is known to cause severe pathological conditions in the host, often completely destroying the reproductive organs and causing mass mortality (Metz, 1967). Temperature is known to have a strong effect on the prevalence of infestation (Figure 2). The prevalence increases as the water temperature drops, possibly due to a weakening condition of the medusae. Shortly after

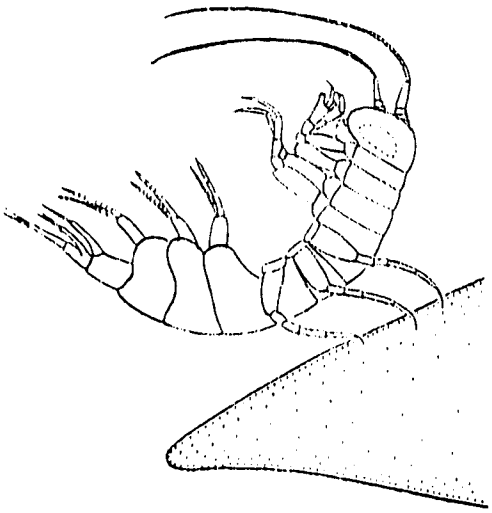

Figure 1. Hyperia galba, adult male in resting posture on edge of Cyanea capillata bell (after Bowman et al, 1963).

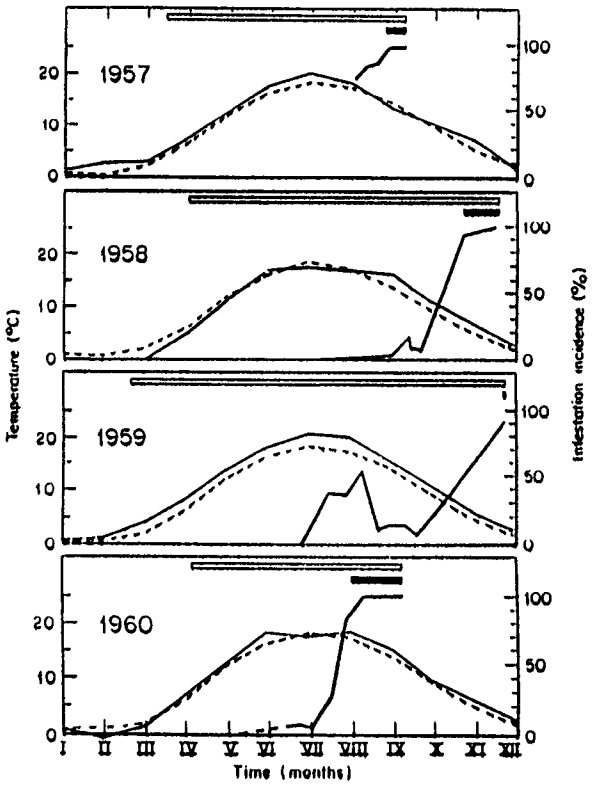

Fig. 2. *Aurelia aurita*. Infestation by *Hyperia galba* in Isefjord, Denmark. Open horizontal bars: period during which medusae occur in fjord; solid bars: interval between 90% infestation incidence and disappearance of medusae; heavy line: infestation incidence; light line: mean monthly water temperatures; broken line: monthly mean water temperatures for period 1895-1930. (After Metz, 1967; reproduced by permission of Dansk Naturhistorisk Forening.) Taken from Lauckner (1980: 186).

the prevalence reaches 90 percent, the population of Aurelia was seen to decline dramatically (Metz, 1967). Dahl (1961) points out an interesting aspect of this association. He found that young whiting, Gadus merlangus, which are symbionts of Cyanea capillata, will readily consume Hyperia galba. Thus it might be speculated that it may help the jellyfish by removing adults from the umbrella of the medusa. However, the whiting have only been observed to feed on free swimming Hyperia and the possibility of them removing individuals from the jellyfish is uncertain.

If one keeps in mind, however, that Hyperia is often found free swimming in heavy infestations, and that it probably is changing hosts (Metz, 1907), it seems not unlikely that Gadus merlangus can help control the distribution and spread of Hyperia.

Isopods

An association between a deep-sea scyphomedusae Deepstaria enigmatica with the giant isopod Anuropus sp. is reviewed by Lauckner (1980). This association was first noted by Barham and Pickwell (1969), and is thoroughly discussed by Phillips (1972, 1973).

Decapoda

Phyllosoma larva associations with jellyfish are discussed by Thomas (1963) and later by Herrnkind and Kanciruk (1976). Various crabs are known to associate with medusae. The association of Cancer gracilis with jellyfish is described by Weymouth (1910) and Corrington (1927). Corrington (1927) reports that megalops larvae of Cancer gracilis were found in association with the medusae and speculated that the association of Libinia dubia with Stomolophus as first reported by him, also extends to the megalops stage. Gutsell (1928) also reported the association of L. dubia with Stomolophus.

The most important review of the association of L. dubia with jellyfish was produced by Phillips et al. (1969). They carried out laboratory and field experiments which showed that Libinia will eat medusae tissue and that they would associate with any medusa placed with them in an aquarium. They cite evidence supporting the belief that the young crabs begin associating with jellyfish when the medusae brushes or rests on the bottom and not as a megalops larvae. In the study, they collected specimens 4-18 mm in carapace width with Chrysaora and Stomolophus, the percent association with jellyfish varying from 0-100 percent with different swarms. Libinia dubia has also been reported as associating with Aurelia (Jackowski, 1963) on which it was found to feed and burrow its way into the medusae.

In a recent study, I found that the average size of symbiotic specimens of Libinia dubia changed very little over the summer while the number of crabs per medusa declined (Figure 3). At the same time the population of medusae increased dramatically from a low in late spring to a high in late fall. Only juvenile crabs under 40 mm in carapace length are found associated with Stomolophus. The size range, however, increased throughout the summer. The increase in the size range is due to a constant recruitment of young crabs into the population and to the growth of the older crabs. This indicates that the crabs drop out of the association before reaching 40 mm in carapace length, since one would expect the average size of the crab to increase through the season in a nonassociation population. The decline in the number of crabs per medusa from a high in June to lows in the fall is certainly a function of the increasing jellyfish populations, so that even if the crab population were to remain constant through time, the average number of crabs per medusa would decline. The monthly percent frequency of Libinia with Stomolophus shows a peak in July of 95 percent occurrence (Figure 3). Since the jellyfish

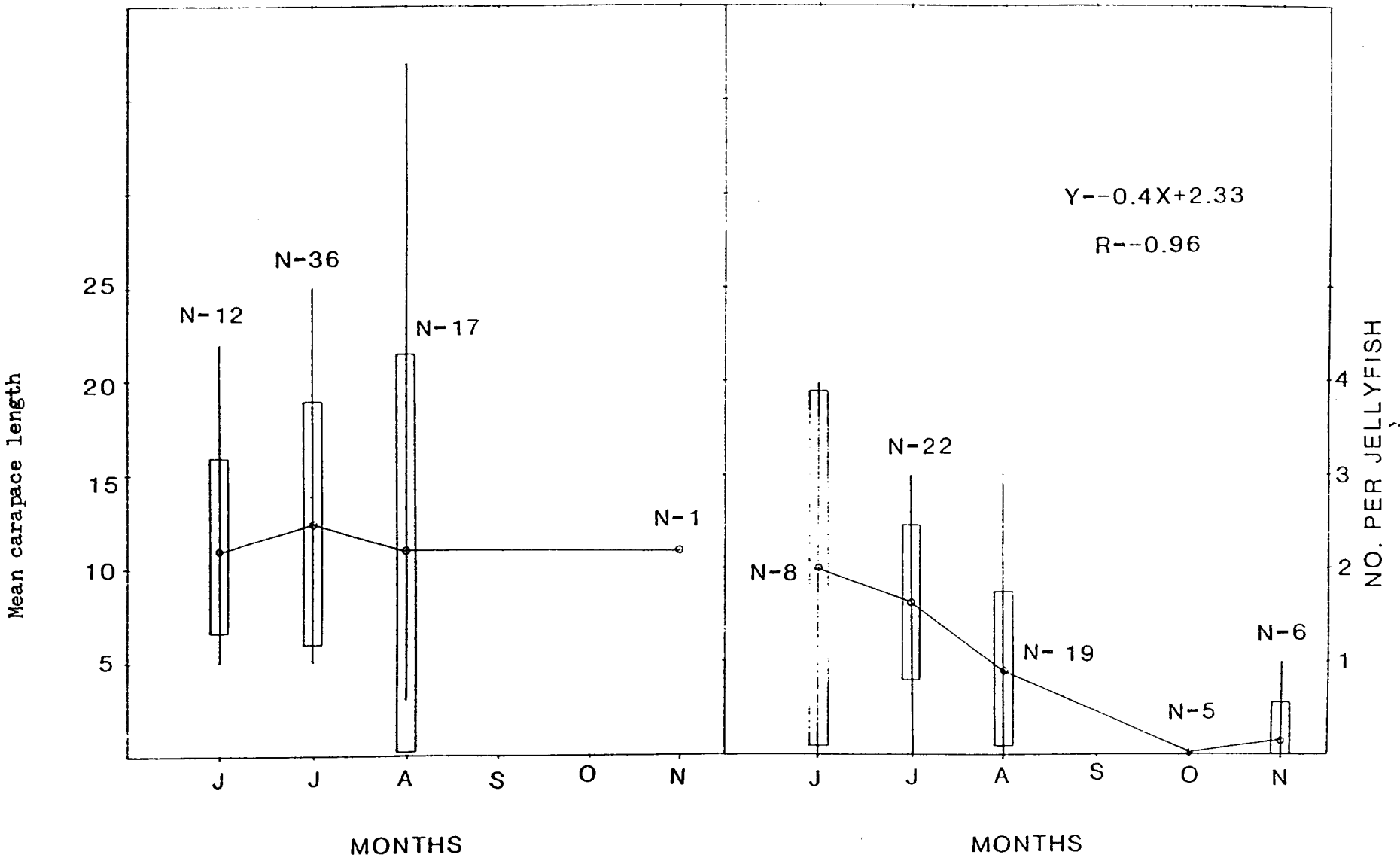

Figure 3. Mean monthly carapace length and mean number of crabs per medusa for Libinia dubia symbionts of Stomolophus.

population has increased in July over what it was in June, the population of Libinia must have correspondingly increased. It can therefore be concluded that the population of juvenile Libinia peaked around July. The subsequent drop in the number per medusa and in the percent frequency was probably due to a decline in the recruitment of new juveniles with the onset of colder temperatures and to the large increase in the jellyfish population after July.

An examination of the locations where the crabs were found on the jellyfish revealed that most of the smaller crabs were found between the scapulets. This suggests that they were most likely feeding on zooplankton captured by the medusae since this is the site of capture of the zooplankton (Larson, 1978). This was supported by the fact that crabs given the choice of feeding on medusae tissue or other food items such as shrimp, invariably choose the latter in my observation, although they readily fed on the medusae tissue if nothing else was available. Larger crags were positioned at the base of the centrum and umbrella. From this position they can easily reach out and get food from the scapulets. This position is also likely to be favored because it is the most stable part of the constantly contracting umbrella. The larger crabs occasionally found on the exterior of the bell were probably those individuals which will soon abandon the jellyfish host. The predation of the crab on the jellyfish probably does not serious impair it since its regenerative powers are remarkable. I have observed many specimens with scars from very large wounds which probably resulted from an encounter with the propellar of a boat. The association of Libinia dubia with Stomolophus is suggested to be of a facultative ectoparasite.

Pisces

Fish associations with jellyfish are well known and documented world wide. Many species of fishes are involved, often associating with more than one jellyfish species. However, little attention has been paid to the biology of these associations. Records of the relationships have been known for many years (Peach, 1855; Smith, 1907; Mortensen, 1917; Gunter, 1935; and Miner, 1936), but little has been written on their nature. Sars (1879a; 1879b), examined the association of cods with Cyanea capillata. He indicated that young cod probably feed on zooplankton captured by the medusae. He further suggested that they aid the medusae by feeding on parasitic crustaceans (Hyperia). Sars was one of the first to recognize the role of the jellyfish as a host to the pelagic young of a fish species which spends its adult life in a benthic environment (Sars, 1879a; 1879b). Another important early study was carried out by Schuering (1915), who described the association as a parasitic relationship based on his experiments. More recently the association of young whiting, Gadus merlangus, with the jellyfish, Cyanea capillata, was reviewed (Dahl, 1961).

Investigations into the possibility of immunity to jellyfish toxins by some of the associates (Lane, 1960; 1963), and mechanical avoidance of nematocysts by means of a heavy mucous coating by other associates (Rees, 1961; 1966? Miner, 1936; Dahl, 1961) have been made. However, the most important review on the associations of fishes is by Mansueti (1963) who reported 57 species of fishes associating with 27 species of jellyfish. He reviewed the literature and examined theories on the nature of the symbiosis of fishes and jellyfish, in particular with Peprilus triacanthus and P. paru. Records of fish medusa associations since the work of Mansueti are compiled in Table 1 and include two unreported by him (Hargitt, 1905; and Sumner et al., 1913).

Table 1

Records of the associations of fishes with jellyfish since Mansueti (1963), including those unreported by him.

Family Gadidae		
Gadus merlangus	*Cyanea lamarcki*	Rees (1966: 285)
Theragra chalogramma	*Cyanea* sp.	Van Hyning and Cooney (1974)
Family Carangidae		
Caranx fusus	Unidentified	Bohlke and Chaplin (1968: 331)
Caranx kalla	*Cyanea nozakii*	Morton (1972)
Caranx malabaricus	*Chrysaora quinquecirrha*	Morton (1972)
Caranx trachurus	*Rhizostoma octopus*	Rees (1966: 285)
Caranx sp.	*Chrysaora quinquecirrha*	Phillips et al. (1969)
Chloroscombrus chrysurus	Unidentified	Hastings (1972: 213-14)
"	*Aurelia aurita*	McKenny (1965: 104); Zann (1980); Franks (1970: 55-56)
"	*Chrysaora quinquecirrha*	Phillips et al. (1969)
"	*Stomolophus meleagris*	Phillips et al. (1969)
Trachurus lathami	Unidentified	Hastings (1972: 226)
Family Stromateidae		
Ictius pellucidus	*Pelagia noctiluca*	McKenny (1965: 85)
Mupus ovalis	*Physalia*	Maul (1964)
Nomeus gronovii	*Physalia*	Sumner et al. (1913: 754)
Peprilus alepidotus	Jellyfish	Cooley (1978)
Peprilus burti	*Stomolophus meleagris*	Horn (1970); Phillips et al. (1969)
"	*Chrysaora quinquecirrha*	Phillips et al. (1969)
"	*Cyanea capillata*	Phillips et al. (1969)
"	*Beroe ovata*	Phillips et al. (1969)
"	Jellyfish	Hastings (1972: 410); Franks et al. (1972)
"	Ctenophore	Hastings (1972)
Peprilus simillimus	*Aurelia*	Horn (1970)
Peprilus triacanthus	*Cyanea capillata*	Milstein (1974: 58); Cooley (1978); Hoese et al. (1964)
"	*Chrysaora quinquecirrha*	Hargitt (1905: 25)
"	*Stomolophus meleagris*	Hoese et al. (1964)
"	Unidentified	Sumner et al. (1913)
Psenes cyanophrys	Unidentified	Parin (1958: 66) and Besedonov (1960: 184) as cited in McKenny (1965)
Psenes maculatus	*Pelagia noctiluca*	McKenny (1965: 85)
Psenes pellucidus	*Dactylometra pacifica*	Adler (1975: 120); Zann (1980)
Psenopsis sp.	Unidentified	Haedrich (1967)
Psenopsis anomala	Unidentified	Masuda et al. (1975: 246)
Family Balistidae		
Monacanthus hispidus	*Stomolophus meleagris*	Phillips et al. (1969); Phillips (1971)
"	*Cyanea*	Phillips (1971)
"	*Chrysaora*	Phillips (1971)

A less known but important study by McKenny (1965) discusses the association of stromateoid fishes with jellyfishes and classified the hosts into three general groups according to tentacle size, complexity of shape (size of bell cavity for example) and virulence of its nematocysts. He suggests that the strength of the fish-medusae relationships increases somewhat with the complexity of the medusae (more places to hide), but that it is more strongly influenced by the nematocyst virulence. As evidence, he cites the strong association of Nomeus. He further suggests that morphological changes in other fish symbionts with growth may make them less capable of the relationship. This idea is supported by a study on the function of the swimbladder and its relationship to the behavior and mode of life in stromateoid fishes (Horn, 1975) where the presence of a swimbladder only in juveniles is suggested to allow the fish to maneuver with sufficient agility to avoid the jellyfish's tentacles. In the revision of the stromateoid fishes (Haedrich, 1967) and the genus Peprilus (Horn, 1970), symbiosis with jellyfish was also discussed.

A significant study on the nature of the fish associations with jellyfish is that of Phillips et al. (1969). Here the interrelationship of jellyfish and other organisms in the Mississippi Bay were studied. Visual observations of the behavior of fishes and jellyfishes were made in the field and in the laboratory. Tests were made on the immunity of associate fishes, and it was found that nematocysts adhered strongly to symbiotic fish, contradicting Dahl (1961).

Thiel (1979) recently reviewed the types of symbiosis between fish and jellyfish and discussed some of the parameters affecting the relationship. The most recent treatment of the subject is found in Zann (1980), an excellent review of fish symbiosis in general. It includes a good summary of current knowledge on the behavior of the fish symbionts and groups them into temporary

and permanent consorts. He further discusses the evolution of the association and possible immunity to stings by the fish.

The associations between fishes and jellyfish are widely varied in nature, ranging from a simple opportunistic relationship (Mortensen, 1917; Mansueti, 1963; Haedrich, 1967; and Horn, 1970) to commensalism (Mansueti, 1963; Haedrich, 1967; and Horn, 1970) and parasitism (Schuering, 1915; Mansueti, 1963; Haedrich, 1967). Opportunistic species are those that take advantage of any relatively passive cover near the surface like debris and sargassum. Caution should be exercised when applying any symbiotic term to an association without adequate data due to the lack of clear cut boundaries between the types of behavior. For this reason, the terms used herein should be taken in the broadest sense.

The reasons for the association of fishes with jellyfish are controversial. One possible reason is that the jellyfish serves as a food source for the associated fish (Schuering, 1915; Mansueti, 1963; Haedrich, 1967; Horn, 1970).

Another possible factor is that the jellyfish offers protection to the associated fish (Dahl, 1961; Mansueti, 1963; Haedrich, 1967; Horn, 1970; Van Hyning and Cooney, 1974). Mansueti (1963) holds that the associations are largely fortuitous and that the fish may have a selective advantage over non-symbionts in that they are assured a continuous food supply, protection and possibly gradual immunity to jellyfish toxin. No single factor can totally explain all the associations, and it is likely that they result from a combination of factors.

In a recent study (In preparation) I found that the number of symbionts per medusa of Stomolophus meleagris decreased from a high in June into November (Figure 4). The number of fish symbionts per jellyfish reflected a similar trend (Figure 5). The percentage of jellyfish with associates by species and

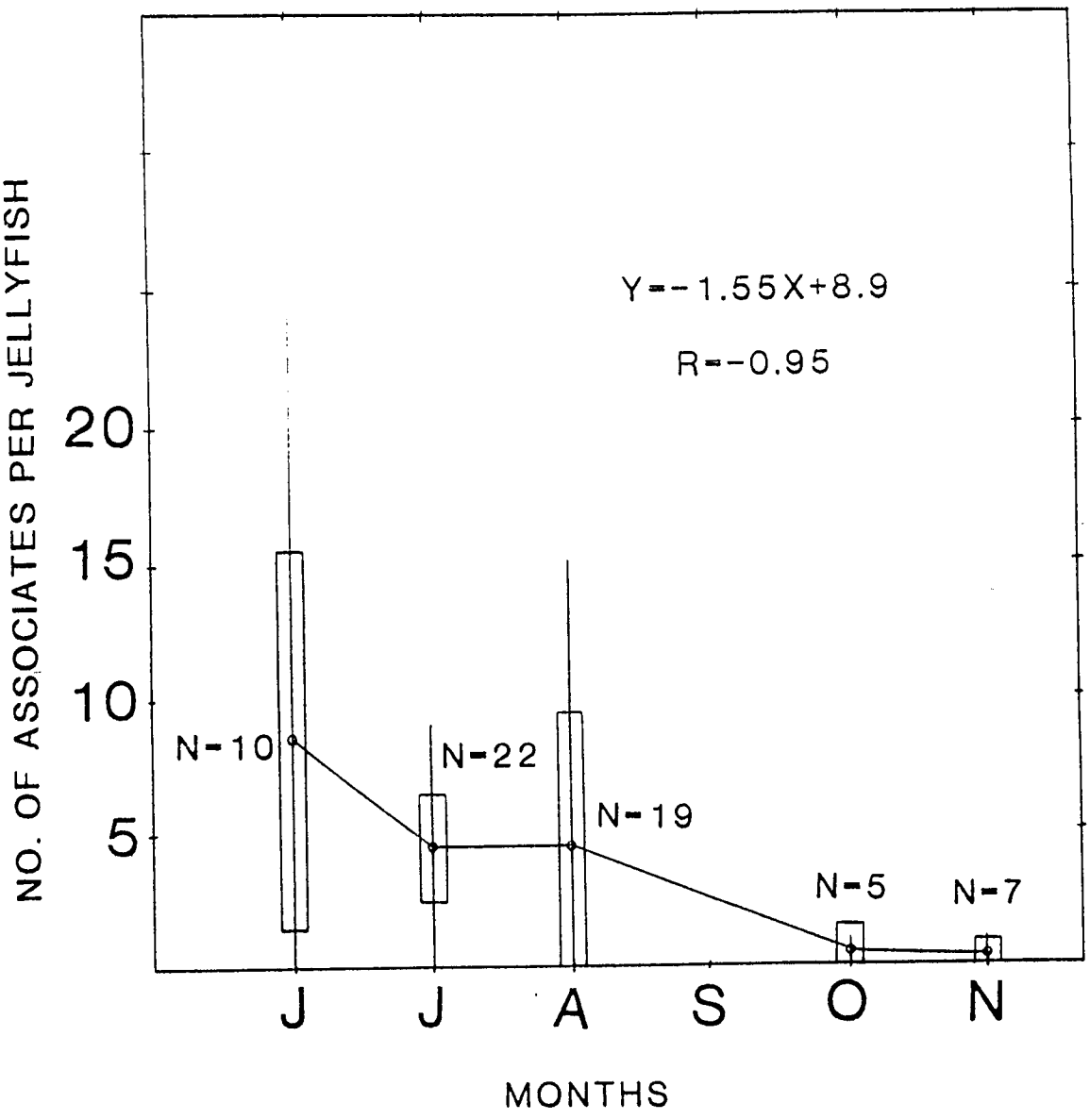

Figure 4. Mean number of symbionts occurring with Stomolophus by month.

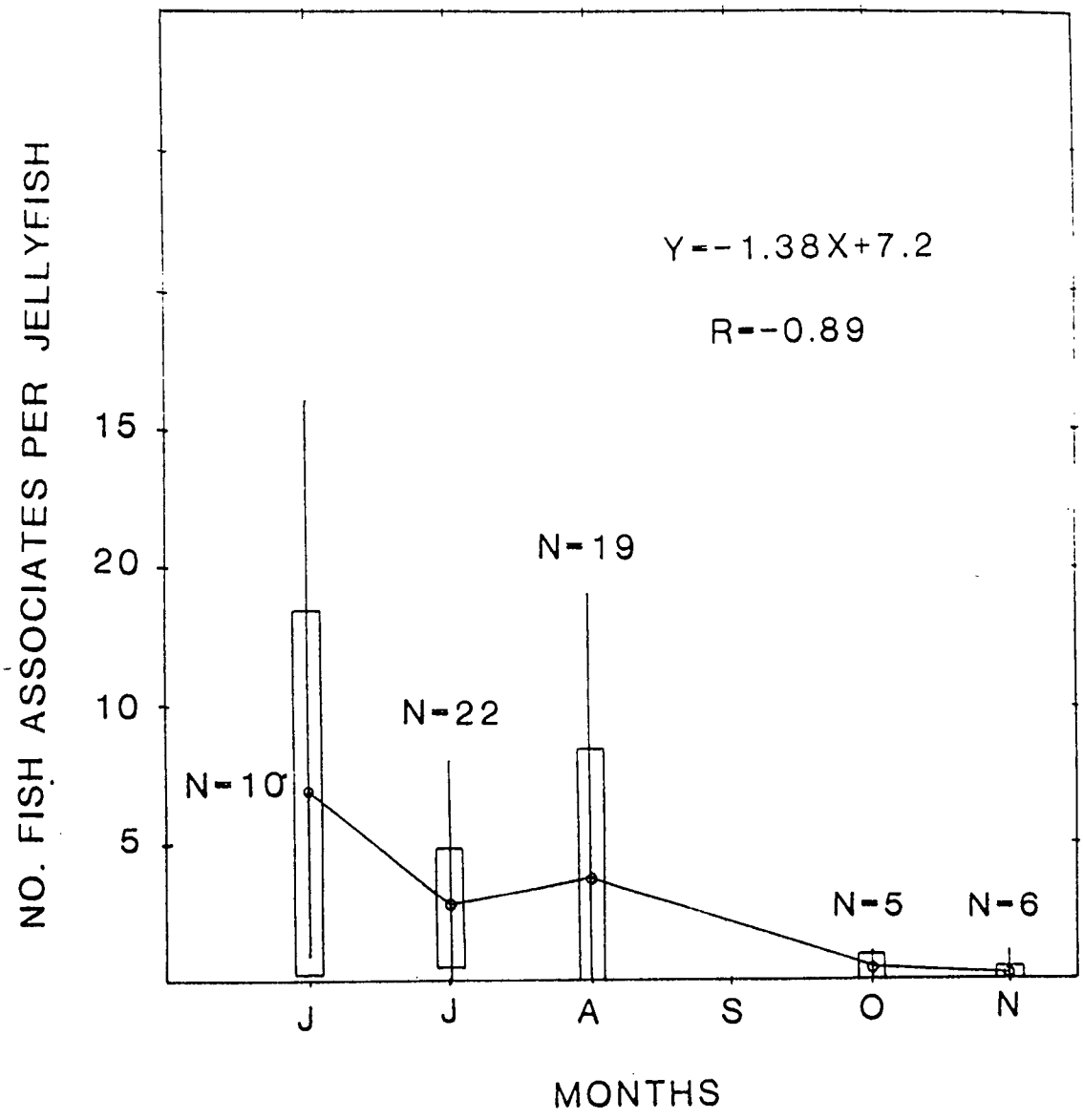

Figure 5. Mean number of fish occurring with Stomolophus by month.

and month are shown in Figure 6, only Chloroscumbrus showed an increased abundance after June. Generally, the percent frequency of Libinia dubia peaked in July and then declined, the percent frequency of fish with Stomolophus declined from a peak of 100 percent in June, and the percent frequency of symbionts declined from a peak of 100 percent in June and July (Figure 7). This is a reflection of the increasing population of jellyfish and the decreasing population of young consorts.

It is apparent then, that the symbiosis of fishes with Stomolophus appears to be largely a function of the population dynamics of each. The size of the fish associates of Stomolophus are a function of the season and the growth of the fish and host, as opposed to a "carrying capacity" of the host. The percentage of jellyfish which have symbiotically associated fish or crabs is a function of the size of the jellyfish population and of the fish population. If the jellyfish population remains constant and the total population of the symbiont increases, the frequency of the association and the number of associates per medusae will correspondingly increase. On the other hand, if the host population increases, and the symbiont population decreases, the percent frequency and number of symbionts per medusae can be expected to decrease. The size of the symbionts are a function of their growth and not of the size of the host jellyfish. The associations are therefore considered nonspecific with respect to the host jellyfish, but are determined by which jellyfish are available to it within the context of its own movement patterns.

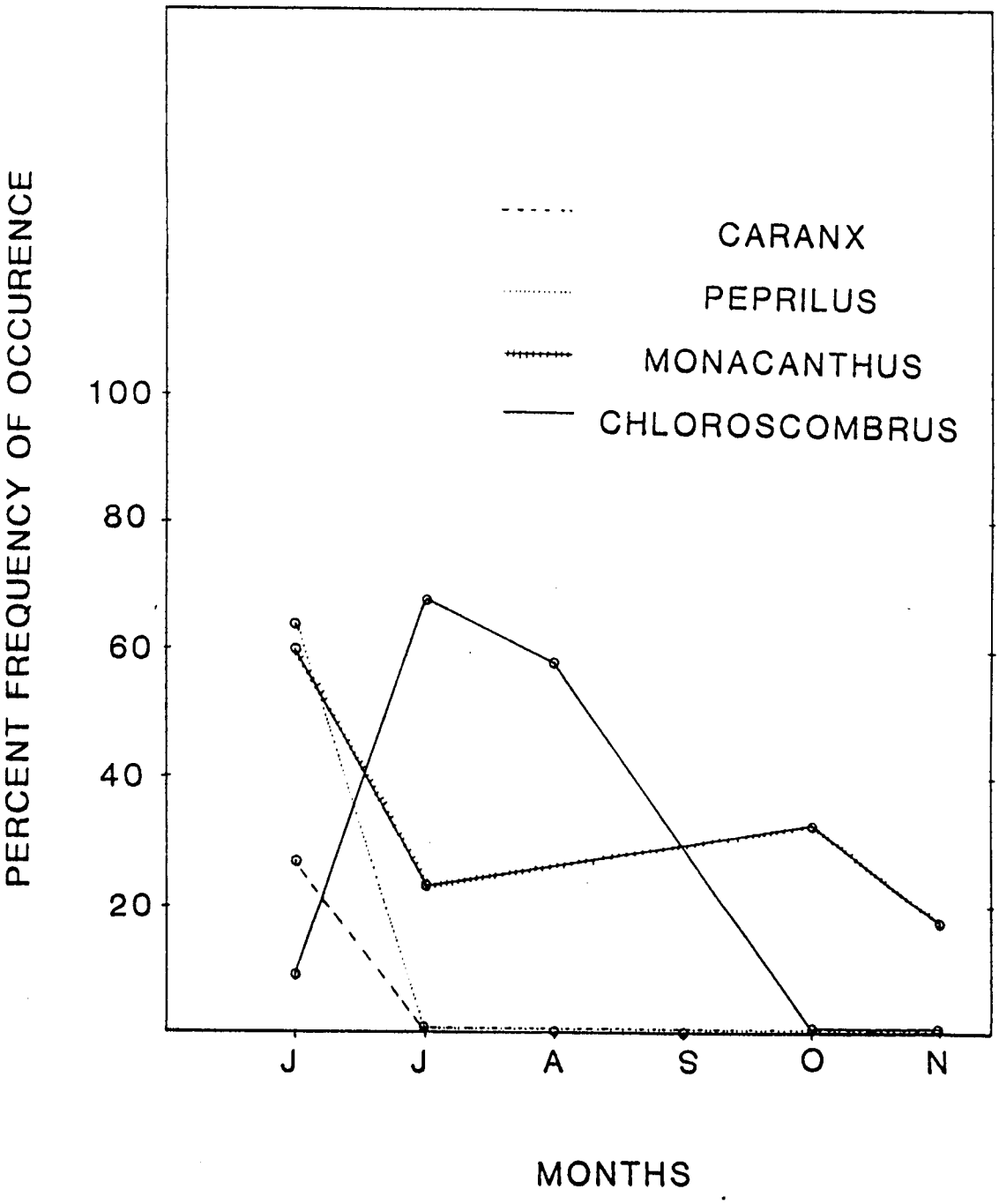

Figure 6. Percent of Stomolophus harboring symbionts by month and species.

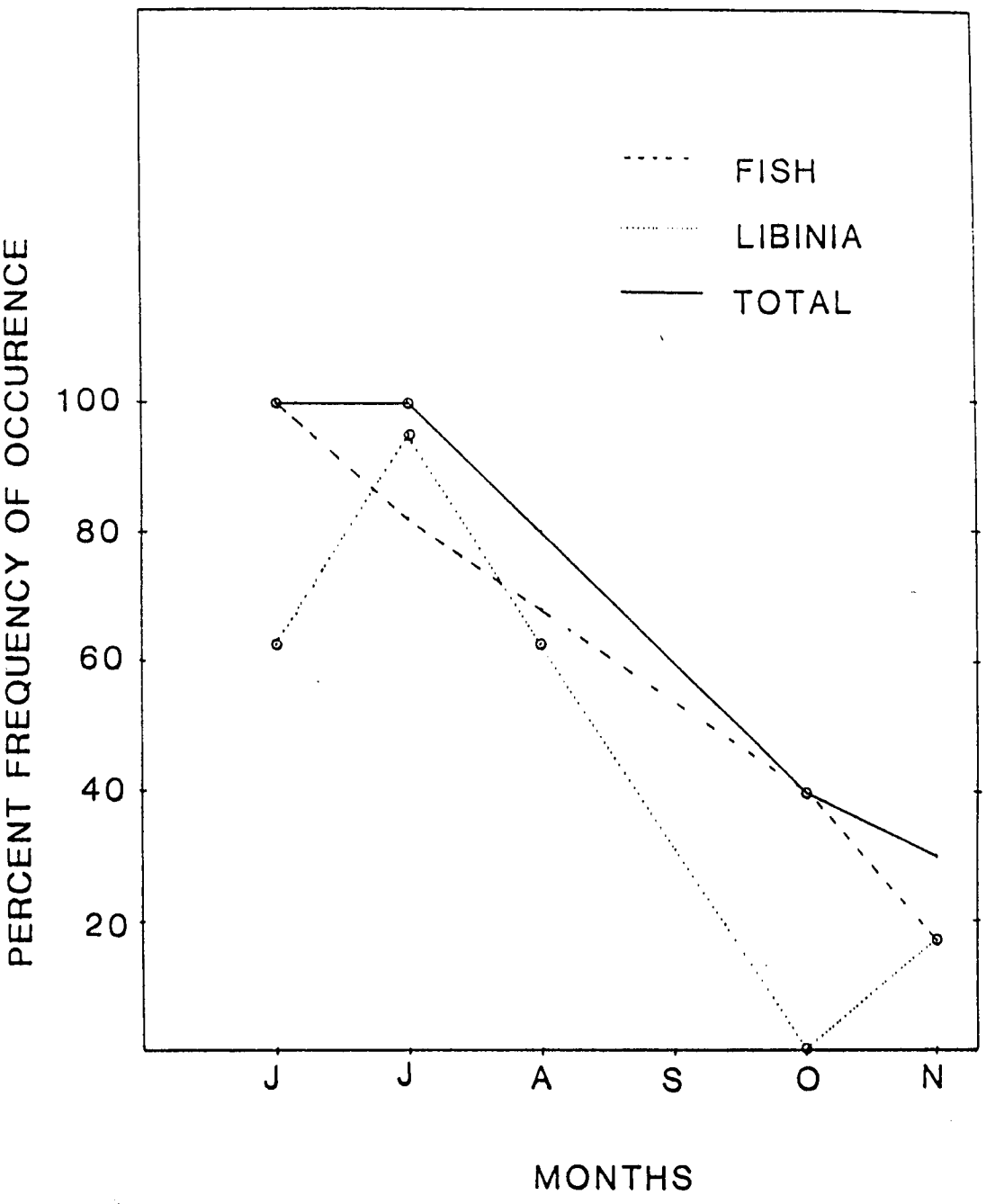

Figure 7. Percent of Stomolophus harboring symbionts by month.

CONCLUSION

One of the primary goals of this report is to provide a pool of information for which future studies on the parasites of cnidarians can draw. Any parasite with an indirect life cycle which utilizes cnidarians as an intermediate host would most likely have a definitive host which regularly feeds on the cnidarian. It is highly likely, then, that at least some fish symbionts of cnidarians act as definitive hosts. For this reason, Table 2 provides a list of all the known parasites of all the known fish symbionts of cnidarians based on information extracted from the Index-Catalogue of Medical and Veterinary Zoology. No attempt has been made to classify the parasites or to follow changes in nomenclature or systematic designations.

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APPENDIX A

Table 1A

A list of all fish associates of jellyfish (see Mansueti*, 1963 and Table 1 of this review) with known jellyfish hosts, and including all parasites of the fishes as indexed in the Index - Catalogue of Medical and Veterinary Zoology. No attempt has been made to combine synonyms or to follow taxonomic changes. Fish subspecies are not recognized, and are included under the appropriate species. No attempt has been made to review original sources.

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Balistadae			
Monacanthus hispidus			
Chrysaora, Cyanea, Stomolophus meleagris			
Apocreadium mexicanum	Int	Apalachee Bay, FL; Jamaica	Nahhas and Cable, 1964; Nahhas and Short, 1965.
Binianum plicitum	??	??	Doss and Farr, 1969
Cercaria	??	??	"
Dermadena tactophrysi	??	??	"
Diplomonorchis leiostomi	C, Int	Florida, Gulf of Mexico	Nahhas and Powell, 1965; 1971
Distoma valdeinflatum	??	??	Doss and Farr, 1969
Eurypera ovalis	??	??	"
Gonocercella atlantica	??	??	"
Gonocercella trachinoti	??	??	"
Megapera ovalis	??	??	"
Pycnadena piriforme	??	??	"
Stephanostomum (metacercaria)	HW	Apalachee Bay, FL	Nahhas and Short, 1965
Stephanostomum imparspine	??	??	Doss and Farr, 1969

*Copeia, 1963, No. 2, pp. 40-80.

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae			
Carangoide ferdau			
Mastigias sp.			
Anamonorchis ulva	Int, PC, S	Hawaii	Yamaguti, 1970
Bothriocephalus carangis	Int	Hawaii	Yamaguti, 1968
Bucephalus ulva	Int, PC	Hawaii	Yamaguti, 1970
Lasiotocus ulva	Int	Hawaii	"
Caranyx bartholomaei			
Physalia pelagica, Stomolophus meleagris			
Alicicornis carangis	Int	Jamaica	Nahhas and Cable, 1964
Bucephalus retractilis	??	Tortugas, FL	Manter, 1963
Bucephalus varicus	Int	Jamaica	Doss and Farr, 1969; Nahhas and Cable, 1964
Ectenurus americanus	S	Jamaica	Nahhas and Cable, 1964
Ectenurus virgulus	Int	"	"
Genolopa brevicaecum	Int	"	"
Haemogregarina bigemma	B	Puerto Rico	Saunders, 1966
Lecithochirium parvum	S	Jamaica	Nahhas and Cable, 1964
Magnacetabulum americanum	??	??	Doss and Farr, 1969
Paractenurus americanus	??	??	"
Paraprototrema brevicaecum	??	??	"
Pseudopecoeloides carangis	??	??	"
Stephanostomum ditrematis	Int	Jamaica	Nahhas and Cable, 1964
Tergestia acuta	Int	"	Doss and Farr, 1969; Nahhas and Cable, 1964
Tergestia pectinata	Int	Jamaica	Nahhas and Cable, 1964

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx crysos (= C. fusus)			
Stomolophus meleagris			
Bucephalus solitarius	??	??	Doss and Farr, 1969
Bucephalus varicus	Int, C	Alligator Harbour, FL; Curacao, Grand Isl., LA	Corkum, 1967; Doss and Farr, 1969; Nahhas and Cable, 1964; Nahhas and Short, 1965.
Caligus amplifurcus	??	Alligator Harbour, FL	Pearse, 1953
Callotetrarhynchus gracilis	??	Bermuda	Rees, 1969
Cemocotoyle carangis	??	??	Doss and Farr, 1969
Distoma carangis	??	??	"
Ectenurus americanus	S	Jamaica	Nahhas and Cable, 1964
Ectenurus virgulus	S	Ghana; Pensacola Bay, FL	Fischthal, 1972; Fischthal and Thomas, 1971; Nahhas and Powell, 1971
Ectenurus yamagutii	S	Pensacola Bay, FL	Nahhas and Powell, 1971
Epibdella melleni	??	??	Doss and Farr, 1969
Gorgorhynchoides elongatus	??	Curacao	Cable and Linderoth, 1963
Grubea sp.	G	Alligator Harbour, FL	Loftin, 1960
Lecithochirium monticelli	??	??	Doss and Farr, 1969
Microcotyle carangis	??	??	"
Parahemiurus merus	S	Jamaica; Pensacola Bay, Florida	Nahhas and Cable, 1964; Nahhas and Powell, 1971
Pseudopecoeloides carangi	Int	Curacao	Nahhas and Cable, 1964
Stephanostomum ditrematis	Int	Jamaica	"
Sterrhurus monticelli	??	??	Doss and Farr, 1969
Tergestia acuta	Int	Jamaica	Nahhas and Cable, 1964
Tergestia pectinata	Int	Apalachee Bay, FL; Florida	Hutton, 1964; Nahhas and Short, 1965

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx hippos			
Stomolophus meleagris			
Abotipedia indica	G	Trivandrum, India	Unnithan, 1962
Acanthodiscus mirabile	??	??	Doss and Farr, 1969
Allodiscocotyla mexicana	G	Salina Cruz, Oaxaca, Mexico	Caballero y Caballero and Bravo-Hollis, 1964; Doss and Farr, 1969
Axine carangis	??	??	Doss and Farr, 1969
Bucephalus introversus	??	??	"
Bucephalus varicus	C, GC, Int	Apalachee Bay, FL; Curacao; Florida; Grand Isle, LA; Jamaica; Santa Rosa Island	Corkum, 1967; Doss and Farr, 1969; Hutton, 1964; Nahhas and Cable, 1964; Nahhas and Powell, 1971; Nahhas and Short, 1965
Caligus constrictus	??	Sinalua and Guerrero, Mexico	Causey, 1960
Caligus tenax	??	Guinea Gulf	Marques, 1965
Cemocotyle noveboracensis	G	Campeche, Gulfo de Mexico; New York; Rep. de cote d'Ivoire	Baer, 1972; Caballero y C. and Bravo-Hollis, 1968; Doss and Farr, 1969; Price, 1962.
Dihemistephanus brachyderus	??	??	Doss and Farr, 1969
Dionchus remorae	??	??	"
Distoma appendiculatum	??	??	"
Distoma tenue	??	??	"
Ectenurus americanus	S	Jamaica	Nahhas and Cable, 1964
Ectenurus virgulus	Int	Jamaica	"
Ectenurus yamagutii	S	Santa Rosa Sound	Nahhas and Powell, 1971
Epibdella melleni	??	??	Doss and Farr, 1969
Gasterostomum arcuatum	??	??	"
Gasterostomum gracilescens	??	??	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx hippos (Continued)			
Gorgorhynchoides bullocki	??	Gulf Coast, Florida	Cable and Mafarachisi, 1970
Haemogregarina bigemina	B	Puerto Rico	Saunder, 1966
Helixaxine winteri	G	Campeche, Gulfo de Mexico	Caballero y Caballero and Bravo-Hollis, 1968
Heteraxine carangis	??	??	Doss and Farr, 1969
Lecithochirium parvum	??	Curacao; Jamaica	Nahhas and Cable, 1964
Lironeca ovalis	G, OL	Long Island, NY	Briggs, 1970
Manteria branchydera	??	??	Doss and Farr, 1969
Monascus typicus	Int	Salina Cruz, Oaxaca	Lamothe-Argumedo, 1971
Parahemiurus merus	S	Ghana; Jamaica	Fischthal, 1972; Fischthal and Thomas, 1971; Nahhas and Cable, 1964
Poracanthium ghanensis	Int	Ghana	Fischthal, 1972; Fischthal and Thomas, 1970
Protomicrocotyle ivoriensis	G	Côte d'Ivoire	Wahl, 1972
Protomicrocotyle manteri	G	Oaxaca	Lamothe-Argumedo, 1970
Protomicrocotyle mirabilis	G	Campéche, Gulfo de Mexico; Côte d'Ivoire	Caballero y Caballero and Bravo-Hollis, 1968; Doss and Farr, 1969; Wahl, 1972
Pseudomazocraes monsiraisae	??	Oaxaca	Lamothe-Argumedo, 1970
Pseudopecoeloides carangis	??	??	Doss and Farr, 1969
Pyragraphorus caballeroi	??	??	"
Pyragraphorus hippos	??	??	"
Pyragraphorus incomparabilis	??	??	"
Separogermiductus zeloticus	S	Brazil	Doss and Farr, 1969; Travassos *et al.*, 1966
Stephanostomum ditrematis	Int	Apalachee Bay, FL; Florida; Jamaica	Doss and Farr, 1969; Hutton, 1964; Nahhas and Cable, 1964; Nahhas and Short, 1965
Stephanostomum filiforme	??	??	Doss and Farr, 1969
Stephanostomum hispidum	??	??	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx hippos			
Stephanostomum longisomum	??	??	Doss and Farr, 1969
Stephanostomum megacephalum	Int	Apalachee Bay, FL; Ghana; Santa Rosa Sound	Doss and Farr, 1969; Fischthal, 1972; Fischthal and Thomas, 1968b; Nahhas and Powell, 1971; Nahhas and Short, 1965
Tergestia pectinata	Int	Apalachee Bay, FL; Jamaica	Nahhas and Cable, 1964; Nahhas and Short, 1965
Trematoda sp.	??	??	Doss and Farr, 1969
Vallisia riojai	G	Salina Cruz, Oaxaca, Mexico	Caballero y Caballero and Bravo-Hollis, 1964; Doss and Farr, 1969
Zeuxapta seriolae	??	Mexico	Lamothe-Argumedo, 1970
Caranx kalla			
Cyanea nozakii, Mastigias papua, Rhopilema hispidum			
Acanthocolpus orientalis	??	??	Doss and Farr, 1969
Capillaria carangi	??	Southern Seas	Parukhin, 1973b
Discogastroides caranxi	??	??	Doss and Farr, 1969
Discogastroides indicus	??	??	"
Ectenarus carangis	??	China Sea	Gu and Shen, 1978
Gastrocotyle indica	G	Ayiramthengu, India; Madras Coast, Indian Ocean; Trivandrium, India	Doss and Farr, 1969; Radha, 1971; Unnithan, 1968
Gastrocotyle kalla	G	Ayiramthengu and Trivandrium, India	Unnithan, 1966; 1968
Gephyrocotyle ixoracorona	??	Trivandrium, India	Unnithan, 1966
Heteraxine indica	??	??	Doss and Farr, 1969

TABLE 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx Kalla (Continued)			
Lecithocladium iglisi	S	Bay of Bengal	Gupta and Ahmad, 1978b
Paradiscogater caranxi	??	??	Doss and Farr, 1969
Prosorhynchus caballeroi	Int	Bay of Bengal	Gupta and Ahmad, 1978a
Pseudaxinoides bychowskyi	G	Mozambique Strait	Lebedev, 1977
Pseudaxinoides caballeroi	G	"	"
Pseudodiscogasteroides caranxi	??	??	Doss and Farr, 1969
Pseudodiscogasteroides indicus	??	??	"
Caranx malabaricus			
Chrysaora quinquecirrha			
Alcicornis baylisi	??	South China Sea	Parukhin, 1966a
Anisakis sp. (larvae)	??	"	"
Capillaria crangi	??	Southern Seas	Parukhin, 1973
Didymozoidae (larvae)	??	South China Sea	Parukhin, 1966a
Dinurus longisinus	??	"	"
Dinurus selari	Int, S	South China Sea	Parukhin, 1966b
Lecithocladium seriolellae	??	"	Parukhin, 1966a
Lepidapedon megalaspi	??	South China Sea; Tonkin	Parukhin, 1966a; 1966c
Opisthomonorcheides indicus	Int	Arabian Sea	Gupta and Gupta, 1978
Opisthomonorchis carangis	??	South China Sea	Mamaev, 1968; Parukhin, 1966a
Parahemiurus simhai	S	Arabian Sea	Gupta and Gupta, 1978
Philometra sp.	BC	Monarsk Bay; S. China Sea	Parukhin, 1966a; 1973
Porrocaecum sp. (larvae)	??	South China Sea	Parukhin, 1966a
Serrasentis socialis	??	South China Sea	"
Thynnascaris carangis	Int	Indian Ocean	Kalyankar, 1971
Tormopsolus carangis	??	South China Sea	Parukhin, 1966a
Tormopsolus orientalis	??	"	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx mate			
Phyllorhiza pacifica			
Dinurus magnacetabulum	??	China Sea	Gu and Shen, 1978
Pseudaxine decapturi	G	Hawaii	Doss and Farr, 1969; Yamaguti, 1968b
Caranx medusicola			
Unidentified sp.			
None known			
Caranx melampygus			
Mastigietta palmipes			
Anisakis-type larvae	??	Malaysia	Myers and Kutz, 1969
Caligus confusus	Buc	Eniwetok Atoll	Lewis, 1968
Caligus coryphaenae	BS	"	"
Caranx trachurus			
Rhizostoma octopus			
Aphanurus stossichi	??	??	Doss and Farr, 1969
Axine trachuri	??	??	"
Distoma laticolle	??	??	"
Distoma polonii	??	??	"
Ectenurus lepidus	??	??	"
Gastrocotyle trachuri	??	??	"
Haplocladus typicus	??	??	"
Lecithaster sp.	??	??	"
Lecithocladium excisum	??	??	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Caranx trachurus (Continued)			
Monascus typicus	??	??	Doss and Farr, 1969
Pristisomum pumex	??	??	"
Pseudaxine trachuri	??	??	"
Synaptobothrium caudiporum	??	??	"
Tergestia acanthocepha	??	??	"
Tergestia laticollis	??	??	"
Chloroscombrus chrysurus			
Aurelia aurita, Chiropsalmus quadramanus?, Chrysaora quinquecirrha, Stomolophus meleagris, Mastigas scintila, Tamoya haplonema			
Acanthocephala spp.	??	Brazil	Travassos *et al.*, 1963
Amphipolycotyle chloroscombrus	??	??	Doss and Farr, 1969
Bucephalus varicus	C, Int	Jamaica	Nahhas and Cable, 1964
Cestoda sp.	??	Brazil	Travassos *et al.*, 1963
Ectenurus lepidus	S	Ghana	Fischthal, 1972; Fischthal and Thomas, 1971
Gastrocotylidae sp.	??	Rep. de Côte d'Ivoire	Baer, 1972
Monascus typicus	Int	Ghana	Fischthal, 1972; Fischthal and Thomas, 1968a
Opechona chloroscombri	Int	Jamaica	Doss and Farr, 1969; Nahhas and Cable, 1964
Opechona sp.	??	??	Doss and Farr, 1969
Parectenurus chloroscombri	??	??	"
Podocotyloides chloroscombri	Int	Ghana	Fischthal, 1972; Fischthal and Thomas, 1970
Prosorhynchus attenuatus	??	??	Doss and Farr, 1969
Tergestia pectinata	??	Jamaica	Doss and Farr, 1969; Nahhas and Cable, 1964

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Hemicaranz amblyrhychus			
Aurelia aurita, Chrysaora quinquecirrha, Mastigias scintillae, Stomolophus meleagris			
Lecithophyllum intermedium	Int	Baja California, Mexico	Arai, 1963
Naucrates ductor			
Physalia, Physalia pelagica, Vellela sp.			
Ancyrocotyle bartschi	??	??	Doss and Farr, 1969
Caligus productus	GCV	Indian Ocean	Lewis *et al.*, 1969
Distoma giardii	??	??	Doss and Farr, 1969
Epibdella melleni	??	??	"
Placunella vallei	??	??	"
Stephanostomum naucrotis	??	??	"
Neptomeus crassus			
Unidentified sp.			
Neobothriocephalus aspinosus	Int	Callao, Peru	Mateo and Bullock, 1966
Pantolobus parasitians			
Mastigietta sp.			
None known			

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Selaroides leptolepsis			
Acromitus flagellatus			
Anisakis sp. (larvae)	??	Manila; South China Sea	Jueco *et al.*, 1971; Parukhin, 1966a
Bomolochus selaroides	ISO	Trivandrum, India	Pillai, 1965
Lecithocladium dawesi	Int	Bay of Bengal	Bashirullah and D'Silva, 1973
Lecithocladium excisiforme	??	South China Sea	Parukhin, 1966a
Lernanthropus alatus	G	Trivandrum, India	Pillai, 1965
Meinertia usacarangis	MC	Australia-New Zealand	Avdeev, 1979
Porrocaecum	??	South China Sea	Parukhin, 1966a
Tergestia laticollis	??	"	"
Seriola zonata			
Chrysaora quinquecirrha			
Bucephalus gorgon	C, Int	Grand Isle, LA; Pensacola Bay, FL	Corkum, 1967; Nahhas and Powell, 1971
Didymozoon	??	??	Doss and Farr, 1969
Hemiurus appendiculatus	??	??	"
Hirudinella fusca	??	??	"
Trachurus declivis			
Catostylus mosaicus			
Codonophilus imbricus	G	New Zealand	Stephenson, 1976
Meinertia trillesi	MC	Tasmon Sea	Avdeev, 1979
Trachurus lathami			
Cyanea capillata			
Monascus filiformis	AC	Venezuela	Nasin and Gomez, 1977

Table 1 (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus McCullochi			
Unidentified sp.			
None known			
Trachurus mediterraneus			
Aurelia aurita, Chrysaora hysoscella, Cotylorhiza tuberculata, Cyanea capillata, Rhizostoma pulmo			
Accacoeliidae gen. sp. (larvae)	Int	Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966
Agamospirura sp. (larvae)	S	Tyrrhenian Sea	"
Anahemiurus trachuri	??	??	Doss and Farr, 1969
Ancylocoelium typicum	GCV, Int, PA, S	Azov Sea; Black Sea	Kovaleva, 1965; Nikolaeva, 1963
Anisakis sp.	??	Adriatic Sea	Sey, 1970b
Anisakis sp. (larvae)	??	Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966; Nikolaeva and Naidenova, 1964
Aphanurus stossichi	GCV, Int	Azov Sea; Black Sea	Doss and Farr, 1969; Kovaleva, 1965
Bacciger bacciger	S	Black Sea	Kovaleva, 1965
Brachyphallus muscallus (sic)	??	Black Sea	"
Brachyphallus musculus	S	Adriatic Sea; Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966
Contracaecum aduncum	BC, Int, S	Adriatic Sea; Aegean Sea; Azov Sea; Black Sea; Mediterranean Sea; Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966; Nikolaeva and Naidenova, 1964
Contracaecum fabri	BC	Adriatic Sea; Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966; Nikolaeva and Naidenova, 1964
Contracaecum sp. (larvae)	BC	Adriatic Sea	Nikolaeva and Kovaleva, 1966
Ectenusus lepidus	PC, S	Black Sea	Kovaleva, 1965; Nikolaeva, 1963
Ectenurus trachuri	S	Adriatic Sea; Mediterranean Sea; Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus mediterraneus (Continued)			
Ergasilus sieboldi	G	Azov Sea; Black Sea	Kovaleva, 1965; Nikolaeva, 1963
Gastrocotyle trachuri	G	Mediterranean Sea	Nikolaeva and Kovaleva, 1966
Haplocladus typicus	GCV, Int	Azov Sea; Black Sea; Mediterranean Sea	Doss and Farr, 1969; Kovaleva, 1965; Nikolaeva, 1963; Nikolaeva and Kovaleva, 1966
Lecithocladium excisum	Int	Black Sea	Nikolaeva, 1963
Lepocreadium retrusum	Int, PA, PC	Adriatic Sea; Azov Sea; Black Sea; Mediterranean Sea	Kovaleva, 1965; Nikolaeva, 1963; Nikolaeva and Kovaleva, 1966
Nematobothrium sp.	G, L	Black Sea	Nikolaeva, 1963
Nematobothrium sp. (larvae)	BC, G, L	Black Sea; Medit. Sea	Nikolaeva, 1964; 1965
Nematoda gen. sp. (larvae)	INTW	Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966
Nematoda sp.	INTW	Ionian Sea; Tyrrhenian Sea; Azov Sea	Kovaleva, 1965; Nikolaeva and Naidenova, 1964
Opechona polonii	??	??	Duss and Farr, 1969
Opistholebes cotylophorus	??	??	"
Philometra sp.	Int	Azov Sea	Kovaleva, 1965
Philometra tauridica	BC	Black Sea	Ivashkin *et al.*, 1971
Pseudaxine trachuri	G	Mediterranean Sea	Nikolaeva and Kovaleva, 1966
Scolex pleuronectis	Int, S	Adriatic Sea; Azov Sea; Black Sea; Med. Sea; Tyrrhenian Sea	Kovaleva, 1965; Nikolaeva, 1963: Nikolaeva and Kovaleva, 1966
Stephanostomum cesticillum	MB, MP, ME	Black Sea	Nikolaeva, 1963
Stephanostomum sp.	GCV, Int	Azov Sea; Black Sea	Kovaleva, 1965
Stephanostomum sp. (larvae)	GCV	Adriatic Sea; Mediterranean Sea	Nikolaeva and Kovaleva, 1966
Syncoptobothrium caudiporum	S	Black Sea	Kovaleva, 1965; Nikolaeva, 1963
Telosentis exigus	Int	Azov Sea; Black Sea	Kovaleva, 1965
Tentaculariidae gen. sp. (larvae)	BC	Adriatic Sea; Mediterranean Sea; Tyrrhenian Sea	Nikolaeva and Kovaleva, 1966

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus mediterraneus (Continued)			
Tergestia lacicollis	Int, S	Black Sea, Mediterranean Sea	Nikolaeva, 1963; Nikolaeva and Kovaleva, 1966
Tetracotyle sp. (larvae)	BR	Black Sea	Nikolaeva, 1963
Tetrarhynchobothrium sp. (larvae)	GB, Int	Black Sea	"
Trematoda gen. sp. (larvae)	Int	Black Sea	"
Trypanorhyncha sp. (larvae)	BC, Int	Azov Sea; Black Sea	Kovaleva, 1965
Trachurus symmetricus			
Pelagia noctiluca			
Anisakis sp.	BC, SW	California, Market	Dailey, 1969
Contracaecum sp.	MFS	"	"
Cryptocaryon irritans	G, SK	San Diego Aquaria	Wilkie and Gordin, 1969
Dasyrhynchus sp.	??	California, Market	Dailey, 1969
Lecithochirium magnaporum	??	??	Doss and Farr, 1969
Porracaecum sp.	SW	California, Market	Dailey, 1969
Rhadinoryhnchus sp.	IM	"	"
Scolex pleuronectis bilocularis	??	"	"
Scolex polymorphus unilocularis	??	"	"
Trachurus trachurus			
Aurelia aurita, Cyanea capillata, Rhizostoma pulmo			
Alataspora serenum	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Ancylocoelium typicum	Int	Black Sea	Doss and Farr, 1969; Pogorel'tseva, 1952
Anisakidae sp.	BC, V	North Atlantic; South Atlantic	Radulescu, 1969
Anisakis simplex	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus trachurus (Continued)			
Anisakis sp.	??	Atlantic Ocean; Mediterranean Sea	Nikolaeva and Naidenova, 1963; Parukhin and Todorov, 1972; Todorov, 1973
Anthobothrium cornucopia	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Aphanurus stossichi	??	??	Doss and Farr, 1969
Aponurus tschuganovi	??	??	"
Ascarophis sp.	??	Mediterranean Sea	Nikolaeva and Naidenova, 1963
Axine trachuri	??	??	Doss and Farr, 1969
Bucephalus varicus	??	Indian Ocean	Parukhin, 1973a
Caligus elongatus	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Caligus curtus	??	"	"
Caligus pelamydis	??	"	"
Capillaria carangi	??	Indian Ocean	Parukhin, 1973a
Cemocotyle trachuri	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Choricotyle charcoti	??	??	Doss and Farr, 1969
Chrisomom tropicus	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Christianella minuta	??	"	"
Contracaecum aduncum	Int	Atlantic Ocean; Black Sea; Mediterranean Sea	Gaevskaia and Kovaleva, 1980; Nikolaeva and Naidenova, 1963; Pogorel'tseva, 1952
Contracaecum clavatum	Int	Black Sea	Pogorel'tseva, 1952
Contracaecum fabri	??	Mediterranean Sea	Nikolaeva and Naidenova, 1963
Contracaecum sp.	??	Indian Ocean	Parukhin, 1973a
Contracaecum sp. (larva)	Int	Black Sea	Pogorel'tseva, 1952
Cryptocotyle concavum	??	??	Doss and Farr, 1969
Cucullanellus minutus	Int	Black Sea	Pogorel'tseva, 1952
Cymbephallus japonicus	??	??	Doss and Farr, 1969
Derogenes varicus	??	Atlantic Ocean	Doss and Farr, 1969; Gaevskaia and Kovaleva, 1980
Didymozoon sp.	??	??	Doss and Farr, 1969
Didymozoon sp. (larva)	??	Black Sea	Pogorel'tseva, 1952
Diplectanotrema trachuri	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus trachurus (Continued)			
Distoma fallax	??	??	Doss and Farr, 1969
Distoma sp.	??	??	"
Echinostoma laticolle	??	??	Doss and Farr, 1969
Ectenurus lacteum	??	??	"
Ectenurus lepidus	S	Atlantic Ocean; Black Sea	Gaevskaia and Kovaleva, 1980; Pogorel'tseva, 1952
Ectenurus virgulus	??	Indian Ocean	Parukhin, 1973a
Eimeria cruciata	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Galactosomum lacteum	G	Black Sea	Pogorel'tseva, 1952
Gastrocotyle trachuri	G	Atlantic Ocean; Plymouth; Rhodes, Greece; all Italian Seas	Brinkman, 1967; Doss and Farr, 1969; Gaevskaia and Kovaleva, 1980; Llewellyn, 1962; 1964; Orecchia and Paggi, 1978
Gnathia sp.	SK	Black Sea	Pogorel'tseva, 1952
Gorgorhynchus sp.	??	Indian Ocean	Parukhin, 1973b
Grillotia erinacens	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Haplocladus typicus	Int	Adriatic Sea; Black Sea; Indian Ocean	Doss and Farr, 1969; Parukhin, 1973a; Pogorel'tseva, 1952; Sey, 1970a
Helicometra pulchella	??	??	Doss and Farr, 1969
Hemiurus communis	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Hemiurus luhei	??	"	"
Hemiurus ocreatus	??	??	Doss and Farr, 1969
Heteraxine	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Heteraxinoides atlanticus	??	"	"
Kudoa nova	??	"	"
Kudoa quadratum	??	"	"
Lacistorhynchus tennis	??	"	"
Lecithaster confusus	??	"	"
Lecithaster gibbosus	??	Atlantic Ocean	Doss and Farr, 1969; Gaevskaia and Kovaleva, 1980
Lecithaster salmonis	??	??	Doss and Farr, 1969
Lecithochirium monticelli	??	Indian Ocean	Parukhin, 1973a

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus trachurus (Continued)			
Lecithocladium augustiovum	??	Indian Ocean	Parukhin, 1973a
Lecithocladium megalaspi	??	"	"
Lepocreadium retrusum	Int	Adriatic Sea; Black Sea; all Italian Seas	Doss and Farr, 1969; Koval and Otsupok, 1964; Orecchia and Paggi, 1978; Pogorel'tseva; Sey, 1970a
Lepocreadium sp.	??	??	Doss and Farr, 1969
Lernanthropus pomatomi	??	San Blas, Nayarit, Mexico	Causey, 1960
Lernanthropus trachuri	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Magnacetabulum selari	??	Indian Ocean	Parukhin, 1973a
Meinertia oestroides	??	??	Trilles, 1965
Microcotylidae sp.	??	??	Doss and Farr, 1969
Monaseus foliformis	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Nematoda sp.	??	Black Sea	Pogorel'tseva, 1952
Neonotoporus decapteri	??	Indian Ocean	Parukhin, 1973a
Neonotopurus trachuri	??	All Italian Seas; Indian Ocean	Doss and Farr, 1969; Orecchia and Paggi. 1978; Parukhin, 1973a
Neopechona pyriforme	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Notopurus trachuri	??	??	Doss and Farr, 1969
Nybelinia lingualis	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Opechona magnibursata	??	"	"
Opechona polonii	??	??	Doss and Farr, 1969
Opisthomonorchis decapteri	??	Indian Ocean	Parukhin, 1973a
Paramacrochiron sewelli	G	Sri Lanka	Avdeev, 1975
Phyllobothrium sp.	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Plagioporus trachuri	Int	Black Sea	Doss and Farr, 1969; Pogorel'tseva, 1952
Podocotyloides chloroscombri	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Porrocaecum sp.	??	Indian Ocean	Parukhin, 1973a
Protorhadinorhynchus carangis	??	"	Paurkhin, 1973b
Pseudaxine trachuri	G	Atlantic Ocean; Plymouth	Doss and Farr, 1969; Gaevskaia and Kovaleva, 1980; Llewellyn, 1962

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Carangidae (Continued)			
Trachurus trachurus (Continued)			
Pseudopecoelus japonicus	??	??	Doss and Farr, 1969
Radinorhynchus (Sic) *praisi*	Int	North Atlantic; South Atlantic	Radulescu, 1969
Rhadinorhynchus cadenati	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Rhadinorhynchus pristis	??	Atlantic Ocean; Indian Ocean	Parukhin, 1973b; Parukhin and Todorov, 1972
Scolex pleuronectis	Int	Atlantic Ocean; Black Sea; Indian Ocean	Gaevskaia and Kovaleva, 1980; Parukhin, 1973a; Pogorel'tseva, 1952
Serrasentis sagittifer	??	Indian Ocean	Parukhin, 1973b
Spirurata gen. sp.	??	Indian Ocean	Parukhin, 1973a
Stephanostomum sp.	??	??	Doss and Farr, 1969
Stephanostomum sp. (larva)	G	Black Sea	Pogorel'tseva, 1952
Telolectithus tropicus	??	Indian Ocean	Parukhin, 1973a
Telosentis exiguus	GB	Black Sea	Pogorel'tseva, 1952
Tergestia laticollis	Int	Atlantic Ocean; Black Sea; Indian Ocean; Morocco	Dollfus, 1973; Doss and Farr, 1969; Parukhin, 1973a; Pogorel'tseva, 1952
Tergestia sp.	??	??	Doss and Farr, 1969
Tetrarhynchidae sp. (Larvae)	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980
Thynnascaris aduncum	??	All Italian Seas	Orecchia and Paggi, 1978
Tocotrema concavum	??	??	Doss and Farr, 1969
Tormopsolus carangi	??	Indian Ocean	Parukhin, 1973a
Zoogonus rubellus	??	Atlantic Ocean	Gaevskaia and Kovaleva, 1980

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae			
Brosme brosme			
Cyanea capillata			
Derogenes varicus	??	??	Doss and Farr, 1969
Gadus macrocephalus			
Chrysaora helvola, Cyanea citrea			
Abothrium gadi	Int	Kamchatka	Skriabia, 1963
Anisakis sp.	BC, Int, S	"	"
Ascarophis pacificus	??	"	"
Bacciger petrowi	??	"	"
Bothriocephalus sp.	Int, PC	"	"
Clavella aduna	BRC, G	Vancouver Isl.	Kabata, 1970
Clavella uncinata	??	Hokkaido, Japan	Shiino, 1956
Contracaecum sp.	BC, Int, L, K	Kamchatka	Skriabia, 1963
Corynosoma strumosum	??	"	"
Derogenes varicus	Int, S	Kamchatka	"
Echinorhynchus gadi	Int	Kamchatka; Hokkaido Sea	Kamegai, 1962; Skriabia, 1963
Hemiurus leuinseni	PC, S	Kamchatka	Skriabia, 1963
Lepidapedon gadi		"	"
Lepodora gadi	??	??	Doss and Farr, 1969
Podocotyle reflexa	Int, PC, S	Kamchatka	Skriabia, 1963
Porrocaecum sp.	BC, M	"	"
Scolex pleuronectis	GB, Int	"	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus merlangus			
Aurelia aurelia, Cyanea capillata, Cyanea lamarcki, Rhizostoma pulmo			
Acanthochasmus imbutiformis	??	??	Doss and Farr, 1969
Bucephalopsis haimeanus	??	??	"
Cercaria doricha	??	??	"
Clavella adunca	G	??	Kabata, 1960
Contracaecum clavatum	??	Manx waters	Shutter, 1969
Dactycotyle merlangi	??	??	Doss and Farr, 1969
Derogenes varicus	S	England; Manx	Doss and Farr, 1969; Shutter, 1969; El Maghraby and Perkins, 1956
Diclidophora merlangi	G	??	Halton and Jennings, 1965; Doss and Farr, 1969
Diclidophora minor	??	??	Doss and Farr, 1969
Diclidophora pollachii	??	??	"
Digenea sp.	??	??	"
Distoma appendiculatum	??	??	"
Echinorhynchus gadi	??	Scandinavian waters	Nordenberg, 1963
Galactosomum lacteum	??	??	Doss and Farr, 1969
Gasterostomum gracilesceus	??	??	"
Gasterostomum sp.	??	??	"
Gilquinia squali	E	North Sea	Mackenzie, 1965
Gyrodactylus sp.	??	??	Doss and Farr, 1969
Hemiurus communis	??	Manx	Shutter, 1969; Doss and Farr, 1969
Hemiurus ocreatus	??	??	Doss and Farr, 1969
Lecithaster gibbosus	??	??	"
Octobothrium merlangi	??	??	"
Octobothrium platygaster	??	??	"
Octostoma merlangi	??	??	"
Opechona bacillare	??	??	"

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus merlangus (Continued)			
Pharyngora bacillaris	??	??	Doss and Farr, 1969
Pharyangora retractilis	??	??	"
Podocotyle atomon	??	??	"
Prosorhynchus grandis	??	??	"
Pterocotyle morrhuae	??	??	"
Spinitectus oviflagellis	Int	W. Coast, Scotland	Rahman, 1964
Stephanochasmus caducus	??	??	Doss and Farr, 1969
Stephanochasmus rhombispinosus	??	??	"
Stephanostomum caducum	??	??	"
Stephanostomum lebourae	??	??	"
Stephanostomum pristis	??	??	"
Stephanostomum rhombispinosum	??	??	"
Gadus morhua			
Aurelia aurita, Cyanea capillata, Rhizostoma pulmo			
Abothrium gadi	C, FG, Int, P, PA, PC	Chukotsk Peninsula; Georges Bank; Scottish Waters	Gaevskaia and Umnova, 1977; Williams and Halversen, 1971; Williams *et al.*, 1970; Zhukov, 1964
Absthrium gadi (Juv.)	Int	Barents Sea	Polianskii and Kulemina, 1963
Anisakis sp.	??	North Atlantic; Arctic	Platt, 1975
Anisakis sp.(larvae Type I)	??	Pacific off Japan	Koyama *et al*
Anisakis sp.(larvae)	L	Barents Sea	Polianskii and Kulemina, 1963
Anisakis sp.(larvae)	BCM	"	"
Anisakis sp.(larvae)	Int	"	"
Anisakis spp.(larvae)	??	Hokkaido, Japan	Saito *et al.*, 1970a
Ascarophis morrhuae	G, Int, PC, S	Georges Bank; Scottish Waters	Gaevskaia and Umnova, 1977; Williams *et al.*, 1970
Ascarophis pacificus	S	Chukotsk Peninsula	Zhukov, 1964a

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus morhua (Continued)			
Ascarophis	??	Mediterranean Sea	Nikolaeva and Naidenova, 1963a
Bomolochus confusus	N	Georges Banks	Gaevskaia and Umnova, 1977
Brachyphallus crenatus	??	??	Doss and Farr, 1969
Brachyphallus crenatus (Juv.)	S	Barents Sea	Polianskii and Kulemina, 1963a
Bucephalopsis haimeanus	??	??	Doss and Farr, 1969
Bucephalus gadorum	??	??	Doss and Farr, 1969
Caligus curtus	F	Barents Sea	Polianskii and Kulemina, 1963
Caligus elongatus	BS, BUC, PF	Georges Bank; Scotland	Kabata, 1973; Gaevskaia and Umnova, 1977
Capillaria sp.	HG, R	Scottish Waters	Williams *et al.*, 1970
Clavella adunca	BUC	Georges Banks	Gaevskaia and Umnova, 1977
Clavella uncinata	F, ORC	Barents Sea	Polianskii and Kulemina, 1963
Contracaecum aduncum	FG, Int, PC, S	Estonian Coastal Waters; Georges Banks; Mediterranean; Scottish Waters; White Sea	Gaevskaia and Umnova, 1977; Nikolaeva and Naidenova, 1963; Popova and Val'ter, 1965; Puidak, 1965; Williams *et al.*, 1970
Contracaecum aduncum (larva)	BC, Int	Barents Sea	Polianskii and Umnova, 1977
Contracaecum fabri	??	Mediterranean Sea	Nikolaeva and Naidenova, 1963
Contracaecum osculatum	??	White Sea	Val'ter, 1979
Cryptocotyle lingua	??	??	Doss and Farr, 1969
Cucullanus cirratus	FG, MG, Int	Nova Scotia; Scottish Waters	Gaevskaia and Umnova, 1977; Williams *et al.*, 1970
Dactylocotyle morrhuae	??	??	Doss and Farr, 1969
Derogenes varicus	E, S	Barents Sea; Eastern Canada; Georges Bank; Scottish Waters	Bray, 1974; Doss and Farr, 1969; Gaevskaia and Umnova, 1977; Polianskii and Kulemina, 1963a; Williams *et al.*, 1970
Diclidophora merlangi	??	Scottish Waters	Treasurer, 1976
Dinobothrium sp.	BC	Barents Sea	Kulemina, 1964a; Polianskii and Kulemina, 1963a.
Diplocotyle olrikii	Int		Zhukov, 1964

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus morhua (Continued)			
Distoma appendiculatum	??		Doss and Farr, 1969
Distoma rachion	??		"
Distoma scabrum	??		"
Echinorhynchus gadi	FG, Int, MG	Barents Sea; Chukotsk Peninsula; Estonian Coastal Waters; Georges Bank; Nova Scotia; N.W. Atlantic; Scottish Waters	Gaevskaia and Umnova, 1977; Polianskii and Kulemina, 1963a; Puidak, 1965; Williams *et al* 1970; Zhukov, 1964
Echinorhynchus vancleavi (=E. gadi)	??	New England	Huffman and Bullock, 1975a
Echinostoma scabrum	??	??	Doss and Farr, 1969
Gasterostomum arcuatum	??	??	"
Gasterostomum gadorum	??	??	"
Gasterostomum gracilescens	??	??	"
Genarches muelleri	??	??	"
Gyrodactylus marinus	??	??	"
Hemiurus communis	S	Scottish waters	Doss and Farr, 1969; Williams *et al.*, 1970
Hemiurus levinseni	S	Barents Sea; Chukotsk Peninsula; Eastern Canada; Georges Bank	Bray, 1979; Doss and Farr, 1969; Gaevskaia and Umnova, 1977; Polianskii and Kulemina, 1963; Zhukov, 1964
Johanssonia artica	??	Newfoundland	Meyer and Khan, 1979
Lecithaster gibbosus	FG, Int, MG	Eastern Canada; Scottish Waters	Bray, 1979; Williams *et al.*, 1970
Lecithaster sp.	Int	Barents Sea	Doss and Farr, 1969; Polianskii and Kulemina, 1963
Lepidapedon elongatum	Int, PC	Eastern Canada; Scottish Waters	Bray, 1979; Doss and Farr, 1969; Williams *et al.*, 1970
Lepidapedon gadi	Int	Barents Sea	Doss and Farr, 1969; Polianskii and Kulemina, 1963

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus morhua (Continued)			
Lepidapedon microcotyleum	FG, PC	Scottish Waters	Williams *et al.*, 1970
Lepidapedon rachion	Int, MGR	Eastern Canada; Scottish Waters	Bray, 1979; Doss and Farr, 1969; Williams *et al.*, 1970
Lepodora elongata	??	??	Doss and Farr, 1969
Lepodora rachiaea	??	??	"
Lernaeocera branchialis	??	New England	Kabata, 1961
Lintonia papillosa	??	??	Doss and Farr, 1969
Monostoma sp.	??	??	"
Neophasis oculatus	G	Chukotsk Peninsula	Zhukov, 1964a
Neuronaia monroi	??	??	Doss and Farr, 1969
Octobothrium morrhuae	??	??	"
Octodactylus innaerens	??	??	"
Octodactylus morrhuae	??	??	"
Plagioporus sp.	??	??	"
Plistophora gadi	M	Barents Sea	Polianskii and Kulemina, 1963
Plistophora sp.	E, SK	Essex	Young, 1969
Podocotyle atomon	Int, PCR	Barents Sea; Chukotsk Peninsula; Scottish Waters	Doss and Farr, 1969; Polianskii and Kulemna, 1963; Williams *et al.* 1970; Zhukov, 1964
Podocotyle olssoni	??	??	Doss and Farr, 1969
Podocotyle reflaxa	Int	Barents Sea; Chukotsk Peninsula	Doss and Farr, 1969; Polianskii and Kulemina, 1963; Zhukov, 1964
Pomphorychus laevis	??	Estonian Coastal Waters	Puidak, 1965
Porrocaecum decipiens	M	Scotland	Rae, 1963
Prosorhynchus crucibulum	PC	Chukotsk Peninsula	Zhukov, 1964
Prosorhynchus grandis	??	??	Doss and Farr, 1969
Prosorhynchus squamatus	??	??	"
Pseudophyllidea gen. sp.	Int, S	Barents Sea	Polianskii and Kulemina, 1963
Pterocotyle morrhuae	??	??	Doss and Farr, 1969
Pyramicocephalus phocarum	Int	Barents Sea	Polianskii and Kulemina, 1963
Rhodotrema quadrilobata	??	??	Doss and Farr, 1969

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Gadus morhua (Continued)			
Scolex pleuronectis	Int	Chukotsk Peninsula	Zhukov, 1964
Scolex polymorphis	Int	Barents Sea	Polianskii and Kulemina, 1963
Steganoderma formosum	??	??	Doss and Farr, 1969
Stephanochasmus pristis	??	??	"
Stephanostomum caducum	Int, PC	Gullmar Fjord, Sweden	Køie, 1978
Stephanostomum pristis	PC	Scottish Waters	Williams *et al.*, 1970
Stephanostomum sp.	FG, PC	"	"
Terranova decipiens	M, PA	Arctic; Georges Bank; N. Atlantic	Gaevskaia and Umnova, 1977; Platt, 1975
Thominx sp.	??	Mediterranean	Nikolaeva and Naidenova, 1963
Tocotrema sp.	??	??	Doss and Farr, 1969
Trichodina murmanica	F, G	Barents Sea; Chukotsk Peninsula	Polianskii and Kulemina, 1963; Zhukov, 1964
Trypanosoma murmanensis	??	Eastern Canada; Newfoundland	Khan, 1972; 1977
Tubulovesicale lindbergi	??	??	Doss and Farr, 1969
Udonella caligorum	??	??	"
Melanogrammus aeglefinus			
Aurelia aurita, Cyanea capillata			
Anisakis sp. (Exper.)	??	??	Smith, 1974
Brachyphallus crenatus	??	??	Doss and Farr, 1969
Bucephaloides gracilescens	AUD, CC, CN, EM, NR, O, SC	Irish Sea	Johnston and Halton, 1981
Contracaecum aduncum	INTM	Georges Bank; N & S Atlantic	Gaevskaia and Umnova, 1977; Radulescu, 1969
Derogenes varicus	??	Georges Bank	Doss and Farr, 1969; Gaevskaia and Umnova, 1977
Distoma rachion	??	??	Doss and Farr, 1969

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Melanogrammus aeglefinus (Continued)			
Echinorhynchus gadi	Int	Georges Bank; N & S Atlantic	Gaevskaia and Umnova, 1977; Radulescu, 1969
Glugea branchiale	G	Bay of Fundy	Dykova and Lom, 1980; Lom and Laird, 1976
Grillotia erinaceus	??	Sable Isl.; N. W. Atlantic	Gaevskaia and Umnova, 1977
Gyrodactylus marinus aeglefini	??	??	Doss and Farr, 1969
Haemogregarina aeglefini	B	New Brunswick; Sweden	Faenge, 1979; Laird and Bullock, 1969
Haemohormidium terraenovae	??	Newfoundland	So, 1972
Hemiurus levinseni	??	Georges Bank; West North Atlantic	Gaevskaia and Umnova, 1977; Hill, 1974
Lecithaster gibbosus	??	??	Doss and Farr, 1969
Lepidapedon rachion	Int	Georges Bank	Doss and Farr, 1969; Gaevskaia and Umnova, 1977
Lernaeocera branchialis	??	Ireland	O'Riordan, 1966
Nybelina sp.	BC, Int	N. & S. Atlantic	Radulescu, 1969
Opechona sp.	??	N. North Sea West of Scotland	MacKenzie, 1974
Phocanema sp.	??	U. S.	Chitwood, 1970
Podocotyle atomon	??	??	Doss and Farr, 1969
Merluccious bilinearis			
Cyanea capillata			
Acanthocotyle merlucci	G	Raritan Bay, NJ	Meyers, 1978
Anisakis simplex	??	Georges Banks	Gaevskaia and Umnova, 1977
Anisakis sp.	LS, PER	NJ; Atlantic	Parukhin and Todorov, 1972; Todorov, 1973
Anthocotyle americanus	??	??	Doss and Farr, 1969

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Merluccius bilinearis (Continued)			
Anthocotyle merluccii	G	Georges Banks	Doss and Farr, 1969; Gaevskaia and Umnova, 1977
Anthocotyle merluccii americanus	??	??	Doss and Farr, 1969
Brachyphallus crenatus	??	??	"
Capillaria kabata	Int	Georges Banks	Gaevskaia and Umnova, 1977
Capillaria sp.	Int	New Jersey	Meyers, 1978
Carcinobdella sp.	GA	New Jersey	"
Cestoda sp. (Plerocercoids)	G, Int	New Jersey	Meyers, 1978
Chondracanthus merluccii	??	Georges Banks; Markets, England	Gaevskaia and Umnova, 1977; Ho, 1971
Clestobothrium crassiceps	Int, PC, R	New Jersey	Meyers, 1978
Contracaecum aduncum	BC	Georges Banks	Gaevskaia and Umnova, 1977
Contracaecum sp.	Gon, Int, LS, MES, PC, PER, SW	New Jersey; Atlantic	Meyers, 1978; Parukhin and Todorov, 1972; Todorov, 1973a
Cymbephallus vitellosus	??	??	Doss and Farr, 1969
Derogenes varicus	??	Georges Banks	Doss and Farr, 1969; Gaevskaia and Umnova, 1977
Diclidophora maccallumi	??	??	Doss and Farr, 1969
Diclidophora merlangi	??	??	"
Dinurus pinguis	??	??	"
Distoma ocreatum	??	??	"
Distoma vitellosum	??	??	"
Gonocerca crassa	??	??	"
Gonocerca phycidis	??	??	"
Grillotia erinaceus	??	Georges Banks	Gaevskaia and Umnova, 1977
Grillotia sp.	INTW, LS, MES, SW	New Jersey	Meyers, 1978
Hemiurus levinseni	S	New Jersey; Georges Banks	Doss and Farr, 1969; Gaevskaia and Umnova, 1977; Meyers, 1978
Nybelina lingualis	INTW	Georges Banks	Gaevskaia and Umnova, 1977

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Merluccius bilinearis (Continued)			
Opecoeloides vitellosus	??	??	Doss and Farr, 1969
Paracreadium sp.	Int	New Jersey	Meyers, 1978
Pomphorhynchus rocci	MEC, PER	New Jersey	"
Scolex pleuronectis	Int, PC	New Jersey	"
Sterrhurus praeclarus	??	??	Doss and Farr, 1969
Theragra chaliogramma			
Cyanea sp.			
Abothrium gadi	??	Kamchatka	Mamaev and Baeva, 1963
Anisakis simplex	GI	USSR	Grabda, 1977
Anisakis sp.	BC, Int, S	Japan; Kamchatka	Otsuru *et al.*, 1965; Skriabina, 1963
Anisakis sp. (larva)	??	Kamchatka	Mamaev and Baeva, 1963
Anisakis sp. (larvae)	BC, WO	Bering Sea	Mamaev, 1965
Anisakis sp. (larvae Type I)	??	Pacific Coast of Japan	Koyama *et al.*, 1969
Anisakis spp. (larvae)	??	Hokkaido, Japan	Saito *et al.*, 1970
Apocrocotyle simplex	G, Int, Lum, S, VB	Kamchatka; USSR	Grabda, 1977; Mamaev, and Baeva, 1963
Ascarophis skrjabini	??	Kamchatka	Mamaev and Baeva, 1963
Bolbosoma nipponicum	??	"	"
Bothriocephalus scorpii	Int	Kamchatka	Skriabina, 1963
Brachyphallus crenatus	??	Kamchatka	Mamaev and Baeva, 1963
Caligus clemensi	BS	British Columbia	Parker and Margolis, 1964
Cestoda gen. sp (larva)	??	Kamchatka	Mamaev and Baeva, 1963
Clavella perfida	G, GL	USSR; Vancouver Isl.	Kabata, 1970; Grabda, 1977
Contracaecum aduncum	??	Kamchatka	Mamaev and Baeva, 1963
Contracaecum sp.	BC, Int, K, L	Kamchatka	Skriabina, 1963
Contracaecum sp. (larvae Type B)	??	Pacific Coast of Japan	Koyama *et al.*, 1969

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Theragra chaliogramma (Continued)			
Corynosoma reductum	Int	Bering Sea	Mamaev, 1965
Corynosoma strumosum	??	Kamchatka	Mamaev and Baeva, 1963
Derogenes varicus	S	Bering Sea; Kamchatka	Mamaev, 1965; Mamaev and Baeva, 1963
Diphyllobothrium sp. (larvae)	??	Kamchatka	Tsimbaliuk and Semeshko, 1971
Echinorhynchus gadi	Int	Bering Sea; Kamchatka; USSR	Grabda, 1977; Mamaev, 1965; Mamaev and Baeva, 1963; Skriabina, 1963
Grillotia erinacea	??	Kamchatka	Mamaev and Baeva, 1963
Gyrodactylus marinus	G	USSR	Doss and Farr, 1969; Malmberg, 1970
Haemobaphes diceraus	GA	USSR	Grabda, 1977
Hemiurus levinseni	PC, S	Chukotsh Peninsula; Kamchatka; USSR	Doss and Farr, 1969; Grabda, 1977; Mamaev and Baeva, 1963; Skirabina, 1963; Zhukov, 1963
Hemiurus odhneri	??	??	Doss and Farr, 1969
Lecithaster gibbosus	??	Kamchatka	Mamaev and Baeva, 1963
Lecithochiriidae gen. sp.	??	??	"
Lecithophyllum sphaerolectithum	??	??	"
Lepidapedon gadi	??	Kamchatka	Mamaev and Baeva, 1963; Skriabina, 1963
Levinsenia rectangulata	??	Bering Sea	Epshtein, 1973
Microsporida gen. sp.	??	USSR	Grabda, 1977
Myxidium theragrae	GB	Peter the Great Gulf	Dugiel, 1949
Nematoda gen. sp. (larva)	??	Kamchatka	Mamaev and Baeva, 1963
Nybelinia surmenicola	AC, BC, Gon, Int, PA, S, SW	Far East; Kamchatka; USSR	Grabda, 1977; Mamaev and Baeva, 1963; Oshmarin *et al.*, 1961; Skriabina, 1963
Nybelinia surmenicola (larvae)	BC, WO	Bering Sea	Mamaev, 1965
	??	Kamchatka	Mamaev and Baeva, 1963

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Gadidae (Continued)			
Theragra chaliogramma (Continued)			
Opechona alascensis	??	Kamchatka	Mamaev and Baeva, 1963
Phocanema decipiens	DMS, L	USSR	Grabda, 1977
Podocotyle reflexa	Int, PC	Chukotsk Peninsula; Kamchatka	Mamaev and Baeva, 1963; Zhukov, 1963
Porrocaecum sp.	BC, M	Kamchatka	Skriabina, 1963
Porrocaecum sp. (larva)	??	Kamchatka	Mamaev and Baeva, 1963
Pseudophyllidea sp. (larva)	??	"	"
Pyramicocephalus phocarum	Gon, Int, M, PA, S	Kamchatka; USSR	Grabda, 1977; Mamaev and Baeva, 1963
Rhodotrema quadrilobata	??	??	Doss and Farr, 1969
Scolex pleuronectis	GB, Int	Bering Sea; Kamchatka	Mamaev, 1965; Skriabina, 1963.
Scolex pleuronectis I	??	Kamchatka	Mamaev and Baeva, 1963
Scolex pleuronectis II	??	"	"
Steganoderma formosum	??	Kamchatka	Doss and Farr, 1969; Mamaev and Baeva, 1963
Terranova sp. (larvae Type A)	??	Pacific Coast of Japan	Koyama *et al.*, 1969
Thynnascaris aduncа	Int, L, PA	USSR	Grabda, 1977
Trichodina eleçini	??	Far East Seas of USSR	Shtein, 1979
Tubulovesicola lingergi	??	??	Doss and Farr, 1969
Urophysus chus			
Cyanea capillata			
Brachyphallus crenatus	??	??	Doss and Farr, 1969
Dactylocotyle minor	??	??	"
Derogenes varicus	??	??	"
Diclidophora maccallumi	G	New Jersey; Nova Scotia; N.W. Atlantic	Doss and Farr, 1969; Gaevskaia and Umnova, 1977; Meyers, 1978

Table 1A (Continued)

Parasites	Tissue	Locality	Reference
Family			
Fish Host Species			
Host Jellyfishes			
Gadidae (Continued)			
Urophysus chus (Continued)			
Distoma ocreatum	??	??	Doss and Farr, 1969
Gonocerca phycidis	??	??	"
Hemiuris levinseni	??	??	"
Lepidapedon elongatum	??	??	"
Podocotyle olssoni	??	??	"
Stromateidae			
Centrolophus niger			
Rhizostoma pulmo			
Prosorchiopsis legendrei	??	??	Doss and Farr, 1969
Prosorchis legendrei	??	??	"
Cubiceps gracilis			
Unidentified species			
None known			
Cubiceps natalensis			
Unidentified species			
None known			
Girella nigricans			
Unidentified species			
Benedenia girellae	??	??	Doss and Farr, 1969

Table 1A (Continued)

Family Fish Host Species Host Jellyfishes Parasites	Tissue	Locality	Reference
Stromateidae (Continued)			
Girella nigricans (Continued)			
Cryptocaryon irritans	G, SK	San Diego Marine Aquaria	Wilkie and Gordin, 1969
Haplosplanchnus girellae	??	??	Doss and Farr, 1969
Helicometrina elongata	??	??	"
Opechona orientalis	Int	S. California	Doss and Farr, 1969; Martin, 1978
Opecoelus adsphaericus	DT	S. California	Doss and Farr, 1969
Opisthadena cheni	S	S. California	Martin, 1978
Parafilaroides decorus	??	California	Dailey, 1970a
Schikhobalotrema girellae	DT	S. California	Doss and Farr, 1969; Martin, 1978
Vitellibaculum girellae	Int	S. California	Doss and Farr, 1969; Martin, 1978
Icichthys lockingtoni			
Pelagia noctiluia			
None known			
Icticus pellucidus			
Cephea cephea, Cyanea nozakii, Pelagia noctiluca			
None known			
Mupus imperialis			
Unidentified species			
None known			

Table 1A (Continued)

Family / Fish Host Species / Host Jellyfishes / Parasites	Tissue	Locality	Reference
Stromateidae (Continued)			
Mupus maculatus			
Physalia pelagica			
None known			
Mupus ovalis			
Physalia sp.			
None known			
Mupus tasmanica			
Unidentified			
None known			
Nomeus gronovii			
Physalia pelagica, Porpita sp., *Stomolophus meleagris*			
None known			
**Peprilus alepidotus (see P. paru)*			
Chirosalmus quadrumanus, Chrysaora quinquecirrha, Cyanea capillata, Physalia pelagica			

**Peprilus paru = P. alepidotus* (Horn, 1970. Bull. Mus. Comp. Zoology 140(5):165-261)

Table 1A (Continued)

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference
Stromateidae (Continued)			
Peprilus burti			
Beroe ovata, Chrysaora quinquecirrha, Ctenophore, Cyanea capillata, Stomolophus meleagris			
None known			
**Peprilus paru (See also P. alepidotus)*			
None known under this synonym			
Cestoda (spp.)	??	Brazil	Travassos *et al.*, 1963
Dinurus tornatus	??	??	Doss and Farr, 1969
+*Lecithocladium excisum*	Int, S	Apalachee Bay, FL	Nahhas and Short, 1965
Lepocreadium pyriforme	Int	Jamaica	Doss and Farr, 1969; Nahhas and Cable, 1964
+*Microcotyle peprili*	G	Chesapeake Bay	Doss and Farr, 1969; McMahon, 1964
+*Microtyle peprilli*	??	Chesapeake Bay	Kingston *et al.*, 1969
Nematoda	??	Brazil	Travassos *et al.*, 1965
+*Opechona gracilis*	Int	Apalachee Bay, FL	Nahhas and Short, 1965
+*Stomachicola rubea*	??	Sapelo Is., Georgia	Sinclair *et al.*, 1972
Peprilus smillimus			
Aurelia			
None known			

Peprilus paru = P. alepidotus (Horn, 1970. Bull. Mus. Comp. Zoology 140(5):165-261)
+With *Pialepidotus* in literature

Table 1A (Continued)

Parasites	Tissue	Locality	Reference
Family			
Fish Host Species			
Host Jellyfishes			
Stromateidae (Continued)			
Peprilus triacanthus			
Chrysaora quinquecirrha, Cyanea capillata, Physalia pelagica, Stomolophus meleagris			
Anisakin (ae sp.)	??	Florida	Hutton, 1964
Contracaecum sp.	Int, MES	New Jersey	Meyers, 1978
Cryptocotyle lingua	??	??	Doss and Farr, 1969
Cymbephallus vitellosus	??	??	"
Didymozoon scombri	??	??	"
Lecithaster confusus	??	??	"
Lecithocladium excisum	S	Apalachee Bay, FL	Nahhas and Short, 1965
Lecithocladium gulosum	??	??	Doss and Farr, 1969
Lepidapedon elongatum	Int	New Jersey	Meyers, 1978
Lepocreadium pyriforme	??	??	Doss and Farr, 1969
Microcotyle poronoti	G	Chesapeake Bay; New Jersey	Doss and Farr, 1969; McMahon, 1964; Meyers, 1978
Opecoeloides vitellosus	??	??	Doss and Farr, 1969
Scolex pleuronectis	Int	New Jersey	Meyers, 1978
Psenes cyanophrys			
Porpita sp.			
None known			
Psenes maculatus			
Pelagia noctiluca			
None known			
Psenes pellucidus			
Dactylometra pacifica			
None known			

Table 1A (Continued)

Parasites	Tissue	Locality	Reference
Family			
Fish Host Species			
Host Jellyfishes			
Stromateidae (Continued)			
Psenes whiteleggii			
Unidentified sp.			
Prosorchis dolifusi	S	??	Kurochkin *et al.*, 1971
Psenopsis anomala			
Unidentified			
Echinophallus japonicus	Int, PA, S	Segami Bay, Japan	Ichihara, 1968; Ichihara *et al.*, 1965
Lecithocladium magnacetabulum	S	Segami Bay, Japan	Doss and Farr, 1969; Ichihara, 1968; Ichihara *et al.*, 1965
Lecithocladium psenopsis	??	??	Doss and Farr, 1969
Lecithocladium sp.	S	Segami Bay, Japan	Ichihara, 1968; Ichihara *et al.*, 1965
Parabothriocephalus gracilis	ESP, Int, S	Segami Bay, Japan	Ichihara, 1968; Ichihara *et al.*, 1965
Prosorchis psenopsis	??	??	Doss and Farr, 1969
Radhidascaris sp.	BC, Int	Segami Bay, Japan	Ichihara, 1968; Ichihara *et al.*, 1965
Schedophilus medusophagus			
Unidentified			
None known			

Table 1A (Continued)

Parasites	Tissue	Locality	Reference
Family			
Fish Host Species			
Host Jellyfishes			
Stromateidae (Continued)			
Stromateus fasciatus			
Unidentified			
None known			
Stromateus fiatola			
Cotylorhiza tuberculata, *Rhizostoma pulmo*			
Distoma cristatum	??	??	Doss and Farr, 1969
Echinostoma cristatum	??	??	"
Lecithocladium cristatum	??	??	"
Tetragonurus atlanticus			
Unidentified			
None known			
Tetragonurus cuvieri			
Unidentified			
None known			
Zaprora silenus			
Cyanea sp.			
None known			

Family

Fish Host Species

Host Jellyfishes

Parasites	Tissue	Locality	Reference

Key to Tissue Abbreviations.

AC = Abdominal cavity
AUD = Auditory canal
B = Blood
BC = Body cavity
BCM = Body cavity mesentery
BR = Brain
BRC = Branchial cavity
BUC = Buccal cavity
BS = Body surface
C = Ceca
CC = Cranial cavity
CN = Central nerves
DMS = Dorsal muscles of spine
DT = Digestive tract
E = Eye
EM = Eye muscle
ES = Esophagus
ESP = Esophageal pouch
F = Fins
FG = For-gut
G = Gills
GA = Gill Arch
GB = Gall bladder
GC = Gastric ceca
GCV = Gill cavity
GL = Gill lobes
Gon = Gonads
HG = Hind-gut
HW = Wall of heart
Int = Intestine
INTM = Intestine mesentery
Im = Intestine mucosa
INTW = Intestine walls
ISO = Inner surface of opercle
K = Kidney
L = Liver
LS = Liver surface
LUM = Lumen
M = Muscle
MB = Muscles of branchial cavity
MC = Mouth cavity
ME = Muscles of esophagus
MES = Mesentery
MFS = Mesenteric fat around stomach
MG = Mid-gut
MGR = Mid-get to rectum
MP = Muscles of pharynx
N = Nostrils
NR = Nasal region
O = Orbit
OC = Opercle cavity
ORC = Oral cavity
P = Pyloric region of intestine
PA = Pyloric appendages
PC = Pyloric caecum
PCR = Pyloric ceca to rectum
PER = Peritoneal cavity
PF = Pectoral fin
R = Rectum
S = Stomach
SC = Spinal canal
SK = Skin
SW = Stomach wall
V = Viscera
VB = Between viscera
WO = Walls of organs

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