
Mesidotea entomon

A large idoteid isopod

Phylum: Arthropoda, Crustacea

Class: Multicrustacea, Malacostraca, Eumalacostraca

Order: Peracarida, Isopoda, Valvifera

Family: Chaetillidae

Taxonomy: There is confusion regarding the proper genus name for this species (*Mesidotea entomon* or *Saduria entomon*, see International Commission of Zoological Nomenclature (ICZN) 1963, 1964; Rafi and Laubitz 1990). *Mesidotea* was described by Richardson in 1905 but *Saduria*, described by Adams in 1852, is the oldest available name and was determined to be the appropriate name by the ICZN (1964), while *Mesidotea* was listed as an unaccepted junior synonym. However, many authors still recognize Richardson's genus or indicate both names, including the most recent intertidal guide for the northeastern Pacific, which we follow with *M. entomon* (Brusca et al. 2007). Readers should note, however, that use of *Saduria entomon* is just as common and may replace *M. entomon* in the near future.

Description

Size: One of the largest crustaceans in the Baltic Sea and large size is typical of this genus (Richardson 1905). Northwest specimens about 40 mm in length (Hatch 1947). The illustrated specimen, a young mature male from the Columbia River estuary, was 43 mm in length (Fig. 1). Arctic males can be to 95 mm (11 grams) and females 79 (7 grams) mm (McCrimmon and Bray 1962).

Color: Light brown, mottled and with small black chromatophores.

General Morphology: Isopod bodies are dorso-ventrally flattened and can be divided into a compact **cephalon**, with eyes, two **antennae** and **mouthparts**, and a **pereon** (thorax) with eight segments, each bearing similar **pereopods** (hence the name "iso-

pod"). Posterior to the pereon is the **pleon**, or abdomen, with six segments, the last of which is fused with the telson (the **pleotelson**) (see Plate 231, Brusca et al. 2007). The Isopoda can be divided into two groups: ancestral ("short-tailed") groups (i.e. suborders) that have short telsons and derived ("long-tailed") groups with long telsons. Valviferan (including the Chaetillidae) isopods have an elongated telson (Figs. 1, 4) (Fig. 73, Ricketts and Calvin 1952). *Mesidotea entomon* individuals are ovate, flattened with broad anterior, tapering to a narrow posterior extremity (Richardson 1905).

Cephalon: Anterior deeply excavate, lateral margins notched into two sub-lobes (Schultz 1969). The anterior lobe is rounded, while the posterior is acute and does not extend beyond the anterior one (Fig. 1) (Richardson 1905). First thoracic segment fused with head (Isopoda, Brusca et al. 2007).

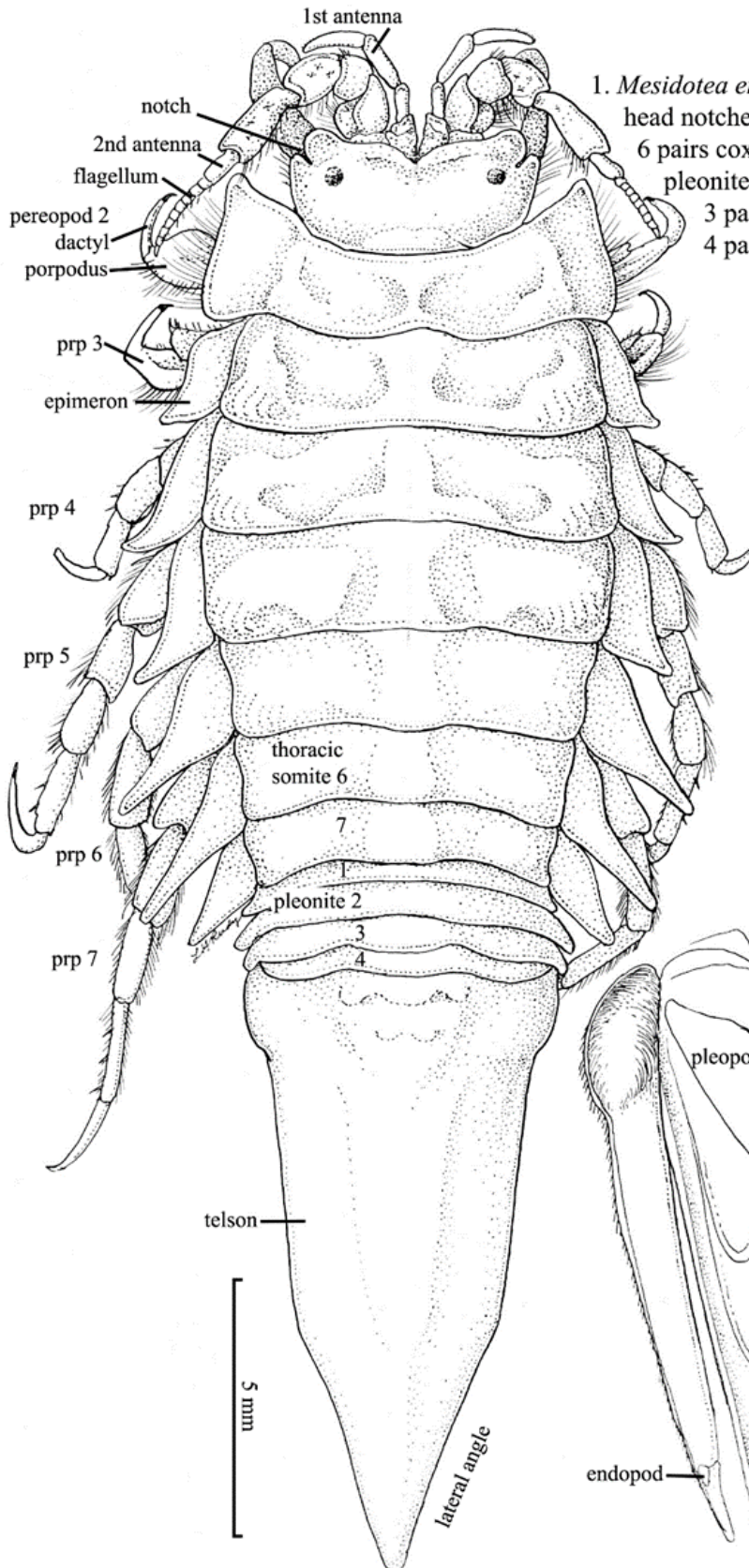
Eyes: Dorsal eyes are small, round, distinct, compound (Richardson 1905) and set at base of lateral cleft of head (Fig. 1).

Antenna 1: Small and with four articles. The basal article is enlarged and twice as wide as article two. In length, the first antenna reaches the fourth peduncle article of the second antenna (Fig. 1).

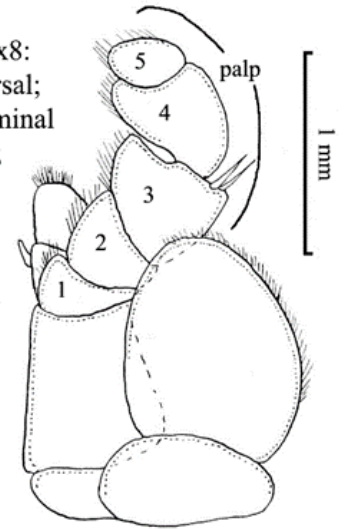
Antenna 2: The second antenna is with multiarticulate flagellum (Richardson 1905) and the peduncle consists of five articles, the fifth being longest and the first flagellum article is also quite long.

Mouthparts: Well developed for chewing and biting (Idoteidae, Schultz 1969). Maxilliped palp with five articles (Schultz 1969) (Fig.2) and mandible with molar

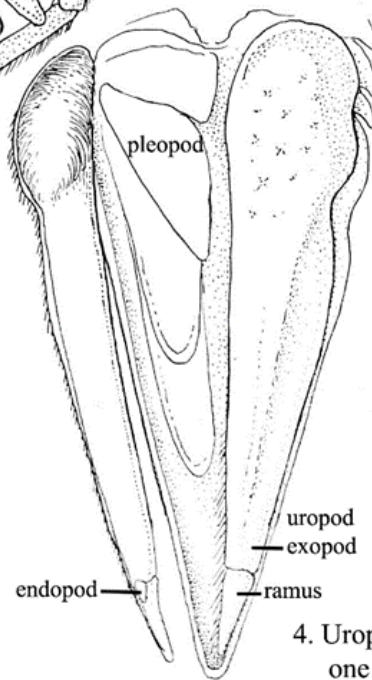
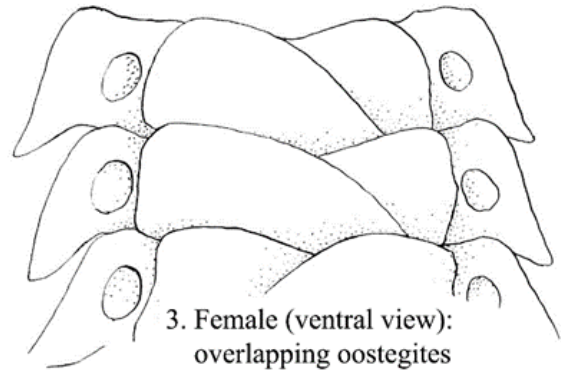
Mesidotea entomon



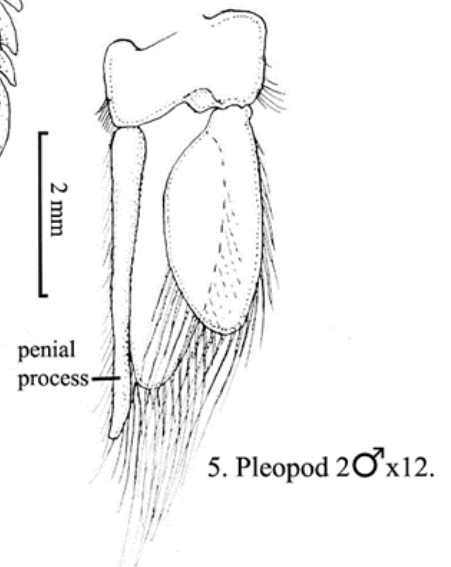
1. *Mesidotea entomon* (L: 28mm) x8:
head notched laterally; eyes dorsal;
6 pairs coxal epimera; 4 abdominal
pleonites, shield-like telson;
3 pairs prehensile legs,
4 pairs ambulatory.



2. Maxilliped x30:
5 articulated palp.



4. Uropods (ventral view) x8:
one side of operculum open.



process and without palp (not figured).

Rostrum:

Pereon: Body elongate and depressed with thorax composed of seven segments (Fig. 1) (Brusca et al. 2007).

Pereonites: Pereon with seven segments that are all free, subequal and sculptured (Idoteidae, Miller 1975). Distinct coxal epimeral sutures are present on somites 2–7 (Fig. 1), forming long points (epimeron six longest, Richardson 1905).

Pereopods:

Pleon: Short pleon with five pleonites (Brusca et al. 2007).

Pleonites: Five pleonites, with anterior four short and a long telson, which is partly fused with fourth pleonite (Fig. 1).

Pleopods: Appendages of the pleon include five respiratory pairs and a single pair of uropods (Brusca et al. 2007). Pleopods are enclosed within operculum (Fig. 4). Male second pleopods with penial process along midline, about 2½ times total pleopod length (McCrimmon and Bray 1962) (nearly mature male, Fig. 5).

Uropods: Ventral. Exopod (outer branch) forms operculum over pleopods (Fig. 4) (Valvifera, Miller 1975), is large, and with two parts – a large upper and a small terminal ramus. The endopod (inner branch) is minute (Schultz 1969) (Fig. 4).

Pleotelson: Long, shield-like, pointed and with lateral angles on posterior 1/3 (Fig. 1) and operculum is clearly visible ventrally (Fig. 4).

Sexual Dimorphism: Conspicuous sexual dimorphism is rare among isopods, but mature males are considerably larger (130–140% larger) than females in *M. entomon* (Korczyński 1991). Males have a penial process on pleopod two and modified first pleopods, called gonopods (Sadro 2001; Boyko and Wolff 2014). Females have leaf-like overlapping abdominal oostegites (Fig. 3) comprising a thoracic marsupium. This

conspicuous brood pouch is lost once young hatch and the female molts and must develop again for another brood (Haahtela 1978).

Possible Misidentifications

The order Isopoda contains 10,000 species, 1/2 of which are marine and comprise 10 suborders, with eight present from central California to Oregon (see Brusca et al. 2007). Among isopods with elongated telsons (with anuses and uropods that are subterminal), there are several families including Flabellifera, Anthuridea, Gnathiidea, Epicaridea and Valvifera. The Valvifera are characterized by hinged doors or valves covering the pleopods, well-developed coxal plates, the absence of mandibular palps, occasionally fused pleonites and males with modified sexual appendages arising from the first pleonite, rather than the thorax.

This suborder includes three local families and 34 species: the Chaetiliidae, the Arturidae and the Idoteidae (see *Idotea resecata* and *I. wosnesenskii*, this guide). The Arturidae is composed of species with narrow but cylindrical bodies, with the anterior four pleopods larger and less setose than the posterior three. The Idoteidae is composed of 22 local species and characteristics of the group include a dorso-ventrally compressed body, similar pereopods, and seven free pereonites (Brusca et al. 2007). The Idoteidae includes those species with a pleon composed of two complete and one incomplete pleonite(s), a maxillipedal palp with five articles and one coupling seta, eyes that are not elongated transversely and a large shield-like pleotelson (Brusca et al. 2007).

Among the *Idotea*, *I. urotoma*, *I. rufescens*, and *I. ochotensis* have a maxillipedal palp with four articles (rather than five in the remaining eight *Idotea* species). Of the *Idotea* species with five maxillipedal palp articles, *I. aculeata*, a reddish idoteid, has a long projection on its narrowing pleotelson.

It has oval eyes (not reniform), long antennae and blunt lateral borders on the first pleonite. *Idotea montereyensis* is slender and small (up to 16 mm), red, green-brown, or black and white and is found on or amongst *Phyllospadix* species and red algae. It has a rounded telson and with a short projection. *Idotea stenops* is olive-green to brown, found on brown algae and with narrow eyes, a slender pointed telson, and 2–3 coupling hooks on its maxillipeds, not one. *Idotea schmitti* has pleonite one with acute lateral borders and an anterior margin of pereonite one that does not encompass the cephalon. *Idotea kirchanskii* is bright green and found on *Phyllospadix* species. It has a rounded telson (lacking a medial projection), oval eyes and the epimera of pereonial somites are visible dorsally only on segments 5–7.

(The following characteristics are from descriptions of the genus as *Saduria*, and, thus, we use this name (see **Taxonomy**) (Rafi and Laubitz 1990)). *Saduria* (= *Mesidotea*) and *Idotea* species are similar in that their maxilliped palps have 4–5 articles and their abdomens have 4–5 segments. *Saduria* species can be distinguished from other idoteid genera by their dorsal eyes, most idoteids have essentially dorsolateral eyes (see Fig. 1 *I. resecata*, Fig. 1 *I. wosnesenskii*). *Saduria* species are also very large and occur in brackish or fresh water, which is unusual in the family. Furthermore, *Saduria* species have an abdomen with five segments, rather than four in *Idotea* and uropods are biramous, rather than uniramous in *Idotea*. Furthermore, *Saduria* species have a cephalon that is incised laterally, which is not the case in *Idotea* (Rafi and Laubitz 1990).

Mesidotea entomon is the only local species in the family Chaetiliidae, however, there are only two other northern Pacific

species of *Saduria*. *Saduria sibirica* is a small (8.8 mm) Siberian species which occurs only as far east as Alaska. It is short and broad, not long and narrow and its thoracic epimera are blunt, not pointed. Its telson is short, not elongate (Schultz 1969). *Saduria sabini* is a blind species, up to 20 mm long. Unlike *M. entomon*, its head has posterior lobes which are produced and the second antennal flagellum has only six articles (Richardson 1905). *Saduria sabini* is a circumpolar species, found on beaches with muddy bottoms.

Synidotea species have maxilliped palps with 3 segments and an abdomen with 1–3 segments. In *Synidotea* species, there are no visible thoracic epimeral sutures. All abdominal pleonites are coalesced (showing only one lateral suture). The maxilliped palp has three articles and the flagellum (of the second antenna) has many joints (Miller 1975). *Chiridotea* species also have maxilliped palp with three articles as well as mandibles with no molar processes. This genus is similar to *Saduria*, but it occurs only in the Atlantic.

Ecological Information

Range: Type region is the northeast Atlantic. Known range is circumpolar from the west coast of North America south to Puget Sound, Washington (Kozloff 1974) and Pacific Grove, California (Richardson 1905). Also in freshwater European lakes (Hatch 1947) and has been introduced to the Black Sea (Kvach 2009). *Mesidotea entomon* is often called a “glacial relict” as populations in the Baltic are believed to have been isolated there by glacial advance and recession (Croghan and Lockwood 1968; Hagerman and Szaniawska 1991).

Local Distribution: Oregon distribution includes the Columbia River estuary, particularly the lower reaches, and Florence (Hatch 1947).

Habitat: Highly variable from marine mud bottoms, small bays and inlets, on beaches buried in sand, and under rocks (Schultz 1969) to freshwater lakes (Hatch 1947).

Least abundant in sand and gravel (McCrimmon and Bray 1962). *Mesidotea entomon* is a common species used in toxicity testing (e.g. petroleum, Percy 1978; hydrogen sulfide, Vismann 1991).

Salinity: An effective osmoregulator (Croghan and Lockwood 1968; Percy 1984; Carey 1991) that is mostly marine, but also found in brackish water, occasionally in fresh water (Kozloff 1974) and may prefer low salinity (Alaska, (MacGinitie 1955)). Although all other idoteids are marine, *M. entomon* has been found in deep Scandinavian (Brusca 1984) and Canadian (Korcznski 1991) freshwater lakes where individuals exhibit a very high tolerance to a range of salinities (e.g. 0 to more than 35 at 12°C or below, Hagerman and Szaniawska 1991) and commonly reside at salinities of 6–8. Furthermore, individuals have high tolerance to low oxygen and sulphide concentrations, with some populations reported to survive anoxia for up to 12 days (Hagerman and Szaniawska 1990; Modig and Olafsson 1998). In marine populations, males mature at larger sizes and females are larger and produce more eggs than freshwater populations (Narver 1968; Korcznski 1991).

Temperature: Very high tolerance to a range of temperatures (Percy 1984; Hagerman and Szaniawska 1991) from -1.3 to +10.0 C° reported (Beaufort Sea, McCrimmon and Bray 1962). Extreme cold temperatures may limit distribution (Schultz 1969).

Tidal Level: Highly variable. In the Arctic, individuals prefer shallow water (above 13 meters, MacGinitie 1955). However, *M. entomon* populations are also found on beaches and subtidally to as deep as to 813 meters (mid-California, Schultz 1969).

Associates:

Abundance: On Canadian Arctic muddy bottoms, abundances reached 0.46–0.93 individuals per gram per square meter (McCrimmon and Bray 1962). By far the most abundant isopod in Alaskan shallow waters with a sex-skewed ratio of seven females for every one male (MacGinitie 1955).

Life-History Information

Reproduction: Most isopods have separate sexes (i.e. dioecious, Brusca and Iverson 1985) (although protogynous and protandric species are known, Araujo et al. 2004; Boyko and Wolff 2014). Reproduction proceeds by copulation and internal fertilization where eggs are deposited within a few hours after copulation and brooded within the female marsupium (Brusca and Iverson 1985). The biphasic molting of isopods allows for copulation; the posterior portion of the body molts and individuals mate, then the anterior portion, which holds the brood pouch, molts (Sadro 2001). Embryonic development proceeds within the brood chamber and is direct before individuals hatch as manca larvae, resembling small adults, with no larval stage (Boyko and Wolff 2014).

Breeding in *M. entomon* can occur all year (Alaska, MacGinitie 1955) but probably occurs in summer months in the Arctic, where individuals die after reproducing once (McCrimmon and Bray 1962). Male penial styles form a tube for transmission of sperm and ova move into the brood pouch through genital ducts, which open onto the ventral surface of fifth abdominal pleonite. Oviducts are on each lateral edge, close to oostegite attachments, and end in fimbria within the body cavity. Juveniles hatch from May–June at lengths of approximately 3 mm (Bothnian Sea, Leonardsson 1986). The brood size is highly variable. Females were ovigerous from January to May and carried 153 eggs for several months before hatching in the

Bothnian Sea (Leonardsson 1986). In an arctic marine population, the number of larvae carried by a single female ranged from 482–776 (MacGinitie 1955 in Narver 1968) while the average in Chignik Lake, Alaska was 92 larvae per brood (Narver 1968).

Larva: Since most isopods are direct developing, they lack a definite larval stage. Instead young developmental stages resemble small adults (e.g. Fig. 40.1, Boyko and Wolff 2014). Most isopods develop from embryo to a manca larva, consisting of three stages. Manca larvae are recognizable by lacking the seventh pair of pereopods, but otherwise resemble small adults. They usually hatch from the female marsupium at the second stage and the molt from second to third manca produces the seventh pair of pereopods and sexual characteristics (Boyko and Wolff 2014). Isopod development and larval morphology can vary between groups (e.g. Gnathiidae, Cryptoniscoidea, Bopyroidae, Cymothoidae, Oniscoidea) (see Boyko and Wolff 2014). Parasitic isopods, for example, have larvae that are morphologically dissimilar from adults (Sadro 2001). Isopod larvae are not common members of the plankton, with parasitic larvae most likely to be observed. Occasionally, suspended benthic juveniles or pelagic species are collected in plankton samples, but these can be differentiated from larvae by their larger size (Sadro 2001). Recruitment is positively correlated to densities of the amphipod *Monoporeia affinis*, as cannibalism amongst *M. entomon* is higher in areas of low amphipod density (Sparrivek and Leonardsson 1998).

Juvenile: Juvenile development follows the third manca stage, where males have gonopods (modified first pleopods) and females have plate-like limbs on pereopods 2–5, called oostegites (that, together with the sternites, form the marsupium) (Boyko and

Wolff 2014). Juvenile *M. entomon* have fewer second antennal flagellum articles than adults (Richardson 1905). Immature males have a ridged inner edge of pleopod two, where penial process will develop, as well as beginnings of penes on seventh thoracic somite (ventral). Immature females have oostegite "buds" inside bases of pereopods (ventral) (Schultz 1969). Individuals reach sexual maturity after 2–3 years (Bothnian Sea, Leonardsson 1986; Korcznski 1991), males usually before females with females reach maturing at 23–36 mm (Leonardsson 1986).

Longevity:

Growth Rate: Growth among isopods occurs in conjunction with molting where the exoskeleton is shed and replaced. Post-molt individuals will have soft shells as the cuticle gradually hardens. During a molt, arthropods have the ability to regenerate limbs that were previously autotomized (Kuris et al. 2007), however, isopods do not autotomize limbs as readily as other groups (Brusca and Iverson 1985). Compared to other arthropods, isopods exhibit a unique biphasic molting, in which the posterior 1/2 of the body molts before the anterior 1/2 (Haahtela 1978; Brusca et al. 2007).

Young of the year grow to less than 50 mm (McCrimmon and Bray 1962).

Food: An omnivore, predator and scavenger (Leonardsson 1986; Carey 1991), *M. entomon* is known to eat small crustaceans, from the plankton or benthos (e.g. euphausiids, McCrimmon and Bray 1962; copepods, Narver 1968; amphipods, Sparrivek and Leonardsson 1998), fish (e.g. sculpin, salmon, Narver 1968). Several individuals ate a 100–200 mm pygmy whitefish (*Prosopium coulteri*) within 10 hours (Chignik Lake, Alaska, Narver 1968).

Predators: Isopods play a significant role as intermediate food web links, like amphipods, (e.g. see *Americorophium salmonis*, this

guide), that are consumed by more than 20 species of marine fish (McCrimmon and Bray 1962; Narver 1968; Welton and Miller 1980) and whales (Brusca et al. 2007). Cannibalism is also common in *M. entomon*, particularly between individuals of disparate sizes (Sparrivek and Leonardsson 1998).

Behavior:

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