ANNOTATED LIST AND NEW RECORDS OF MARINE AND FRESHWATER HALACARID MITES (HALACARIDAE, ACARI) FROM NORWAY

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ABSTRACT: Records of halacarid species collected in the Norwegian Exclusive Economic Zone are summarized, and three new records are added. The list of halacarids includes 45 marine species in 15 genera and two species belonging to two freshwater genera. To each genus a short diagnosis is given, and to each species information about original descriptions, as well as recently published details about the morphology, geography and habitat is provided. The fauna of Norway, compared to that of other eastern North Atlantic coastlines, is poor. We can expect that in the course of further collecting activities, spanning from the tidal zone to deep-sea basins, the number of species will be distinctly more than doubled.

KEY WORDS: Halacaroidea, checklist, diagnoses, distribution, Norway.

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INTRODUCTION

Halacarid mites live in all geographical zones of the world: in polar, temperate and tropical areas, in the deep-sea (almost 7,000 m b.s.l.) as well as high up in the mountains (5,000 m a.s.l.); on and in epigeal as well as hypogean substrata; in the sea but also in fresh water. At present, more than 1,000 marine and about 50 freshwater species are known (Bartsch 2009).

The first halacarid mite was illustrated by Baster (1758). Descriptions of species followed in the middle of the nineteenth century (Johnston 1836; Gosse 1855a, b; Hodge 1860, 1863). All these species were from the seashore of Great Britain. The first halacarids from the Norwegian territories, Svalbard, were collected in 1889 during a French investigation of the Arctic benthos. In all, seven halacarid species were extracted from benthos samples (Trouessart 1902). The first freshwater halacarid species from Norway, *Porohalacarus alpinus* (Thor, 1910), was described a few years later (Thor 1910). Further detailed studies of the Norwegian marine halacarid fauna were carried out in the tidal and subtidal zone around Bergen (about 1925) and on beaches near Tromsø (August 1969–May 1971) (K. Viets 1927a, 1928a; Schmidt 1972; Bartsch 1978a; Bartsch and Schmidt 1979). Minor amendments to the knowledge of Norwegian halacarids species were made by Bartsch (1978b, 2003a); in recent years, Roy Wrånes added more species to the list of halacarids (Artsdatabanken 2019). In August to November 2016, Halldis Ringvold collected mussels, barnacles, algae and sediment around Vestfold, Stavanger, Bergen and Trondheim and extracted the halacarid mites. Still, the knowledge of the halacarid fauna of Norway is very poor.

In many parts of the world we can watch a change of flora and fauna (Gollasch and Nehring 2006) partly because of altered environmental parameters (e.g., raise of temperature), partly because of immigration and introduction of alien species. The present paper summarizes previous and adds new records to the list of halacarid species. It also outlines morphological and ecological characters of the species and refers to relevant taxonomic keys.

MATERIALS AND METHODS

The genera and their species are arranged in the alphabetical order. To each genus, a short outline of morphological characters is given, mainly restricted to easily recognizable characters of species present in the North Atlantic. More detailed information, covering the wide range of variants, as well as keys to halacarid genera, are given by Bartsch (2006a). The presentation of the species includes the information of the original description, recent and detailed presentations of morphological data, geographical records from Norway and worldwide, the habitats in which a species commonly is found, and biological data. Though not including all Norwegian species, the keys to species known from the United Kingdom, published by Green and MacQuitty (1987), are recommended. Major changes to the systematics of Halacaridae are: (1) the genus *Thalassarachna*, as used by Green and MacQuitty (1987), has been split into *Thalassarachna* and *Halacarellus* (Bartsch 1997a); (2) the north-eastern Atlantic species, once placed into the genus *Arhodeoporus*, have been moved to *Maracarus* (Bartsch 2016a). Also, *Rhombognathides merri-*

mani turned out to be a junior synonym of *R. trionyx* (Trouessart, 1899) (cf. Bartsch 2009).

Abbreviations used in the presentation of morphological details: AD—anterior dorsal plate; AE—anterior epimeral plate; AP—anal plate; ds-1 to ds-6—first to sixth pair of dorsal idiosomal setae, numbered from anterior to posterior; EI to EIV—epimera I to IV; GA—genitoanal plate; GO—genital opening; glp-1 to glp-5—gland pores 1 to 5, numbered from anterior to posterior; GP—genital plate; OC—ocular plate(s); P-1 to P-4—first to fourth palpal segment, numbered from basal to apical; pas—parambulacral seta(e); PD—posterior dorsal plate; PE—posterior epimeral plate(s); pgs—perigenital setae; sgs—subgenital setae. The legs, their segments and claws are numbered from I to IV, from anterior to posterior. The leg segments are trochanter, basifemur, telofemur, genu, tibia, and tarsus. The number of dorsal setae on the tarsi includes the solenidion. Rarely occurring numbers of setae are in parentheses. A question mark (?) is added in case the data are in need of verification.

The presentation of geographical records from Norway starts with the ones from Oslofjord and follows the coastline until Gamvik and Svalbard. The records of countries outside Norway are arranged in the alphabetical order.

RESULTS

Halacaridae: general information

Halacarids belong to the mite suborder Prostigmata. The family name Halacaridae was introduced by Murray (1877) for mites 'living habitually under the sea, having either a stiff or more or less rigid, cuirassed skin, and with their legs springing from the outer margin of the body'.

Halacarids can be distinguished from other mites on the basis of a combination of characters, namely: (1) the anterior two pairs of legs are directed forward, the posterior two pairs backward, the gap between insertion of legs II and III equals at least one third of the width of the idiosoma; (2) the legs insert marginally or dorsomarginally, not ventrally; (3) adults have four pairs of six-segmented legs, and (4) the idiosoma of the majority of species has six pairs of dorsal setae, though species with no more than two or up to ten pairs are known.

Checklist of marine halacarids recorded from Norway

Forty-seven named halacarid species in 17 genera are recorded from the Exclusive Economic

Zone of Norway; 45 species are marine, two live in freshwater. The marine genera and the number of species (in parentheses) are: *Agauopsis* (1), *Anomalohalacarus* (1), *Bradyagaue* (1), *Copidognathus* (8), *Halacarellus* (6), *Halacarus* (1), *Isobactrus* (4), *Lohmannella* (4), *Makarovana* (1), *Maracarus* (1), *Metarhombognathus* (1), *Rhombognathides* (5), *Rhombognathus* (2), *Simognathus* (1), and *Thalassarachna* (8), the freshwater genera are *Porohalacarus* (1) and *Porolohmannella* (1). The species, along with the relevant collecting data, are summarized in Table 1.

Genus *Agauopsis* K. Viets, 1927

Diagnosis. Generally intensely armoured, with only narrow areas of striated integument between the plates. Third palpal segment with medial spur or seta. Leg I wider and longer than following legs. Genu I distinctly shorter than telofemur and tibia. Tibia I with three to five blunt spines, telofemur I with zero (one species) to four such spines. Tarsus I with spine on medial, not on ventral flank.

Agauopsis corallina Bartsch, 2003

Agauopsis corallinus Bartsch, 2003a: 118–122, figs. 1–14.

Short description. Length 345 µm (male). Anterior margin with tricuspid process. Porose areolae (with rosette pores) small, on the PD almost restricted to posterior part between the gland pores. Telofemur I with one long ventral and three short medial spines, tibia I with one long and one short ventral and three rather short medial spines. Tibiae of following legs with three bristle-like ventral setae. Tarsi II–IV with slender ventral seta.

Norwegian record. Sula Ridge, 64°05'N, 08°02'E, 285 m depth (Bartsch 2003a).

Further records. None.

Biology. Collected from a deep-water reef formed mainly by colonies of the stony coral *Lophelia pertusa* (Linnaeus, 1758) (Scleractinia).

Remarks. *Agauopsis corallina* is momentarily the only record of an *Agauopsis* species from north of 58°N. The species is most similar to the two north-eastern Atlantic species *A. minor* (Trouessart, 1894) and *A. meteoris* Bartsch, 1973, but in *A. corallina* the porose areolae on the dorsal plates are smaller, on the PD almost restricted to the posterior part; in the two other species, the areas with rosette pores extend within the costae anteriorly to or beyond the level of the posterior corner of the OC (Trouessart 1894a; Bartsch 1973a, 2001a).

Table 1
Halacaridae from the Norwegian Exclusive Economic Zone: sampling sites and their halacarid fauna.

Location/Marine	Coordinates		Substratum	Species	Depth	Source
	N	E				
Vestfold						
Ringshaugstranda outside Tønsberg	59°17'	10°26'	<i>Enteromorpha</i> (green algae)	<i>Rhombognathides pascens</i>	tidal area	present paper
Kristiansand	ca 58°04'	08°02'		<i>Anomalohalacarus minutus</i> , <i>Copidognathus brevirostris</i> , <i>C. fabricii</i> , <i>Halacarus bisulcus</i> , <i>Isobactrus levis</i> , <i>I. setosus</i> , <i>Rhombognathides</i> <i>pascens</i> , <i>R. seahami</i> , <i>R. trionyx</i> , <i>Simognathus minutus</i> , <i>Thalassar-</i> <i>achna basteri</i>		Artisdatbanken
Stavanger						
Lysebotn, innermost beach, close to ferry pier	59°03'	06°39'	blue mussels with bar- nacles	<i>Halacarellus balticus</i>	shallow water	present paper
Lysebotn	59°03'	06°39'	rocks with <i>Enteromorpha</i>	<i>Isobactrus hartmanni</i> , <i>Rhombognathides seahami</i>	tidal area	present paper
Vikedal camping	59°29'	05°54'	kelp with <i>Spirorbis</i> (Polychaeta)	<i>Isobactrus juveniles</i> , <i>Rhombognathides pascens</i> , <i>Rh. seahami</i>	tidal area	present paper
Bergen						
Jektevika/ferry pier	59°53'	05°32'	barnacles	<i>Isobactrus setosus</i>	tidal area	present paper
Mundheim/near river outlet	60°10'	05°55'	<i>Enteromorpha</i>	<i>Rhombognathides seahami</i>	tidal area	present paper
Golten	60°13'	05°00'	<i>Semibalanus balanoides</i> , <i>Balanus crenatus</i> (bar- nacles)	<i>Isobactrus unguis</i>	upper tidal area	present paper
Telavåg/Harbour	60°15'	04°59'	<i>Semibalanus balanoides</i> , <i>Balanus crenatus</i>	<i>Isobactrus unguis</i>	tidal area	present paper
Torvikbygda/by ferry to Jondal	60°15'	06°06'	floating wooden piece	<i>Halacarellus balticus</i>		present paper

Røyrvik/south of Tørvikbygd/near farm	60°15' 06°06'	<i>Enteromorpha</i>	<i>Isobactrus hartmanni</i> , <i>I. levis</i> , <i>I. setosus</i> , <i>Rhombognathides seahami</i>	tidal area	present paper
Grønevika	60°15' 05°16'	<i>Enteromorpha</i> on rock	<i>Halacarellus capuzinus</i> , <i>Isobactrus unguilatus</i> , <i>Rhombognathus subtilis</i>	lower tidal area	present paper
Grønevika	60°15' 05°16'	<i>Patella vulgaris</i> (gastropods) with algae and barnacles	<i>Rhombognathides seahami</i>	tidal area	present paper
Arboretet/Grønevika	60°15' 05°16'	<i>Semibalanus balanoides</i>	<i>Isobactrus setosus</i>	tidal area	present paper
Arboretet/Sandholna	60°15' 05°17'	<i>Semibalanus balanoides</i>	<i>Isobactrus unguilatus</i>	tidal area	present paper
Sandholna, by swing	60°15' 05°17'	debris, shellsand, green and red algae	<i>Halacarellus capuzinus</i> , <i>Rhombognathides spinipes</i>	tidal area	present paper
Hagenes bay/pier	60°17' 05°07'	shellsand and red algae	<i>Isobactrus unguilatus</i>	18 m	present paper
Tellnes pier	60°17' 05°05'	shellsand with small amounts of red algae	<i>Copidognathus brifacius</i> , <i>C. rhodostigma</i>	15 m	present paper
Kyrkjætangen/Nordnesvatnet	60°19' 05°17'	blue mussels with barnacles	<i>Rhombognathides pascens</i>	tidal area	present paper
Håkonshella/Pollen	60°21' 05°11'	<i>Semibalanus balanoides</i> , <i>Enteromorpha</i> sp.	<i>Halacarellus balticus</i> , <i>Isobactrus setosus</i> , <i>I. unguilatus</i>	tidal area	present paper
Nordheimsund	60°22' 06°09'	<i>Fucus</i> (brown algae) with barnacles, spirobites, bryozoa	<i>Halacarellus balticus</i> , <i>Rhombognathides pascens</i>	lower tidal area	present paper
Bognestrømmen in Mangerford	ca 60°22' 05°32'	red algae	<i>Copidognathus oculatus</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Simognathus minutus</i> , <i>Thalassarachna basteri</i>	25 m	Viets 1928a
Nordre Bratholmen	60°25' 5°15'	Ascidia, bivalves, remnants of corals (<i>Lophelia</i>)	<i>Lohmannella norvegica</i> , <i>Rhombognathides pascens</i> , <i>Thalassarachna basteri</i> , <i>T. hexacantha</i>	150 m	Viets 1928a
Turøy	60°29' 04°58'	brown algae (<i>Chorda filum</i> , <i>Laminaria</i>), bryozoans, hydrozoans, small bivalves	<i>Copidognathus fabricii</i> , <i>Halacarellus balticus</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus notops</i> , <i>Thalassarachna basteri</i> , <i>T. hexacantha</i>	at and below low water edge	Viets 1928a

Bjelkarvågen/end of road	60°24' 05°44'	Enteromorpha	<i>Halacarellus balticus</i> , <i>H. subterraneus</i> , <i>Lohmannella (falcata?)</i> juvenile	mid tide	present paper
Nordnes/Peak of Nordnes and Nordnesparken	60°24' 05°18'	<i>Semibalanus balanoides</i>	<i>Halacarellus balticus</i> , <i>Isobactrus hartmanni</i> , <i>I. unguatus</i> , <i>Rhombognathides seahami</i>	mid tide	present paper
Skuteviken/beginning of cycle tunnel	60°24' 05°19'	<i>Semibalanus balanoides</i> , <i>Balanus crenatus</i>	<i>Metarhombognathus armatus</i>	tidal area	present paper
Eidsvågneset/tip of Eidsvågneset	60°27' 05°17'	<i>Semibalanus balanoides</i> , <i>Balanus crenatus</i>	<i>Isobactrus hartmanni?</i> (juveniles)	tidal area	present paper
Osund, Kvernepollen	60°31' 04°54'	brown algae (<i>Chorda filum</i> , <i>Ascophyllum</i> , <i>Laminaria</i>) with bryozoans and polychaetes (<i>Spirorbis</i>), seagrass (<i>Zostera</i>), small gastropods and bivalves, sponges	<i>Copidognathus fabricii</i> , <i>C. oculatus</i> , <i>C. reticulatus</i> , <i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Isobactrus setosus</i> , <i>Maracarus gracilipes</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus notops</i> , <i>Simognathus minutus</i> , <i>Thalassarachna basteri</i> , <i>T. hexacantha</i> , <i>T. striata</i>	at and beneath low water edge	Viets 1928a
Herdla, shoreline	ca 60°34' 04°53'	green algae (<i>Enteromorpha</i>), brown algae (<i>Pelvetia</i>), barnacles, bivalves (<i>Mytilus</i>)	<i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Isobactrus setosus</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Thalassarachna basteri</i>	tidal area	Viets 1928a
Herdla	ca 60°34' 04°53'	brown and red algae (<i>Laminaria</i> , <i>Corallina</i>), seagrass (<i>Zostera</i>)	<i>Copidognathus fabricii</i> , <i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus notops</i> , <i>R. subtilis</i> , <i>Thalassarachna basteri</i>	at and beneath low water edge	Viets 1928a
Herdla, Paddeholet	ca 60°34' 04°53'	brown algae (<i>Ascophyllum</i>)	<i>Copidognathus brevistris</i> , <i>C. fabricii</i> , <i>C. latus</i> , <i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Isobactrus levis</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus subtilis</i> , <i>Thalassarachna basteri</i>	low water edge	Viets 1928a
Herdla, Sjatien near Kalsøy		brown algae (<i>Fucus</i> , <i>Laminaria</i>), hydrozoa, small bivalves (<i>Mytilus</i>), bryozoans, polychaetes (<i>Spirorbis</i>)	<i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Thalassarachna basteri</i> , <i>T. hexacantha</i>	at and beneath low water edge	Viets 1928a

Herdla Sund	ca 60°34' 04°58'	sand and broken shell	<i>Halacarus bisulcus</i> , <i>Rhombognathides pascens</i> , <i>Thalassarachna basteri</i>	10 m	Viets 1928a
Lindås/Leirvåg by ferry pier	60°49' 05°00'	<i>Semibalanus balanoides</i> , <i>Balanus crenatus</i> (?)	<i>Halacarellus balticus</i> , <i>Isobactrus unguilatus</i>	tidal area	present paper
Lindås/Fanebust, Nautevågen	60°46' 05°11'	<i>Enteromorpha</i> on sand	<i>Isobactrus setosus</i> (?), <i>Rhombognathides mucronatus</i>	tidal area	present paper
Herdla Fjord, north-western end		muddy sediment, red algae (<i>Corallina</i>)	<i>Rhombognathides pascens</i>	low water edge to 100 m	Viets 1928a
Rylands Sund, Rosland Vaag	ca 60°56' 05°04'	brown algae (<i>Desmarestia</i> , <i>Fucus</i>), seagrass (<i>Zostera</i>), holothurians (<i>Cucumaria</i>)	<i>Copidognathus latus</i> , <i>Halacarellus balticus</i> , <i>H. floridearum</i> , <i>Isobactrus setosus</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Thalassarachna basteri</i>	low water edge to 20 m	Viets 1928a
Hatte Sund		strong currents; brown algae (<i>Laminaria</i>); tunicates (<i>Ciona</i>)	<i>Copidognathus fabricii</i> , <i>Halacarellus balticus</i> , <i>Isobactrus setosus</i> , <i>Lohmannella falcata</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus notops</i> , <i>Thalassarachna basteri</i> , <i>T. longipes</i>	at and beneath low water edge	Viets 1928a
Rogne Sund		sediment rich in broken shell	<i>Rhombognathides pascens</i> , <i>Thalassarachna basteri</i>	30-40 m	Viets 1928a
Sten Sund		brown algae (<i>Laminaria</i>); hydroids	<i>Copidognathus oculatus</i> , <i>Halacarellus balticus</i> , <i>Lohmannella norvegica</i> , <i>Maracarus gracilipes</i> , <i>Rhombognathides pascens</i> , <i>R. seahami</i> , <i>Rhombognathus notops</i> , <i>Thalassarachna basteri</i> , <i>T. longipes</i>	beneath low water edge	Viets 1928a
Trondheim					
Korsvika	63°17' 10°26'	<i>Enteromorpha</i> and barnacles	<i>Rhombognathides seahami</i>		present paper
Tromsø					
Kvaløy, sampling site 3	69°36' 18°01'	gentle sandy slope,	<i>Halacarellus capizinus</i> , <i>H. procerus</i> , <i>H. subcrispus</i> , <i>H. subterraneus</i> , <i>Makarovana spinosa</i>	tidal area	Bartsch and Schmidt, 1979
Grindøy South, sampling site 2	69°38' 18°51'	sandy slope, moderately steep	<i>Copidognathus reticulatus</i> , <i>Halacarellus capizinus</i> , <i>H. procerus</i> , <i>H. subcrispus</i> , <i>H. subterraneus</i> , <i>Makarovana spinosa</i> , <i>Metarhombognathus armatus</i> , <i>Rhombognathus subtilis</i> , <i>Thalassarachna basteri</i> , <i>T. robusta</i>	tidal area	Bartsch 1978a, Bartsch and Schmidt, 1979

Grindøy North, sampling site 1	69°38' 18°51'	steep sandy slope	<i>Anomalohalacarus minutus</i> , <i>Copidognathus brifacius</i> , <i>C. reticulatus</i> , <i>Halacarellus capizinus</i> , <i>H. floridearum</i> , <i>H. procerus</i> , <i>H. subcrispus</i> , <i>H. subterraneus</i> , <i>Makarovana spinosa</i> , <i>Maracarus gracilipes</i> , <i>Rhombognathides mucronatus</i> , <i>R. pascens</i> , <i>R. seahami</i> , <i>R. trionyx</i> , <i>Rhombognathus subtilis</i> , <i>Thalassarachna basteri</i> , <i>T. hexacantha</i>	tidal area	Bartsch 1978a, Bartsch and Schmidt, 1979
Finmark					
Gamvik	71°03' 28°14'		<i>Copidognathus reticulatus</i> , <i>Halacarellus floridearum</i> , <i>Thalassarachna basteri</i>		Bartsch 2015b, 2017
Svalbard					
Hopen Island	76°30' 25°27'	pebbles and shell fragments	<i>Bradyagaue alberti</i> , <i>Copidognathus richardi</i>	48 m	Trouessart 1902
Grønfyordbrean	77°58' 14°16'		<i>Isobactrus levis</i> , <i>Rhombognathides spinipes</i>	shallow water	Chertropud <i>et al.</i> 2017
Longyearbyen	78°12' 15°40'		<i>Copidognathus brifacius</i> , <i>C. reticulatus</i> , <i>Halacarellus subcrispus</i> , <i>H. subterraneus</i>		Bartsch 1979
Ny Ålesund	78°55' 11°56'		<i>Halacarellus subcrispus</i> , <i>Rhombognathus subtilis</i>		present paper
Sorgfjord	79°58' 16°52'		<i>Copidognathus reticulatus</i>		Trouessart 1902
northern coast	80°01' 10°51'	muddy sand	<i>Bradyagaue alberti</i> , <i>Copidognathus richardi</i>	430 m	Trouessart 1902
Sulu Reef	64°05' 08°02'	remnants of corals (<i>Lophelia</i>)	<i>Agauopsis corallina</i> , <i>Lohmannella njoerdri</i> , <i>L. sulensis</i>	285 m	Bartsch 2003a, 2020
Norwegian Basin	64°24' 01°44'	sponges, hydrozoans	<i>Thalassarachna caecoides</i>	2615 m	Bartsch 1978b
Location/fresh water					
Kristiansand	ca 58°04' 08°02'	small pond	<i>Porolohmannella violacea</i>		Artsdatabanken
Gudbrandsdalen, Valsvand		lake with vascular plants (<i>Sparganium</i>)	<i>Porohalacarus alpinus</i>	850m asl	Thor 1910

Genus *Anomalohalacarus* Newell, 1949

Diagnosis. Idiosoma, gnathosoma and legs slender. AD and PD as well as two anterior pairs and two posterior pairs of legs situated near ends of idiosoma. Plates small; dorsum and venter of body dominated by flexible, striated integument. AE mostly divided in the median into a right and left half. Female genital plate divided. Third palpal segment with medial spur. Telofemora, genua and tibiae similar in length. Tarsus I with small ventro-medial spur (rarely two spurs) and a pair of short eupathidia.

Anomalohalacarus minutus Bartsch, 1976

Anomalohalacarus minutus Bartsch, 1976a: 659–661, figs. 32–46.

Anomalohalacarus minutus, Green and MacQuitty 1987: 66, 67, fig. 23A–E.

Short description. Length 210–287 µm. PD divided in two halves. Female genital groove masked. Male GA oviform, anteriorly narrowed, with 9–11 pairs of pgs. Rostrum short, far from reaching to end of P-2. In middle of ventral flank of tibia I one short spur and, adjacent, one short seta. Tibia II ventro-apically with a slender and a bipectinate seta, tibiae III and IV with two bipectinate setae. Telofemur II with three dorsal and zero ventral setae.

Norwegian records. Kristiansand (Artsdata-banken 2019); Tromsø (north-eastern edge of Grindöy, from sandy moderately exposed beach slope) (Schmidt 1972; Bartsch and Schmidt 1979).

Further records. North-eastern Atlantic, North Sea and the Baltic: France (Brittany), Germany (Sylt, Schilksee), England (Yorkshire) (Bartsch 1976a, 1985a).

Biology. *Anomalohalacarus minutus*, just as the other *Anomalohalacarus* species, is specialized to life within the interstitia of medium grained sediments. Most records are from tidal and shallow subtidal sandy deposits.

Remarks. At present, this is the only *Anomalohalacarus* species known from Norway but seven more species, with records from the English Channel, the Irish Sea, the North Sea (England), and Skagerrak (Sweden) (Monniot 1967; Bartsch 1985a, 1991a; Bartsch and Schmidt 1979), are likely to be found in Norwegian waters.

Genus *Bradyagaue* Newell, 1971

Diagnosis. Body slender, length about twice the width. Posterior epimeral plates enlarged, their

length equalling more than one-third of body length, opposing margins of right and left plate truncate. Gnathosoma slender. Telofemora, genua and tibiae of legs often with narrow cerotegumental layer. Tarsi III and IV curved. Tarsi II to IV with wide, bidentate median claw.

Bradyagaue alberti (Trouessart, 1902)

Halacarus (Leptospathis) alberti Trouessart, 1902: 67–68.

Bradyagaue alberti, Bartsch 1991b: 1348–1350, figs. 18–26.

Short description. Length 880 µm (female). Body slender, with dorsal plates AD, pair of OC and PD separated by rather small areas of striated integument. Opposing margins of AD and PD arched. Posterior margin of AE widely rounded. Tibia I to IV with 4, 4, 3, 3–2 ventral setae. Setae on tibiae III and IV on setigerous processes.

Norwegian records. Hopen Island, found off the south-eastern coast of Svalbard, 76°30'N, 25°27'E, 48 m, amongst pebbles and shell fragments and off northern coast of Svalbard, 80°01'N, 10°51'E, 430 m, in muddy sand; stations 970 and 1012 of the Cruise of the Yacht Princesse-Alice in 1898 and 1899 (Trouessart 1902).

Further records. None. Specimens once mentioned from the Great Meteor Seamount (Bartsch 1973a) proved to belong to *B. meteoris* Bartsch, 1991 (Bartsch 1991b).

Biology. Found in sediment samples, in muddy as well as gravelly sand from a depth of 48 and 430 m. *Bradyagaue* species are expected to live on hydrozoans (cf. Bartsch 2016b, fig. 2C); and this is also true for *B. alberti*.

Remarks. Three *Bradyagaue* species are known from the North Atlantic, namely, *B. alberti* from Svalbard, *B. meteoris* Bartsch, 1991 from the Great Meteor Seamount, ca 29°N, 28°W, 300–340 m, and *B. stocki* Bartsch, 1992 from the Cape Verde Islands, 16°35'N, 24°36'W, 1,200 m (Trouessart 1902; Bartsch 1991b, 1992). *Bradyagaue alberti* (length of female 880 µm) is larger than *B. meteoris* (length of females 545–625 µm) and *B. stocki* (length of female 595 µm), the anterior margin of the PD is arched instead of slightly tapering. Tibiae III and IV of *B. alberti* have three and two to three ventral setae, respectively, in *B. meteoris* and *B. stocki* these two segments bear four ventral setae.

Genus *Copidognathus* Trouessart, 1888

Diagnosis. Dorsal and ventral plates often panelled or with markedly porose areas, rarely

smooth. P-2 with one posterior seta. No seta on P-3. Genu I shorter than adjacent telofemur and tibia. Tibiae I and II each with three ventral and four dorsal setae, tibiae III and IV with two ventral and three dorsal setae. Tarsus I with one ventral seta and a pair of apical eupathidia. Both tarsus I and II with solenidion in dorsolateral position.

Copidognathus brevirostris K. Viets, 1927

Copidognathus brevirostris K. Viets, 1927a: 142–143, figs. 77–80.

Copidognathus brevirostris, Green and MacQuitty 1987: 78, 79, fig. 28A–D.

Short description. Length of adults 300–350 μm . Body short, width 0.7 times the length. Dorsal plates reticulated. AD with small frontal knob. Ocular plates hardly reaching the level of insertions of legs III. PD with four pairs of faintly raised costae; costae with foveae including 6–10 canaliculi. Opposing margins of AE and GA concave and convex, respectively. In males; perigenital setae arranged in a wide ring, anteriormost pgs almost reaching to anterior margin of GA. Gnathosoma and rostrum short. Rostrum hardly reaching the level of seta on P-2. Tectum with a small, short median process. Length of telofemur I 1.3–1.4 times the height. Tarsus III with four dorsal setae, the two basal ones close together; tarsus IV with three dorsal setae. Claws with pectines.

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (Herdla, Paddeholet, low water edge, from *Ascophyllum* sp. (Phaeophyta)) (K. Viets 1927a, 1928a).

Further records. Along north-eastern Atlantic coast, including the North Sea and the Baltic, from Denmark, France, Germany, the Netherlands, southern Spain (Cadiz), Sweden and the United Kingdom (K. Viets 1956; Bartsch 1976c, 2015a; Green and MacQuitty 1987; Bartsch and Smit 2006).

Biology. Most records of *Copidognathus brevirostris* are from sheltered, often slightly muddy areas. Substrata inhabited are salt marshes (*Puccinellietum*), algae (*Fucus* sp., *Ascophyllum* sp.) in sheltered bays. Records are from the lower tidal and shallow subtidal zone and from about 10–31 S‰.

Remarks. Compared to other northern Atlantic *Copidognathus* species, the ornamentation of the dorsal plates of *C. brevirostris* is weakly developed, the ventral plates are wide, especially the AE, the opposing margins of AE and GA are concave and convex, respectively, not truncate or arched.

Copidognathus brifacius Bartsch, 1989

Copidognathus brifacius Bartsch, 1989a: 320–324, figs. 1–8, 10–14.

Short description. Length of adults 447–531 μm (531 μm is the length of the Norwegian record). Dorsal plates with distinctly demarcated areolae with rosette pores; each rosette pore with fovea surrounded by 5–10 canaliculi. AD with three such areolae, pair of posterior pair circular in outline. PD with four porose costae, the median pair extending to ovate anterior margin of PD. Ventral plates reticulated, polygons with canaliculi. Rostrum extending anteriorly to, rarely slightly beyond the level of seta on P-2. Tectum truncate. Length of telofemur I 2.0 times the height. Each of the three ventral setae on tibia I arising from a small setigerous process; two of the three ventral setae bipectinate, one smooth. Tarsus III with four, tarsus IV with three dorsal setae. Pectines of claws with numerous delicate tines.

Norwegian records. Bergen (Tellnes pier—coll. H. Ringvold). A *Copidognathus* protonymph recorded from Tromsø (Bartsch 1978a), from the northern part of Grindøy, proved to be a *C. brifacius*.

Further records: North Sea: Germany, Sweden (Skagerrak), the United Kingdom (England, Robin Hood Bay—coll. C. Poizat; unpublished record); the Baltic: Germany (Bartsch 1989a, 1991a).

Biology. Inhabiting subtidal sandy deposits and their epifauna and flora. Records are from 5 to 55 m depth.

Copidognathus brifacius is one of the hosts of the suctorian *Praethecacinetia halacari* (Schulz, 1933) which is commonly found on halacarids (Schulz 1933a; Chatterjee *et al.* 2018). The protonymph from Tromsø proved to be infested, also *C. brifacius* collected in the Skagerrak area (Bartsch 1989a, Dovgal *et al.* 2009 Chatterjee *et al.* 2018) and individuals from the Baltic (Stolper Bank; unpublished record).

Remarks. Very similar to *C. fabricii* (Lohmann, 1889). The two species are of almost the same size, their plates have similar porose areolae and the ventral setae on tibia I arise from small setigerous processes. Distinguishing characters are mentioned at the end of the presentation of *C. fabricii*.

Copidognathus fabricii (Lohmann, 1889)

Halacarus fabricii Lohmann, 1889: 347–350, pl. 6, figs. 1, 4, 9, 21, 22, 38, pl. 7, figs. 74, 75, 81, 82, 84, 85, pl. 8, 95, 96–98, 100.

Copidognathus fabriciusi, K. Viets 1927b: 26, 27, figs. 2, 62–65, 91A, B, 92, 105, 106.

Copidognathus fabricii, K. Viets 1936: 552, fig. 647a–c; Green and MacQuitty 1987: 82, 83, fig. 28A–D; Bartsch 1989a: 323–324, figs. 15–22.

Short description. Length 430–550 µm. Dorsal plates with slightly raised areolae with foveae at the surface and delicate canaliculi in deeper integumental layers. AD with three such areolae. PD with four areolae in form of costae; these generally two pores wide and not reaching to anterior margin of PD. PD oviform. Parts of ventral plates porose, surface reticulated; porosity absent within transverse area in anterior part of female and male GA. Rostrum extending anteriorly just beyond level of seta on P-2. Tectum truncate. Length of telofemur I 2.0–2.2 times the height. On tibia I one of three ventral setae smooth, two bipectinate; each one of setae arising from a small setigerous process. Both tarsus III and IV with four dorsal setae and each basal seta removed from following apical setae. Pectines of claws with about 10 coarse tines.

Norwegian records. Kristiansand (Artsdatabanken 2019; Bergen (Turøy, Osund/Kvernepollen, Herdla shoreline, Hatte Sund)) (K. Viets 1928a).

Further records. North-eastern Atlantic, from the Cape Verde Islands to Iceland, from North Sea, the Baltic and the Mediterranean (K. Viets 1956; Motaş 1961).

An individual similar to *Copidognathus fabricii* had been extracted from sandy deposits in 5 m depth, Mudderbugten, Nuuk, Diskö, Greenland—coll. R.M. Kristensen; unpublished record.

Biology. Inhabitant of lower tidal and subtidal substrata, namely, sandy deposits, algae and colonial organisms.

Remarks. *Copidognathus fabricii* is in size as well as in the outline and ornamentation of the plates very similar to *C. brifacius*. Distinguishing characters are: in *C. brifacius* the pectines on the claws bear numerous delicate tines and tarsus IV has three dorsal setae.

Copidognathus fabricii is often infested by the suctorian *Thecacinetia calix* (Schröder 1907) (Bartsch 1989a; Dovgal *et al.* 2009).

Copidognathus latus K. Viets, 1927

Copidognathus latus K. Viets, 1927a: 140–142, figs. 74–76a–c.

Short description. Length 505 µm. Dorsal plates with slightly raised porose areolae. AD with three such areolae, PD with four longitudinal areolae (costae), medial costae in anterior part about

two rosette pores wide, in posterior part three to four pores wide. Medial costae extending to anterior margin of PD. AD slightly protruding. OC hardly reaching the level of insertions of legs III. Outline of PD ovate. Rostrum longer than basal part of gnathosoma and slightly extending beyond apical end of P-2. Legs slender. Telofemur I 2.5 times longer than high. Tibiae I and II with three ventral bristles, on tibia I one of bristles smooth, the other two slender (no pectination mentioned in the description), on tibia II one seta smooth, two faintly pectinate. Pectines of claws with delicate tines.

Norwegian record. Bergen (Rylands Sund) (K. Viets 1927a, 1928a).

Further records. Unproven records are from Denmark (Hagerman 1966) and Russia (White Sea) (Sokolov 1952; Krivolutsky and Antsiferova 2008).

Biology. The Norwegian record is from a depth of 20 m, from sediment inhabited by sea cucumbers (*Cucumaria* sp.) and brown algae (*Desmarestia* sp.).

Remarks. Unfortunately in the type material (slide-mounted in glycerine jelly and stored in the Zoological Museum, Hamburg, CENAK) the black sealing agent has penetrated into the mounting medium, masking large parts of the mite.

Copidognathus latus shows an overall similarity to *C. brifacius* and *C. fabricii* but in the two last mentioned species the ventral setae of tibiae I arise from small setigerous processes, such processes are not mentioned in the description of *C. latus*. Moreover, in *C. brifacius* and *C. fabricii* the rostrum and telofemora III and IV are somewhat shorter than in *C. latus*. New material from the type locality may allow a reliable description.

Copidognathus oculatus (Hodge, 1863)

Halacarus oculatus Hodge, 1863: 300–301, pl. 16, fig. 8.

Copidognathus oculatus, Bartsch 1977a: 2–4, figs. 1–11; Green and MacQuitty 1987: 96, 97, fig. 37A–E.

Short description. Length of idiosoma 270–322 µm. Colour of integument slightly and uniformly brown. Porose areolae of dorsal plates with rosette pores. Middle of AD with a transverse, porose areola. Pair of costae on PD about three rosette pores wide. Anterior margin of AD slightly tricuspid. OC elongate, its posterior tail-like part distinctly extending beyond insertion of leg III. Opposing margins of ventral plates AE and GA truncate. Male GA with papilla posterior to GO and perigenital setae arranged in a dense ring around GO. Rostrum not

reaching to end of P-2. Tectum with triangular process. Telo-femur I short, length:height ratio 1.4–1.5:1. Tarsus III with four dorsal setae, the basal ones distinctly separated; tarsus IV with three dorsal setae. Claws with distinct tines.

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (Bognestrømmen, 25 m, and Osund/Kvernepollen, low water edge) (K. Viets 1928a).

Further records. Widespread in the north-eastern Atlantic, from Norway (Bergen) to northern Spain (the Bay of Santander), the Mediterranean (France, Italy) (K. Viets 1956; Bartsch 1985a; Green and MacQuitty 1987; Somerfield 1991; Riesgo *et al.* 2010), North Sea and the Baltic, in the latter basin as far as to Estonia (Järvekülg 1965). The identity of records from the Black Sea is in need of verification (cf. Bartsch 2001b). Durucan (2019a) mentioned *C. oculatus* from the Turkish Mediterranean coast, but the characters presented in the description and illustrations (Durucan 2019a: 200, fig. 10) do not agree with that nowadays accepted as valid for *C. oculatus*. The specimens studied by Durucan are smaller (212–237 µm long), fig. 10A does not show the large ovate area on the AD, neither the unusual width of the porose costae on the PD; telofemur I (fig. 10G) seems to be slenderer. Unfortunately, the posterior part of the male GA (fig. 10C) is not illustrated.

Biology. Most records are from subtidal habitats, from the surface of sandy deposits, amongst hapteres and algal turfs (Bartsch 1979a and personal observations). There are no records from low saline brackish water.

Remarks. Another species, namely *C. latisetus*, known from the North Atlantic, shares with *C. oculatus* the characters such as: middle of AD with a transverse, porose areola, OC with posterior tail-like part extending beyond level of insertion of leg III, male GA with papilla posterior to GO and perigenital setae arranged in a dense ring around GO, and tectum with triangular process. Differences between these two species are: *C. latisetus* is smaller (248–285 µm), slenderer, the median transverse areola on the AD is smaller, the rostrum longer, it reaches to the end of P-2, and the telofemora I are slenderer (height:length 1.7–1.9:1) than in *C. oculatus*.

Copidognathus reticulatus (Trouessart, 1893)
Halacarus reticulatus Trouessart, 1893: 262, 263, fig. 30A–C; 1894b: 197–199, fig. 3A–C.

Copidognathus reticulatus, Green and MacQuitty 1987: 100, 101, fig. 39A–D.

Short description. Length 275–421 µm. Dorsal plates reticulated. AD slender, its anterior margin with small triangular process; plate with slightly raised gable-like or arched area, posterior ‘legs’ of gable two polygons wide; walls of polygons slightly wider than of those outside gable-like area. OC short, length:width 1.8:1; reaching posteriad to the level of insertion of leg III. PD with pair of medial and pair of delicate lateral costae. Costae recognizable because of their wider walls of polygons. Pair of ds-2 in striated integument between AD and OC. Major parts of ventral plates faintly punctate, marginal parts reticulate. Opposing margins of AE and GA truncate. Ovipositor extending beyond GO by a length equalling 0.6 times length of GO. Males with 10–12 pairs of pgs rather closely arranged around GO. Rostrum reaching to seta on P-2. Distal half of telofemur I with small ventral lamella. Telo-femora, genua and tibiae with short articular membranes. Length:height ratio of telofemur I 2.3:1, its lateral flank reticulated. Tibiae I and II ventrally each with one smooth and two bipectinate setae, on tibia II the basal one of bipectinate setae almost level with smooth ventral seta, hence bipectinated setae situated close together. Tarsus III with four dorsal setae; basal seta distinctly removed from dorsal fossary seta. Tarsus IV with three to four dorsal setae; several individuals with unilateral differences in the number of setae. Pectines of claws with numerous delicate tines.

Norwegian records. Kristiansand (Artsdatabanken 2019); Tromsø (Grindøy); Finmark (Gamvik); Svalbard (Longyearbyen, 78°13'N, 15°40'E and Sorgfjord—Baie Treurenberg, 79°58'E, 16°52'E, 22 m depth) (Trouessart 1902; Bartsch 1978a).

Further records. Northern Atlantic: Greenland, northern Iceland, Russia (the White Sea), Spain, the United Kingdom (the Isle of Man, Northern Ireland) (Trouessart 1902; Green and MacQuitty 1987; Somerfield 1988; Bartsch 2009; Krivolutsky and Antsiferova 2008; Riesgo *et al.* 2010). If the species *C. gorbunovi* Sokolov, 1946 turns out to be a junior synonym of *C. reticulatus*, the record from Franz Josef Land (Sokolov 1946) will have to be added to this list.

Biology. Most records are from just below the lower tidal fringe to about a 50 m depth, here the mites had been extracted from brown and red algae (*Fucus* sp., *Laminaria* sp., corallines) and from tunicates. Marine.

Remarks. Four species from the northern Atlantic are similar in general shape and have a gable-like raised area on the AD, namely, *Copidognathus gorbunovi*, *C. loricifer* André, 1946, *C. poucheti* Trouessart, 1893, and *C. reticulatus*. The two costae on the PD of *C. poucheti* are posteriorly fused, U-shaped (Trouessart 1893), in the other just mentioned species the costae are separated throughout their length. In *C. loricifer*, the gnathosoma has three pairs of maxillary setae (André 1946) and the basal one of the three ventral setae on tibia I is spiniform; the other three species have two pairs of maxillary setae and the basal ventral seta on tibia I is bristle-like (bipectinate). *Copidognathus gorbunovi* and *C. reticulatus* are similar in characters such as outline and ornamentation of the plates, shape of the gnathosoma and legs, and in both species the distal half of telofemur I has a small ventral lamella. Further studies may prove *C. gorbunovi* to be a junior synonym of *C. reticulatus*.

Copidognathus rhodostigma (Gosse, 1855)

Halacarus rhodostigma Gosse, 1855a: 27, pl. 3, figs. 1–5.

Halacarus (Copidognathus) rhodostigma, Trouessart 1894a: 172.

Copidognathus rhodostigma, K. Viets 1927a: 136; Bartsch 1979b: 221–223, figs. 15–23; Green and MacQuitty 1987: 102, fig. 40A–D.

Short description. Length of adults 318–379 µm. AD with slightly raised porose areolae; anteromedian one and pair of ovate ones more or less contiguous; fourth transverse area along posterior margin of plate. PD with four pairs of slightly raised costae; two costae of each side often anteriorly fused. Ventral plates marginally with porose foveae, towards median part only a few small pores present. Opposing margins of AE and GA truncate. Rostrum shorter than gnathosomal base, not reaching to the level of seta on P-2, only to middle of P-2. Telofemora I and II with porose foveae. Telofemur I 1.7 times longer than high; its ventral margin with pair of costae; these rarely straight, generally slightly bulging. Tibiae I and II each with two bipectinate and one slender, smooth seta; tibia III and IV each with one bipectinate and one slender, smooth seta. Tarsus IV with three dorsal setae. Pectines of claws on tarsi III to IV with numerous delicate tines.

Norwegian records. Bergen (Tellnes Pier—coll. H. Ringvold), from 15 m depth. New record for Norway.

Further records. Along the coasts of the North-eastern Atlantic: Eire, France, Denmark, the United Kingdom (England, Northern Ireland, Scotland, Wales), Germany, Spain, Sweden; the Mediterranean (K. Viets 1956; Bartsch 1979a, 1985a, b, 1991a; Green and MacQuitty 1987; Somerfield 1988, 1991; Riesgo *et al.* 2010; Carriglio 2010). Black Sea records are in need of verification (Bartsch 2001b).

Biology. Inhabitant of the surface layer of sandy deposits, with or without algae. Commonly found in subtidal areas, from just below the low water edge to more than 50 m depth. Rarely extracted from tidal beaches (Bartsch 1979a, 1985a, b).

Remarks. *Copidognathus rhodostigma* has a very short rostrum, it reaches to the middle of P-2; in most of the other *Copidognathus* species the rostrum extends beyond this line.

Copidognathus richardi (Trouessart, 1902)

Halacarus richardi Trouessart, 1902: 69, 70.

Copidognathus richardi, Bartsch 1983a: 285–288, figs. 1–9; 1991b: 1347–1348, figs. 16 and 17.

Short description. Length 550–570 µm. Dorsal plates with raised areolae, surface of these areolae with rosette pores, i.e. foveae at the surface and few delicate canaliculi in deeper layers. AD short, almost rectangular, with rounded anterior and dumbbell-like median areola. PD with two pairs of costae. OC with two corneae. Ventral plates with demarcated areolae with rosette pores. Females with anterior pair of the three pairs of pgs close to anterior margin of GA. Male GA with 47 perigenital setae densely arranged around GO. In female interval between anterior margin of GO and that of GA equalling length of GO, in males more than length of GO. Rostrum extending just beyond tip of P-2. Gnathosoma of males with three pairs of maxillary setae, two pairs on gnathosomal base, one pair on rostrum. Telofemur I slender, its length:height ratio 2.4:1. Three ventral setae of tibia I slender, on tibia II one seta widened and bipectinate, two slender, on tibiae III and IV both ventral setae slender. Each of medial and lateral articular membranes of tibiae with delicate lamellar dent. Tarsi III and IV with three dorsal setae. All claws with pectines.

Norwegian record. Southeast of Svalbard, near Hopen Island, 76°30'N, 25°27'E, 48 m, pebbles and shell fragments, and north of Svalbard, 80°01'N, 10°51'E, 430 m, muddy sand (Trouessart 1902).

Further records. Azores, from a depth of 599 m (Trouessart 1902).

Biology. Most records are from tidal and shallow subtidal zones.

Remarks. *Copidognathus richardi* is similar to *C. granulatus* (Hodge, 1863). According to Bartsch (1991b) there is a difference in the length of the idiosoma, namely 550–570 µm (*C. richardi*) vs. 425–460 µm (*C. granulatus*) and the shape of the ventral setae on the tibiae, namely on tibia I all three setae smooth and similar in length vs. one of ventromedial setae short and bipectinate. New material from the type localities of the two species is needed for a detailed examination of morphological characters, this may either give more reliable distinguishing characters or prove *C. richardi* to be a junior synonym of *C. granulatus*.

Genus *Halacarellus* K. Viets, 1927

Diagnosis. Dorsal plates lack conspicuous porose areolae. P-2 with one distodorsal seta. Third palpal segment with medial spur or short seta. Genu I shorter than adjacent segment. Tarsus I with one, rarely two ventral spurs or setae. Tarsi I and II each with three dorsal setae; solenidion on tarsus I in dorsolateral, on tarsus II in dorsomedial position.

Halacarellus balticus (Lohmann, 1889)

Halacarus balticus Lohmann, 1889: 341, 342, pl. 6, fig. 40, pl. 8, figs. 108, 119, 120, 123.

Halacarellus balticus, K. Viets 1927a: 120.

Thalassarachna baltica, Green and MacQuitty 1987: 118, 119, figs. 47A–E.

Short description. Length of females 553–800 µm, of males 575–715 µm. Major parts of dorsal plates with foveate or reticulate ornamentation, raised areas punctate, these present on arched median part of AD and on pair of costae of PD. Dorsal plates of females and males similar in outline. Anterior and posterior margin of AD truncate, anterior margin of PD ovate. Length of PD less than twice that of AD. Male GA larger than female GA. Distance between GO and anterior margin of GA in females about half length of GO; in males that distance somewhat more than length of GO. Length of gnathosoma about one-third of that of idiosoma. Rostrum shorter than gnathosomal base. Telofemur I with one ventral seta. Tibia I generally with eight ventral setae, rarely with four (cf. Bartsch 1972: fig. 22F), six, seven or nine setae. Two or three of these ventral setae short, spur-like, the other bristle-like. Claws with J-shaped pectines.

Norwegian records. Stavanger (Lysebotn—coll. H. Ringvold); Bergen, low water edge: (Røyr-

vik/Tørvikbygda, Håkonshella, Nordheimsund, Bjelkarvågen, Nordnes, Lindås—coll. H. Ringvold); Turøy, Kvernepollen, Herdla/Paddeholet, Sjatien ved Kalsøy, Hatte Sund, Stensund; bottom samples, 20 m depth: Rylands Sund and Rosland Vaag (K. Viets 1928a).

Further records. North-western Atlantic: Greenland (Godhavn), Canada (New Brunswick), the United States (from Massachusetts to New York); North-eastern Atlantic: Denmark, Eire (east, south, west coast), France, Germany, Russia (the Barents Sea and the White Sea), Spain, Sweden (Öresund), the United Kingdom (England, Outer Hebrides, Scotland, Wales); the Baltic: Denmark, Estonia, Finland, Germany, Latvia, Poland (Lohmann 1889; Newell 1947; K. Viets 1956; Bazan-Strzlecka 1972; Bartsch 1972, 1982; Jarvekjul 1979; Pugh and King 1985; Green and MacQuitty 1987; Riesgo *et al.* 2010; Krivolutsky and Antsiferova 2008).

Biology. *Halacarellus balticus* lives in various habitats and sea levels. The species has been taken from middle, lower and subtidal colonies of bryozoans, hydrozoans, barnacles and bivalves, from salt marshes and green and brown algae which held (almost) no bryozoans or hydrozoans, from areas exposed to swell but also from sheltered ones (Bartsch 1972, 1978c, 1982). *Halacarellus balticus* has been found in a salinity range from about 3 to 31‰. In general, it is carnivorous, though rarely, it also feeds on algae (Bartsch 1974a).

A juvenile specimen was infested with the suctorian *Thecacinetia calix*.

Remarks. In contrast to the other *Halacarellus* species mentioned from Norway (cf. below), the PD of *H. balticus* is rather short, its length is less than twice that of AD (vs. being at least or distinctly more than twice that length).

Halacarellus petiti Angelier, 1950, as yet not found in Norway, is slightly smaller than *H. balticus* but the two species are similar in the general shape of the idiosoma, plates and legs. Distinguishing characters are given in Bartsch (1976b) and Green and MacQuitty (1987). According to present data (Angelier 1950; Bartsch 1979a), *H. petiti* has been found in constantly low saline habitats (2–16‰) but also in ones with enormously fluctuating salinity (1‰ at low, 30‰ at high tide).

Halacarellus capuzinus (Lohmann, 1893)

Halacarus capuzinus Lohmann, 1893a: 199–201, figs. 1–5.

Halacarellus capuzinus, Schulz 1933b: 98, 99, figs. 4, 5; Bartsch 1972: 205–209, figs. 25A–L. *Halacarellus (Thalassarachna) capuzinus*, Newell 1947: 118–123, figs. 179–191.

Thalassarachna capuzina, Green and MacQuitty 1987: 122–123, figs. 49A–D.

Short description. Length 250–367 μm . AD with short frontal process. Dorsum with four plates and three pairs of small sclerites bearing dorsal setae. Gnathosoma about 1.3–1.5 times longer than wide. Rostrum short, extending to but not beyond level of seta on P-2. Tibia I ventrally with two spur-like and three slender smooth setae, tibiae II to IV ventrally each with one slender and two coarsely bipectinate setae.

Norwegian records. Bergen (Grønevika, Sandholna by swing—coll. H. Ringvold); Tromsø (Kvaløy, southern and north-eastern edges of Grindøy), sandy deposits on slope of beach (Schmidt 1972; Bartsch and Schmidt 1979).

Further records. Western North Atlantic: Canada (New Brunswick), the United States (from Massachusetts to Connecticut); Eastern North Atlantic: Eire, France, the United Kingdom (Northern Ireland, Scotland, Wales); the North Sea, the Baltic (as far as Poland and northern Sweden) (Bartsch 2017).

Biology. Inhabitant of sandy or turfy deposits, also extracted from brown algae (*Fucus*). Salinity ranges from 1 to about 30‰. An individual (female) from Sandholna was inhabited by a suctorian (*Thecacineta* sp.).

Remarks. *Halacarellus capuzinus* belongs to the *capuzinus* group (cf. Bartsch 1997a, 2017). Distinguishing characters of the Norwegian species are given in Remarks added to *Halacarellus subcrispus*.

Halacarellus floridearum (Lohmann, 1889)

Halacarus floridearum Lohmann, 1889: 340–341, pl. 6, fig. 41, pl. 8, figs. 111, 112, 114–116.

Halacarellus floridearum, Bartsch 2017: 74–76, 79–80, figs. 2A–G, 3A–D.

Halacarus (Halacarellus) bergensis K. Viets, 1927a: 219–131, figs. 61–66.

Short description. Length 402–555 μm . Dorsum with AD, pair of OC and PD but without small dorsal sclerites. Anterior margin of AD truncate. Gnathosoma 1.5–1.7 times longer than wide. Legs slender, their length less than that of idiosoma. Tibia I with (5–)6(–7) setae, two basal setae spur-like. Tibiae II to IV ventrally with one smooth seta and 2, 3, 2 bipectinate setae, respectively.

Norwegian records. Bergen (Osund/Kvernepollen, Sjatien, Rosland Vaag, from low water edge) (K. Viets 1927a, 1928a); Tromsø (Bartsch 1978a; Bartsch and Schmidt 1979); Finmark (Gamvik) (Bartsch 2017).

Further records. Spread in the western and eastern North Atlantic and the White Sea. North Atlantic records are from Greenland, Norway and Russia, North Sea records from the Netherlands, and the Baltic ones come from Germany, Poland, Estonia (cf. Bartsch 2017). A record from the Mediterranean (Carriglio 2010) is in need of verification.

Biology. Found amongst algae (*Enteromorpha*, *Fucus*, *Ascophyllum*, *Laminaria* with bryozoans), vascular plants (*Zostera*) and sediments which were extracted from the lower tidal to subtidal (160 m) zone (K. Viets 1928a; Bartsch and Schmidt 1979). Also found in the mantle cavity of bivalves (Krapivin 2012).

Remarks. This is a species of the *capuzinus* group; distinguishing characters of this group are discussed within the Remarks added to *Halacarellus subcrispus*.

Halacarellus procerus K. Viets, 1927

Halacarus (Halacarellus) procerus K. Viets, 1927a: 127–129, figs. 57–60.

Halacarellus procerus, Bartsch 1976b: 103, figs. 10–23; 2017: 80–81, fig. 3F.

Thalassarachna procera, Green and MacQuitty 1987: 126–127, fig. 51A–D.

Short description. Length (350?) 372–496 μm . Dorsum with AD, pair of OC, PD and three pairs of minute sclerites, each sclerite with one of dorsal setae ds-2, ds-3 and ds-4. Length of gnathosoma 1.4–1.6 times the width. Rostrum extending to the level of seta on P-2. Tibia I with 8 ventral setae, tibiae II to IV with three setae each; 2, 2, 2 of these setae bipectinate, 1, 1, 1 setae smooth and slender. Tarsus I of *H. procerus* with two spur-like ventral setae.

Norwegian record. Tromsø (Kvaløy, south-western edge of Grindøy) (Bartsch and Schmidt 1979).

Further records. Widespread in the North Atlantic. Records from the north-western Atlantic are from the United States (Massachusetts), those from the north-eastern Atlantic, including the North Sea, the Baltic, and the Black Sea, are from the Azores, Denmark, Eire (Dublin, West Cork), France (English Channel), Germany (North Sea and the Baltic), Romania, Spain (La Coruña), Sweden (Öresund?), and the United Kingdom (Northern Ireland, Strangford Narrows) (Bartsch 1989a, 2017).

Biology. Inhabitant of tidal and shallow subtidal sediment. Most abundant in the middle and lower slope of a beach. Salinity ranges from 7 to 32‰.

Remarks. Unique in *Halacarellus procerus* are the two spur-like ventral setae on tarsus I, all other northern *Halacarellus* species have a single spur-like seta.

Halacarellus procerus belongs to the *capuzinus* group; additional distinguishing characters are added to the Remarks after the description of *H. subcrispus*.

Halacarellus subcrispus Bartsch, 1978

Halacarellus subcrispus Bartsch, 1978a: 10–14, figs. 10–24, Bartsch 2017: 82.

Short description. Length 407–478 µm. Idiosoma slender. Surface of dorsal plates almost smooth. Setae ds-2, ds-3 and ds-4 arising from small sclerites. Gnathosoma slender, rostrum not reaching to the level of end of P-2. Tibia I ventrally with seven setae, two of these spur-like, five bristle-like. Tibiae II to IV each with three ventral setae, two bipectinate, one slightly longer and slender.

Norwegian records. Tromsø (Kvaløy, Grindøy) and Svalbard (Longyearbyen, Ny Ålesund) (Bartsch 1978a; Bartsch and Schmidt 1979).

Further records. Western Greenland near-shore in almost fresh water (Bartsch 2017).

Biology. Extracted from tidal and shallow water sandy deposits, from lower to mean high water level (Bartsch and Schmidt 1979). Supposed salinity range is from almost fresh to about 32‰.

Remarks. *Halacarellus capuzinus*, *H. floridearum*, *H. procerus* and *H. subcrispus* belong to the *H. capuzinus* group (Bartsch 2017). *Halacarellus capuzinus* is the smallest one, *H. floridearum* lacks the pairs of small dorsal sclerites while *H. procerus* and *H. subcrispus* both have these three pairs of sclerites. Another distinguishing character is the number of ventral setae on tibia I, eight in *H. procerus* but seven in *H. subcrispus*.

Halacarellus subterraneus Schulz, 1933

Halacarellus subterraneus Schulz, 1933b: 100, 101, figs. 7–10; Bartsch 1998: 168–170, figs. 107–117.

Halacarus (Thalassarachna) subterraneus, Newell 1947: 112–118, figs. 168–178.

Thalassarachna subterranea, Green and MacQuitty 1987: 132, 133, fig. 54A–D.

Short description. Length 425–570 µm. Dorsal plates with slightly foveate ornamentation. Anterior margin of AD as well as opposing margins

of AD and PD truncate. PD almost three times longer than AD. Each OC with two gland pores in lateral margin. Pair of elongate sclerites between PD and PE. Rostrum with both pairs of maxillary setae and extending to about end of P-2. Telofemur I with three stout ventral spines, these spines increasing in length from basal to apical, from 25 to almost 40 µm. Tibiae I to IV with 8, 6, 4, 4 ventral setae. Claws II to IV pectinated.

Norwegian records. Bergen (Bjelkarvågen, end of road—coll. H. Ringvold); Tromsø (Kvaløy, Grindøy); Svalbard (Bartsch and Schmidt 1979).

Further records. Widespread in the North Atlantic. Western Atlantic records are from the United States (Rhode Island and Connecticut); eastern Atlantic ones are from Eire, France, Germany, the United Kingdom (England, Wales), Russia (the White Sea), and Sweden), further records are from the Baltic (Germany, Sweden) and the Black Sea (Bulgaria, Ukraine) (Schulz 1933b; Newell 1947; Dahl and Wieser 1955; Bilio 1966; Bartsch 1972, 1979a, c, 1982, 1998; Pugh and King 1985; Green and MacQuitty 1987; Somerfield 1991; Krivolutsky and Antsiferova 2008).

Biology. Inhabitant of sandy deposits in the mid- and upper tidal area of beaches, also commonly found in salt marshes. Several records are from almost fresh nearshore groundwater, from just above the groundwater level (Bartsch 1972, 1974a). In beaches from near Tromsø (Grindøy), it proved to be the dominant halacarid species (Bartsch and Schmidt 1979). Collected within a salinity range from 1–30‰ (Bilio 1966; Brinck *et al.* 1955; Bartsch 1972, 1998; Bartsch and Schmidt 1979).

Remarks. Adults of *Halacarellus subterraneus* are characterized by the three stout ventral spines on telofemur I. Another two *Halacarellus* species are known to have three stout spines, namely, *H. arenarius* Bartsch, 1979 and *H. phreaticus* Petrova, 1972. *Halacarellus arenarius* is a species of the north-western Atlantic and *H. phreaticus* is only known from the Mediterranean and the Black Sea freshwater zones, even as far as 120 km away from the sea shore (Petrova 1972; Bartsch 1979c; Morselli and Mari 1986; Galassi *et al.* 2009).

Genus *Halacarus* Gosse, 1855

Diagnosis. AD present, OC and PD distinct, reduced to small platelets or even absent. Plates smooth or faintly reticulated and with prominent costae or porose areolae. Majority of species with five pairs of gland pores. Second palpal segment

with two setae in its posterior half. Third palpal segment with medial spur. Tibia, genu and telofemur I almost equal in length. Tibia I with four ventral spines, these tapering or with a blunt tip. Solenidion and famulus on tarsus I generally rather equal in length. Solenidion on tarsus II in dorsomedial position.

Halacarus bisulcus K. Viets, 1927

Halacarus bisulcus K. Viets, 1927a: 118–120, figs. 45–47.

Halacarus bisulcus, Weinstein 1961: 208–212, figs. I A–F, II P1–P4, C; Bartsch 1980: 39, figs. 16–20; Green and MacQuitty 1987: 112–113, fig. 45 A–D.

Short description. Length 435–537 μm . Integument on plates and legs with delicate epicuticular striae. AD with frontal spine. OC very small, posteriad not extending to glp-3. Female PD shorter than male PD; in both, PD anteriad not reaching the level of glp-4. Female GA with two pairs of pgs and a pair of bean-shaped areas with raised cerotegument. Male with about 35 pgs closely arranged around GO and three to four pairs of outlying pgs. Telofemur I with one slender, tapering and one short, bluntly ending spine. Genu and tibia I with one and two pairs of smooth, tapering spines, respectively. Tarsus I with two bristle-like ventral setae, tarsi III and IV with pair of pas but no further ventral setae.

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (Herdla Sund, sandy deposits rich in shell, 10 m depth) (K. Viets 1927a, 1928a).

Further records. North-eastern Atlantic and North Sea: Eire, Faeroe Islands, France, Germany, Iceland, Sweden, the United Kingdom (England, Northern Ireland). The Mediterranean: France, Italy (Weinstein 1961; Motaş 1961; Morselli and Mari 1985; Bartsch 1979a, 1991a; Green and MacQuitty 1987; Somerfield 1991; Carriglio 2000). A record from the Mediterranean coast of Turkey (Durucan 2019b) seems to be not one of *H. bisulcus*. The individuals are smaller (females 349–350 μm) than elsewhere documented and the PD includes and extends anteriad beyond the glp-4 (Durucan 2019b: fig. 5A) whereas in *H. bisulcus* the glp-4 are in the striated integument and the PD does not reach that far. The OC of *H. bisulcus* have no cornea. Durucan (2019b: 273, lines 3 and 16) mentioned both character states, namely OC with and without cornea. The *Halacarus* species described by Durucan (2019b) may be a *H. subtilis* K. Viets, 1940.

Biology. Inhabitant of coarse lower tidal and subtidal sediment and Maërl as well as algae and colonial organisms (Weinstein 1961; Bartsch 1980). Present records are from the lower tidal fringe to about a depth of 40 m. There are no records from brackish water areas (<28‰).

Remarks. At least three North-eastern Atlantic *Halacarus* species are expected to inhabit shallow water areas (<200 m) of the Norwegian Exclusive Economic Zone, namely *H. bisulcus*, *H. actenos* Trouessart, 1889, and *H. borealis* Trouessart, 1893 (Trouessart 1889a, 1893; K. Viets 1927a), though at present, there are no records of the two last mentioned species. *Halacarus actenos* has an AD, a pair of small OC, but no PD. OC and PD of *H. borealis* are larger than in *H. bisulcus*, the plates include glp-3 and glp-4. *Halacarus borealis* is similar to *H. ctenopus* Gosse, 1855, a species which is expected to be restricted to the western Atlantic (Bartsch 2009).

Genus *Isobactrus* Newell, 1947

Diagnosis. Plates with delicate, rather uniform ornamentation. Each OC with two gland pores. Epimeral plates small, EI and EII as well as EIII and EIV partly divided. Epimera I and II widely separated in the midline, not fused to AE. In females, GO within striated integument, not on a distinct genital plate. In males, GO on a distinct genital plate. Gnathosoma short, at ventral aspect almost triangular, at dorsal aspect partly or completely concealed by anterior part of idiosoma. Genua of all legs shorter than telofemora and tibiae. Tibiae I and II with pair of ventral setae, tibiae III and IV with one to two such setae. All tarsi lack ventral setae. Solenidia on both tarsus I and II small, clavate and in dorsolateral position.

Biology. Species of this genus are algivorous. In non-tidal basins they live close to the water line, in areas with a regular tide in the tidal zone. Most, but not all species seem to be restricted to the upper tidal belt exposed to long periods of desiccations. Inhabitants of small green algae (*Enteromorpha*, *Blidingia*, *Monostroma*) and delicate green algal films on macrofauna and -flora.

Isobactrus hartmanni Bartsch, 1972

Isobactrus hartmanni Bartsch, 1972: 193–196, figs. 20A–G, 21A–D.

Isobactrus hartmanni, Bartsch 1975a: 66, figs. 64–67.

Short description. Length of females 310–445 μm , of males 290–378 μm . AD slightly longer

than wide. Dorsal plates reticulated. Pair of glp-1 distinctly anterior to ds-1. Distance between ds-1 smaller than that between ds-1 and margin of plate. Anterior margin of PD semi-circular. Epimeral plate III without setae but pair of setae present in adjacent striated integument. Tarsi I to IV with 4, 4, 4, 3 dorsal setae; on all tarsi dorsal fossary seta long, extending beyond claws. Claws with about six apical tines.

Norwegian records. Stavanger (Lysebotn, Vike-dal camping—coll. H. Ringvold); Bergen (Røyrvik, Nordnes, Eidsvågneset—coll. H. Ringvold); new records for Norway.

Further records. North-western Atlantic: the United States (Rhode Island), North-eastern Atlantic: France; the North Sea and the Baltic: Denmark (Öresund), Germany (Bartsch 1972, 1975a, 1979c).

Biology. The species can be found in rather large numbers amongst brown algae (*Ascophyllum* sp., *Fucus* sp. and *Pelvetia* sp.), green algae and barnacles in the middle and upper tidal area; especially if these substrata are regularly desiccated due to exposure to the sun. Present also in the lower tidal area on pebbles and shells with delicate green algae (Bartsch 1972, 1978c, 1982). Found within a salinity range of about 18 to 31‰.

Remarks. With its claws, apically bearing a few tines, *I. hartmanni* is most similar to *I. setosus*. Morphological differences are: the AD of *I. hartmanni* is distinctly longer than wide and the setae generally situated on EIII and IV are within the striated integument whereas in *I. setosus* the AD is wider than long and EIII and EIV each bear one ventral seta.

If experienced, the two species can be separated at low magnification (25×) on the basis of an arched (*I. hartmanni*) vs. somewhat pointed, triangular (*I. setosus*) frontal margin of the AD.

Isobactrus levis (K. Viets, 1927)

Rhombognathus levis K. Viets, 1927a: 103–105, figs. 19–22.

Isobactrus levis, Newell 1947: 74–77, figs. 71–73; Bartsch 1975a: 64, 65, figs. 62, 63; Green and MacQuitty 1987: 22, 23, figs. 5A–D.

Short description. Length of females 316–372 µm, of males 304–310 µm. AD longer than wide and almost as long as PD. Distance between pair of ds-1 less than that between ds-1 and lateral margin of AD. Epimeral plates III and IV without ventral setae, these setae in striated integument. Dorsal fossary seta on tarsi I to IV duplicated and

long, distinctly extending beyond claws. Tarsal claws smooth.

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (Røyrvik—coll. H. Ringvold) and Paddeholet on Herdla (K. Viets 1928a); Svalbard (Chertoprud *et al.* 2017).

Further records. North-western Atlantic: the United States (Rhode Island, Connecticut) (Bartsch 1982). North-eastern Atlantic, Arctic Ocean, North Sea, and the Baltic: Eire, France (English Channel), Germany (Elbe and Weser estuary), Russia (White Sea, Barents Sea), Sweden (Skagerrak), the United Kingdom (England, Wales) (Sellnick 1949; Green 1956; Bartsch 1972, 1975a; Pugh and King 1985; Somerfield 1988; Krivolutsky and Antsiferova 2008). The Baltic records (Sellnick 1949) are from east and north of Stockholm, from Kalkskär (ca 58°51'N, 17°56'E) and from Tjärven (ca 59°48'N, 19°22'E).

Biology. Extracted from green and brown algae and from barnacles growing in tidal areas. Mostly taken in the upper tidal zone, but rarely in large numbers. Seems to be more common in low than in high saline areas (personal observations). Known to inhabit a salinity range from 3 (Elbe estuary, Brokdorf) to about 30‰.

Remarks. *Isobactrus levis* is the only *Isobactrus* species with a duplicated dorsal fossary seta, hence tarsi I to IV bear 5, 5, 5, 4 dorsal setae (sol-enidia included) instead of 4, 4, 4, 3 setae.

Isobactrus setosus (Lohmann, 1889)

Aletes setosus Lohmann, 1889: 326–328, pl. 6, figs. 16, 18, 47a–c, pl. 7, figs. 79, 80, pl. 9, fig. 90a, b.

Isobactrus setosus, Newell 1947: 69–74, figs. 54–70; Bartsch 1975a: 64, figs. 60, 61; 1975b: 195, fig. 4a–c; Green and MacQuitty 1987: 24, 25, figs. 6A–D.

Short description. Length of female 294–427 µm. Males not known. AD slightly wider than long; its anterior margin triangular and slightly pointed, posterior margin wide and truncate. Anterior margin of PD arched. Plates representing EIII each with one dorsal and one ventral seta, EIV with one ventral seta. Tarsi I to IV with 4, 4, 4, 3 dorsal setae. Dorsal fossary setae hardly extending beyond claw fossa. Distally widened claws with 8–9 short dents.

Norwegian records. Kristiansand (Artsdatabanken 2019); Stavanger (Jektevika—coll. H. Ringvold); Bergen (Røyrvik, Grønevika, Håkanshella, Lindås—

coll. H. Ringvold—and Osund, Herdla, Rylands Sund, Roslands Vaag) (K. Viets 1927a, 1928a).

Further records. North-western Atlantic: Canada (Quebec) (Bartsch 1997b); the United States (Massachusetts to New York). North-eastern Atlantic: from Spain to Norway and from the North Sea (Germany, Denmark; the United Kingdom) and the Baltic (as far as the Bothnian Bay, Finland) (K. Viets 1937; Bartsch 1972, 1982; Green and MacQuitty 1987).

Biology. Often found in high numbers in lower tidal areas; in non-tidal basins along the water line on green algae (*Monostroma*) as well as green algal films on *Fucus* and barnacles. Documented to inhabit a salinity range of 5 to 31‰ (Bartsch 1972).

Adult *Isobactrus setosus*, in September collected in Bergen (Håkanshella), were inhabited by the suctorian *Acineta* sp. (*A. sulcata* Dons, 1927). The one to more than 20 suctorians per mite were primarily fixed to the legs. The loricae, with several interrupted transverse ridges, were laterally compressed, the apical opening narrow. The length of the loricae varied between 35 and 73 µm, the width between 30 and 42 µm. The two bundles of tentacles, situated on actinophores, were withdrawn in the loricae. The stalks were somewhat shorter than the loricae.

Most records of *A. sulcata* are from halacarid mites (Dovgal *et al.* 2008; Chatterjee *et al.* 2018). The suctorians described by Dons (1927) had been collected on the coast line of Gibostad, and Even-skjer, in the Tjeldsund, both sites in the northern part of Norway.

Remarks. *Isobactrus setosus* is most similar to *I. hartmanni*. Distinguishing characters are mentioned above.

Isobactrus ungulatus Bartsch, 1975

Isobactrus ungulatus Bartsch, 1975a: 71, 72, figs. 105–121; Green and MacQuitty 1987: 26, 27, fig. 7A–E.

Short description. Length of females 272–334 µm, of males 260–319 µm. AD almost as long as wide, its anterior margin arched. Epimeral plates almost completely separated. EIII with one dorsal and one ventral seta, EIV with one ventral seta. Tarsi I to IV with 4, 4, 4, 3 dorsal setae. Claws apically truncate and widened, this part with 7–11 conspicuous dents.

Norwegian records. Bergen (Golten, Telavåg, Grønevika, Arboretet Sandholna, Hagenes bay,

Håkonshella/Pollen, Peak of Nordnesparken, Lindås/Leirvåg—coll. H. Ringvold). New record for Norway.

Further records. North-western Atlantic: Eire, France (Bretagne, Gironde), the United Kingdom (England, Northern Ireland, Wales); the Mediterranean (Croatia) (Bartsch 1975a, 1976c; Green and MacQuitty 1987; Somerfield 1988).

Biology. The species has been found on barnacles, green algae and lichens growing in the upper tidal zone.

Remarks. The most obvious character of *I. ungulatus* is the shape of the claws, namely the apically widened accessory process with up to 11 dents. In the other *Isobactrus* species the claws are smooth or apically slightly widened but bearing only minute dents.

A few adult *Isobactrus ungulatus* collected in August and October around Bergen (Golten, Telavåg) were infested with the suctorian *Acineta* sp. (*A. sulcata*).

Genus *Lohmannella* Trouessart, 1901

Diagnosis. Body generally flattened and rather wide. Surface of dorsal plates almost smooth, reticulated or granulated but not heavily sculptured. Gnathosoma slender, longer than wide, its length from somewhat less than half to slightly more than total length of idiosoma. Four-segmented palps in dorsal position, i.e. distance between paired P-1 generally less than width of P-1 and hence P-1 obscured in ventral aspect. P-2 with two dorsal setae. Third palpal segment with spur-like process (no spur because alveolus lacking). P-4 basally with three setae and medial spur. Genua of all legs shorter than telofemora and tibiae.

Lohmannella falcata (Hodge 1863)

Leptognathus falcatus Hodge, 1863: 302–303, pl. 16, figs. 6, 7.

Lohmannella falcata, Fountain 1953: 363–364, fig. 3; Newell 1947: 190, 191, figs. 327–330; Green and MacQuitty 1987: 140, 141, fig. 57A–D.

Short description. Length 298–501 µm. AD hexagonal. OC with two corneae. Rostrum slender, longer than gnathosomal base. P-2 slender, its length about five times the diameter of basal part and more than 10 times longer than P-3. Tibia I with six, rarely five bipectinate setae. Tarsus IV with four dorsal setae. Claws with minute accessory process.

Norwegian record. Bergen (Bjelkarvågen—coll. H. Ringvold) and Hattesund (K. Viets 1928a).

Further records. Northwestern Atlantic: Canada (New Brunswick); the United States (Rhode Island). North-eastern Atlantic and the adjacent North Sea, the Baltic and the White Sea: Denmark, Eire, Estonia, Finland, France, Germany, Iceland, Latvia, the Netherlands, Poland, Russia, Spain, Sweden, the United Kingdom (England, Northern Ireland, Scotland, Wales) (K. Viets 1956; Motaş 1961; Żmudziński 1974; Jarvekjul 1979; Green and MacQuitty 1987; Somerfield 1988; Bartsch and Smit 2006; Krivolutsky and Antsiferova 2008; Riesgo *et al.* 2010). The Mediterranean and the Black Sea: France, Italy, Monaco, Bulgaria, Crimea, Romania, Russia (Caucasian coast), Turkey, Ukraine (K. Viets 1956; Bartsch 2004a; Durucan 2018).

A deep-water record from 2,500–3,000 m and tentatively called *L. falcata* (Bartsch 1978b) is no *L. falcata* (cf. Bartsch 2003b).

Biology. Extracted from various lower tidal and subtidal substrata, often found amongst colonies of hydrozoa. Inhabiting a salinity range from about 10 to 33 ‰. A record mentioned by Svenonius (1949) from Bottenviken (Gulf of Bothnia), the Baltic, Sweden, from the 2.5–3.5 ‰, may be one of *Porolohmannella violacea* (Kramer, 1879). The latter species has commonly been found in this area (Bartsch 1989b; personal observations) and its general shape is similar to that of *L. falcata*.

Remarks. This is one of the few *Lohmannella* species with four dorsal setae on tarsi III and IV. At present, we know two northern Atlantic *Lohmannella* species with the combination: rostrum slender and four dorsal setae on tarsus III and IV, namely, *L. falcata* and *L. sulensis* (mentioned below). The majority of species have three dorsal setae on tarsus IV.

Lohmannella njoerdri Bartsch, 2020

Lohmannella njoerdri Bartsch, 2020: 278–281, figs. 1–16.

Short description. Length of idiosoma 310 µm (male). AD hexagonal, major part of PD rectangular. OC with two corneae. Gland pores vestigial. Length of gnathosoma 0.6 times that of idiosoma. Rostrum longer than gnathosomal base. Length of P-2 5.8 times the diameter. All legs shorter than idiosoma. Tibiae I with six bipectinate ventral setae. Tarsus IV with three dorsal setae. Claws very slender.

Norwegian record. Sula Ridge, 64°05'N, 8°02'E, 285 m, extracted from small pieces of *Lophelia* sp.(Scleractinia) (Bartsch 2020).

Further records. None.

Biology. The claws on the tarsi of *L. njoerdri* are slenderer and longer than in the majority of *Lohmannella* species. Slender claws often seem to be correlated with life in a soft surface ooze. An example is *Halacarus longiunguis* Police, 1909, its long claws are expected to find several stepping points and in that way prevent the mite from sinking into deeper sediment layers (Bartsch 2007b). But, in contrast to *Halacarus longiunguis*, the legs of *Lohmannella njoerdri* are short, not meant to raise the mite above the ground. The mode of life of *L. njoerdri* is not known.

Remarks. Four *Lohmannella* species have been mentioned from Norway, namely *L. falcata*, *L. njoerdri*, *L. norvegica* and *L. sulensis*. The most striking character of *L. njoerdri* is the shape of the claws; they are unusually long and slender. Other distinguishing characters are: tarsus IV of *L. falcata* and *L. sulensis* has four dorsal setae, *L. njoerdri* three setae, the rostrum of *L. norvegica* is shorter than the gnathosomal base, that of *L. njoerdri* is longer.

Lohmannella norvegica K. Viets, 1927

Lohmannella norvegica K. Viets, 1927a: 149, 150, figs. 86–92.

Short description. Length of female 425 µm. AD hexagonal. OC with two corneae. PD anteriorly rectangular. Length of gnathosoma 205 µm, i.e. slightly less than half the length of idiosoma; rostrum shorter than gnathosomal base. P-2 short, length more than four times the basal part diameter. Legs short. Tibia I with three pairs of bipectinate setae. Claws with minute accessory process.

Norwegian records. Bergen (Nordre Bratholmen, amongst red algae from 25 m depth, and Sten Sund, from *Laminaria* growing near the low water edge) (K. Viets 1928a).

Further records. No reliable records published. A record from the United Kingdom (England-Cornwall) (Pugh 1988) turned out to be one of *L. kervillei* Trouessart, 1894 (Somerfield 1991).

Biology. Inhabitant of subtidal substrata.

Remarks. *Lohmannella norvegica* is one of the few *Lohmannella* species with a short gnathosoma and rostrum. In the majority of species, the length of the gnathosoma equals 0.7 to 1.0 times that of the idiosoma and the rostrum is longer than the gnathosomal base. Another species from the North-eastern Atlantic, *L. kervillei*, has an even more compact gnathosoma, the length of P-2 is less than three times the diameter (in basal part).

Lohmannella sulensis Bartsch, 2020

Lohmannella sulensis Bartsch, 2020: 281–283, figs. 17–32.

Short description. Length 386 µm (female). AD 1.5 times wider than long. PD only slightly wider than long; its anterior part wider than posterior half. Length of gnathosoma 0.9 times that of idiosoma. Rostrum longer than gnathosomal base. Palps slender. Length of P-2 seven times the diameter. P-4 slender. Length of P-2 equalling 2.5 times that of P-4. Leg I almost as long as idiosoma, leg IV somewhat longer. Tibia I with six bipectinate ventral setae. Tarsus IV with four dorsal setae.

Norwegian record. Sula Ridge, 64°05'N, 8°02'E, 285 m (Bartsch 2020).

Further records. None.

Biology. Extracted from small pieces of the scleractinian *Lophelia* sp.

Lohmannella sulensis is expected to be primarily a deep-water form.

Remarks. The most obvious characters of *Lohmannella sulensis* are: a wide AD, namely 1.5 times wider than long; a short PD, compared to the length of the AD; a gnathosoma almost as long as the idiosoma (0.9:1); long and slender palps, length of P-4 about 0.4 times that of P-2; long and slender legs, tibia I with six bipectinate ventral bristles, and tarsus of leg IV with four dorsal setae. None of the presently known North Atlantic species has the combination: AD very wide, gnathosoma long and slender, P-4 long, legs almost as long as the idiosoma.

Genus *Makarovana* Koçak and Kemal, 2008

Diagnosis. Posterior half of P-2 with two setae. Third and fourth palpal segment with medial spine. Genu I shorter than both telofemur and tibia. These segments with wide, apically dentate spines. Tarsus I with ventral spine.

Makarovana spinosa (Bartsch, 1978)

Agauopsis spinosa Bartsch, 1978a: 16–20, figs. 25–46.

Short description. Length 440–485 µm. Surface of dorsum slightly villous. Rostrum shorter than gnathosomal base. P-4 with three setae in basal whorl, one of these spiniform. Leg I with short spines, ventral spines apically widened and dentate, ventromedial spines less spinose. Ventral spine on genu I short, divaricate and dentate, ventromedial spine not divaricate. Ventromedial flank of tibia I with four spiniform slightly dentate setae,

of these one slender and three wide and apically slightly divaricate.

Norwegian record. Tromsø (southwestern beach of Kvaløy and southern and northern part of Grindøy) (Bartsch 1978a).

Further records. None.

Biology. At present, only females, nymphs and larvae are known, no males.

The species was most abundant in the upper tidal area of beaches with coarse sediment rich in shell fragments (Bartsch and Schmidt 1979).

Remarks. *Makarovana spinosa* is similar to a species described under the name *Acanthopalpus hirsutus* Makarova, 1978, collected in the Gulf of Anadyr and nowadays called *Makarovana hirsuta*. The two species may be conspecific. Both were described in 1978, the description of *M. spinosa* appeared October 10, 1978. The publishing data for *Makarovana hirsuta* is not mentioned.

Genus *Maracarus* Bartsch, 2016

Diagnosis. Dorsal plates either uniformly ornamented, often reticulated or with punctate areolae. Dorsum with four pairs of glands, each generally opening to the exterior via a conspicuous canal. AE with pair of epimeral pores. P-2 with one distodorsal seta; P-3 without spur or seta. Genua shorter than telofemora and tibiae. Tibia I with four ventral and three dorsal setae. Tarsi I to IV with 3, 0–1, 0–1, 0–1 ventral setae. Solenidion on tarsus II in dorsomedial position. Tarsus I with three almost equal-sized claws.

Remarks. The genus *Arhodeoporus*, introduced by Newell (1947), has recently been re-evaluated (Bartsch 2016a). The genus *Arhodeoporus* includes, at present, no more than two species which are spread in the north-western Atlantic. For a few other species, e.g., the European species once described as *Halacarus gracilipes* Trouessart, 1889, a new genus, *Maracarus*, has been erected, with *Halacarus gracilipes* as the type species.

Maracarus gracilipes (Trouessart, 1889)

Halacarus gracilipes Trouessart, 1889b: 243.

Arhodeoporus gracilipes, Newell 1947: 183; Bartsch 1977b: 627–629, figs. 1–10; Green and MacQuitty 1987: 70, 71 fig. 25 A–E.

Maracarus gracilipes, Bartsch 2016a: 563.

Short description. Length of female 310–450 µm, male 304–360 µm. Porose areolae on dorsal and ventral plates delicately punctate. Integument between areolae reticulated. OC drawn

out into long, caudiform projection which posteriad extends far beyond insertion of leg IV. Ventral plates with porose areolae. Female GA with three pairs of pgs. Male GO surrounded by 25–33 pgs. Gnathosoma longer than wide, rostrum short, hardly reaching beyond middle of P-2. Legs slender, all shorter than idiosoma. Tibia I with four ventral setae, all slender and smooth, tibia II ventrally with two bipectinate and two smooth bristles, tibia III with one bipectinate and one smooth bristle, and tibia IV with two smooth ones. Tarsi I to IV with 3, 1, 0, 0 ventral setae.

Norwegian records. Bergen (Osund/Kvernepollen, Stensund, subtidal) (K. Viets 1928a); Tromsø (northern edge of Grindöy) (Bartsch and Schmidt 1979).

Further records. North-eastern Atlantic from northern Africa (Senegal) and Azores to northern Norway, namely Denmark, Eire, France, Germany, the United Kingdom (England, Northern Ireland, Wales), Spain, Sweden. The Mediterranean: Italy, France, Monaco, Turkey; the Black Sea: Bulgaria, Crimea, Russia (Caucasian coast) (K. Viets 1956; Riesgo *et al.* 2010; Bartsch 2004a, 2016a; Durucan 2019b).

Biology. Inhabitant of constantly wet lower tidal and subtidal sediments. The identity of a deep-water record from the Bay of Biscay, 1,410 m (Trouessart 1896), is in need of verification.

Remarks. Another species, namely *Maracarus minor* (Bartsch, 1977), is in dorsal aspect similar to *M. gracilipes*. The former is spread in the north-eastern Atlantic (France; the United Kingdom (England, Northern Ireland)) (Bartsch 1977b; Green and MacQuitty 1987) and the Mediterranean (France, Golfe de Lion—coll. C. Poizat, unpublished record). At present, there are no records of *M. minor* from Norway. *Maracarus minor*, with its idiosomal length of 267–300 µm, is smaller than *M. gracilipes*, the ventral plates are slenderer and the porose areolae distinctly smaller or lacking.

Genus *Metarhombognathus* Newell, 1947

Diagnosis. Idiosomal plates of adults small, areas of striated integument large. Tarsi without midventral setae. Several gland pores replaced by short setae. Gnathosoma about as long as wide; rostrum much shorter than gnathosomal base, palps four-segmented, but P-3 reduced to minute sclerite. Tibiae I to IV each with pair of spiniform, pectinate ventral setae. Tarsi I and II each with one spiniform ventral seta and eupathid doubled pas, tarsi III and

IV without ventral setae; pas short, flattened. Tarsi end with three claws.

Dorsal and ventral plates of deutonymphs distinctly larger than in adults whereas in the majority of halacarids the plates of juveniles are smaller than in adults.

Metarhombognathus armatus (Lohmann, 1893)

Rhombognathus armatus Lohmann, 1893b: 18.

Rhombognathopsis armatus, K. Viets 1927a: 108–111, figs. 28–30.

Rhombognathus mollis, K. Viets 1927a: 111–113, figs. 31–38.

Metarhombognathus armatus, Newell 1947: 63–68, figs. 36–53; Bartsch 1975b: 195, 196, fig. 7a–d; Green and MacQuitty 1987: 30, 31, fig. 9A–D.

Short description. Length of adults 320–612. Dorsal and ventral plates (AD, pair of OC, PD; pairs of AE and PE, GP) very small; length of dorsal plates less than 0.3 of idiosomal length. Pairs of anterior epimeral plates in the median separated by striated integument. All tarsi end with three strong claws. Paired claws with delicate tines along their shaft.

Norwegian records. Bergen (Skuteviken—coll. H. Ringvold); Tromsø (Grindöy) (Bartsch and Schmidt 1979).

Further records. North-western Atlantic: Canada (New Brunswick), the United States (North Carolina to Rhode Island); North-eastern Atlantic, the North Sea and the Baltic included: France (Bay of Arcachon) to Greenland (eastern coast) (Bartsch 1979c, 1982).

Biology. Most abundant amongst thalli of green algae (*Enteromorpha*, *Blidingia*), growing on rocks and wooden pilings, also living on green algal films on barnacles and brown algae (*Fucus*). Present in the midtidal and lower tidal zone. Often very abundant. Records are from a salinity range from 6 to 33‰ (cf. Bartsch 1974a).

Remarks. Another *Metarhombognathus* species, namely *M. nudus* (K. Viets, 1928), is expected to be found on the coast of Norway, especially in the northern part. The dorsal and ventral plates of adult *M. nudus* are very small, as in *M. armatus*, and the legs bear three large-sized claws (K. Viets 1928b). In *M. nudus* a few tines are present at the apical part of the lateral claws whereas in *M. armatus* these tines are lacking. Deutonymphs of the two species can be separated on the basis of (1) the shape of the AE: in *M. ar-*

matus the epimera are fused to a ventral plate, in *M. nudus* the epimera are separated in the median by striated integument; and (2) the lateral claws: apically almost smooth in *M. armatus* vs. with a few large tines in *M. nudus*. *Metarhombognathus nudus* is expected to colonize more “rough” regions, colder and/or more wave-beaten than those inhabited by *M. armatus* (Bartsch 1979c).

Genus *Rhombognathides* K. Viets, 1927

Diagnosis. Dorsal plates of adults large, may even be fused; areas with striated integument between plates narrow. Ocular plates often with three setae, two of them representing setiform gland pores. In females, genital opening terminal and covered by two solid genital plates. Gnathosoma hardly longer than wide. Rostrum much shorter than gnathosomal base. Palps three-segmented, flattened. Genua shorter than both telofemora and tibiae. Tibiae I and II with pair of ventral setae, tibiae III and IV with two ventral setae (rarely one). Tarsi with pair of lateral claws, these smooth, with small accessory process or angled and with pectines. Median claw ranging from absent to almost as long as lateral claws but never bearing pectines.

Biology. Species of the genus *Rhombognathides* are mainly algivorous.

Remarks. The species can be separated on the basis of the shape and the number of the claws.

Rhombognathides mucronatus (K. Viets, 1927)

Rhombognathopsis mucronatus K. Viets, 1927a: 113–115, figs. 39–42, 43a, b, 44a, b.

Rhombognathides mucronatus, Newell 1947: 54–56, figs. 24–26; Bartsch 1972: 178, fig. 9; Green and MacQuitty 1987: 38, 39, fig. 12A–C.

Short description. Length of females 407–487 µm, of males 383–450 µm. Paired claws on all tarsi angled and with rake-like pectines. Median claw on all tarsi scythe-shaped; length of median claw on tarsi I and II at least $\frac{3}{4}$ of that of lateral claws, length of median claws on posterior legs somewhat smaller.

Norwegian records. Bergen (Lindås/Fanebust, Nautevågen—coll. H. Ringvold); Tromsø (Grindøy) (Bartsch and Schmidt 1979).

Further records. Western North Atlantic, from New Brunswick (Canada) to Connecticut (the United States). Eastern North Atlantic from France (the Bay of Arcachon) to Russia (White Sea) (Bartsch 1976c, 1978a; Nikitina 2013). Further records are from Denmark, Eire, the German North

Sea and the Baltic coast, the Netherlands, and the United Kingdom (England, Northern Ireland, Scotland, Wales) (Bartsch 1972; Green and MacQuitty 1987; Somerfield 1988; Bartsch and Smit 2006). In the Baltic, this species is spread eastward to the island Hiddensee (salinity 8‰; unpublished record).

Biology. Algivorous. Inhabitant of coarse sand, salt marshes, clumps of *Modiolus* sp. (Bivalvia), green algae, thalli of *Fucus* sp. and holdfasts of *Laminaria* sp. (brown algae) (Bartsch 1972, 1979a). Most common within a salinity range of 7–20‰.

Remarks. *Rhombognathides mucronatus* is one of the species in which the paired claws are rake-like. In contrast to other similar-looking species, the median claw on the tarsi has a length of more than $\frac{1}{2}$ of that of the paired claws.

Rhombognathides pascens (Lohmann, 1889)

Aletes pascens Lohmann, 1889: 322–324, pl. 6, figs. 6, 15, 19, 20, 45–48; pl. 7, figs. 53, 64–66, 70, 76–78.

Rhombognathides pascens, Newell 1947: 48–51, figs. 12–19; Bartsch 1972: 174, 175, fig. 6; 1996: 142–144, figs. 1–7; Green and MacQuitty 1987: 40, 41, fig. 13A–C.

Short description. Length of females 290–414 µm, of males 281–385 µm. Paired claws on all tarsi angled and with rake-like pectines. Claws on tarsi I and II with small median claw; on tarsi III and IV median claw vestigial.

Norwegian records. Kristiansand (Artsdatabanken 2019); Stavanger (Vikedal camping—coll. H. Ringvold); Bergen (Bognestrømmen/Mangerfjord, Nordre Bratholmen, Turøy, Osund, Herdla, Herdla Sund, Hatte Sund/Roslags Vaag, Rogne Sund (K. Viets 1928a) and Kyrkjætangen/Nordnesvatnet, Nordheimsund—coll. H. Ringvold); Tromsø (Grindøy) (Bartsch and Schmidt 1979).

Further records. Western North Atlantic: Canada (Nova Scotia); the United States (Connecticut to Massachusetts). Eastern North Atlantic and the North Sea, the Baltic, the Black Sea and the White Sea. Records from the North Atlantic range from Spain and the Azores to the White Sea, in the Baltic as far north and east as Finland, Poland and Estonia and in the Black Sea along the northern and southern coastlines (Bulgaria, Crimea, Romania, Turkey, Ukraine) (Bartsch 2004a, 2009; Krivolutsky and Antsiferova 2008).

Biology. Inhabitant of lower tidal and subtidal green, brown and red algae. *Rhombognathides pascens* is one of the few species regularly found

on the large thalli of *Laminaria* sp. (brown algae; personal observation). Common on exposed shorelines. Still present in brackish water of about 4‰ (cf. Bartsch 1974a).

Remarks. At present, it is the only *Rhombognathides* species with the combination: of paired claws rake-like and the median claw lacking on tarsi III and IV.

Rhombognathides seahami (Hodge, 1860)

Rhombognathus seahami Hodge, 1860: 319, pl. 16, fig. 1a–c.

Rhombognathides seahami, Newell 1947: 51–54, figs. 20–23; Bartsch 1972: 175–178, fig. 7; 1975b: 195, fig. 6a–c; Green and MacQuitty 1987: 42, 43, fig. 14A–C.

Short description. Length of females 390–458 µm, of males 327–433 µm. Paired claws on all tarsi angled and with rake-like pectines. Claws I to IV with small median claw, on claws III and IV median claw distinctly smaller than on legs I and II.

Norwegian records. Kristiansand (Artsdatabanken 2019); Stavanger (Lysebotn, Vikedal camping—coll. H. Ringvold); Bergen (Mundheim, Røyrvik, Grønevika, Tellnes pier, Nordnes—coll. H. Ringvold) and Bognestrommen, Turøy, Osund/Kvernepollen, Herdla, Kalsøy, Hjeltefjord, Rylands Sund, Hatte Sund/Rosland Vaag, Stensund) (K. Viets 1928a); Trondheim (Korsvika—coll. H. Ringvold); Tromsø (Grindøy) (Bartsch and Schmidt 1979).

Further records. Western North Atlantic: Canada (Nova Scotia); the United States (Connecticut to Rhode Island). Eastern North Atlantic and the North and White Sea: from Spain to Russia; the Baltic: north to Estonia and Finland (Krivolutsky and Antsiferova 2008; Bartsch 2009; Carlton *et al.* 2020).

Biology. Inhabitant of lower tidal and subtidal green, brown and red algae, their thalli and hapteres. Rarely extracted from sandy deposits. Found within a salinity range from about (1–)3–32‰.

A female and a few nymphs, collected in September and October 2016 near Stavanger (Lysebotn) and Bergen (Røyrvik), were inhabited by the peritrich ciliate *Cothurnia* sp. (Peritrichea). The ciliates, 1–11 per mite, were fixed to the basal leg segments, mainly to the two pairs of front legs. The smooth, hyaline, somewhat compressed loricae of *Cothurnia* sp. had a length of 35–40 µm, a width of 18–22 µm in the middle part and a smaller opening of about 11 µm. The short (15–20 µm) stalk was fixed to the mite with a basal disc. In some individuals, the zooid was completely withdrawn

into the lorica, in others it was extended, reaching beyond the lorica. The zooid was fixed to the bottom of the lorica with a 5 µm long style.

Remarks. The shape of the dorsal plates and the rake-like paired claws of *Rhombognathides seahami* are similar to those of *R. mucronatus* and *R. pascens*; however, the tarsi III and IV have a median claw (absent in *R. pascens*) and this median claw is distinctly shorter than that of legs I and II (in *R. mucronatus*, its length is more than half that of paired claws).

Rhombognathides spinipes (K. Viets, 1933)

Rhombognathus spinipes K. Viets, 1933a: 267–269, figs. 8a, b, 9a, b, 10a, b.

Rhombognathus spinipes, Willmann 1952: 166, 167, pl. 28, 21a–c.

Rhombognathides spinipes, Bartsch 1972: 178–180, figs. 11A–G, 12A–F; Green and MacQuitty 1987: 44, 45, fig. 15A–D.

Rhombognathus aculeatus Sokolov, 1952: 58–60, fig. 19, 1 and 2.

Short description. Length of females 280–430 µm, of males 365–439 µm. Dorsal plates AD, OC and PD fused to a shield. Basidorsal setae of tarsi I to IV short, spiniform; apical fossary setae slender. Paired claws of tarsi smooth, median claw lacking.

Norwegian record. Bergen (Sandholna–Calm bay, Sandholna-by swing—coll. H. Ringvold); Svalbard (puddle near Grønfjordbreen; 77°58'N, 14°16'E) (Chertropud *et al.* 2017).

Further records. Northwestern Atlantic and the Arctic Ocean (Barents Sea and White Sea): Eire, France (Bay of Arcachon, Roscoff), Russia, the United Kingdom (England, Wales); the North Sea and the Baltic: Germany, the Netherlands (Sokolov 1952; Bartsch 1975a, 1976c; Green and MacQuitty 1987; Somerfield 1991; Bartsch and Smit 2006; Krivolutsky and Antsiferova 2008).

Biology. Often found in high numbers in salt marshes, amongst the surface layer of sediment and algae; also extracted from brown algae (*Fucus spiralis*). Found within a salinity range from 8–32‰. In experiments, the mites proved to be able to survive in freshwater for several weeks (Bartsch 1974a), consequently, long-term rainfall or being covered by melting snow should not seriously affect the mites.

Remarks. At present, this is the only *Rhombognathides* species in which the dorsal seta on the tarsi is spiniform, the paired claws are smooth, and a median claw is lacking.

Rhombognathides trionyx (Trouessart, 1899)
Rhombognathus trionyx Trouessart, 1899: 210.
Rhombognathus trionyx, André 1939: 310–312, fig. 2.

Rhombognathides merrimani merrimani and *R. merrimani needleri* Newell, 1947: 56–60, figs. 27–35.

Rhombognathides merrimani, Bartsch 1975a: 74–76, fig. 135, 136; Green and MacQuitty 1987: 36, 37, fig. 11A–C.

Rhombognathides trionyx, Bartsch 1975a: 75, figs. 133, 134.

Short description. With two subspecies. Length of *Rhombognathides trionyx merrimani* females 316–353 µm, of males 310–341 µm, of *R. trionyx needleri* females 322–359 µm, of males 292–335 µm. Tarsi I and II with two (subspecies *merrimani*) or three claws (subspecies *needleri*), tarsi III and IV with two claws. All claws smooth.

Norwegian records. Kristiansand (Artsdata-banken 2019); Tromsø (Grindöy) (Bartsch and Schmidt 1979).

Further records. Western North Atlantic: Canada (New Brunswick). Eastern North Atlantic: Eire, France (Bay of Arcachon, English Channel), the Netherlands, the United Kingdom (England, Northern Ireland, Wales) (Newell 1947; Bartsch 1975a, 1976c; Green and MacQuitty 1987; Somerfield 1991; Bartsch and Smit 2006).

Biology. Abundant on tidal beaches amongst pebbles and sand with algae; also present in algal scrubs and, though in low numbers, on *Fucus* sp. (brown algae) and *Ulva* sp. (green algae) (Bartsch 1979a). Inhabitant of the tidal zone from the upper to the lower tide mark and of mesohaline brackish to marine coastlines.

Remarks. *Rhombognathides trionyx* is characterized by its smooth paired claws and slender dorsal setae on the tarsi.

Newell (1947) described two subspecies, *Rhombognathides merrimani merrimani*, with two claws on all tarsi, and *Rhombognathides merrimani needleri*, with three claws on tarsi I and II; accordingly *R. m. needleri* is a junior synonym of *R. trionyx* and *R. m. merrimani* is called *R. trionyx merrimani*.

Genus *Rhombognathus* Trouessart, 1888

Diagnosis. Dorsal and ventral plates present, two or more may be fused. Each OC with two setae, PD with one or two pairs of setae. Most species with ventral shield (AE, PE, GP fused). AE and PE often with marginal (adjunct) setae in addition to

the three pairs of setae on AE and four pairs on PE. Gnathosoma slightly longer than wide. Rostrum about as long as gnathosomal base. Palps four-segmented. Legs slender. Genua shorter than the legs' telofemora and tibiae. Tibiae I to IV of most species with a pair of ventral setae. Ventral setae on tibia I bipectinate. Tarsi I to IV with paired claws, median claw lacking. With rod-like carpite between tip of tarsus and claws.

Biology. Mainly algivorous. Inhabitants of tidal and subtidal substrata, in the tidal area from the upper to the lower fringe.

Rhombognathus magnirostris lionyx Trouessart, 1899

The identity of the specimens is not known. They were collected in the Sorgfjord (Baie Treurenberg), 79°58'E, 16°52'E, Svalbard, extracted from dredged algae from 22 m depth (Trouessart, 1899).

Rhombognathus notops (Gosse, 1855)

Pachygnathus notops Gosse, 1855b: 305–306, pl. 8, figs. 1–4.

Rhombognathus notops, Newell 1956: 468–471, figs. 1–11; Bartsch 1975a: 54; Green and MacQuitty 1987: 48, 49, fig. 26A–F.

Short description. Length of females 333–415 µm, of males 315–390 µm. Dorsal plates separated by distinct areas of striated integument. OC smaller and shorter than AD. PD with single pair of setae in anterior third of plate. AE, PE, GP, and AP fused. Both AE and PE with a pair of adjunct setae. Tibiae I to IV with 2, 1, 1, 2 bipectinate ventral setae. Accessory process on apex of claws with 9–13 tines.

Norwegian records. Bergen (mentioned as *R. magnirostris*) (Turøy, Herdla/Hjeltefjord, Hatte Sund, Sten Sund) (K. Viets 1928a).

Further records. Eastern North Atlantic, including the North Sea and the Baltic: Denmark, Eire, France, Germany (Heligoland), Spain, the United Kingdom (England, Northern Ireland, Scotland, Wales) (Bartsch 1975a; Green and MacQuitty 1987; Somerfield 1991). Records from the Mediterranean and the Black Sea (K. Viets 1940) are in need of verification.

Biology. The species is algivorous; it inhabits lower tidal and subtidal algae and their epibios.

Remarks. The original description in Gosse (1855b) offered limitid data (length 1/87th of an inch, body rather slender, gnathosoma short, claws with narrow accessory process), which consequently resulted in unreliable identifications. No

type locality was given but the types obviously had been collected on the shores of southwestern England. On the basis of material collected on the south coast of England, Newell (1956) redescribed this species. A slide in K. Viets' Norwegian halacarid collection, labelled *Rhombognathus magnirostris*, agrees with the characters of *R. notops*.

Rhombognathus subtilis Bartsch, 1975

Rhombognathus subtilis Bartsch, 1975a: 61–64, figs. 42–59.

Rhombognathus subtilis, Green and MacQuitty 1987: 50, 51, fig. 17A–D.

Rhombognathus magnirostris lionyx, K. Viets 1927b: 11, figs. 20 and 21.

Short description. Length of females 328–390 µm, of males 298–341 µm. OC large, longer than AD. PD extending anteriorly to about the level of insertion of leg III. AE, PE and GP fused to a ventral shield. In both female and male a distinct area of striated integument present between this shield and anal plate. AE with two to three pairs and PE with single pair of adjunct setae. Tibiae I to IV with 2, 1, 1, 1 bipectinate ventral setae. All legs with long sclerite between tip of tarsus and claws. Claws smooth.

Norwegian records. Bergen (mentioned as *R. magnirostris lionyx*) (Herdlia, low water edge) (K. Viets 1928a); Tromsø (Grindöy); Svalbard (Ny Ålesund) (Bartsch 1978a; Bartsch and Schmidt 1979).

Further records. Northwestern Atlantic: Eire, England, France (Bay of Arcachon, Gironde and Roscoff, Bretagne) (Bartsch 1975a; Green and MacQuitty 1987; Somerfield 1988).

Biology. Inhabitant of tidal algae and sediment.

Remarks. *Rhombognathus subtilis* has often been recorded as *R. lionyx* Trouessart, 1899. Newell and André (1959) restudied *Rhombognathus* species described by E.L. Trouessart, also a slide labelled *Rhombognathus magnirostris*, variété *lionyx* n.var. with a single female collected near Saint-Vaast-la-Hougue (English Channel). The idiosoma of the individual is damaged but the legs show an important detail, namely the tarsal claws have a delicate accessory process. A similar process was found on the claws of a female dredged in the Bai de Morlaix (English Channel), at a depth of 13 m (Bartsch 1980). *Rhombognathus lionyx* may be an inhabitant of subtidal substrata, whereas *R. subtilis* is most abundant in the tidal area.

K. Viets (1936: fig. 630) shows a ventral aspect of a female which seems to be a *R. subtilis*, not a *R. notops*.

Genus *Simognathus* Trouessart, 1889

Diagnosis. Dorsal and ventral plates strongly sclerotized. AD and PD large, surface often foveate. OC distinctly smaller or largely reduced. Conical rostrum shorter than almost spherical gnathosomal base. Palps three-segmented and dorsally attached to gnathosoma. Genu I much shorter than telofemur and tibia. Tarsus I shorter and slenderer than following tarsi and with a single tapering ventral seta. Tarsus I ending with large, smooth median claw and almost setiform paired claws. Tarsi II to IV with large paired claws, median claw reduced to minute central sclerite.

Simognathus minutus (Hodge, 1863)

Pachygnathus minutus Hodge, 1863: 301–302, pl. 16, figs. 10, 11.

Pachygnathus sculptus Brady, 1875: 306, 307, pl. 42, figs. 1–6.

Simognathus sculptus, André 1946: 136–138, figs. 78, 79.

Simognathus minutus, Bartsch 1974b: 276–179: figs. 1–20; Green and MacQuitty 1987: 136, 137, fig. 56A–D.

Short description. Length of female 526–530 µm. Dorsal plates foveate. AD and PD elongate, length of OC about 1/3 of that of AD. PD including and anteriorly extending beyond pair of ds-4. Marginal parts of AE foveate, median part uniformly porose. Second palpal segment with ventral protruding and seta. Tibia I ventrally with one massive, rather short and tapering spine and one rather slender bristle-like seta. Tibiae II to IV with pair of bipectinate bristles.

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (Bognstrømmen, red algae from 25 m depth, and Osund, subtidal brown algae, *Laminaria*) (K. Viets 1928a).

Further records. North-eastern Atlantic: from Norway to Spain (K. Viets 1956; Green and MacQuitty 1987; Riesgo *et al.* 2010).

Biology. Inhabitant of lower tidal and shallow subtidal algae and sandy deposits.

Remarks. From the English Channel area a second *Simognathus* species is known, i.e. *Simognathus leiomerus* Trouessart, 1894. The species is smaller (length 365–403 µm), the OC are reduced to small, elongate sclerites, and on the P-2 the ventral protruding and the seta are fused (Trouessart 1894c).

Genus *Thalassarachna* Packard, 1871

Diagnosis. Dorsal plates often reticulate but without raised sculpturing. Male PD in some spe-

cies somewhat larger than female PD. Idiosoma generally with four pairs of gland pores. Gnathosoma longer than wide. Palps four-segmented. P-2 with one distodorsal seta. P-3 with medial spine. Genu I shorter than both tibia and telofemur I. Tibia I with bristle-like or spiniform ventral setae, telofemur I often with similar setae. Tarsi I and II with more than three dorsal setae.

Thalassarachna basteri (Johnston, 1836)

Acarus basteri Johnston, 1836: 353–355, fig. 51a and b.

Halacarus (Thalassarachna) basteri, Newell 1947: 102–106, figs. 143–154.

Thalassarachna basteri, Green and MacQuitty 1987: 120, 121, fig. 4A–D; Bartsch 2015b: 230–233, figs. 1A–F, 2A–J.

Short description. Length 864–1,197 μm . AD longer than wide and with bluntly ending frontal spine. OC short, narrow. Female GA with three to four pairs of pgs. In males GA with about 110 pgs, these densely arranged around GO. Gnathosoma longer than wide. Rostrum extending to or just beyond P-2. Telofemur I with three ventral spines, tibia I generally with 8 ventral setae, 6 of these spiniform. Tarsi I and II each with (8–)9 dorsal setae (solenidion included).

Norwegian records. Kristiansand (Artsdata-banken 2019); Bergen (Bognestrømmen, Nordre Bratholmen, Turøy, Osund/Kvernepollen, Herdla/Sjaten ved Kalsøy, Hjeltefjord, Herdla Sund, Rylands Sund, Rosland Vaag) (K. Viets 1928a); Tromsø (Grindøy); Finmark (Gamvik) (Bartsch 1978a, 2015b).

Further records. Western North Atlantic: the United States and Canada (Connecticut to Quebec). Eastern North Atlantic and adjacent seas (Russia (Nowaja Zemlya) to Spain), the Mediterranean, the Baltic (Bartsch 2015b).

Biology. Inhabiting various substrata from the low water edge to a depth of 25 m, namely colonial organisms such as hydroids, bryozoans, bivalves, tubes of serpulid polychaetes, various algae (green, brown, red), hapteres of *Laminaria* (brown algae), and sediments rich in organic material. Found within a salinity range of 2–32‰.

Remarks. A similar though slightly shorter frontal spine is present in *Thalassarachna princeps* (Trouessart, 1902). The latter species has five ventral spines on telofemur I whereas *T. basteri* has three such spines.

Thalassarachna caecoides (Bartsch, 1978)

Halacarellus caecoides Bartsch, 1978b: 48–52, figs. 1–10.

Short description. Length 730 μm (female). Wide areas of striated integument between anterior and posterior dorsal plates. Ocular plates minute. Narrow PD reaching halfway between levels of ds-4 and ds-5. Each PE with one dorsal and two ventral setae; one pair of setae in striated integument between PE. Legs slender. Rostrum reaching to end of P-2. Ventral setae on telofemora rather slender, not markedly spiniform. Tibia I with 7–8 short ventral setae. Tarsi I and II with five dorsal setae each (solenidion included). Claws on tarsi smooth.

Norwegian record. Norwegian Basin, 64°24'N 1°44'E (Bartsch 1978b).

Further records. None.

Biology. The single record is from the deep-sea, from 2,615 m depth. The halacarid mite was extracted from a sample which included sponges and hydrozoans (Bartsch 1978b).

Remarks. Unusual though not unique is the reduction of the ocular plates. Similar reduced plates are present in *T. alvina* Bartsch, 1994, a deep-sea species just as *T. caecoides* (Bartsch 1994). A difference between the species is that the PD of *T. alvina* extends anteriorly only slightly beyond the level of ds-5; in *T. caecoides* the PD of is distinctly longer.

Thalassarachna coeca (Trouessart, 1902)

Halacarus coecus Trouessart, 1902: 68.

Halacarellus coecus, Bartsch 1983b: 49–51, figs. 1–11.

Short description. Length of male 731 μm , width 425 μm . Ocular plates slender, posteriorly tapering, about as long as AD. Anterior margin of PD narrowly ovate, plate about twice as long as AD. Male with GO in middle of genital plate. GO surrounded by 44 pgs. Rostrum reaching somewhat beyond the level of middle P-2. Tibia I with four pairs of ventral bristles, basal ones spiniform, apical ones slenderer and longer. Tibia I to IV ventrally with 8, 8, 6 slender setae. Tarsus I with 8 dorsal setae (short dorsolateral solenidion included).

Norwegian record. Northern Atlantic: off south-eastern coast of Svalbard, near Hopen Island, 76°30'N, 25°27'E, 48 m (Trouessart 1902).

Further records. None.

Biology. The species was extracted from gravely sediment, from a depth of 48 m.

Remarks. *Thalassarachna coeca* is a rather large-sized species. It differs from the similar-sized *Thalassarachna hexacantha* (outlined below) by more elongate OC, narrower PD, much smaller number of pgs, shorter rostrum, and larger number of ventral setae on tibiae I to IV.

Thalassarachna hexacantha (K. Viets, 1927)

Halacarellus hexacanthus K. Viets, 1927a: 124–126, figs. 50–55; 1927b: 20, 21, figs. 43, 49.

Short description. Length 865–930 µm. Anterior margin of AD truncate. Pair of ds-4 in both female and male in striated integument. Female PD slightly longer than wide, its arched to ovate anterior margin anteriorly not extending to the level of ds-4. PD in male larger than in female; its arched (or slightly truncate) anterior margin reaching just beyond the level of ds-4. GA of females only slightly extending beyond anterior margin of GO; plate with up to five pairs of pgs (K. Viets 1927a). Male GA distinctly extending beyond GO; distance from anterior margin of GA to GO and from GO to basis of anal sclerites about the same as length of GO. Male GA with almost 200 pgs. Rostrum slender, reaching the end of P-3. Legs slender, legs I to III shorter than idiosoma, leg IV as long or slightly longer than idiosoma. Tibiae I to IV with 6, 4, 4, 4 smooth ventral setae. Tarsi I to IV with 6–8, 6, 4, 4 dorsal setae (solenidia included). Claws with pectines.

Norwegian records. Bergen (Herdla Sund, shell fragments from 10 m depth) (K. Viets 1927a); Tromsø (Grindöy) (Bartsch 1978a).

Further records. North-eastern Atlantic and Arctic Ocean: Denmark, Russia (the White Sea), Sweden, the United Kingdom (Northern Ireland) (K. Viets 1956; Bartsch 1991a; Somerfield 1991; Krivolutsky and Antsiferova 2008).

Biology. Found amongst shallow water algae. This seems to be one of the *Thalassarachna* species in which adults directly leave the protonymphal skin, a second nymphal stage is suppressed (Bartsch 2015c).

Remarks. Characters distinguishing *Thalassarachna hexacantha* from *T. coeca* have been mentioned above, those separating *T. hexacantha* from *T. robusta* are mentioned below.

Thalassarachna longipes (Trouessart, 1888)

Leptopsalis longipes Trouessart, 1888: 755.

Halacarellus longipes, K. Viets 1927a: figs. 48, 49; 1927b: 20, figs. 93, 95–97.

Halacarus (Thalassarachna) longipes, Newell 1947: 126–129, figs. 192–196.

Short description. Length 410–624 µm. Anterior margin of AD truncate. Female PD short, hardly as long as wide, male PD ovate, 1.3 times longer than wide. Anal valves prolonged, extending beyond anal sclerites. Male GA with 90–100 perigenital setae arranged around GO. Distance from anterior margin of GO to that of GA equalling length of GO. Gnathosoma slender, twice as long as wide. Tip of rostrum extending beyond P-2. Legs slender, leg I somewhat shorter, legs III and IV longer than idiosoma. Tibia I with 7–8 smooth ventral setae. Claws with numerous small tines.

Norwegian record. Bergen (Hattesund, Stensund), extracted from stems of *Laminaria* (K. Viets 1928a).

Further records. Northwestern Atlantic: Canada (Nova Scotia), the United States (Connecticut to Maine); Northeastern Atlantic, North Sea and the Baltic: Eire, France, the United Kingdom (England), Germany, Denmark, Sweden (Anderson 1933; K. Viets 1956; Bartsch 1979c, 1982; Somerfield 1991).

Biology. Records of *T. longipes* are from lower tidal and subtidal areas; from brown and red algae (*Chondrus* sp., *Ascophyllum* sp., corallines) and the decapod *Libinia* sp.

Remarks. Amongst the presently known *Thalassarachna* species, *T. longipes* is the only one with prolonged anal valves.

Thalassarachna princeps (Trouessart, 1902)

Halacarus spinifer princeps Trouessart, 1902: 69. *Halacarellus princeps*, Bartsch 1983b: 51, 53–57, figs. 12–21.

Short description. Length of male 1,002 µm, width 661 µm. AD with wide frontal spine. Anterior and posterior margin of OC arched. PD elongate, almost rectangular, anterior margin arched. Surface of plate reticulated. Anterior part of male GA oviform; GO surrounded by at least 135 pgs. Rostrum reaching to about the end of P-2. Leg I with solid ventral spines, telofemur I with five such spines, genu I with one short and one slenderer, tapering spine, and tibia I ventrally with six spines and apically with pair of bristle-like setae. Tibia II with six (three pairs) of ventral setae, tibiae III and IV each with four ventral setae.

Norwegian record. Off south-eastern coast of Svalbard (near Hopen Island, 76°30'N, 25°27'E, 48 m) (Trouessart 1902).

Further records. None.

Biology. A single specimen was extracted from gravelly sediment in 48 m depth.

Remarks. With its frontal spine, *Thalassarachna princeps* is similar to the northern Pacific species *T. aculeata* (Makarova, 1978) and the northern Atlantic *T. basteri*. Distinguishing characters are: (1) frontal spine in *T. aculeata* is longer than in *T. basteri* and *T. princeps*; and (2) telofemur I bears five ventral spines in *T. aculeata* and *T. princeps* vs. three in *T. basteri*. The length of the frontal spine may turn out to vary once more individuals from the Arctic Sea become available for examination. *Thalassarachna aculeata* may prove to be a junior synonym of *T. princeps*.

Thalassarachna robusta (Bartsch, 1978)

Halacarellus robustus Bartsch, 1978a: 8–10, figs. 1–9.

Short description. Length 434 µm (female). OC narrow, shorter than AD. PD anteriorly narrowly ovate. One pair of ventral setae within striated integument. Ovipositor extending anteriorly distinctly beyond anterior margin of GA. Rostrum slender, reaching to end of P-3. One pair of maxillary setae in posterior third of gnathosomal base, following pair on basis of rostrum. Tibia I with three pairs of ventral setae, all slender, none spiniform. Tibia II to IV with four (two pairs), four (one pair, two setae in line), and three slender ventral setae. Tarsus I with seven dorsal setae. Lateral claws with pectines.

Norwegian record. Tromsø (southern end of Grindøy) (Bartsch 1978a).

Further records. None.

Biology. Found in the upper slope of a sandy beach.

Remarks. *Thalassarachna robusta* and *T. hexacantha* are rather similar but *T. robusta* is much smaller and has a longer PD than *T. hexacantha*. Also, the PD of *T. robusta* is anteriorly converging whereas the PD of *T. hexacantha* is widely arched.

Thalassarachna striata (Lohmann, 1889)

Halacarus striatus Lohmann, 1889: 342, 343, pl. 6, fig. 26, pl. 8, figs. 113, 117, 118.

Halacarellus striatus, Bartsch 1976b: 103–107, figs. 24–43.

Thalassarachna striata, Green and MacQuitty 1987: 130, 111, fig. 4A–E.

Halacarellus similis K. Viets, 1927a: 131–134, figs. 69–73.

Short description. Length 456–565 µm. Anterior margin of AD slightly arched, posterior margin truncate. Females with pair of ds-4 within striated integument, outside PD; female PD reaching the level of ds-4. Male PD longer, ds-4 situated on PD; PD distinctly passing beyond ds-4. Ovipositor of female extending beyond GA. Male GA large, anteriorly truncate to concave; GO surrounded by ca 70 pgs. Rostrum short, hardly reaching the level of dorsal seta on P-2; rostrum distinctly shorter than gnathosomal base. Number of maxillary setae increased, two to four setae on the rostrum and three to five on the gnathosomal base. Tibiae I with 6 ventral setae, namely three spur-like and three bristle-like. Tarsi I to IV with 6, 6, 3, 3 dorsal setae (solenidia included).

Norwegian records. Kristiansand (Artsdatabanken 2019); Bergen (mentioned as *Halacarellus similis*) (Osund) subtidal, extracted from *Laminaria* with epibios (bryozoans—*Membranipora*) (K. Viets 1927a, 1928a).

Further records. Eastern North Atlantic, the North Sea and the Baltic: Denmark, France (English Channel), Germany, Sweden, the United Kingdom (England, Northern Ireland) (K. Viets 1956; Bartsch 1976b; Green and MacQuitty 1987).

Biology. Amongst lower tidal and subtidal algae and their hapteres.

Remarks. *Thalassarachna striata* can be separated from congeners because of the increased number of maxillary setae, short rostrum, and spur-like setae on tibia I. The other *Thalassarachna* species have two pairs of maxillary setae, the ventral setae on tibia I are bristle-like or spiniform but not short and spur-like and in most of the *Thalassarachna* species the rostrum is extending to or beyond the end P-2.

Checklist of freshwater halacarids

Genus *Porohalacarus* Thor, 1922

Diagnosis. Female GP with 4–15 pairs of slender pgs; its genital sclerites with three to nine external acetabula. Male GP with 10–40 pairs of pgs; genital acetabula posterior to GO. Palps four-segmented; P-2 with two dorsal setae. Third palpal segment with short medial spine. Legs slender. Genu I much shorter than telofemur I.

Porohalacarus alpinus (Thor, 1910)

Halacarus alpinus Thor, 1910. 348–351, figs. 1 and 2.

Porohalacarus alpinus, K. Viets 1927c: 465–469, figs. 3–10; Bartsch 1973b: 116–119,

figs. 1–21; 1987: 85, 86, figs. 2, 3; 2006b: 130–132, figs. 5-9a–f, 5-10a, b; 2011: 497–498, fig. 6A–D; 2018: 88–90, fig. 6A–G; Green and MacQuitty 1987: 164, 165, fig. A–D; Durucan and Boyaci 2019: figs. 8–15.

Short description. Length of females 280–371 µm, that of a male 286 µm. AD and OC with conspicuous spots of black eye pigment. Dorsal plates with reticulate ornamentation. Anterior margin of AD truncate. OC with cornea. Female genital plate with four to five (rarely up to nine) pairs of pgs, each genital sclerite with four to nine external acetabula. In males, GP and AP fused to GA. GO of male surrounded by about 40 perigenital setae. Genital acetabula on a pair of domes posterior to GO. Rostrum shorter than gnathosomal base and hardly extending to middle of P-2. Legs shorter (0.7 times or less) than idiosoma. Tibiae I to IV with 4, 3, 2, 2 ventral setae. Tarsus I with single slender ventral seta, tarsi II to IV without ventral setae. Paired claws with delicate tines.

Norwegian record. Freshwater, Valsand in Gudbrandsdalen, 850 m a.s.l. (Thor 1910).

Further records. North America: Canada (Ontario, Quebec), the United States (New Hampshire, Rhode Island); South America: Brazil (Rio Grande do Sul); Northern Africa: Algeria; Tropical Africa: Madagascar; Australia (Western Australia); New Zealand (North Island); Europe: Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Iceland, Italy, the Netherlands, Poland, Russia, Sweden, Switzerland, Ukraine, the United Kingdom (England, Scotland, Wales); Northern Asia: Russia (Sakha Republic, Kamchatka, Turkey) (Bartsch 2018; Durucan and Boyaci 2019; Pepato and da Silva Conceição 2020).

Biology. *Porohalacarus alpinus* is a freshwater species though has also been found in low saline brackish water (ca 6 S‰). It is one of the species commonly present in surface waters, namely in ditches, ponds, lakes, more rarely on the banks of rivers. It inhabits water mosses (*Fontinalis* sp.), vascular plants, the epibios on stalks of *Phragmites*, interstitia within bulks of bivalves such as *Dreissena* sp., crabs, and colonies of sponges.

Males are present but extremely rare (Bartsch 1987, 2018).

The feeding of *P. alpinus* is not known. The majority is expected to be carnivorous, but, as demonstrated by individuals with a green gut content, these mites are also phytophagous.

Remarks. Two variants are known, namely, *P. a. alpinus* and *P. a. brachypeltatus* Viets 1927. The above mentioned data refer to *P. a. alpinus*.

Durucan and Boyaci (2019: Table 2) presented data of the length range of individuals from western Turkey, namely 250–312 µm. These specimens are somewhat smaller than those from northern Europe. The documented length for females of the latter area is 280–371 µm.

Genus *Porolohmannella* K. Viets, 1933

Diagnosis. Idiosoma flattened. Female genital plate with three pairs of pgs. Gnathosoma with long and slender rostrum. Palps four-segmented, attached dorsally. Third palpal segment with spini-form process but no spine or seta. Legs slender. Genua shorter than adjacent segments. Tarsi with pair of claws.

Porolohmannella violacea (Kramer, 1879)

Leptognathus violaceus Kramer, 1879: 147, pl. 8, figs. 1–4.

Porolohmannella violacea, K. Viets 1933b: 283; Green and MacQuitty 1987: 144–145, fig. 59A–C; Bartsch 2006b: 151–152, fig. 5-26a–e; 2007a: 49–56, figs. 1–39.

Short description. Length of females 475–600 µm; males not known. Integument of idiosoma, gnathosoma and legs pink to violet. Dorsal plates reticulate. Female with three pairs of slender perigenital setae on large GA. GO almost in middle of GA. Each genital sclerite with two external acetabula and one rather inconspicuous acetabulum inside genital cavity. Gnathosoma slightly less than half length of idiosoma. Legs slender, shorter than length of idiosoma. Tibia I with two pairs of ventral setae; ventromedial setae distinctly pectinate, ventrolateral setae weakly pectinate. Tibiae II to IV with 4, 4, 3–4 ventral setae.

Norwegian record. Kristiansand (Artsdatabanken 2019).

Further records. Very common and widespread in the northern hemisphere. Records are from North America, Europe, and Asia. North American records are from Canada (Alberta, British Columbia, Manitoba, Newfoundland, Northwest Territories, Ontario, Quebec) and the United States (New Hampshire, New York, Rhode Island); European records are from Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Italy, Latvia, Monte Negro, the Netherlands, Poland, Portugal, Romania, Russia (European part), Spain, the United Kingdom;

also collected on Greenland; Asian records are from Japan and Russia (Siberia) (K. Viets 1956; K.O. Viets 1987; Green and MacQuitty, 1987; Zawal 1998; Pešić 2004; Bartsch 2006b, 2007a; Tolstikov *et al.* 2005; Smit *et al.* 2010; Semenchenko *et al.* 2010; Stolbov *et al.* 2018).

Biology. *Porolohmannella violacea* lives in freshwater. It is wide-spread in lentic surface waters, in lakes, ponds and ditches (Bartsch 2007a). At present, only females and juveniles have been mentioned, but no males.

Remarks. No other similar-looking species has, as of yet, been found in Norwegian fresh water.

DISCUSSION

Norway has a coastline that extends from 58°N (southern coast of Norway) to 81°N (northern edge of Svalbard), its Exclusive Economic Zone has a range from 56° to 84°N and 3°W to 43°E (Flanders Marine Institute 2018). Jan Mayen is excluded since no records of halacarids mites from there exist. Samples taken in the Norwegian Exclusive Economic Zone cover depths ranging from the tidal and shallow water to deep-sea areas (2,615 m) and habitats from rocky, sandy and muddy deposits, coral reefs, belts of small algae, as well as kelp forests. Although one can expect a very diverse halacarid fauna and a long list of Norwegian species, the actual knowledge is poor. The list of halacarids presented in the paper (Table 1) includes three new records, in all, 45 marine and two freshwater species. Further research activities will easily double, more likely triple, the number of species.

The records of the 45 marine species are shown in Fig. 1. The marked difference in the diversity within the study areas is mainly due to the sampling activities and not a result of environmental parameters. Bergen is certainly not a ‘hot spot’ in respect to the Norwegian halacarid fauna.

Table 2 lists halacarid genera and the number of species found on and around Norway, the United Kingdom and Eire, and the French coast of the English Channel (northern coast of Brittany, Normandy, Hauts de France). According to the list, 60 species have been found in tidal and shallow marine habitats around Great Britain and Ireland is (doubtful records are excluded) and eight species in freshwater habitats (plus one represented by juveniles) (Bartsch 1985a, b; Green and MacQuitty 1987; Somerfield 1991; present paper). From the shores and shallows of northern France (English Channel

area) 86 records of marine species exist (Trouessart 1894a, c; André 1946; Monniot 1964, 1967; Bartsch 1979a, 1980, 1984, 1991b). However, the above data are far from presenting a complete number of species. The list of halacarids known from the United Kingdom, Eire and northern France is based on material collected three or more decades ago. At that time, the boundary between warm and cold temperate water masses was expected to be near the western entrance into of the English Channel (Briggs 1974) or in the western part of the North Sea (Hedgepeth 1957). Hence the areas under consideration, namely the northern coast of France, the United Kingdom and Eire, and Norway largely belonged to the boreal zone. New sampling activities should alter the present number of species. This may be due to new records from sites and habitats not studied before and also to an increasing rate of immigrated or introduced species due to changes in climate and habitat as well a greater rate of transport (Gollasch and Nehring 2006; Loebl *et al.* 2006; Witte *et al.* 2010; van Beusekom *et al.* 2018). Detailed analysis may also prove the existence of cryptic species.

Two genera, *Bradyagaue* and *Makarovana*, are recorded from Norway but not from northern France or the United Kingdom/Eire area. *Bradyagaue* is wide-spread both in cold and warm water areas, also in the northern Atlantic, but the number of records is small. Most *Bradyagaue* species have been found in close association with the colonies of hydrozoa. *Makarovana* seems to be restricted to cold-water/polar areas. At least, the records of this genus are lacking from southern shores. In contrast, seven genera mentioned from the Roscoff area (France) (*Acarochelopodia*, *Acaromantis*, *Actacarus*, *Agauae*, *Coloboceras*, *Copidognathides*, *Scaptognathus*) and three genera from the Swedish Skagerrak area, from sediment samples taken at 5–25 m depth (*Actacarus*, *Camactognathus*, *Coloboceras*) (Bartsch 1991a), have no records from Norwegian waters. This absence will mainly be due to the sparse collecting activities in Norway; many habitats and substrata have never been studied.

Several but not all of the species mentioned from Norway have also been found on the French coast of the English Channel, around the United Kingdom and Eire (Table 2). The absence of records from areas outside Norway is partly due to the poor knowledge of the morphological characters of the species (e.g., *Copidognathus latus*, *Lohmannella norvegica*) and that the list of Nor-

Fig. 1. Norway and adjacent countries, sampling sites and records of marine halacarid species. 1. *Agauopsis corallina*; 2. *Anomalohalacarus minutus*; 3. *Bradyagaue alberti*; 4. *Copidognathus brevirostris*; 5. *C. brifacius*; 6. *C. fabricii*; 7. *C. latus*; 8. *C. oculatus*; 9. *C. reticulatus*; 10. *C. rhodostigma*; 11. *C. richardi*; 12. *Halacarellus balticus*; 13. *H. capuzinus*; 14. *H. floridearum*; 15. *H. procerus*; 16. *H. subcrispus*; 17. *H. subterraneus*; 18. *Halacarus bisulcus*; 19. *Isobactrus hartmanni*; 20. *I. levis*; 21. *I. setosus*; 22. *I. unguatus*; 23. *Lohmannella falcata*; 24. *L. njoerdri*; 25. *L. norvegica*; 26. *L. sulensis*; 27. *Makarovana spinosa*; 28. *Maracarus gracilipes*; 29. *Metarhombognathus armatus*; 30. *Rhombognathides mucronatus*; 31. *R. pascens*; 32. *R. seahami*; 33. *R. spinipes*; 34. *R. trionyx*; 35. *Rhombognathus notops*; 36. *R. subtilis*; 37. *Simognathus minutus*; 38. *Thalassarachna basteri*; 39. *T. caecoides*; 40. *T. coeca*; 41. *T. hexacantha*; 42. *T. longipes*; 43. *T. princeps*; 44. *T. robusta*; 45. *T. striata*.

wegian species includes samples from realms and habitats that have not been studied in the other areas (e.g., deep-sea substrata and cold water stony coral reefs). Both the species extracted from the Norwegian coral reefs and from deep-water zones will certainly also be found outside the Norwegian Exclusive Economic Zone.

In the list of Norwegian halacarids, the genera *Copidognathus* and *Thalassarachna* are represented by eight species each, *Halacarellus* and

Rhombognathides by six and five species, respectively. From a world-wide perspective, *Thalassarachna*, *Rhombognathides* and *Metarhombognathus* are preliminarily northern Atlantic cold-water genera (Bartsch 2004b). No reliable records of these genera exist from shores and shallows of the tropics. From the northern Pacific, a single record of a *Thalassarachna* exists, but none of *Metarhombognathus* and *Rhombognathides*. *Halacarellus* fauna is most diverse in cold-temperate and polar

Table 2

Marine and freshwater halacarid genera with records from Norway, the United Kingdom and the Republic of Ireland (UK/Eire) and northern France (France). The number of species in these areas and presence (×) or absence (–) of the species known from Norway. (?—record in need of verification.)

Genus/Species	Norway	UK/Eire	France	Genus/Species	Norway	UK/Eire	France
Marine genera				<i>Lohmannella</i>			
<i>Acarochelopodia</i>				number of species	4	2	5
number of species	0	0	1	<i>L. falcata</i>	×	×	×
<i>Acaromantis</i>				<i>L. njoerdri</i>	×	–	–
number of species	0	0	1	<i>L. norvegica</i>	×	–	–
<i>Actacarus</i>				<i>L. sulensis</i>	×	–	–
number of species	0	1	1	<i>Makarovana</i>			
<i>Agaue</i>				number of species	1	0	0
number of species	0	0	1	<i>M. spinosa</i>	×	–	–
<i>Agauopsis</i>				<i>Maracarus</i>			
number of species	1	2	4	number of species	1	2	2
<i>A. corallina</i>	×	–	–	<i>M. gracilipes</i>	×	×	×
<i>Anomalohalacarus</i>				<i>Metarhombognathus</i>			
number of species	1	6	6	number of species	1	2	1
<i>A. minutus</i>	×	×	×	<i>M. armatus</i>	×	×	×
<i>Bradyagaue</i>				<i>Rhombognathides</i>			
number of species	1	0	0	number of species	5	5	6
<i>B. alberti</i>	×	–	–	<i>R. mucronatus</i>	×	×	×
<i>Coloboceras</i>				<i>R. pascens</i>	×	×	×
number of species	0	1	1	<i>R. seahami</i>	×	×	×
<i>Copidognathides</i>				<i>R. spinipes</i>	×	×	×
number of species	0	0	1	<i>R. trionyx</i>	×	×	×
<i>Copidognathus</i>				<i>Rhombognathus</i>			
number of species	8	17	20	number of species	2	2	5
<i>C. brevirostris</i>	×	×	×	<i>R. notops</i>	×	×	×
<i>C. brifacius</i>	×	×	–	<i>R. subtilis</i>	×	×	×
<i>C. fabricii</i>	×	×	×	<i>Simognathus</i>			
<i>C. latus</i>	×	–	–	number of species	1	2	2
<i>C. oculatus</i>	×	×	×	<i>S. minutus</i>	×	×	×
<i>C. reticulatus</i>	×	×	–	<i>Scaptognathus</i>			
<i>C. rhodostigma</i>	×	×	×	number of species	0	2	2
<i>C. richardi</i>	×	?	?	<i>Thalassarachna</i>			
<i>Halacarellus</i>				number of species	8	4(–5?)	3
number of species	6	6(–7?)	5	<i>T. basteri</i>	×	×	×
<i>H. balticus</i>	×	×	×	<i>T. caecoides</i>	×	–	–
<i>H. capuzinus</i>	×	×	×	<i>T. coeca</i>	×	–	–
<i>H. floridearum</i>	×	–	–	<i>T. hexacantha</i>	×	×	–
<i>H. procerus</i>	×	×	×	<i>T. longipes</i>	×	–	–
<i>H. subcrispus</i>	×	–	–	<i>T. princeps</i>	×	–	–
<i>H. subterraneus</i>	×	×	×	<i>T. robusta</i>	×	–	–
<i>Halacarus</i>				<i>T. striata</i>	×	×	×
number of species	1	2	2	Freshwater genera			
<i>H. bisulcus</i>	×	×	×	<i>Porohalacarus</i>			
<i>Isobactrus</i>				number of species	1	2	1
number of species	4	4	7	<i>P. alpinus</i>	×	×	×
<i>I. hartmanni</i>	×	–	×	<i>Porolohmannella</i>			
<i>I. levis</i>	×	×	×	number of species	1	1	–
<i>I. setosus</i>	×	×	×	<i>P. violacea</i>	×	×	–
<i>I. unglatus</i>	×	×	×				

waters, but poor in the tropics, both in the number of species and specimens (Bartsch 1997a, 2004b). *Copidognathus* holds, worldwide, almost one-third of all halacarid species. A checklist of halacarid species, dating to the end of 2008, included 1,118 species; 359 of these, or 32%, belonged to *Copidognathus* (Bartsch 2009). A few new halacarid species, described in the last decade, do not seriously alter the percentage. In the Norwegian waters, the number of recorded *Copidognathus* species is low. Several more species are expected to be found, either new records or unknown species (e.g., one undescribed very slender species had been extracted from a small piece of a stony coral from the Sula Reef; personal observation).

With respect to freshwater, two species have been recorded from Norway, namely *Porohalacarus alpinus* and *Porolohmannella violacea*. From the central and northern parts of Sweden, seven freshwater species are known (Bartsch 1989b), from Great Britain eight species (Green and MacQuitty 1987) plus one (*Halacarellus hyrcanus*) solely represented by juveniles; their identity should be verified. The seven freshwater species recorded from Sweden, all of which are widespread, will certainly also be found in comparable habitats in Norway.

In conclusion, the present list of species shows that much more sampling has to be done to get a reliable idea of the present-day Norwegian halacarid fauna. Without solid basis, provided by more sampling, we will not be able to evaluate if the missing or new records in the fauna are a result of natural changes in a given ecosystem or human impact.

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