
Idotea wosnesenskii

Phylum: Arthropoda, Crustacea
Class: Malacostraca
Order: Isopoda
Family: Idoteidae

Taxonomy: The genus *Idotea* was described by Fabricius in 1798, and although originally spelled *Idotea*, several authors adopted the spelling *Idothea*, since then. The genus *Pentidotea* was described by Richardson in 1905 and was reduced to subgeneric level by Menzies in 1950. The two subgenera (or genera), *Pentidotea* and *Idotea* differ by the articles on maxilliped palps, the former with five and the latter with four (Miller and Lee 1970), but are not always currently recognized (Rafi and Laubitz 1990). Furthermore, this character may vary with age and other characters may reveal more concrete differences to define the two (Poore and Ton 1993). Thus synonyms for *I. wosnesenskii* include, *Idothea wosnesenskii*, *Pentidotea wosnesenskii* and *Idotea Pentidotea wosnesenskii*. We follow the most recent intertidal guide for the northeast Pacific coast (Brusca et al. 2007), which uses the name *Idotea wosnesenskii*.

Description

Size: Individuals to 35 mm in length (Hatch 1947) and $\frac{1}{2}$ to $\frac{1}{3}$ as wide as long (Fee 1927; Ricketts and Calvin 1952). The figured specimen (male) is 22 mm long. A 22-mm male weighs approximately 0.3 grams and a similar sized female weighs 0.2 grams (wet weight).

Color: Dark green or light olive and some individuals living amongst red algae are dark red and gray (Fee 1927). Males tend to be larger and paler than females (Welton and Miller 1980). Color polymorphism is high in the congener, *I. baltica* and variation is determined by habitat and predation pressure but not sexual selection (Jormalainen and Merilaita 1995).

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 Idoteidae) isopods have an elongated telson (Fig. 73, Ricketts and Calvin 1952). *Idotea wosnesenskii* individuals are robust, not tapered, elongate and depressed (see Fig. 62, Ricketts and Calvin 1952).

Cephalon: Wider than long, with frontal margin slightly concave (Miller 1968) and posterior portion somewhat wider than anterior portion (Richardson 1905). Head narrower than pleon (Schultz 1969). First thoracic segment fused with head (Isopoda, Brusca et al. 2007).

Rostrum: Frontal process widely angulate and hidden by and not extending beyond frontal lamina, which is triangulate (in dorsal view) (Fig. 2).

Eyes: Eyes small, reniform (kidney-shaped) (Miller 1975) (Fig. 4), compound, transversely ovate and situated at extreme lateral margins (compare to *M. entomon*, this guide), about halfway between the anterior and posterior margins (Fig. 1).

Antenna 1: First antennae (antennules) with four articles, basal one large and flattened.

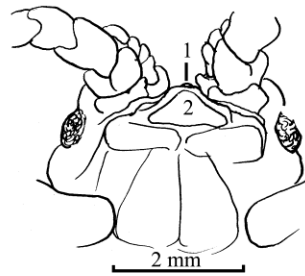
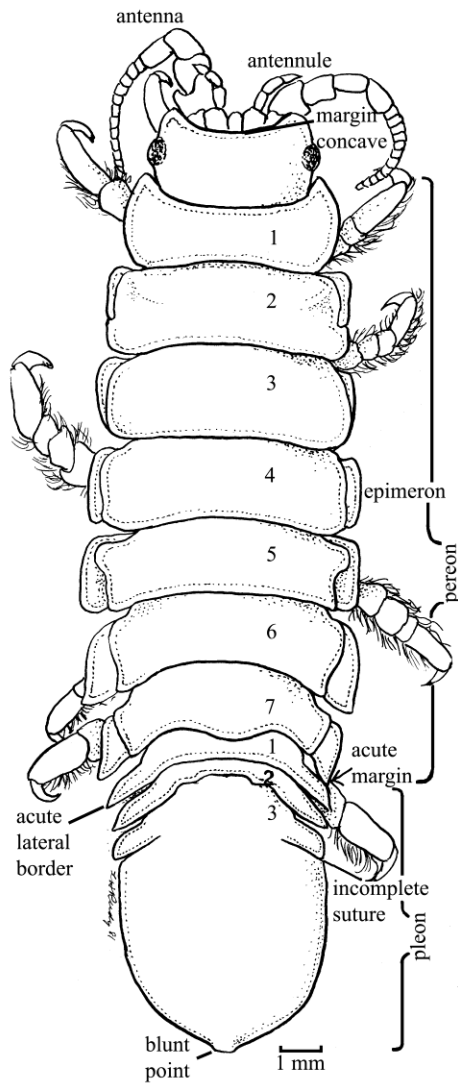
Antenna 2: Second antennae with peduncle of five articles and flagellum of 12–16 articles (Fig. 1).

Mouthparts: Maxilliped palp with five articles and one coupling hook (Miller 1975).

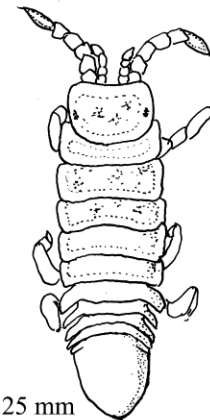
Pereon: Body elongate and depressed with thorax composed of seven segments (Brusca et al. 2007).

Pereonites: All seven thoracic somites (pereonites) are free (Idoteidae) with epimeral sutures visible dorsally (except the first somite) (Fig. 1). Postero-lateral border of last pereonite acute (Fig. 1).

Idotea wosnesenskii

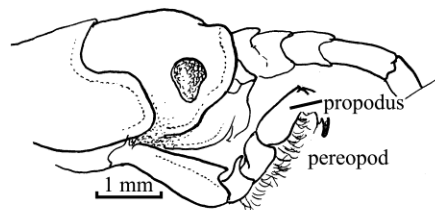


2. Head (ventral view) x12:
frontal process (1) hidden by
frontal lamina (2).

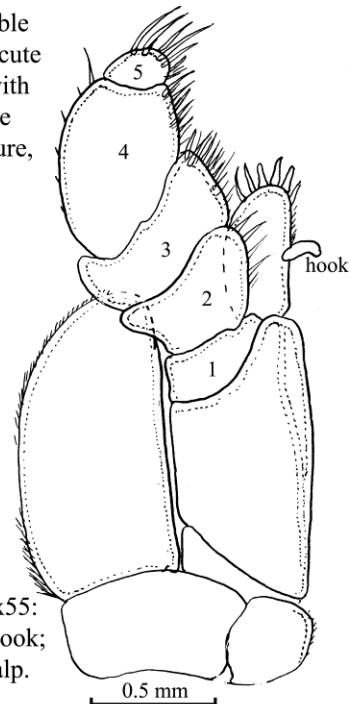


3. Young x7.5:
actual length 8.25 mm
short antennal flagella. 1 mm

1. *Idotea wosnesenskii* (L: 22mm W:6.6mm) ♀ x7.5:
body elongate, not tapered; dark green; head
narrower than pleon, frontal margin concave;
eyes at lateral margins
seven free pereonites, six visible
epimera; last pereonite with acute
posterolateral border. Pleon with
2 pointed pleonites, shield-like
pleotelson, an incomplete suture,
and a blunt terminal point.



4. Head (lateral view) x12:
eyes reniform; pereopods hairy.



5. Maxilliped x55:
one coupling hook;
five-articled palp. 0.5 mm

Pereopods: Seven pairs of ambulatory and similar walking legs.

Pleon: Short pleon with six pleonites (Brusca et al. 2007). Pleon with two complete and one partial intersegmental suture dividing it into three divisions. Pleon wider than head (Schultz 1969).

Pleonites: Two small anterior pleonites and a large shield-like pleotelson with an incompletely fused pleonite near its base (Fig. 1) (Miller 1975). The first pleonite with acute lateral borders and shorter laterally than medially (Miller 1975; Kozloff 1974) (Fig 1).

Pleopods: Seven pleopod pairs are ambulatory, nearly similar and all with small sharp claws. Male pereopods with coarse hairs (Figs. 1, 4) and females with hair only on propodi. Appendages of the pleon include five respiratory pairs and a single pair of uropods (Brusca et al. 2007). The first three pairs are particularly locomotory (e.g. for swimming), while the posterior two pairs are strictly respiratory (Alexander 1988; Alexander et al. 1995), although all five pairs can also function in ventilation as water is passed through the branchial chamber with a total of three strokes (Alexander 1991).

Uropods: Ventral, not visible dorsally, and forming opercular plates or valves.

Pleotelson: Large, shield-like, broadly rounded (Hatch 1947), and ends in large blunt point (Fig. 1).

Sexual Dimorphism: Conspicuous sexual dimorphism is rare among isopods, however, males tend to be larger, paler, and have hairier legs than females in *I. wosnesenskii*. Mature females are broader and bear a thoracic marsupium while males have modified first pleopods, called gonopods (Sadro 2001; Boyko and Wolff 2014).

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 (see *Mesidotea entomon*, this guide), the Arturidae and the Idoteidae. The Arturidae is composed of species with narrow but cylindrical bodies, with the anterior four pleopods larger and less setose than the posterior three. Characteristics of the Idoteidae include a dorso-ventrally compressed body, similar pereopods, and seven free pereonites and is composed of 22 species, locally (Brusca et al. 2007).

Most local species in the Idoteidae are within the genus *Idotea* (12 species), which includes those 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). *Idotea sensu* Poore and Ton 1993 refers only to individuals with free pleonites, anterior spiniform pereopod setae and free penes, while many northeastern Pacific species have fused pleonites, partially fused penes and reduced coxae (Poore and Ton 1993). Based on these characters, authors differentiate *Idotea* from *Pentidotea* (see **Taxonomy**).

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) a character that previously defined two subgenera, *Idotea Idotea* (with four articles) and *Idotea Pentidotea* (with five articles) (Menzies 1950; Miller and Lee 1970).

Of the *Idotea* species with five maxillipedal palp articles (*Idotea Pentidotea*, Menzies 1950), *I. aculeata*, a reddish idoteid with a long projection on its narrowing pleotelson. It has oval eyes (not reniform), long antennae and blunt lateral borders on the first pleonite (compare to acute borders as in *I. wosnesenskii*). *Idotea montereyensis* is slender and small (up to 16 mm), red, green-brown, or black and white and is found on *Phyllospadix* species and red algae. It has a rounded telson and with a short projection. It differs from *I. wosnesenskii* in the frontal process, which is narrow, pointed and

projects much beyond the frontal lamina. The frontal lamina is triangulate (compare to *I. wosnesenskii*, frontal process and Fig. 2). Male *I. montereyensis* are long and slim and females are broader, and more like *I. wosnesenskii* in outline. *Idotea schmitti* has pleonite one with acute lateral borders as in *I. wosnesenskii*, but the anterior margin of pereonite one does not encompass the cephalon. *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 kirchanskii* is bright green and found on *Phyllospadix* species. It has a rounded telson (lacking a medial projection), oval eyes and the epimera of pereonal somites are visible dorsally only on segments 5–7. *Idotea resecata* (this guide) has a very distinctive concave pleotelson that is not a rounded, but convex.

Ecological Information

Range: No exact type locality is given, but region (based on noted locations in the original species description) is likely Sea of Okhotsk and Bering Sea (Menzies 1950). Known range from Sea of Okhotsk, Russia, Bering Sea, Alaska (Menzies 1950), south to San Luis Obispo, Calif. (Ricketts and Calvin 1952; Kussakin 1994).

Local Distribution: Oregon distribution in Coos (e.g. at Pigeon Point) and Tillamook Bays (Hatch 1947).

Habitat: Substrates include rocks and pilings (Puget Sound, Washington Kozloff 1974), but individuals also occur under rocks on gravelly or sandy substrates with lots of vegetative debris as well as in crevices and cracks, within empty shells and worm tubes (Brusca et al. 2007). Also in mussel beds, on *Ulva* and *Porphyra* (Welton and Miller 1980). More common on outer rocky shores than in estuaries (Menzies 1950; Ricketts and Calvin 1952).

Salinity: Tolerates salinity changes better than *I. resecata* (Brusca 1966; Welton and Miller 1980). Primary osmoregulation (i.e. inward ion transport) occurs with the endopodites of the posterior three pleopods (Holliday 1988).

Temperature: North Pacific *Idotea* species exhibit a wide temperature tolerance as their ranges extend across several zoogeographic provinces that are associated with

temperature barriers for other invertebrates (Wallerstein and Brusca 1982).

Tidal Level: Upper middle intertidal zone to 16 m deep. The figured specimen was collected at 0.0 meters.

Associates: Associates include the gastropod *Tegula*, brachyurans *Hemigrapsus* species and *Cancer oregonensis*, and the carnivorous gastropod, *Nucella*. Often co-occurs with mussel species in large clusters (Ricketts and Calvin 1952).

Abundance: Common and probably the most common idoteid isopod in Coos Bay (Kozloff 1974; Menzies 1950). Most common small crustacean in Santa Cruz, California (Ricketts and Calvin 1952).

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 with individuals hatching as manca larvae that resemble small adults, with no larval stage (Boyko and Wolff 2014). Little is known about reproduction and development in *I. wosnesenskii* specifically, but females are ovigerous in July (California, Welton and Miller 1980) and a few advanced (8 mm) juveniles were found in female oöestigites in April (Coos Bay). *Idotea baltica* and *I. chelipes* produce 1–3 broods per year with brood sizes that range from 60 to 120 eggs per brood (Limfjord, Denmark, Kroer 1989; Baltic, Jormalainen and Tuomi 1989).

Larva: Since most isopods are direct developing, they lack a definite larval stage. Instead this young developmental stage resembles 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).

Juvenile: Juveniles possess most adult characteristics, but antennal flagellae are shorter than in adults (Fig. 3). This specimen was found in a female brood pouch. Juvenile development in isopods 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). Females brood beginning when body length is 13 mm (Wallerstein and Brusca 1982).

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 autonomized (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 (Brusca et al. 2007).

Food: *Idotea wosnesenskii* is primarily an herbivore, eating kelp and eelgrass blades (Welton and Miller 1980). However, *I. wosnesenskii* individuals are also known to chew through and ingest egg capsules of the gastropod, *Nucella emarginata* (Rawlings 1990). *Idotea* species produce a phenolic compounds that reduces feeding on eelgrass (*Zostera* species) by other grazers (e.g. *Ampithoe valida*, this guide) (Lewis and Boyer

2014). Regarding the intertidal alga, *Iridaea cordata*, *Idotea wosnesenskii* only fed on reproductively mature plants (Gaines 1985). A feeding rate of approximately 3 mg per day of the unicellular epiphytes, *Isthmia nervosa* and *Odonthalia floccosa* (Ruesink 2000) was reported and overall, algal feeding rates in *Idotea* species can range from 0.1–71.3 mg per individual per day (Trowbridge 1993). *Idotea wosnesenskii* is not negatively affected by macroalgal defenses (e.g. acrylic acid) (VanAlstyne et al. 2001) unlike many grazers (e.g. *Strongylocentrotus* species).

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 (Welton and Miller 1980; cabezon, Best and Stachowicz 2012) and whales (Brusca et al. 2007).

Behavior: Swimming is accomplished by propulsion from the first three pairs of pleopods. In *Idotea resecata* and *I. wosnesenskii*, the power strokes from each pleopod occur in succession, but the recovery strokes occur simultaneously (Alexander 1988).

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