

# *Hemioniscus balani* Buchholz in northern Norway (Isopoda, Cryptoniscina)

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The parasitic isopod *Hemioniscus balani* Buchholz is widespread and common on the outer coasts of northern Norway. Infection percentages show a clear vertical gradient, from 0% in the high intertidal *Balanus balanoides* belt to a maximum (up to 70–80%) near MLW. Multiple infections are not uncommon: up to four *Hemioniscus* females have been found in a single host.

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## INTRODUCTION

Parasitic isopods of the genus *Hemioniscus* Buchholz (Epicaridea, Cryptoniscina) have been found in a variety of intertidal and sublittoral barnacles from temperate and warm temperate waters (cf. Arvy & Nigrelli 1969, Goudeau 1970) while they seem to be absent from arctic waters as well as from tropical and subtropical seas (Crisp 1968). *Hemioniscus balani* Buchholz is common in western Europe south to the Bay of Biscay, and has also been discovered on the Canadian coast around Halifax, Nova Scotia, where it probably has been recently introduced (Crisp 1968). A similar, though smaller, species occurs in the NE Pacific (see Miller 1975 (California), Crisp 1968 (Washington), Cornwall 1955 (British Columbia), Coyle & Mueller 1981 (Alaska)). Coyle and Mueller (op. cit) did not find any morphological differences between their material and that of Norwegian samples of *H. balani*. The only anti-boreal records are those from False Bay, South Africa, by Sandison (1954), who found isopods 'similar to if not exactly identical with the European *H. balani*' in two barnacle species. In my opinion, the fact that the South-African parasites do not appear to cause castration of this barnacle host so that both host and parasite develop ova at the same time (Sandison 1954) points more to an affinity with the genus *Crinoniscus* than with *Hemioniscus*. In *Hemioniscus* the female parasite feeds on the ovarian region of its host (Goudeau 1977) and causes parasitic castration.

The presence of *Hemioniscus balani* in northern Norway remained long undiscovered.

Dahl (1949) did not include the species in his paper on the Epicaridea of the area, and Crisp and Southward (1958) gave the northern limit of distribution as 60–62°N. Crisp (1968) and Vader (1968) independently recorded the presence of *H. balani* in the Tromsø area (c. 69°50'N), and additional collecting has shown *Hemioniscus* to be widespread and common in northern Norway.

## MATERIAL AND METHODS

Three *Balanus* species (*B. balanoides* L., *B. balanus* (L.) and *B. crenatus* Bruguière) and *Verruca stroemia* (O.F. Müller) occur intertidally in northern Norway. *B. balanoides* is the dominant species. Although *B. balanus* is a frequent host elsewhere (Crisp 1968), in northern Norway *Hemioniscus* was exclusively found in *B. balanoides*. Quantitative sampling was therefore restricted to this species.

Samples of 100–200 specimens of *B. balanoides* were scraped off with a knife and usually preserved in alcohol; occasionally samples were sorted on the spot without prior preservation. Whenever the state of the tide and the topography of the shore allowed, a number of samples was taken along a transect from HW to LW.

The samples were sorted in the lab under low power magnification, and numbers of male and female isopods recorded. To ease rapid sorting, specimens were scored as females only after the half-moult of sexual metamorphosis (Goudeau 1967). The frequencies of infection in the present paper are probably nevertheless higher than

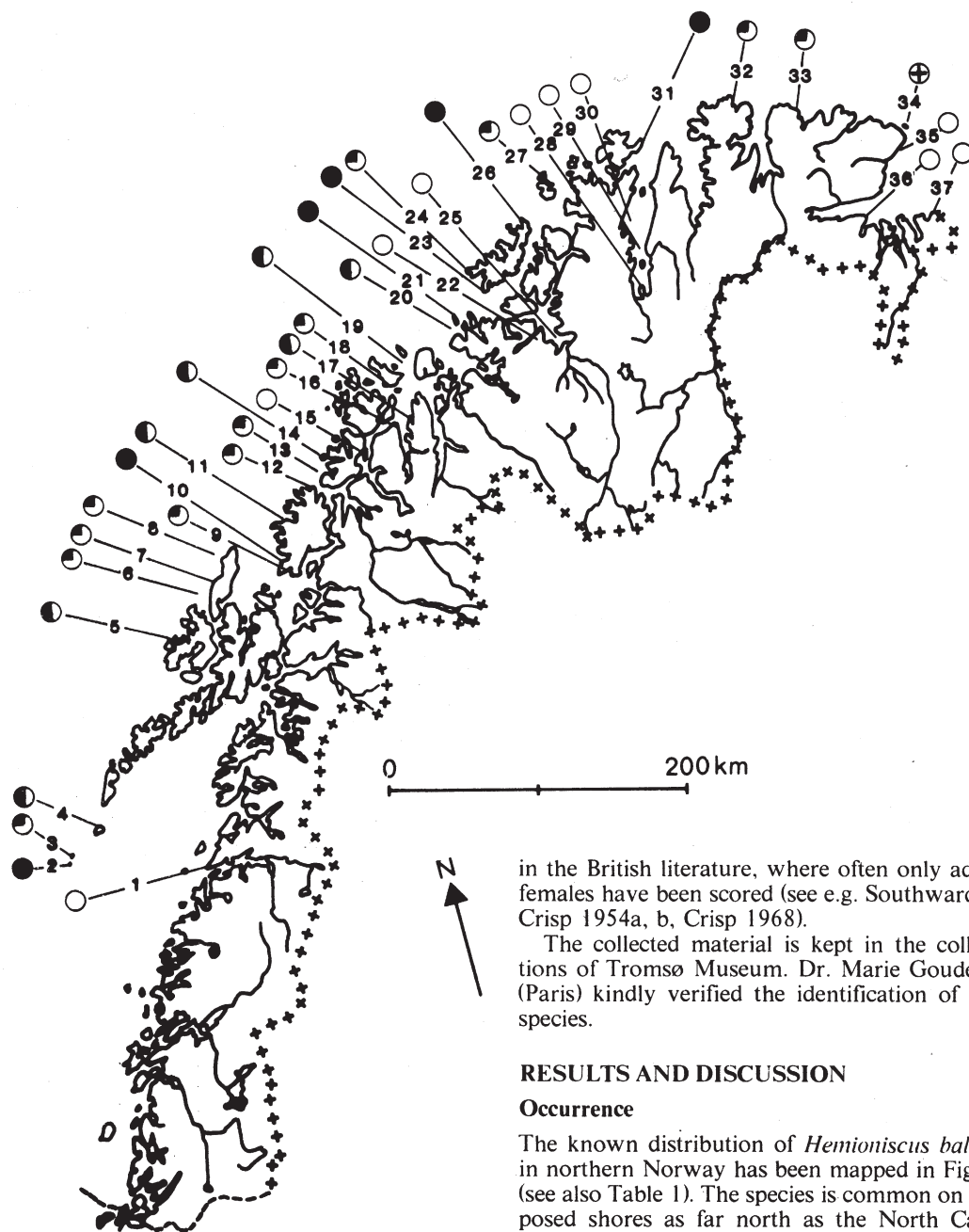


Fig. 1. Occurrence and frequency of *Hemioniscus balani* in intertidal *Balanus balanoides* in northern Norway. The localities are listed in Table 1. Symbols: ○ *Hemioniscus* absent. ⊕ only *Cryptoniscus* larvae found. ◐ 0–5% of *Balanus* infected. ● 6–25% of *Balanus* infected. Only ♀♀ of *Hemioniscus* were counted.

in the British literature, where often only adult females have been scored (see e.g. Southward & Crisp 1954a, b, Crisp 1968).

The collected material is kept in the collections of Tromsø Museum. Dr. Marie Goudeau (Paris) kindly verified the identification of the species.

## RESULTS AND DISCUSSION

### Occurrence

The known distribution of *Hemioniscus balani* in northern Norway has been mapped in Fig. 1 (see also Table 1). The species is common on exposed shores as far north as the North Cape area, with scattered occurrences further east. A similar Atlantic type of distribution is shown by many other organisms, e.g. the brown seaweed *Halosiphon tomentosum* Jaasund (Jaasund 1965), the limpet *Patella vulgata* L. (Vader 1975) and the shore crab *Carcinus maenas* (L.) (Vader 1979). That *Hemioniscus* has been found

Table 1. Maximum percentage infection by *Hemioniscus* (only ♀ counted) in samples of *Balanus balanoides* from different localities in N. Norway. The nrs correspond to those in Fig. 1. Cr = only *Cryptoniscus* larvae found.

nr	locality	% infection	nr	locality	% infection
1	Bodø	0	21	Loppa	70
2	Skomvær	85	22	Langnesholmen	0
3	Vedøy	5	23	Hasvik	36
4	Værøy	14	24	Fuglen	10
5	Nykvåg	24	25	Brattholmen	0
6	Anda	3	26	Tarhalsen	21
7	Nordmjøle	2	27	Gunnarnes	3
8	Bleiksføya	2	28	Reinøya	0
9	Hofsøy	3	29	Hamholmen	0
10	Skrolsvik	38	30	Kistrandneset	0
11	Hamn	4	31	Nordvågen	33
12	Laukvik	1	32	Slettnes	Cr
13	Brensholmen	6	33	Berlevåg	5
14	Gjøssøy	25	34	Vardø	Cr
15	Tromsø	0	35	St. Ekkerøy	0
16	Oldervika	2	36	Bugøynes	0
17	Styrmannstø	8	37	Kobbholmfjord	0
18	Nikkeby	4			
19	Spenna	21			
20	Loppekalven	14			

as far east as Vardø (Fig. 1, loc. no. 34) may in part be due to the fact that cryptoniscid isopods probably have a very long pelagic *Microniscus* stage. On the other hand, in especially favourable microbiotopes the species appears to be able to grow to maturity and reproduce even on the Barents Sea coast. An example is the 5% — infection rate in a sample taken in a shallow run-off gully near Berlevåg (Fig. 1, loc. 33), with several large *Hemioniscus* females with larvae near hatching. Only a few *Cryptoniscus*-larvae had been found in the regular transect at this locality.

The complete absence of *Hemioniscus balani* from the more protected shores of the inner fjords, though in agreement with the species well-known tendency to be more common on exposed shores (Crisp 1964, 1968), is not easy to explain. *Balanus balanoides* is common throughout the area, *Hemioniscus balani* is relatively cold-hardy (Crisp & Southward 1964, Crisp 1968) and summer temperatures in the

fjords are in many places slightly higher than on the outer coast (Sælen 1949). Adverse factors are the frequent temporarily very low surface salinities in many fjords (Sælen 1949) and the mainly outgoing surface-currents in the fjords which make influx of *Microniscus*-larvae from the outer coast populations less likely.

I did not find *Hemioniscus* in a number of intertidal *Balanus* samples from Bjørnøya (c. 74°30'N). The species seems likewise to be absent from Iceland (Crisp 1968) and W. Greenland (Petersen 1966).

#### Vertical distribution

Table 2 shows the results of some of the transects from exposed localities. Without exception, the data show a clearcut gradient, from few or no *Hemioniscus* in the dense barnacle populations of the high intertidal 'main *Balanus* belt' to maximum infection rates in the more scattered *Balanus* populations around MLWN.

Table 2. Vertical gradient in infection percentage with *Hemioniscus balani* of *Balanus* samples from low, medium and high intertidal localities in northern Norway. Only *Hemioniscus* ♀♀ counted. Cr: only *Cryptoniscus* larvae found. —: no sample taken.

Locality	Nr	<u>Balanus</u> samples		
		Low	Medium	High
Skrolsvik	10	38%	8	0
Spenna	19	21	13	1
Loppakalven	20	—	14	Cr.
Hasvik	23	36	6	0
Tarhalsen	26	21	6	Cr.
Nordvågen	31	33	10	0

As none of the published data on the frequency infection of *Hemioniscus* in Britain and France contains any information on the tidal level at which the samples were taken, it is unknown whether a similar gradient exists further south in western Europe, or if this is a result of lower air temperatures in northern Norway.

#### Frequency of infection

Quantitative data on infection rates of *Balanus balanoides* by *Hemioniscus balani* exist only for Britain (cf. Southward & Crisp 1954a, Crisp & Southward 1958), France (Crisp & Southward 1958, Crisp & Fischer-Piette 1959), Ireland (Southward & Crisp 1954b, McGrath & Atkins 1979) and Nova Scotia, Canada (Crisp 1968). Sandison (1954) recorded up to 40% infection of *Balanus algicola* in S. Africa, and in California *Chthamalus dalli* I found infection rates up to 51% (Doran Beach, Sonoma Co, Sept. 1979).

In Europe infection rates are very high (> 50%) in Brittany, SW England and SW Ire-

land, but low (usually < 10%) on eastern and northern coasts of Great Britain. Elsewhere in the North Sea the species is apparently absent. *Hemioniscus* is apparently not uncommon on the Norwegian Skagerak coast, the site of the classical study by Buchholz (1866), although I know of no quantitative estimates. In western Norway, on the other hand, *Hemioniscus* is definitely scarce. Among many *Balanus* samples from exposed sites in the Bergen area (c. 60°N) I have never found an infection rate of more than 1–2% and the frequency of *Hemioniscus* was usually much lower still (see also Crisp 1968, p 1164).

Infection rates in northern Norway are much higher and may in favourable localities reach 50–75%. These high frequencies are not transient: collections taken in different years on the vertical outer wall of a small concrete pier on the island of Loppa (Fig. 1, loc. 21) show some variations from year to year, but *Hemioniscus* was common in the lowest samples in all years (Table 3).

Table 3. Percentage infection of *Balanus balanoides* with ♀♀ of *Hemioniscus balani* in a vertical transect on the island of Loppa (loc. 21, Fig. 1); all samples taken in June. The stations, at c. 40 cm vertical distance, are from the vertical wall of a concrete pier on the protected east coast of Loppa. Station 1 is at ca. MLWN, st. 5 in the high *Balanus* belt.

Year of collection	Station				
	1	2	3	4	5
1975	70%	29	13	5	0
1976	47	26	15	2	0
1977	33	14	10	5	0
1981	28	16	14	2	0

Table 4. Frequency of multiple infections of *Hemioniscus* in samples of *Balanus balanoides* from northern Norway. Only female *Hemioniscus* counted; up to 5 *Cryptoniscus* larvae may be additionally present.

Locality	loc nr.	N <i>Balanus</i>	N <i>Hemioniscus</i> /host			
			1	2	3	4
Nykvåg	5	126	26	4	1	-
Skrolsvik 3	10	180	77	1	-	-
Spenna 4	19	172	23	2	-	-
Loppa 10	21	96	42	3	-	-
" 12	"	132	18	2	-	-
" 32	"	352	48	1	-	-
Hasvik 2	23	99	33	3	-	-
Nordvågen 4	31	98	30	2	-	-
Berlevåg 6	33	98	1	1	-	1

### Double infections

As a rule only 1 subadult or adult female of *Hemioniscus* is present in a single barnacle, together with 1 or more males or *Cryptoniscus*-larvae. However, double infections occur with some regularity (Table 4). The highest percentage of multiple infections was found in the above-mentioned sample from Berlevåg (see p. 3). Of the 5 parasitized barnacles found in this sample 2 contained only a single *Cryptoniscus* larva, while the other three had 1, 2 and 4 *Hemioniscus* females; in this last barnacle 2 isopods were ovigerous, the other two about half grown.

I know of few published data on multiple infections of *Balanus balanoides* with *Hemioniscus* (Prenant 1923, Vader 1969). On the other hand, in a population of *Balanus improvisus* in SW France the frequency of multiple infections is much higher, up to 7 females having been found in a single host (Pérez 1900, 1923, Crisp & Fischer-Piette 1959). These isopods have provisionally been treated as a separate species, *H. socialis* by Pérez (1900, 1923); a comparative morphological study of the two forms is being carried out by Goudeau (1970, p. 436).

Multiple infections are common in the South African '*Hemioniscus*' recorded by Sandison (1954), with 3–4 females per host in *Balanus algicola* Pilsbry, but only 1–2 in *Chthamalus dentatus* Krauss. In Californian *Chthamalus dalli* single females per host are the rule, but two females are found in c. 1% of the infected barnacles (Vader, unpubl. obs.).

A thorough taxonomic revision of the entire *Hemioniscus* complex appears to be overdue.

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