

NEW HOST AND DISTRIBUTION RECORDS FOR PARASITIC
COPEPODS IN THE NORTHEAST PACIFIC OCEAN WITH A
DISCUSSION OF TAXONOMY OF THE GENUS
ACANTHOCHONDRIA

William J. Poly and Christopher L. Mah

ABSTRACT

Five species of parasitic copepods were collected near Unimak Island, Alaska in May 1999 from starry flounder (*Platichthys stellatus* (Pallas, 1788)) and northern rock sole (*Lepidopsetta polyxystra* Orr & Matarese, 2000). Parasites of starry flounder included *Lepeophtheirus parvicurris* Fraser, 1920, *Nectobranchia indivisa* Fraser, 1920, and *Acanthochondria rectangularis* (Fraser, 1920), whereas *Nectobranchia indivisa*, *Haemobaphes diceraus* Wilson, 1917, and *Acanthochondria* sp. were found on northern rock sole. The distribution of *L. parvicurris* was expanded approximately 2200 km, and the species was not known from Alaska previously. *Lepidopsetta polyxystra* was a new host for *H. diceraus*, and *A. rectangularis* was collected from Alaskan waters for the first time. Parasitism by more than one species of parasitic copepod was found for one *Platichthys stellatus* (n = 3 spp.), two other *P. stellatus* (n = 2 spp.), and one *Lepidopsetta polyxystra* (n = 2 spp.). Taxonomic problems in the genus *Acanthochondria* and relevance of the host fish species and geographic location are discussed.

During a trawl survey conducted by the National Marine Fisheries Service in the Gulf of Alaska in 1999, one of us (C.L.M.) collected parasitic copepods from two species of fishes. Based on records of parasitic copepods of fishes from Alaska, the collection was noteworthy for the new distribution and host information (Fraser, 1920; Bere, 1930; Townsend, 1938; Scheffer, 1959; Ho, 1970; Kabata, 1973; Moles, 1982; Moles et al., 1998; Arthur, 1984; Arthur and Arai, 1980; Blaylock et al., 1998a,b; Moser et al., 1985; Khan et al., 1997; Kabata, 1987; Orr and Matarese, 2000). Attempts to identify specimens of *Acanthochondria* resulted in a critical evaluation of some taxonomic practices used for the genus.

MATERIALS AND METHODS

Fishes were collected with a trawl on 25 May 1999 at three locations near Unimak Island and the tip of the Alaskan Peninsula: (1) Ikatan Bay (Southeast part of Unimak Island), midway between Ikatan Point and Sankin Island, (2) 7 km off the west coast of Deer Island, and (3) Cold Bay, 4 km NNE of Delta Point, Alaska Peninsula. Parasitic copepods were removed from fishes with forceps, fixed in 95% ethyl alcohol, and transferred to 70% EtOH (by C.L.M.). Copepods were removed from seven *Lepidopsetta polyxystra* and five *Platichthys stellatus*. All parasites were identified by W.J.P. using published descriptions. Representative specimens were deposited in the California Academy of Sciences Invertebrate Zoology collection (CASIZ), and others were kept in the personal collection of W.J.P. (see Table 1). Prevalence and intensity of infection were not calculated because all copepods were not collected and uninfected fishes were not enumerated in the field.

RESULTS AND DISCUSSION

Five species of parasitic copepods were collected from 12 specimens of two fish species (Table 1). *Lepeophtheirus parvicurris* was known from British Columbia on *P. stellatus* (Fraser, 1920; Bere, 1930; Kabata, 1973), but the present collection was the first Alaskan record and extended the range approximately 2200 linear km from the central coast of British Columbia. *Acanthochondria rectangularis* has not been reported from Alaskan waters, although was known from British Columbia and Far Eastern Seas of the former USSR on the same host (Markewitch, 1976; Kabata, 1988). *Haemobaphes diceraus* was identified for the first time from *L. polyxystra*; however, Kabata (1988) reported *Haemobaphes* sp. from a variety of hosts, including *L. bilineata*, and Orr and Matarese (2000) found *Haemobaphes* sp. on *L. polyxystra*. *H. diceraus* has been found in both the eastern and western North Pacific (Kabata, 1967, 1988; Markewitch, 1976; Ho and Kim, 1996) as far North as the Bering Sea (Markewitch and Titar, 1978). *Nectobrachia indivisa* likewise has been collected from both the eastern and western North Pacific and only recently was found in Alaskan waters (Markewitch, 1976; Kabata, 1988; Orr and Matarese, 2000).

One *P. stellatus* harbored three species of copepods (*L. parvicurris*, *N. indivisa*, *A. rectangularis*), whereas two other *P. stellatus* each had two copepod species (*L. parvicurris*, *A. rectangularis* and *L. parvicurris*, *N. indivisa*). One *L. polyxystra* was parasitized by two copepod species (*A. sp.*, *N. indivisa*). One female *Acanthochondria* sp. had two males attached (CASIZ 128986), but typically only one male has been found on *Acanthochondria* females.

The species of *Acanthochondria* collected from *L. polyxystra* was not identifiable due to a lack of characteristics with which to separate some species of *Acanthochondria* in the North Pacific. *Acanthochondria* sp. possessed type A first antennae and had mandibular and second maxillary denticle counts similar to several other species of *Acanthochondria* (Table 2). Taxonomy of the genus *Acanthochondria* requires much attention despite recent efforts (Kabata, 1984, 1987; Ho and Kim, 1995). Useful taxonomic characters for separation of many 'species' are lacking, and characters that have been used often, such as the shape of the trunk and its constriction, are prone to distortion (Ho, 1971; Kabata, 1987). Based on illustrations in Kabata (1987) *Acanthochondria hippoglossi* appears quite variable in body shape even when specimens have not contracted. The lack of taxonomic characters is evident based on the use of a fish host family as a 'character' four times in a dichotomous key to species (Ho and Kim, 1995). Too much emphasis has been placed on the host fish species when defining a new species of *Acanthochondria*. Host fishes are not taxonomic characters, and although there might be a strong host-parasite association, the fact remains that new host records continue to be found over time. For example, Ho and Kim (1995) described the characteristics of *Acanthochondria sixteni* and reported a new host record that was not only from a new species of host but from a species in both a different family and order than *A. sixteni* had been reported from previously. Yet, in their key, they cited a particular family of fishes as a defining 'character' for some species. Elsewhere in their paper, Ho and Kim (1995) support the idea that the host fish is important in making identification, and Kabata (1984, 1987: 215–216) referred to the host when making comparisons among species. For example, in a comparison of his new species, *A. hippoglossi*, with *A. oralis* Kabata (1987: 215) stated: "The host of *A. oralis* is not a flatfish but *Lophius*, another significant difference." However, there are at least

Table 1. Parasitic copepods collected near Unimak Island, Alaska (25 May 1999). Catalog numbers refer to the California Academy of Sciences Invertebrate Zoology Collection (CASIZ).

Parasite Taxon	Number on <i>Platichthys</i> <i>stellatus</i>	Number on <i>Lepidopsetta</i> <i>polyxystra</i>	Location on host	Collection locality§	Catalog numbers
COPEPODA					
Siphonostomatoida					
Caligidae					
<i>Lepeophtheirus parvicurvis</i> Fraser, 1920	29	-	skin	2	122375, 122377, 122378, 122382, 122383 (n = 17)
Lernaeopodidae					
<i>Nectobranchia indivisa</i> Fraser, 1920	3	-	gills	2	122374, 122380 (n = 3)
	-	7	gills	3	122379, 122381 (n = 4)
Pennellidae					
<i>Haemobaphes diceraus</i> Wilson, 1917	-	2	gill cavity	1,2	122373, 122376 (n = 2)
Poecilostomatoida					
Chondracanthidae					
<i>Acanthochondria rectangularis</i> (Fraser, 1920)	3*	-	gill cavity	2	128983, 128984 (n = 3)
<i>Acanthochondria</i> sp. indet.	-	15**	gill cavity	1,2,3	128981, 128982, 128985, 128986‡ (n = 15)

§Collection localities: (1) Ikatatan Bay (southeast part of Unimak Island), midway between Ikatatan Point and Sankin Island, (2) 7 km off west coast of Deer Island, and (3) Cold Bay, 4 km NNE of Delta Point, Alaska Peninsula. *two of three females each with one male attached. **Thirteen of fourteen females each with one male attached. ‡ Female had two males attached.

Table 2. Denticle counts on mandibles and second maxillae of four *Acanthochondria* sp. (CASIZ 128985) and other *Acanthochondria* spp. with type A antennae.

Species	Mandible (convex)	Mandible (concave)	Second maxilla	Reference
<i>A. sp. indet.</i> (CASIZ 128985)	33 (26–38)§	30 (25–35)§	10 (8–13)§	this study
<i>A. fraseri</i> Ho, 1972	31	28	11	Ho, 1972
<i>A. hippoglossi</i> Kabata, 1987	29	33	8	Kabata, 1987
<i>A. vancouverensis</i> Kabata, 1984	30	27	7–11	Kabata, 1984
<i>A. dojirii</i> Kabata, 1984	33–41	28–34	8–10	Kabata, 1984
<i>A. margolisi</i> Kabata, 1984	22–23	27–33	6	Kabata, 1984
<i>A. sixteni</i> (Wilson, 1922)	43	35	16	Ho and Kim, 1995
	42–45	37–40	15	Dojiri and Ho, 1988
<i>A. priacanthi</i> Shiino, 1964	41	41	11	Ho and Kim, 1995
<i>A. brevicorpa</i> Yü, 1935	36	28–30	12	Suh et al., 1992
<i>A. yui</i> Shiino, 1964	49	32	16	Suh et al., 1992

§Mean value followed by range in parentheses; mandible (convex) n = 7, mandible (concave) n = 6, second maxilla n = 7.

seven host fish species that have been reported to have more than one species of *Acanthochondria* (Table 3). *Acanthochondria fraseri* and *A. rectangularis* even have been collected on the same individual host fish! (Ho, 1972) Similarly, geographic location has been used as a criterion for distinguishing species (Kabata, 1984: 1710, 1987: 215–216); again, this is not a characteristic of a species, and named species continue to turn up in new localities over time. Despite the strong support for using geographic locality and

Table 3. Host fishes reported to harbor more than one species of *Acanthochondria*.

Host fish	<i>Acanthochondria</i> spp.
Chimaeridae	
<i>Hydrolagus colliei</i> Lay & Bennett, 1839	<i>A. rectangularis</i> (Fraser, 1920) <i>A. epachthes</i> (Wilson, 1908)
Lophiidae	
<i>Lophiomus setigerus</i> (Vahl, 1797)	<i>A. oralis</i> Yamaguti, 1939 <i>A. sixteni</i> (Wilson, 1922) <i>A. spirigera</i> Shiino, 1955
Platycephalidae	
<i>Platycephalus bassensis</i> Cuvier in C. & V., 1829	<i>A. diastema</i> Kabata, 1965 <i>A. platycephali</i> Heegaard, 1940
Pleuronectidae	
<i>Hippoglossoides elassodon</i> Jordan & Gilbert, 1880	<i>A. compacta</i> Markewitch, 1956 <i>A. hippoglossi</i> Kabata, 1987
<i>Platichthys stellatus</i> (Pallas, 1788)	<i>A. fraseri</i> Ho, 1972 <i>A. rectangularis</i> (Fraser, 1920)
<i>Pleuronectes limanda</i> Linné, 1758	<i>A. cornuta</i> (Müller, 1776) <i>A. limandae</i> (Krøyer, 1863)
<i>Pleuronectes vetulus</i> (Girard, 1854)	<i>A. rectangularis</i> (Fraser, 1920) <i>A. dojirii</i> Kabata, 1984

Sources: Ho, 1972; Markewitch, 1976; Kabata, 1988; Ho and Kim, 1995

host as features of a species, Kabata (1987) described a new species, *A. hippoglossi*, from the hosts *Hippoglossus stenolepis* and *Hippoglossoides elassodon* in the northeastern Pacific even though in 1956 Markewitch described *A. compacta* from *H. elassodon* in the northwestern Pacific. Several species of *Acanthochondria*, as well as other parasitic copepods mentioned earlier, occur on opposite sides of the Atlantic or Pacific oceans, including *A. ateleopi*, *A. cornuta*, and *A. rectangularis* (Ho, 1970; Markevitch and Titar, 1978; Kabata, 1988; Hogans, 1992). Kabata (1984) considered *A. compacta* to be a species inquirenda and did not mention it when describing *A. hippoglossi*. Yet, considering the host and geographic location (if these are meaningful), *A. compacta* certainly could be the same species as *A. hippoglossi*. Oddly, when Kabata (1984: 1710) compared *A. dojirii* with *A. compacta*, he stated: "It [*A. compacta*] is, therefore, sufficiently distinct from *A. dojirii* in host and distribution to be an unlikely conspecific for it."

Clearly, a better understanding of intraspecific variation is needed for *Acanthochondria* spp. Such variation will be uncovered when larger samples are examined from many localities. Means, ranges, and sample sizes should be reported for each characteristic as well. A single value for a character, such as for the denticle counts in Table 2, provides little useful information because intraspecific variation remains unknown for the character. In this study, a small number of specimens yielded a relatively large range in denticle counts, and counts of 26 and 37 were obtained from the right and left mandibles (convex), respectively, of a single specimen of *Acanthochondria* sp. Additional morphological and molecular data would be useful for further distinguishing between *Acanthochondria* spp. considering the great similarity of characters and effects of distortion on some morphological features.

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ADDRESSES: (W.J.P.) *Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901-6501.* (C.L.M.) *Department of Geology, University of Illinois, Urbana, Illinois 61801.*