

## The Idoteidae (Crustacea: Isopoda: Valvifera) of the shallow waters of the northeastern North Pacific Ocean

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The distribution of the northeastern North Pacific Idoteidae reflects the general eurytopy in the shallow marine environment of the component species. The family is represented by four genera and 20 species in the region between Juan de Fuca Strait, Washington, and Prince William Sound, Alaska. Collections studied from this area contained 16 species of idoteids, of which 3 (*Idotea* (*Pentidotea*) *recta*, *Synidotea cornuta*, and *S. minuta*) are new; the new species are fully illustrated and described. The status of nine additional species recorded in the literature from the area is discussed, and four of them are diagnosed and included in the keys. The morphological characters of the four genera were examined in detail and their systematic importance is discussed. All the appendages surveyed showed differences at least at the generic level.

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La répartition des espèces littorales de la famille des Idotéidés dans la région nord-est du Pacifique Nord indique leur tolérance écologique. Quatre genres et 20 espèces se trouvent dans la région s'étendant du détroit Juan de Fuca (état de Washington) jusqu'à Prince William Sound (état de l'Alaska). Les échantillons étudiés comprennent 16 espèces d'Idotéidés, dont 3 (*Idotea* (*Pentidotea*) *recta*, *Synidotea cornuta* et *S. minuta*) sont nouvelles. Les nouvelles espèces sont décrites en détail. Neuf autres espèces de la région sont signalées dans la littérature scientifique; quatre entre elles sont reconnues; elles sont décrites brièvement et incluses dans les clés d'identification. Les caractéristiques morphologiques des quatre genres ont été examinées en détail et leur importance taxonomique a été étudiée; tous les appendices examinés ont une valeur diagnostique au moins au niveau générique.

### Introduction

Valviferan isopods of the family Idoteidae are abundant in the seas of the northern hemisphere. They are free-living, benthic, omnivorous, and eurytopic. The family is primarily cold temperate in distribution, with a few warmer-water occurrences.

The coastal waters of the northeastern North Pacific Ocean provide a diversity of habitats for idoteids, ranging from rocky stretches of exposed outer coast to the protected waters of the inner passages and embayments.

There have been few studies of the idoteids inhabiting the region between Juan de Fuca Strait, Washington, and Prince William Sound, Alaska. Richardson (1905), in her comprehensive monograph covering all of North America, reported eight species, *Idotea ochotensis* Brandt, 1851, *I. resecata* Stimpson, 1857, *I. schmitti* Menzies, 1950 (as *I. whitei* Stimpson, 1864), *I. urotoma* Stimpson, 1864, *I. wosnesenskii* Brandt, 1851, *Mesidotea* (= *Saduria*) *entomon* (Linnaeus, 1767), *Synidotea angulata* Benedict, 1897, and *S. nodulosa* (Krøyer, 1846). Subsequent studies have been confined to local areas within the southern part of this region. Fee (1927) added two species, *I. fewkesi* (Richardson, 1905) and *I. rufescens* n.sp., to the list in his investigation of Departure Bay. Hatch (1947), in his report on the Isopoda of Washington, listed 15 species of which 4, *S. bicuspidata* (Owen, 1839), *S. nebulosa* Benedict, 1897, *S. pettiboneae* Hatch, 1947, and *S. ritteri* Richardson, 1904, were new to the region. George and Strömberg's (1968) study in the San Juan Archipelago produced one new record, *I. aculeata* (Stafford, 1913). Other additions to the idoteid fauna were made by Menzies (1950), who determined that some of Hatch's *I. ochotensis* were *I. montereyensis* (Maloney, 1933), and by Rafi (1972), who described the new species *I. obscura*. Kussakin (1982) stated that the species referred to as *I. ochotensis* in this region is in fact *I. aleutica* Gurjanova, 1933, and that *I. ochotensis* does not occur here. He also concluded that

*S. bicuspidata* is an arctic species and that specimens from our area attributed to it are *S. consolidata* Stimpson, 1856. Distributional records from the more general literature are listed by Rafi (1985).

Three other species have been reported from the northeastern North Pacific: *Idotea stricta* Dana (Lord 1866) was originally reported from Australia, *I. rotundata* Richardson (Andrews 1925) is a western Pacific species, and *Synidotea muricata* (Harford), reported by several authors, is a northern species very similar to *S. nodulosa*. Thus, it appears that these records are probably based on misidentifications.

This paper reports on the results of investigations on the idoteids in intertidal collections from the northeastern North Pacific, in the region between Puget Sound and Juan de Fuca Strait, Washington, and Prince William Sound, Alaska. The collections are from a wider area than most previous studies. They add four species, *Edotia sublittoralis* (Menzies and Barnard, 1959), one new species of *Idotea*, and two new species of *Synidotea*, to the known idoteid fauna of the region. Extensions to the known distributional ranges of several species are also recorded.

We report on the 16 species of idoteids that were present in the collections available to us. The systematics, distribution, and ecology of these species are considered. Taxonomic descriptions or diagnoses, and illustrations of the whole animal and of diagnostic characters, are included. Information on synonymy and literature records for most of the species is contained in Menzies (1950), Menzies and Miller (1972), and Kussakin (1982). This information is not repeated here but is given for the species not covered by those authors, and is discussed as necessary in the systematic section.

Four species, *Idotea aleutica*, *Saduria entomon*, *Synidotea nebulosa*, and *S. nodulosa*, previously reported from the area covered by this paper were not present in our collections; they also are diagnosed briefly. All the species reliably reported from the northeastern North Pacific are included in the key.

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Some idoteid species are so closely similar as to be very difficult to differentiate. In an attempt to find more diagnostic characters to help identify these species we have investigated a number of morphological features for any apparent taxonomic value. The results of these investigations are discussed in the systematics section.

### Materials and methods

Most of the material for this investigation came from the extensive collections made by National Museums of Canada (NMC) expeditions, mainly under E. L. Bousfield, from 1955 to 1979. Station data for these expeditions have been published by Bousfield (1958, 1963, 1968), Bousfield and McAllister (1962), and Bousfield and Jarrett (1981). Additional material was borrowed from the Royal British Columbia Museum (RBCM); Pacific Biological Station (PBS); United States National Museum of Natural History, Smithsonian Institution (USNM); and Allan Hancock Foundation (AHF). Details on all collecting localities, including unpublished station data for NMC, PBS, and RBCM collections, are available from the authors.

Most of the species reported and illustrated in this study have been described in at least one of Menzies (1950), Menzies and Miller (1972), and Kussakin (1982); these are given only brief diagnoses in our text. All new species are described in full.

As is consistent with current practice, body length is measured from the anterior margin of the cephalon to the posterior of the pleotelson. Lengths recorded are of the largest male and female of each species in the regional collections examined. Terminology follows that of Menzies (1950) and Menzies and Miller (1972). In the figures, the scale bar refers only to the whole animal. The specimens shown are male unless otherwise indicated.

### Idoteidae Latreille, 1829

Body ovate, oblong, or elongate; dorsoventrally flattened. Antenna 1 4-segmented, usually shorter than antenna 2 which has 5-segmented peduncle and uni- or multi-segmented flagellum. Mandible devoid of palp. Maxilliped with 3- to 5-segmented palp. Coxal plates well developed, freely articulated or fused with pereonites. Pereopods similar, ambulatory or raptorial; anterior 3 may be subchelate. Pleonites variously coalesced. Uropods valve-shaped, usually uniramous, covering pleopods.

#### Remarks

The genus *Idotea* was established by Fabricius in 1798. In 1844, Guérin-Méneville erected the genus *Edotia* on the basis of its 3-segmented maxilliped palp, fused coxal plates, antenna 2 of no more than 4 segments, and 1-segmented pleotelson. *Saduria*, characterized by its 5-segmented pleotelson, strongly subchelate pereopods 1–3, and biramous uropods, was recognized by Adams (1852). *Synidotea* was removed from *Edotia* by Harger (1878) because of its multisegmented antenna 2 flagellum.

Only these four genera of Idoteidae were present in the northeastern North Pacific collections.

#### Morphological investigations

Most previous studies of the family Idoteidae have concentrated on only a few of the morphological characters of the species. As early as 1918 Collinge was regretting the absence of accurate descriptions of mouthparts. Menzies (1950) emphasized the unreliability of body shape as a character, dismissed most of the mouthparts as being "very constant intergenerically," and, citing Vandell's (1943) work with the Oniscoidea, introduced the frontal projections of the head as useful specific characters. Kussakin (1955) examined a large number of meristic characters and found that they tend to be dependent

upon age, sex, and environment. Sywula (1964) also found that many characters were highly variable developmentally, ecologically, and geographically. Menzies and Miller (1972) gave a brief critical overview of the characters used to distinguish the genera. Kussakin (1979), in the first of his isopod monographs, gave a general survey of morphology, including mouthparts and appendages. In the second volume (1982) the idoteid species are illustrated with attention to all the mouthparts and appendages, a practice that it is hoped subsequent authors will follow.

During our study we made detailed investigations on the morphology of the idoteid species from the northeastern North Pacific. We have found that although there is indeed considerable variation within a species, certain appendages, particularly the mouthparts, do show interspecific and intergeneric differences. Specific differences are usually not great, though they may be of use in separating closely similar species. At the generic level, some of the differences are significant.

Another type of character that we noted was the diversity of the setae. They differ not only in kind but also in development, distribution, and abundance. Setal types are rarely limited to a single genus or species, like the toothed scales (Nordenstam 1933) on the pereopods of *Edotia sublittoralis*; their location, number, and arrangement do appear to be species specific. We have, therefore, specified the types of complex setae borne by each species and have tried to illustrate them clearly; detailed study requires a separate undertaking.

The following descriptions of mouthparts and appendages are confined to characters not usually detailed in idoteid taxonomy. The information is derived almost entirely from the northeastern Pacific species and from the innovative detailed figures of Kussakin (1982). Refinement of differences showing at the generic level will have to await worldwide revisions, at which time it should be possible to use more objective techniques to clarify relationships.

The *antenna 1*, *antenna 2*, and *uropod* all show intergeneric differences, as noted in the generic diagnoses and illustrated in Figs. 1 and 4.

The *upper lip* (Figs. 11–1L) is fused to the epistome. In *Synidotea* and *Edotia* it is broad and notched; in *Synidotea* there are some saw-toothed setae marginally. In *Saduria* the lip is broadly bilobed with lateral as well as apical setae, and in *Idotea* it is broad and truncate, with a flattened, barely emarginate apex.

The *mandible* (Figs. 2A–2D) protopod (precoxa) is very large and the gnathobase is equipped with strong cutting teeth and a well-developed molar. The incisor process is more strongly chitinized on the left mandible than on the right, and bears 4 or 5 (rarely 3) teeth. For *Idotea* the number was most frequently 5 on the left and 4 on the right. For *Saduria*, *Synidotea*, and *Edotia* it was usually 4 on each side. The teeth wear down very noticeably, particularly in some species (e.g., *Idotea reseca*). As a result there are apparent differences in tooth number within a species, invalidating this as a diagnostic character.

The left lacinia mobilis always bears 3 teeth. The right lacinia is more complex in all four genera and appears to be a more integral part of the setal row (see Dahl and Hessler 1982). Its appearance is of 2 teeth linked by a weakly toothed plate at the centre of which there is sometimes fused a third tooth and on which there may be accessory plates. There is frequently a fourth tooth, which is immediately succeeded by the setal row. The number and type of setae in the setal row is quite variable.

The molar process is well developed. The biting surface is

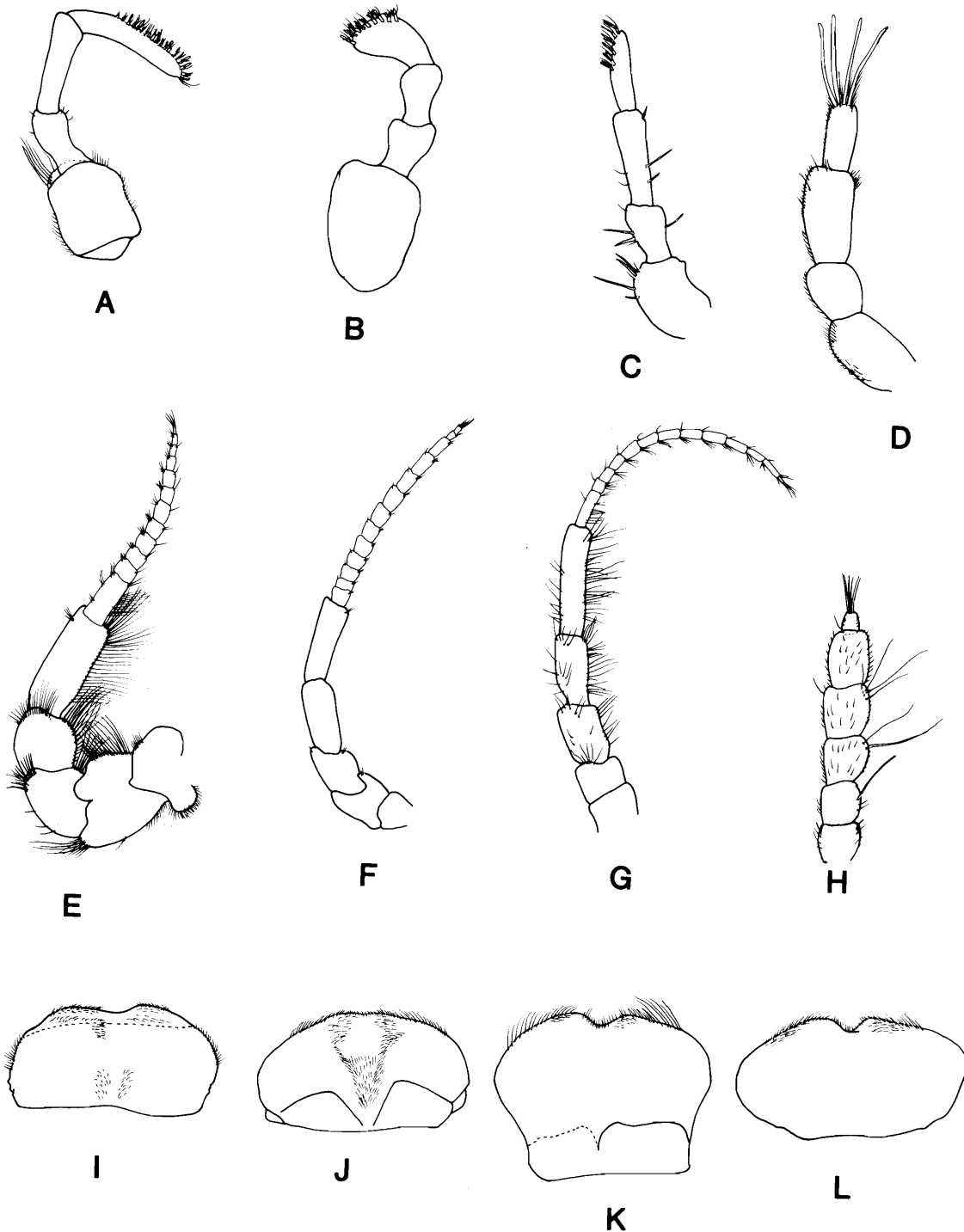


FIG. 1. Antenna 1 (A–D), antenna 2 (E–H), and upper lip (I–L) of *Mesidotea* (A, E, I), *Idotea* (B, F, J), *Synidotea* (C, G, K), and *Edotia* (D, H, L).

ridged and has a dentate margin. We found stronger and sharper dentations in *Saduria*, *Synidotea*, and *Edotia* than in *Idotea*; these dentations are also subject to wear. The molar has a clump of setae situated below its apex; this setation is thick and bushy in *Saduria* and *Idotea* and quite sparse in *Synidotea* and *Edotia*.

The lower lip (Figs. 2E–2H) has two apically setose lobes. In *Idotea* they are apically broad and truncate with a relatively shallow cleft separating them. There are a few stout marginal setae apically along with finer setae that also line the whole of the cleft. Basally, a keel-like structure is visible in most species.

In *Synidotea* the lobes are narrower and more regular in shape and the cleft is deeper. The marginal setae, saw-toothed in some species, do not continue to the base of the cleft. *Edotia* is similar to *Synidotea* but the lobes are widely separated from one another proximally.

In *Saduria* the lobes are more or less rectangular and are broadly separated by a blunt keel; the setae are located laterally on the apex of the lobes.

In the *maxilla 1* (Figs. 2I–2L) the number of large apical and small subapical plumose setae on the endopod appears to be a

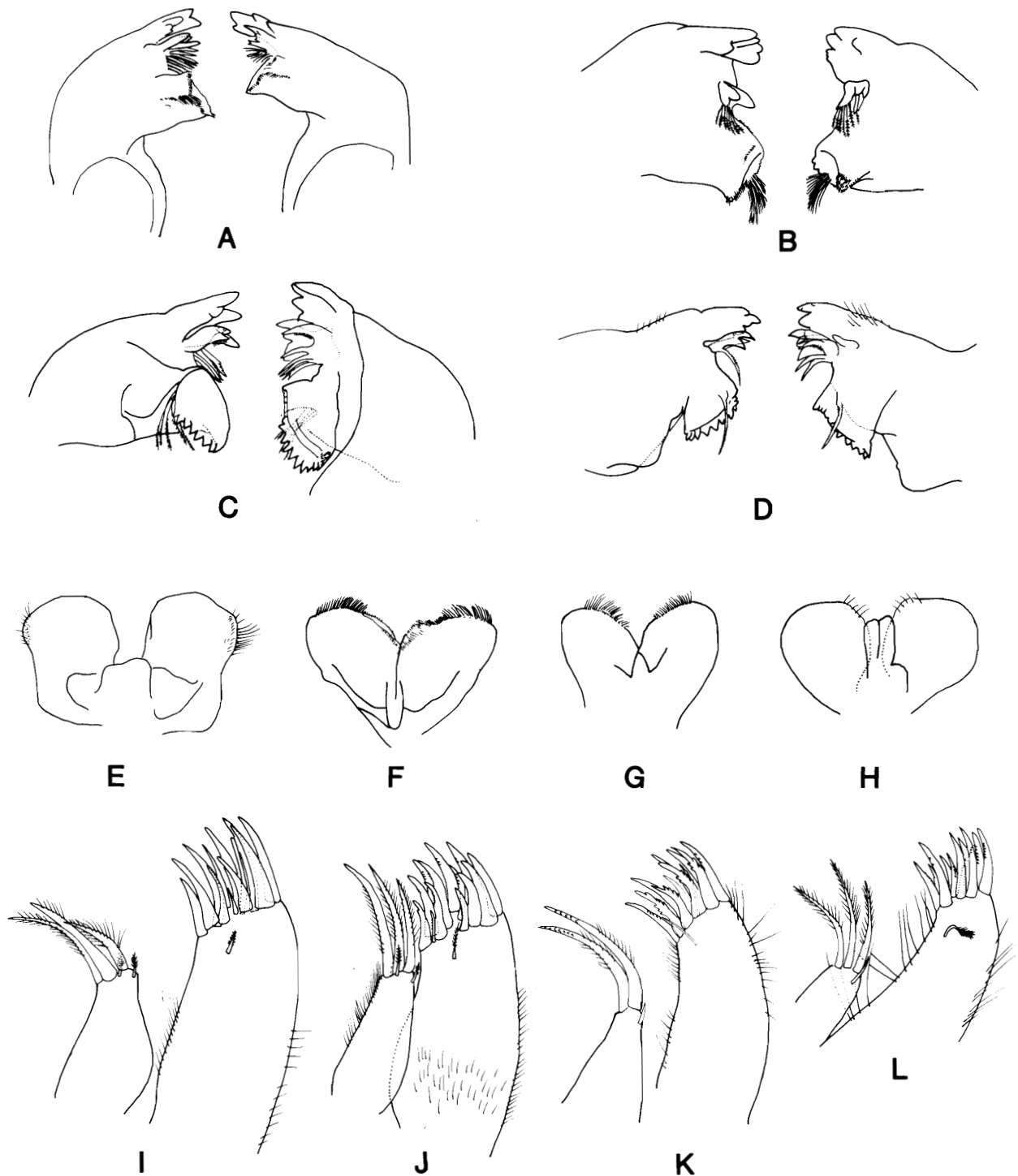


FIG. 2. Mandibles (A–D), lower lip (E–H), and maxilla 1 (I–L) of *Mesidotea* (A, E, I), *Idotea* (B, F, J), *Synidotea* (C, G, K), and *Edotia* (D, H, L).

generic character. In *Idotea* and *Saduria* there are 3 apical and 2 subapical setae; in *Synidotea* there are 2 apical and 1 subapical setae; and in *Edotia* there are 3 apical and 1 subapical setae.

The exopod has two rows of strong apical tooth-like setae and, usually, 1 or 2 small subapical setae. The apical setae are often toothed and are then referred to as ctenate. Since the teeth are ground down during use, the number of ctenate setae observed may depend on how recently the animal has moulted.

In *Idotea* there are 12 setae of which about half are ctenate and 1 is slender and rod-like. In *Synidotea* and *Edotia* there are 11 setae of which the majority are ctenate and 1 is rod-like; in *Synidotea* the latter is extremely slender and difficult to see. *Saduria* has 12 setae including the rod; they are all slender and pointed, of greatly varying sizes, and none are ctenate.

In all four genera the *maxilla 2* (Figs. 3A–3E) endopod has an apical row of simple and plumose setae which is partly

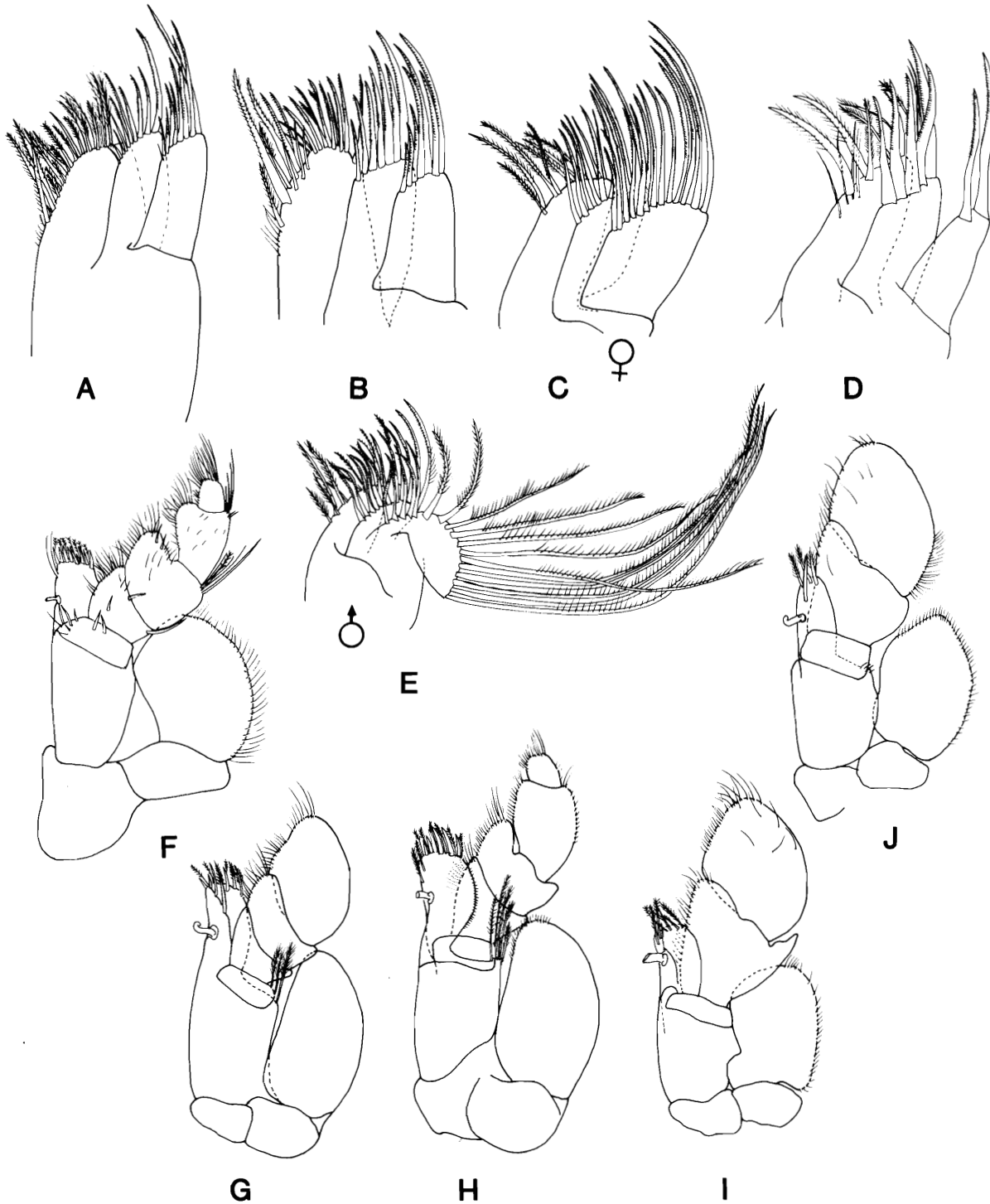


FIG. 3. Maxilla 2 (A-E) and maxilliped (F-J) of *Mesidotea* (A, F), *Idotea* (B, G), *I. (Pentidotea)* (H), *Synidotea* (C, E, I), and *Edotia* (D, J).

overlapped by a row of plumose setae that begins on the median edge and comprises a variable number of setae of which the first one or two are very large.

In *Idotea* and *Saduria* the exopod bears comb setae on both lobes. The number of setae varies within a species but is usually similar for both lobes. Thus, for *I. rufescens* the number for each lobe was 5 or 6; for *I. resecata* it was 10-16 for the inner lobe and 12-15 for the outer lobe.

In *Edotia* the exopod is similar to *Idotea* but bears few rather large setae on each lobe, usually 4 on the outer and 5 on the inner.

*Synidotea* has a sexually dimorphic exopod. In the female both lobes bear comb setae as in *Idotea*. In the male the inner lobe is similar to that of *Idotea*, but the outer lobe is enlarged, recurved laterally, and bears a setal row comprising extremely long plumose setae on the laterally directed portion of the apex;

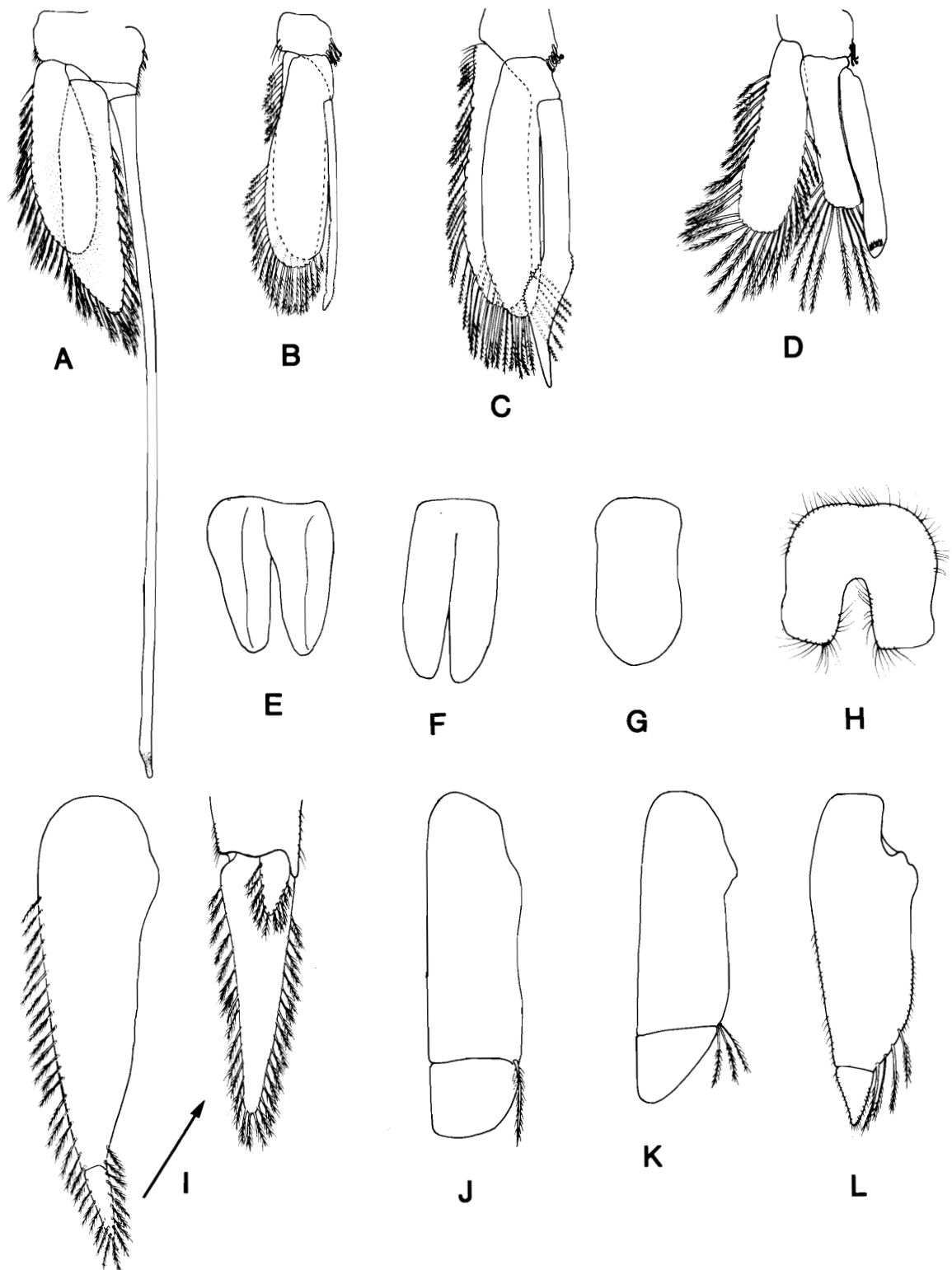


FIG. 4. Pleopod 2 of male (A–D), penes (E–H), and uropod (I–L) of *Mesidotia* (A, E, I), *Idotea* (B, F, J), *Synidotia* (C, G, K), and *Edotia* (D, H, L).

it has median comb setae and usually 1 or 2 intermediate plumopectinate setae. There are always more plumose than comb setae. When we discovered this dimorphism we checked all genera of Idoteidae in our collections, comprising those in this study and *Chiridotea*, *Cleantis*, and *Erichsonella*. None of these genera exhibit this condition. We have not seen any

previous comments on the dimorphic exopod; Kussakin (1982) noted and illustrated both types of exopod but did not appear to recognize that they were related to gender rather than to species.

The *maxilliped* (Figs. 3F–3J) has been used classically as a diagnostic character in idoteids, chiefly because of the variable number of segments in the palp. In *Edotia* and *Synidotia* there

are 3 segments, in *Idotea* 4 (subgenus *Idotea*) or 5 (subgenus *Pentidotea*), and in *Saduria* 5 segments. We noted an apical constriction and a gap in the marginal setae in the distal segment of *Idotea* (*Idotea*), perhaps indicating incomplete fusion. Study of the youngest released stages of *Idotea* (*Pentidotea*) species shows that initially the palp has only 3 segments: there is no suture between segments 2 and 3 or between 4 and 5. The sutures may not be fully developed until after 2 or 3 moults, depending on species and subject to individual variation. In *Synidotea*, palp segment 2 has a characteristic distolateral pointed extension. *Saduria* species have long plumose setae at the distolateral corner of palp segments 2 and 3; otherwise, lateral setation appears to be a specific character. Surface setae were noted in all genera except *Idotea*.

The endite is well developed in *Idotea* and *Saduria* and reaches at least to the distal margin of palp segment 2; it bears strong apical teeth (4–8 in the species studied) as well as plumose setae. In *Edotia* and *Synidotea* the inner lobe does not extend as far as the distal margin of palp segment 2 and it bears only plumose setae; the lobe may be extended distomedially as a triangular spine. The number of coupling hooks or retinacula is usually considered to be invariable, all species having one hook except *Idotea stenops* Benedict, 1898, which has two. However, we have one specimen of *I. recta* that has two hooks, and Kussakin (1982) illustrates several examples with two coupling hooks, such as his Fig. 123 of *I. wosnesenskii*.

The epipod is pointed and squat in *Edotia*, rectangular in *Synidotea*, squarish and inwardly bent in *Saduria*, and elongate and rounded in *Idotea*. The epipod is less than half the length of the palp on *Edotia* and *Synidotea*, just half in *Idotea*, and considerably more than half in *Saduria*. In *Idotea* the basipod usually bears plumose setae (up to 5) which are absent in the other genera.

The male *genital papillae* or *penes* (Figs. 4E–4H) arise from the posterior part of the last thoracic segment and project posteriorly. In *Saduria* they are fused basally and are barely longer than their basal width. In *Idotea* they are either closely contiguous basally or fused for no more than 1/4 of their length; their lateral and mesial margins may be minutely serrate. In *Synidotea* the papillae are fused into a single linguiform structure which may have minute marginal setae. In *Edotia* the fused papillae form a short stout structure with minute setae.

The *appendix masculina* (Figs. 4A–4D) shows generic and minor specific differences. It is a long, trough-like structure. In *Idotea* it is relatively simple with marginal serrations distally and a few recurved spinules at the apex. In *Saduria* it is similar, but extremely long, being at least twice as long as the pleopod rami. In *Synidotea* it is usually complex in its distal quarter, diminishing to a very narrow apex and bearing apical spinules. In *Edotia* it bears a clump of large proximally directed spines just proximal of the apex.

**Key to the genera of Idoteidae in the northeastern North Pacific Ocean**

1. Maxilliped palp 4- or 5-segmented. Abdomen 4- or 5-segmented. Maxilla 1 endopod with 12 apical teeth, exopod with 3 large apical plumose setae. Coxae 2–7 distinct. Pleopod 2 with at least 6 retinacula . . . . . 2  
 Maxilliped palp 3-segmented. Abdomen 1- to 3-segmented. Maxilla 1 endopod with 11 apical teeth, exopod with 2 or 3 large apical plumose setae. Coxae fused to pereonites. Pleopod 2 with no more than 5 retinacula . . . . . 3
2. Cephalon incised laterally. Abdomen 5-segmented. Uropod biramous, inner ramus minute. . . . . *Saduria*  
 Cephalon entire laterally. Abdomen 4-segmented. Uropod uniramous . . . . . *Idotea*
3. Antenna 1 shorter than antenna 2. Antenna 2 flagellum multisegmented. Pleopod 2 with 5 retinacula. Uropod peduncle with apical plumose setae. . . . . *Synidotea*  
 Antenna 1 longer than antenna 2. Antenna 2 flagellum 2- to 4-segmented. Pleopod 2 with 3 retinacula. Uropod peduncle with lateral plumose setae . . . . . *Edotia*

*Saduria* Adam, 1852

*Diagnosis*

Cephalon laterally incised; eyes, when present, dorsal and very small; antenna 1 shorter than antenna 2; antenna 2 flagellum multisegmented; maxilla 1 exopod with 12 apical teeth, endopod with 3 plumose and 2 simple setae; maxilla 2 exopod with comb setae on both lobes, endopod with 2 long plumose setae plus plumose and simple setae; maxilliped endite with apical teeth, palp 5-segmented; coxae, except 1, distinct; penes fused only at base; abdomen 5-segmented; uropod biramous, inner ramus 1/4 to 1/3 outer ramus.

*Remarks*

There has been some confusion concerning the correct name of this genus, many recent authors following Richardson (1905) and referring to it as *Mesidotea*. Bowman (1955) pointed out that there are two older available names, *Saduria* Adams, 1852 and *Idotaega* Lockington, 1876. Two opposing rulings by the International Commission on Zoological Nomenclature (1963, 1964) may have compounded the problem. However, the final

ruling upholds *Saduria* Adams and rejects *Mesidotea* Richardson, placing it in synonymy. The only species of this genus in our study area, *S. entomon* (Linnaeus, 1758), is characterized by the following: abdomen longer than pereon; antenna 2 peduncle segment 5 three to five times longer than broad and flagellum of 10–15 segments; eyes present.

*Idotea* Fabricius, 1798

*Diagnosis*

Cephalon laterally entire; antenna 1 shorter than antenna 2; antenna 2 flagellum multisegmented; maxilla 1 exopod with 12 apical teeth, endopod with 3 plumose and 2 small simple seta; maxilla 2 exopod with comb setae on both lobes, endopod with plumose, simple, and few comb setae; maxilliped endite with apical teeth, palp 4- or 5-segmented; coxae, except 1, distinct, visible dorsally; penes separate or fused only at base; abdomen 4-segmented, posterior 2 segments partly fused to form a pleotelson; uropod, ramus as broad as peduncle which bears 1–6 plumose posterolateral setae.

**Remarks**

Richardson (1905) proposed the new genus *Pentidotea* to accommodate those *Idotea* species having a 5-segmented rather than a 4-segmented maxilliped palp. Menzies (1950) pointed out that this single distinction is scarcely of generic value, and reduced *Pentidotea* to a subgenus, a practice currently followed by most taxonomists. This is supported by our morphological

studies which failed to produce other characters unique to the *Pentidotea* species, and which showed that the maxilliped segmentation develops over several instars. We have therefore not separated the two subgenera in either the text or the key, although we have indicated the subgeneric affiliation of each species.

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**Key to the *Idotea* of the northeastern North Pacific**

1. Posterior margin of pleotelson concave, without median projection . . . . . 2  
Posterior margin of pleotelson convex, with median projection . . . . . 3
2. Posterolateral corners of pleotelson rounded. Maxilliped palp 4-segmented. Coxa 7 rounded posterolaterally . . . . . *I. (I.) rufescens*  
Posterolateral corners of pleotelson sharply pointed. Maxilliped palp 5-segmented. Coxa 7 pointed posterolaterally . . . . . *I. (P.) resecata*
3. Pleonite 1, lateral margins not parallel, forming an acute angle. Posterior margin coxa 7 at least half length of pereonite 7 . . . . . 4  
Pleonite 1, lateral margins more or less parallel. Posterior margin coxa 7 less than half length of pereonite 7 . . . . . 5
4. Pleotelson posterior margin without lateral shoulders. Coxae 5–7 as long as pereonite. Anterior margin of pereonite 1 flush with head margin . . . . . *I. (P.) wosnesenskii*  
Pleotelson posterior margin with rounded lateral shoulders. Coxae 2–7 as long as pereonite. Anterior margin of pereonite 1 laterally separated from head . . . . . *I. (P.) schmitti*
5. Coxae 5–7 as long as pereonite. Pereopod 1, merus with only 1 major seta. Pereopod 7, distal half of propodus palm without setae . . . . . *I. (P.) recta*  
Coxa 5 shorter than pereonite. Pereopod 1, merus with at least 5 major setae. Pereopod 7, distal half of propodus palm with setae . . . . . 6
6. Only coxa 7 (barely) as long as pereonite. Frontal process narrow with pointed apex . . . . . *I. (I.) fewkesi*  
Coxae 6 and 7 as long as pereonite. Frontal process broad with pointed or blunt apex . . . . . 7
7. Pleotelson posterior margin, median projection poorly developed. Lateral margins of pereonite 1 parallel or barely rounded . . . . . 8  
Pleotelson posterior margin, median projection well developed. Lateral margins of pereonite 1 convex . . . . . 9
8. Maxilliped palp 5-segmented. Pereopod 1 carpus and merus with saw-toothed setae. Pereopod 7 merus, carpus, and propodus densely setose . . . . . *I. (P.) montereyensis*  
Maxilliped palp 4-segmented. Pereopod 1 without saw-toothed setae. Pereopod 7 merus, carpus, and propodus barely setose . . . . . *I. (I.) urotoma*
9. Pleotelson posterior margin with elongate median projection. Maxilliped palp segment 4 laterally without setae. Antenna 2 flagellum longer than peduncle . . . . . *I. (I.) obscura*  
Pleotelson posterior margin with short median projection. Maxilliped palp segment 4 laterally setose. Antenna 2 flagellum shorter than peduncle . . . . . *I. (I.) aleutica*

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*Idotea (Idotea) rufescens* Fee, 1927

Figs. 5 and 7

**MATERIAL EXAMINED:** Nearly 100 specimens from southeastern Alaska, Queen Charlotte Islands, British Columbia mainland, Vancouver Island, and Juan de Fuca Strait (RBCM, NMC). Intertidal to 12 m.

**OTHER SPECIMENS EXAMINED:** California, 5 specimens (USNM).

**Diagnosis**

**Male:** Eye horizontally oval, tapering slightly posteriorly. Supra-antennal margin of cephalon slightly concave; frontal process elongate, apically blunt; frontal lamina 1 semicircular. Maxilliped palp, segment 4 without lateral setae, distolateral corner of basipodite with 1–3 plumose seta. Pereopod 1, carpus and propodus with file-toothed setae. Pereopod 7, carpus with file-toothed seta, propodus with file-toothed setae and saw-toothed setae. Coxae 6 and 7 as long as pereonite, deep,

posteriorly square. Pleotelson, posterolateral corners rounded, posterior margin concave except for low median projection. Pleopod 2, appendix masculina extending well beyond ramus and distally rounded, with sharp distal spines on lateral margin. **Female:** Differs from male in having comparatively shorter pleotelson more broadly rounded posterolaterally. Measurements: male 20.6 mm; ovigerous female 18.2 mm.

**DISTRIBUTION:** Previously known from British Columbia to Marin County, California (Kussakin 1982). New records extend the range north to Prince William Sound, Alaska.

**Remarks**

There has been some confusion in the literature regarding the validity of *I. rufescens*. Menzies and Waidzunus (1948) showed that young specimens of the subgenus *Pentidotea* may have a 4-segmented maxilliped palp and therefore suggested that *I. rufescens* was a juvenile of *I. resecata*. However, Menzies (1950) subsequently accepted the validity of *I. rufescens*,

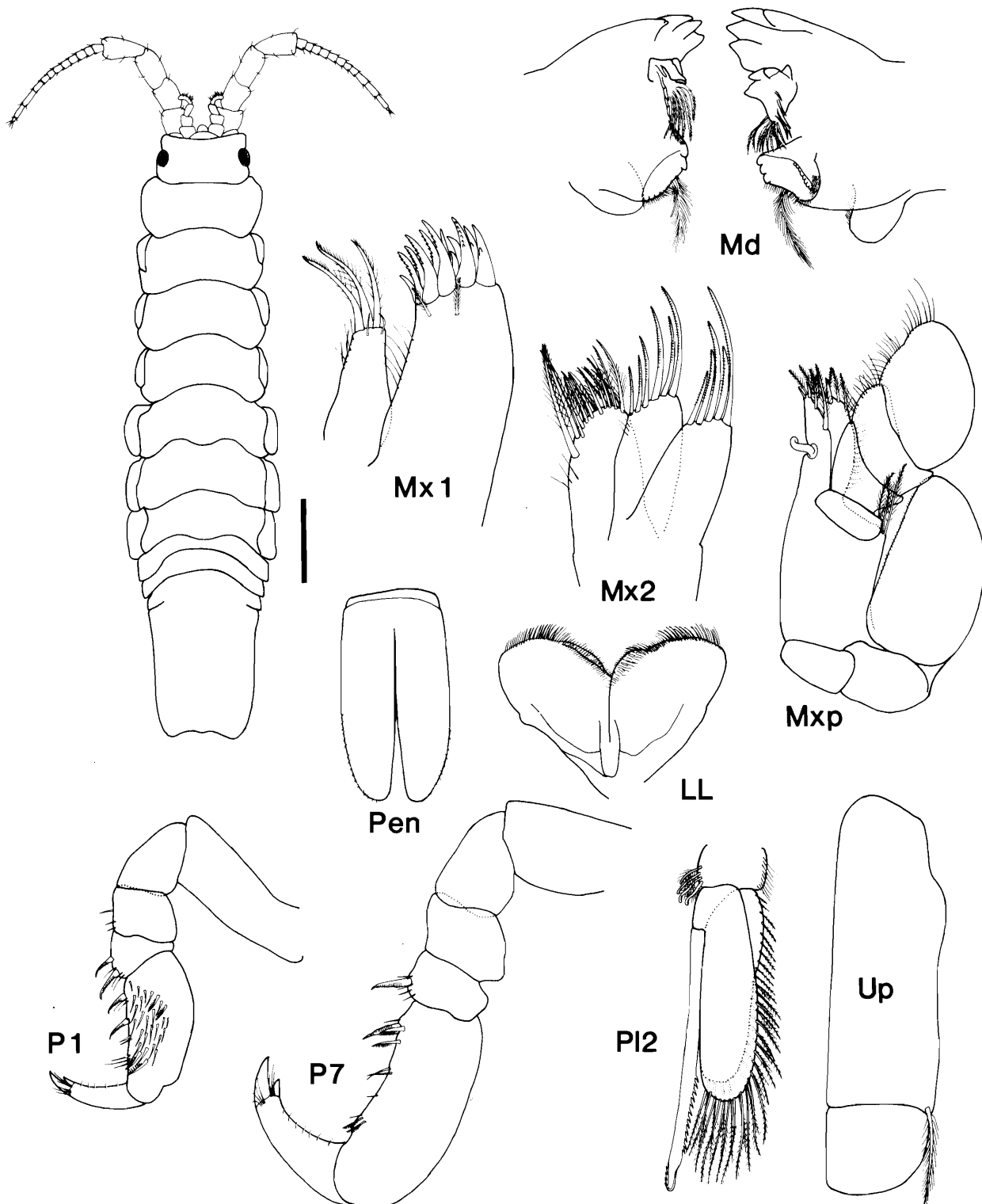


FIG. 5. *Idotea rufescens* Fee. Scale bar for whole animal = 3 mm. LL, lower lip; Md, mandible; Mx1, maxilla 1; Mx2, maxilla 2; Mxp, maxilliped; P1, pereopod 1; P7, pereopod 7; Pen, penes; PI2, pleopod 2; Up, uropod.

describing and illustrating it. Brusca and Wallerstein (1979, p. 89) recently cast doubts on the validity of *I. rufescens*, based on "examination of a large series" of this species and on their finding that "most of the characters used by Menzies (1950) to distinguish this species from *I. resecata* [were] unreliable."

In the material under review, all the specimens attributed to *I. rufescens* agree with Menzies' (1950) description and figures

of this species. However, one character used by Menzies to distinguish the two species, the size of the carpus of pereopod 7, was found by us to be unreliable.

Study of three of Brusca and Wallerstein's specimens from California, kindly lent by Wallerstein, indicates that another, as yet undescribed, species is involved. This species differs from both *I. rufescens* and *I. resecata*, particularly in the frontal

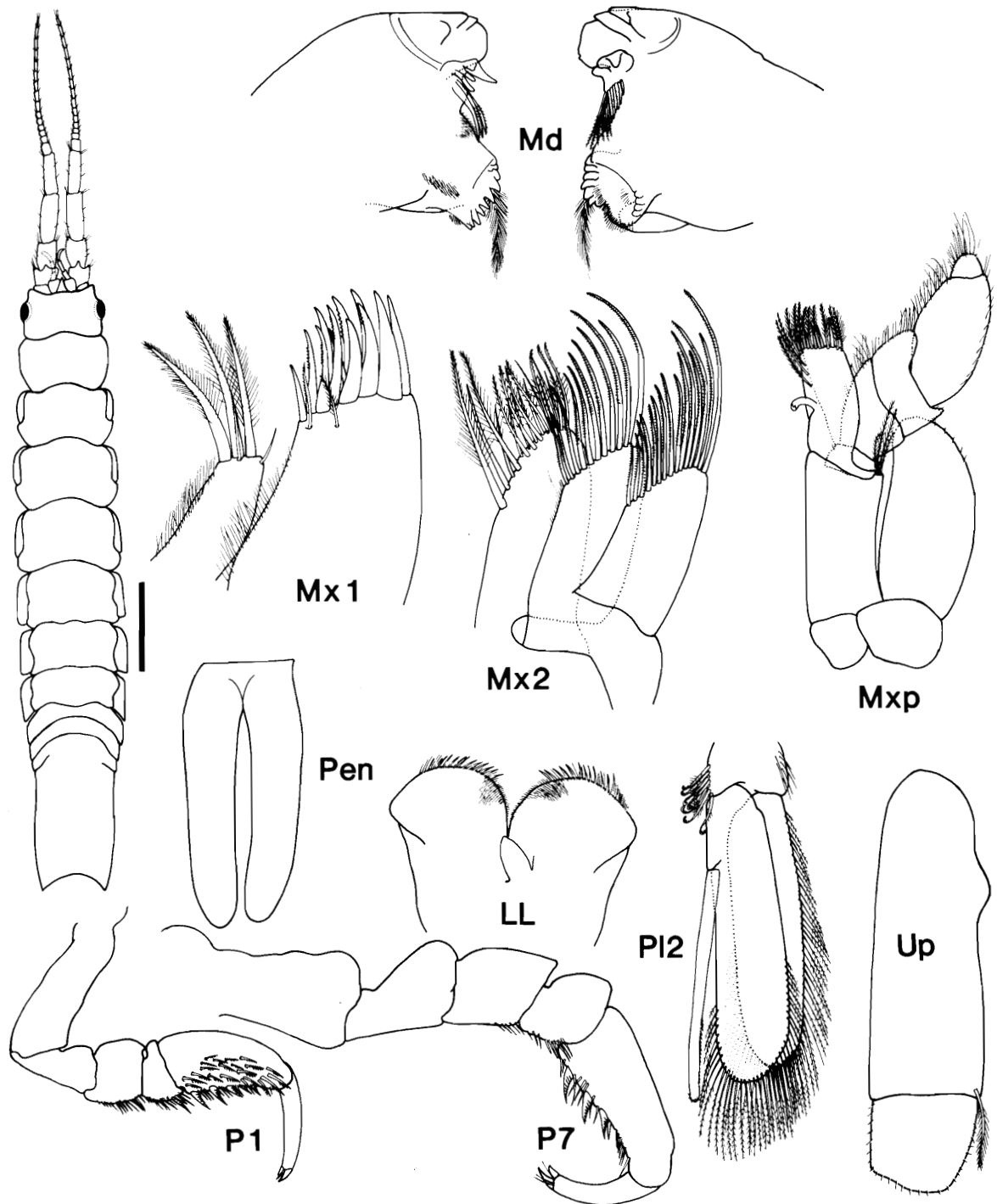


FIG. 6. *Idotea resecata* Stimpson. Scale bar for whole animal = 6 mm. For explanation of abbreviations see Fig. 5.

process, the shape of the posterior border of the pleotelson, and the appendix masculina.

*Idotea (Pentidotea) resecata* Stimpson, 1857  
Figs. 6 and 7

**MATERIAL EXAMINED:** Nearly 200 specimens from south-eastern Alaska, Queen Charlotte Islands, British Columbia mainland, Vancouver Island, Strait of Georgia, and San Juan Islands (RBCM, NMC). Intertidal to 12.6 m.

**OTHER SPECIMENS EXAMINED:** California, 14 specimens (AHF, USNM).

**Diagnosis**

**Male:** Eye pyriform, bulging, and bordered by a heavily pigmented band. Supra-antennal margin of cephalon concave with slight median convexity; frontal process long with pointed apex; frontal lamina 1 broadly rounded, not visible dorsally. Maxilliped palp, segment 4 with lateral marginal setae, disto-lateral corner of basipodite with 2–4 plumose setae. Pereopod 1, merus, carpus, and propodus with saw-toothed setae. Pereopod 7, propodus with file-toothed setae. Coxae 6 and 7 as long as pereonite, deep, and posteriorly angular. Pleotelson, lateral margins slightly convex posteriorly, posterior margin

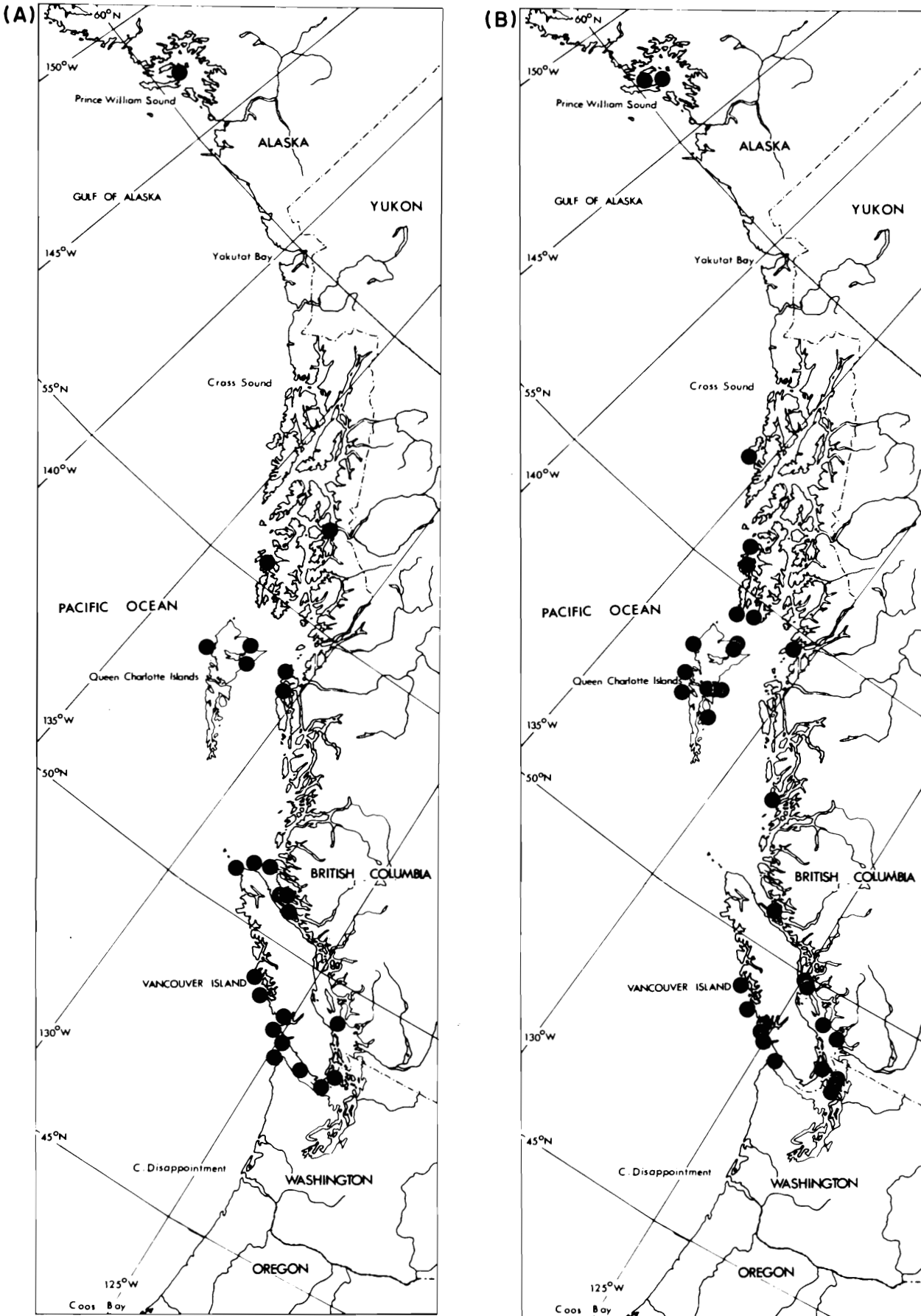


FIG. 7. Regional localities from which specimens of (A) *Idotea rufescens* and (B) *Idotea resecata* were examined.

strongly concave with projecting lateral carinae. Pleopod 2, appendix masculina extending slightly beyond ramus and apically rounded with few marginal spines. *Female*: Differs from male in having more slender pereopods and less carinate posterolateral angles of pleotelson. Measurements: male 42.0 mm; ovigerous female 28.4 mm.

**DISTRIBUTION:** Known from southeastern Alaska to the west coast of Baja California Sur (Brusca and Wallerstein 1979).

*Idotea (Pentidotea) wosnesenskii* Brandt, 1851

Figs. 8 and 10

**MATERIAL EXAMINED:** Over 500 specimens from southeastern Alaska, Queen Charlotte Islands, British Columbia mainland coast, Vancouver Island, Strait of Georgia, Juan de Fuca Strait, and San Juan Islands (RBCM, NMC, PBS). Intertidal to 4.5 m.

*Diagnosis*

*Male*: Eyes pyriform. Supra-antennal margin of cephalon slightly concave; frontal process small, apically blunt; frontal lamina 1 triangular, broader than frontal process; frontal lamina 2 visible dorsally, triangular with blunt apex. Maxilliped palp, segment 4 with 2 distolateral setae; distolateral corner of basipodite with 5 plumose setae. Pereopod 1 carpus and propodus with file-toothed setae. Pereopod 7 propodus with file-toothed setae. Coxae 5–7 as long as pereonite, deep, and posteriorly square. Pleotelson posterior border gently rounded with small median projection; pleonite 1, posterolateral angles acute and narrower than those of pleonite 2. Pleopod 2, appendix masculina as long as ramus and slightly curved with slender apex and distal spines. *Female*: Differs from male in having proportionally smaller head and broader pereonites 3–5, and in lacking the fine setae on the pereopods. Measurements: male 40.2 mm; ovigerous female 32.5 mm.

**DISTRIBUTION:** Known from the Aleutians south to Baja California Sur (Brusca and Wallerstein 1979; Kussakin 1982).

*Remarks*

*Idotea wosnesenskii* is easily recognized by its broad body and rounded pleotelson and by the shape of pleonites 1 and 2.

*Idotea (Pentidotea) schmitti* Menzies, 1950

Figs. 9 and 10

**MATERIAL EXAMINED:** 30 specimens from southeastern Alaska, Queen Charlotte Islands, Vancouver Island, and Juan de Fuca Strait (RBCM, NMC). Intertidal to 73 m.

*Diagnosis*

*Male*: Eyes rectangular. Supra-antennal margin of cephalon concave; frontal process triangular, apex bluntly pointed; frontal lamina 1 triangular, apex acute, longer than frontal process. Maxilliped palp, segment 4 with minute lateral marginal setae, distolateral corner of basipodite with 3 plumose setae. Pereopod 1, merus, carpus, and propodus with file-toothed setae. Pereopod 7, carpus and propodus with file-toothed setae. Coxae 2–7 as long as pereonite, deep, posteriorly rounded. Pleotelson posterolateral angles rounded, posterior border with median projection; pleonite 1 very much broader than posterior margin of pereonite 7. Pleopod 2, appendix masculina extending well beyond ramus, and apically rounded and curved laterally with lateral spines. *Female*: Differs from male in having comparatively more robust body and narrower cephalon and pleotelson, and pereopod 7 carpus and propodus with few file toothed setae. Measurements: male 35 mm; ovigerous female 20 mm.

**DISTRIBUTION:** Known from Bering Sea to Monterey Bay, California (Kussakin 1982).

*Remarks*

Our specimens are in general agreement with the descriptions of Menzies (1950), and with *Pentidotea whitei* of Richardson (1905). There are minor differences in the shape of the pleotelson and its comparative length, in the spination of pereopod 7, and in the relative lengths of antenna 2 peduncular segments 2 and 3.

*Idotea (Pentidotea) recta* n.sp.

Figs. 10 and 11

*Idotea (Pentidotea) aculeata*, George and Strömberg, 1968 non Stafford, 1913.

**MATERIAL EXAMINED:** Holotype: male, Edward King Island, Barkley Sound, Vancouver Island, B.C. (48°50.2'N, 125°-12.5'W), intertidal, 10 July 1976 (NMC); collected by E. L. Bousfield and F. Rafi, stn. B28. Allotype: female, Eagle Point, San Juan Island, Washington (48°27.7'N, 123°01.9'W), intertidal, 27 May 1975 (NMC); collected by R. M. O'Clair, stn. 750001. Paratypes: 3 males, from allotype locality (NMC). The type specimens are deposited in NMC, catalogue Nos. NMCC1981-0384, 0385, and 0386.

*Description*

*Male* (holotype, 29.6 mm): Eyes dorsoventrally elongate, semicircular. Supra-antennal margin of cephalon slightly concave; frontal process broadly triangular, apically notched; frontal lamina 1 triangular and projecting beyond frontal process; anterolateral cephalic angles rounded. Antenna 2 peduncle articles robust with a few long setae, flagellum with 15 articles. Maxilla 2 exopod with 7 comb setae on each lobe. Maxilliped palp 5-segmented, segment 4 without lateral marginal setae; distolateral corner of basipodite devoid of setae.

Pereopod 1, merus with 1 seta, carpus and propodus with file-toothed setae. Pereopod 7, carpus with 2 file-toothed setae, propodus with a large proximal clump of file-toothed setae. Anterolateral margins of pereonite 1 produced forward to surround posterior third of cephalon; coxae 5–7 as long as pereonite, deep, and posteriorly straight.

Pleotelson with barely concave lateral margins, posterolateral angles rounded; posterior margin with prominent median projection. Pleopod 2, appendix masculina extending beyond ramus, with spines on distal lateral margin, and apically rounded. Uropod without marginal setae and with 5 plumose setae on distolateral angle of peduncle. *Female* (allotype, 32.4 mm): Similar to male except flagellum of antenna 2 with 13 articles, pereonites 2–4 much broader, propodus of pereopod 1 weakly setose, uropod with 3 plumose setae.

**DISTRIBUTION:** Southern Vancouver Island, British Columbia, and San Juan Island, Washington.

**ETYMOLOGY:** The specific name, taken from the Greek word meaning "straight," refers to the uniformly straight appearance of the whole animal.

*Remarks*

*Idotea recta* shows some resemblance to *I. aculeata* Stafford, 1913, especially in general body shape, appendages, and in the shape of coxae 6 and 7. *Idotea recta* can be distinguished from *I. aculeata* by the following characters: it is stouter, the anterolateral corners of pereonite 1 are rounded rather than acute; the pereopods are more setose; apart from the median projection the posterior pleotelson margin is more or less

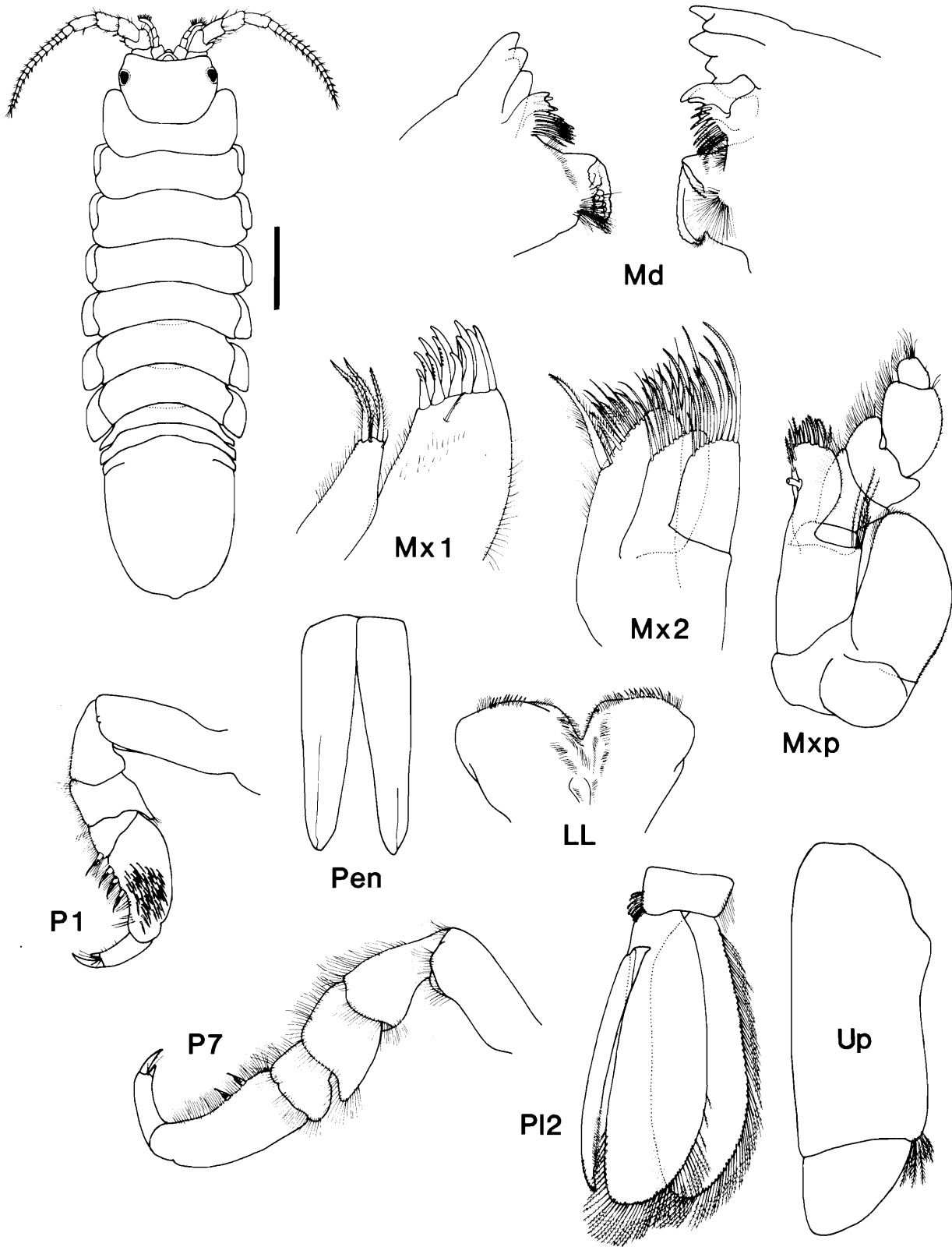


FIG. 8. *Idotea wosnesenskii* Brandt. Scale bar for whole animal = 5 mm. For explanation of abbreviations see Fig. 5.

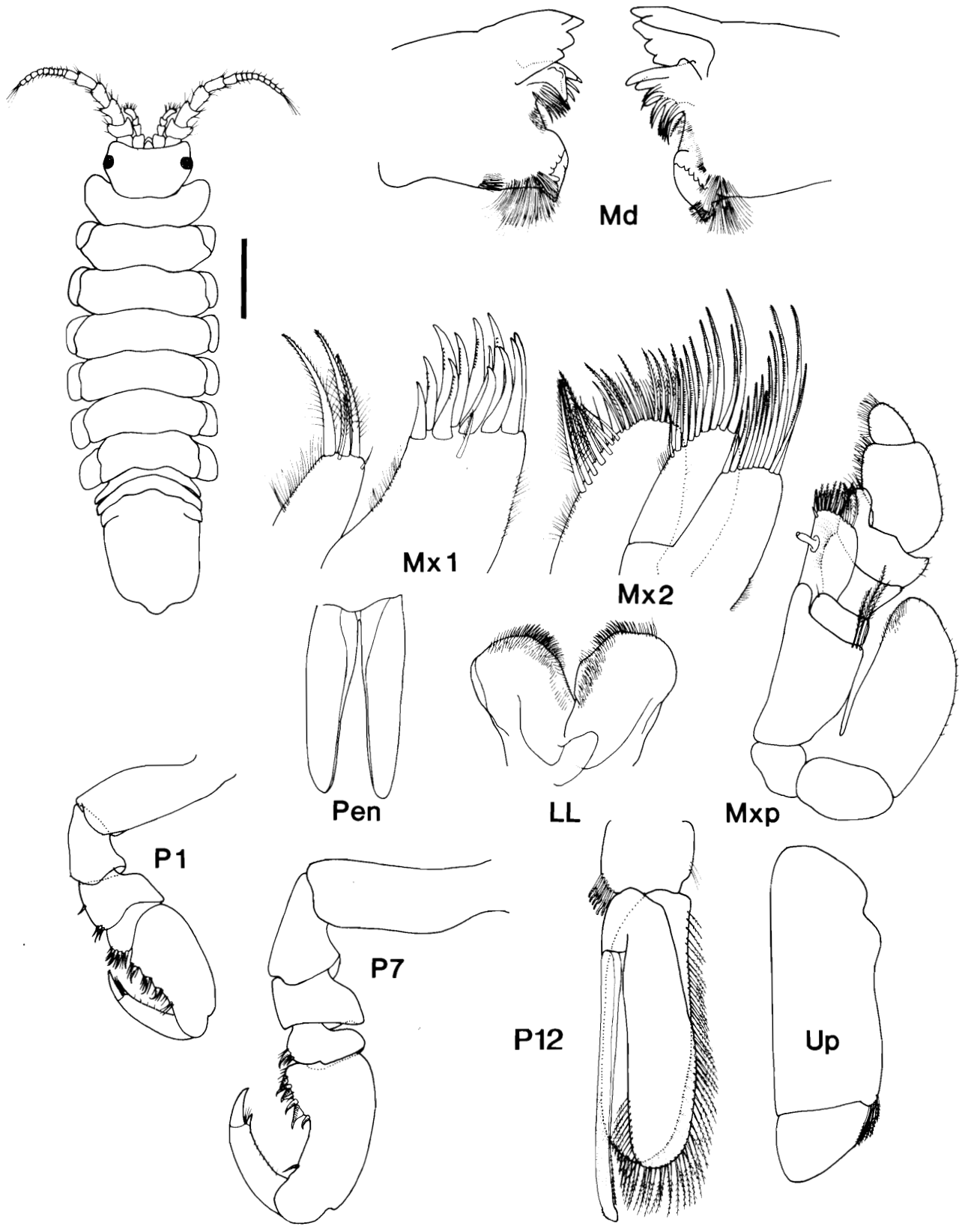


FIG. 9. *Idotea schmitti* Menzies. Scale bar for whole animal = 5 mm. For explanation of abbreviations see Fig. 5.

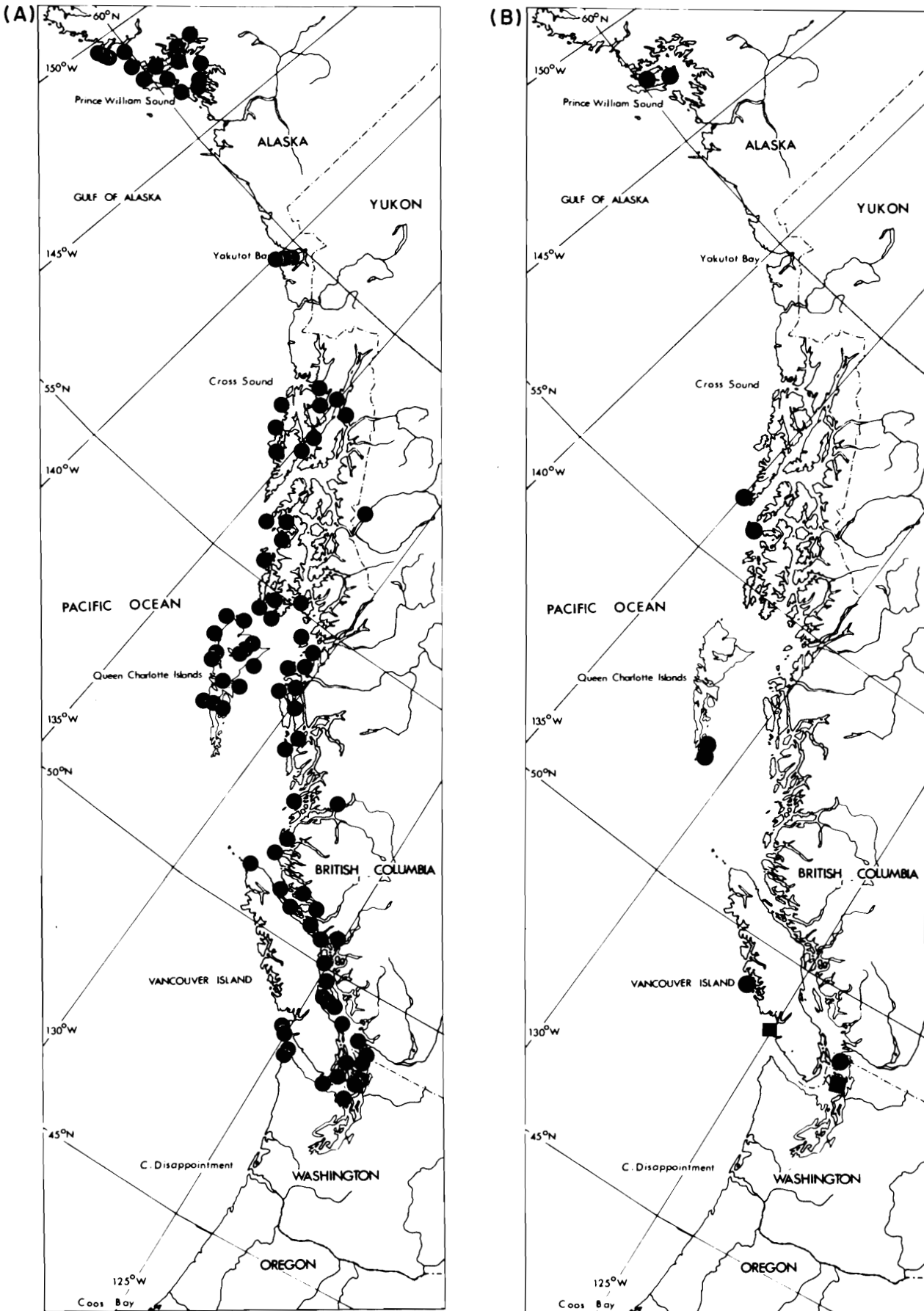


FIG. 10. Localities from which specimens of (A) *Idotea wosnesenskii* and (B) *Idotea schmitti* (●) and *I. recta* (■) were examined.

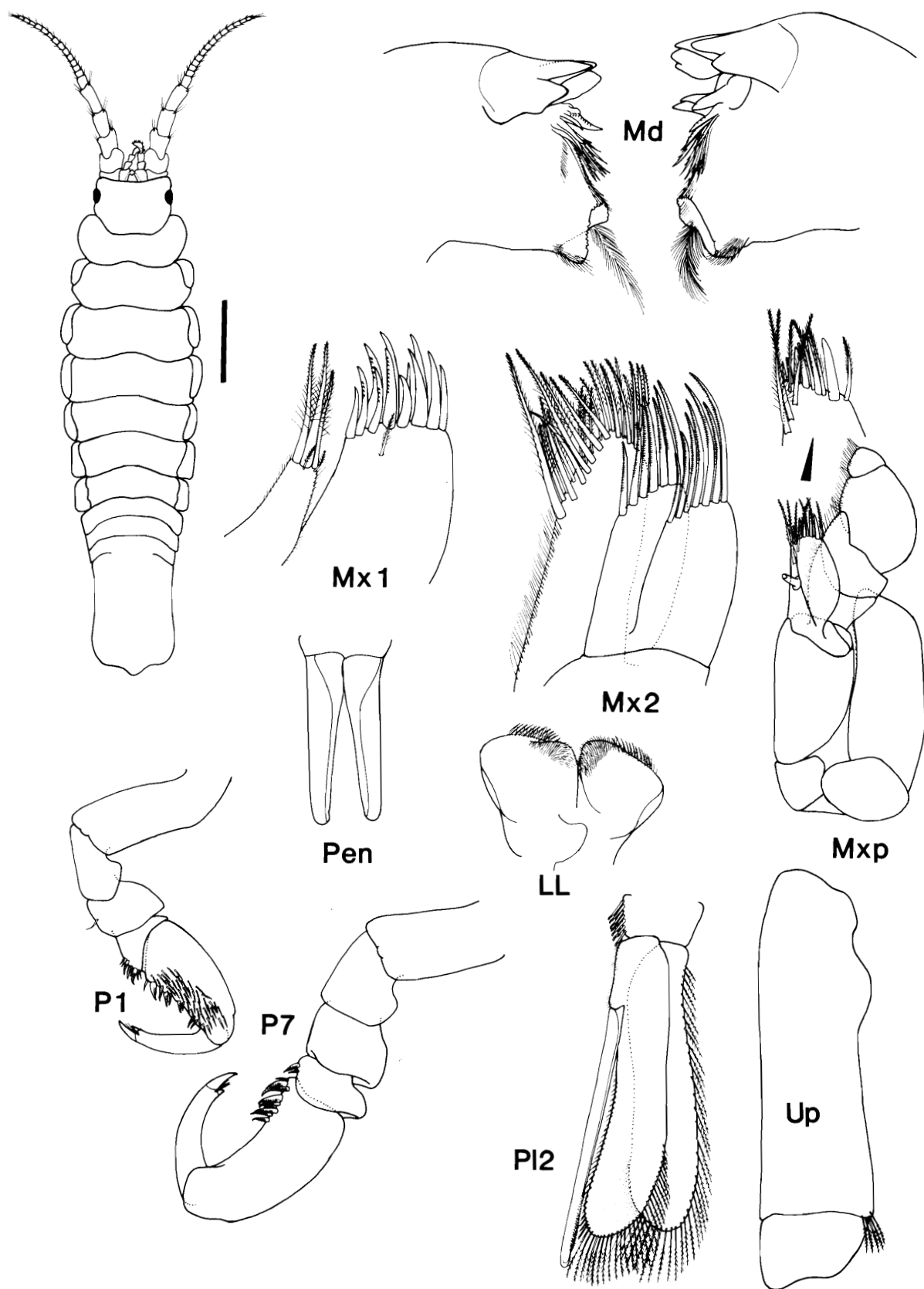


FIG. 11. *Idotea recta* n.sp. Scale bar for whole animal = 7.5 mm. For explanation of abbreviations see Fig. 5.

straight rather than triangular; and the uropod has 5 plumose setae on the posterolateral angle of peduncle instead of 2.

George and Strömberg (1968) reported the California species *I. (P.) aculeata* from the San Juan archipelago. We have not found specimens of this species in our collections, nor have we looked at George and Strömberg's material. However, we suggest that they confused *I. recta* with *I. aculeata*, and that their specimens should be reexamined to determine the validity of their distributional record.

*Idotea (Idotea) fewkesi* Richardson, 1905  
Figs. 12 and 14

**MATERIAL EXAMINED:** 140 specimens from Queen Charlotte Islands, British Columbia mainland, Vancouver Island, Strait of Georgia, and San Juan Islands (RBCM, NMC, PBS). Intertidal to 6 m.

**OTHER SPECIMENS EXAMINED:** California, 5 specimens (USNM).

*Diagnosis*

*Male:* Eye vertically oval, tapering ventrally. Supra-antennal margin of cephalon concave; frontal process narrow, apex pointed; frontal lamina 1 broadly convex. Maxilliped palp, segment 4 laterally setose, distolateral corner of basipodite with 3 long plumose setae. Pereopod 1, carpus and propodus with file-toothed setae. Pereopod 7, propodus with file-toothed setae. Coxa 7 barely as long as pereonite, shallow and posteriorly rounded. Pleotelson, posterior margin with large median projection. Pleopod 2, appendix masculina not longer than ramus and distally narrowing with spines on lateral margin. *Female:* Differs from male in having a broader body, a more slender propodus on pereopod 1, and weakly setose pereopods. Measurements: male 40.5 mm; ovigerous female 26.2 mm.

**DISTRIBUTION:** Previously recorded from Alaska south to southern California (Kussakin 1982). Brusca and Wallerstein (1979) give the distributional limits of *I. fewkesi* as 30–57°N; no specimens were found north of 54°N during the present investigation.

*Remarks*

*Idotea obscura*, *I. fewkesi*, *I. aleutica*, and *I. ochotensis* Brandt, 1851 are all very similar in general body shape. Kussakin (1982) clearly established the distinctiveness of the latter three species while acknowledging that they are not always easily distinguished. During the course of our investigation we studied specimens of all four species and are in agreement with Kussakin's conclusion, and that of Rafi (1972) that *I. obscura* is a valid species.

*Idotea ochotensis* is a western Pacific boreal species (Kussakin 1982) and its known distributional range is out of our study area. *Idotea fewkesi* can be distinguished from *I. aleutica* and *I. obscura* by its strong lateral marginal setae on maxilliped palp segment 4, short slender coxae 7, less setose pereopods, and appendix masculina no longer than the pleopod 2 rami. *Idotea aleutica* differs from *I. obscura* in having broad coxae 6 and 7, a biconvex anterior margin to the head, antenna 2 flagellum shorter than peduncle, and weakly setose lateral margin on maxilliped palp segment 4.

*Idotea (Pentidotea) montereyensis* (Maloney, 1933)  
Figs. 13 and 14

**MATERIAL EXAMINED:** Over 600 specimens from southeastern Alaska, Queen Charlotte Islands, British Columbia mainland,

Vancouver Island, Strait of Georgia, and Juan de Fuca Strait (RBCM, NMC, PBS). Intertidal to 109 m.

**OTHER SPECIMENS EXAMINED:** California, 10 specimens (USNM), 1 specimen (as *Idotea gracillima* (Dana, 1854)) (USNM 65608).

*Diagnosis*

*Male:* Eyes with straight anterior and convex posterior border. Supra-antennal margin of cephalon concave; frontal process long, apex rounded; frontal lamina 1 semicircular. Maxilliped palp, segment 4 with very few lateral marginal setae, distolateral corner of basipodite with 1 plumose seta. Pereopod 1, merus and carpus with file-toothed setae. Pereopod 7 propodus with file-toothed setae. Coxae 6 and 7 as long as pereonite, deep and posteriorly rounded. Pleotelson, posterolateral corners rounded, posterior margin convex with median projection. Pleopod 2, appendix masculina not reaching end of ramus and apically rounded with prominent lateral spines and small surface spinules. *Female:* Differs from male only in having broader pleotelson. Measurements: male 28.3 mm; ovigerous female 20.0 mm.

**DISTRIBUTION:** Previously known from Washington to Central California (Kussakin 1982). New records extend the range northward through the northeastern Pacific region to southeastern Alaska.

*Remarks*

The specimens of *I. montereyensis* from California were smaller and more slender than the northern specimens. Other differences noted between our specimens and Menzies' (1950) description were as follows: the frontal process is apically rounded; the posterolateral angle of coxa 7 is rounded; and none of the specimens has a straight posterior border to the pleotelson.

*Idotea (Idotea) urotoma* Stimpson, 1864  
Figs. 15 and 17

**MATERIAL EXAMINED:** Over 100 specimens from southeastern Alaska, Queen Charlotte Islands, British Columbia mainland, Vancouver Island, Strait of Georgia, and Juan de Fuca Strait (RBCM, NMC, PBS). Intertidal to 14 m.

**OTHER SPECIMENS EXAMINED:** California, Crescent City, 4 specimens (USNM), Monterey Bay, 2 specimens (as *Cleantis heathii* Richardson, 1899) (USNM 22577), San Diego, 1 specimen (as *Idotea rectilinea* Lockington, 1877) (USNM 86598).

*Diagnosis*

*Male:* Eye small, round. Supra-antennal margin of cephalon concave; frontal process apically blunt; frontal lamina 1 with median concavity. Maxilliped palp, segment 4 without lateral setae, basipodite distolateral corner with 2 or 3 long plumose setae. Pereopod 1 propodus with clusters of saw-toothed setae. Pereopod 7, carpus and propodus with clusters of saw-toothed setae. Coxae 6 and 7 as long as pereonite, shallow and posteriorly rounded. Pleotelson, posterolateral corners rounded, posterior margin triangular, with or without minute median projection. Pleopod 2, appendix masculina extending beyond the ramus with lateral and minute medial spines. *Female:* Differs from male in having broader body and more slender, weakly setose pereopods. Measurements: male 20.0 mm; ovigerous female 16.3 mm.

**DISTRIBUTION:** Previously known from southern British Columbia (Bousfield 1958) to southern Gulf of California (Brusca and Wallerstein 1979). New records extend the range

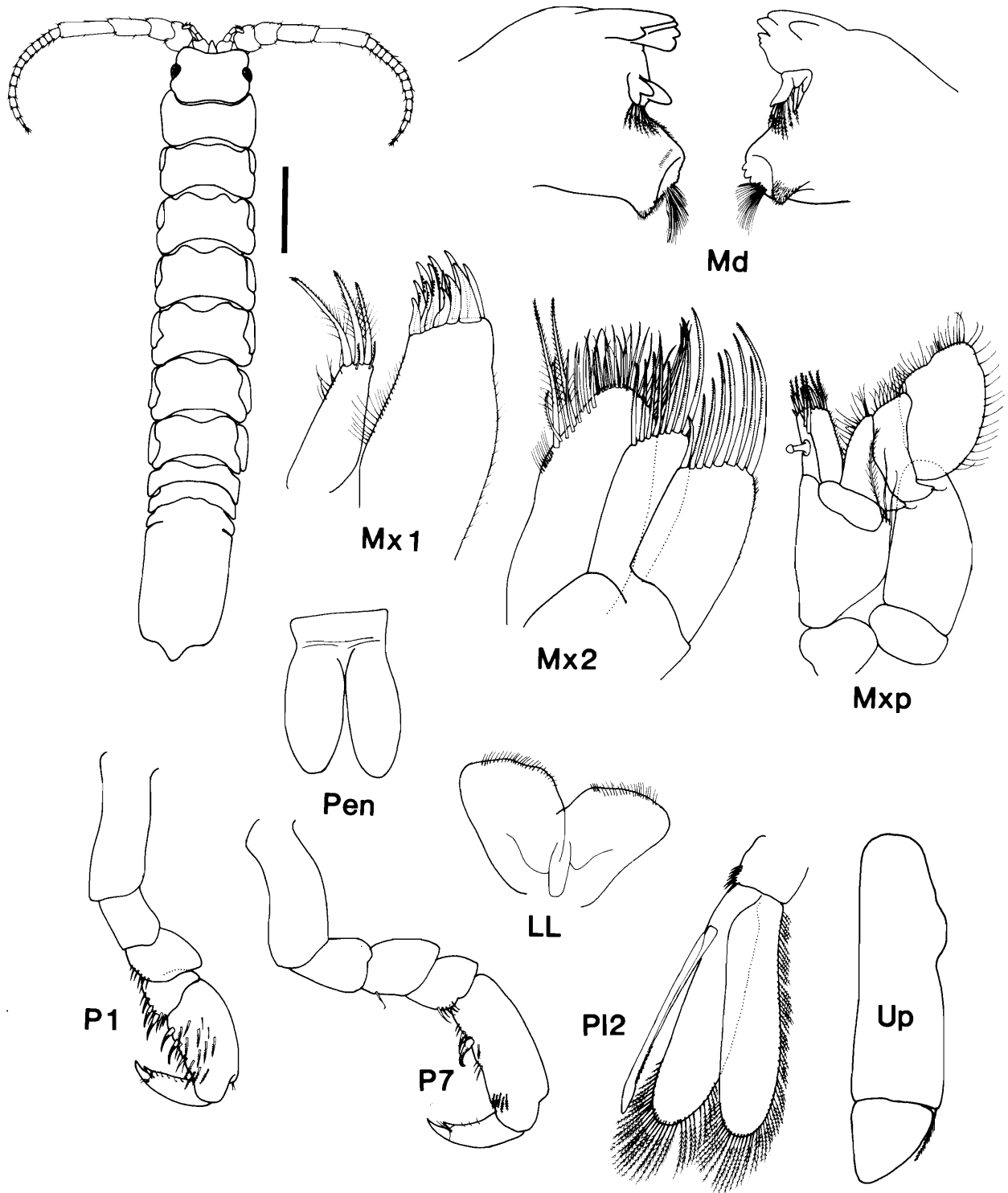


FIG. 12. *Idotea fewkesi* Richardson. Scale bar for whole animal = 5 mm. For explanation of abbreviations see Fig. 5.

through the northeastern North Pacific region to southeastern Alaska.

#### Remarks

The material examined very closely resembles previous descriptions of *I. urotoma*; slight differences were noted in the shape of the posterior border of the pleotelson from the material described by Menzies (1950) and Brusca and Wallerstein (1977). Though sexual dimorphism is minimal in this species, in female and young specimens the median projection on the pleotelson may be absent.

#### *Idotea (Idotea) obscura* Rafi, 1972 Figs. 16 and 17

MATERIAL EXAMINED: Over 200 specimens from southeastern Alaska, Queen Charlotte Islands, British Columbia mainland, Vancouver Island (RBCM, NMC, USNM). Intertidal to 21 m.

#### Diagnosis

*Male*: Eye horizontally ovoid. Supra-antennal margin of cephalon slightly concave; frontal process apically rounded; frontal lamina 1 broadly rounded. Maxilliped palp, segment 4 without lateral setae, distolateral corner of basipodite with 3

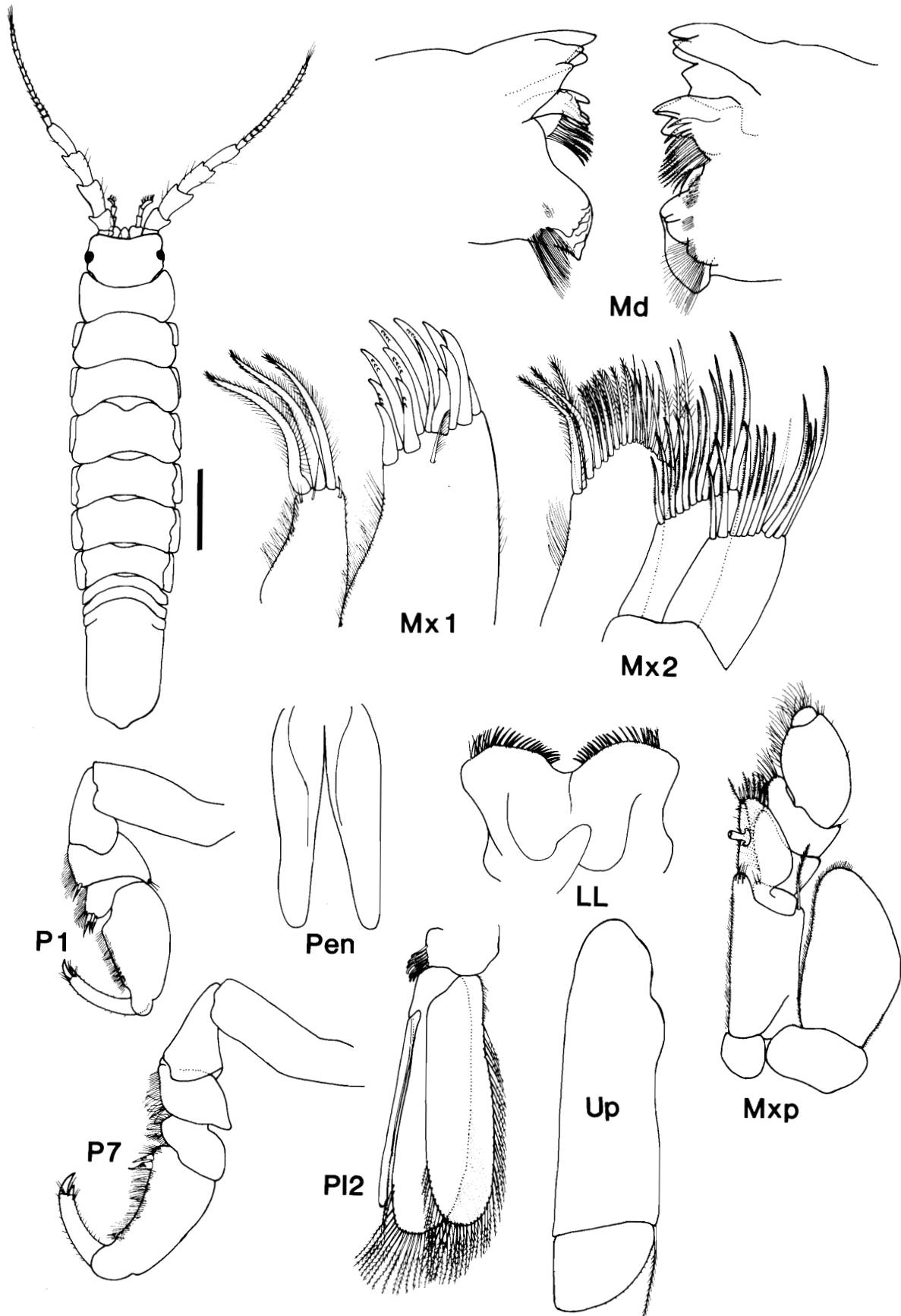


FIG. 13. *Idotea montereyensis* (Maloney). Scale bar for whole animal = 6 mm. For explanation of abbreviations see Fig. 5.

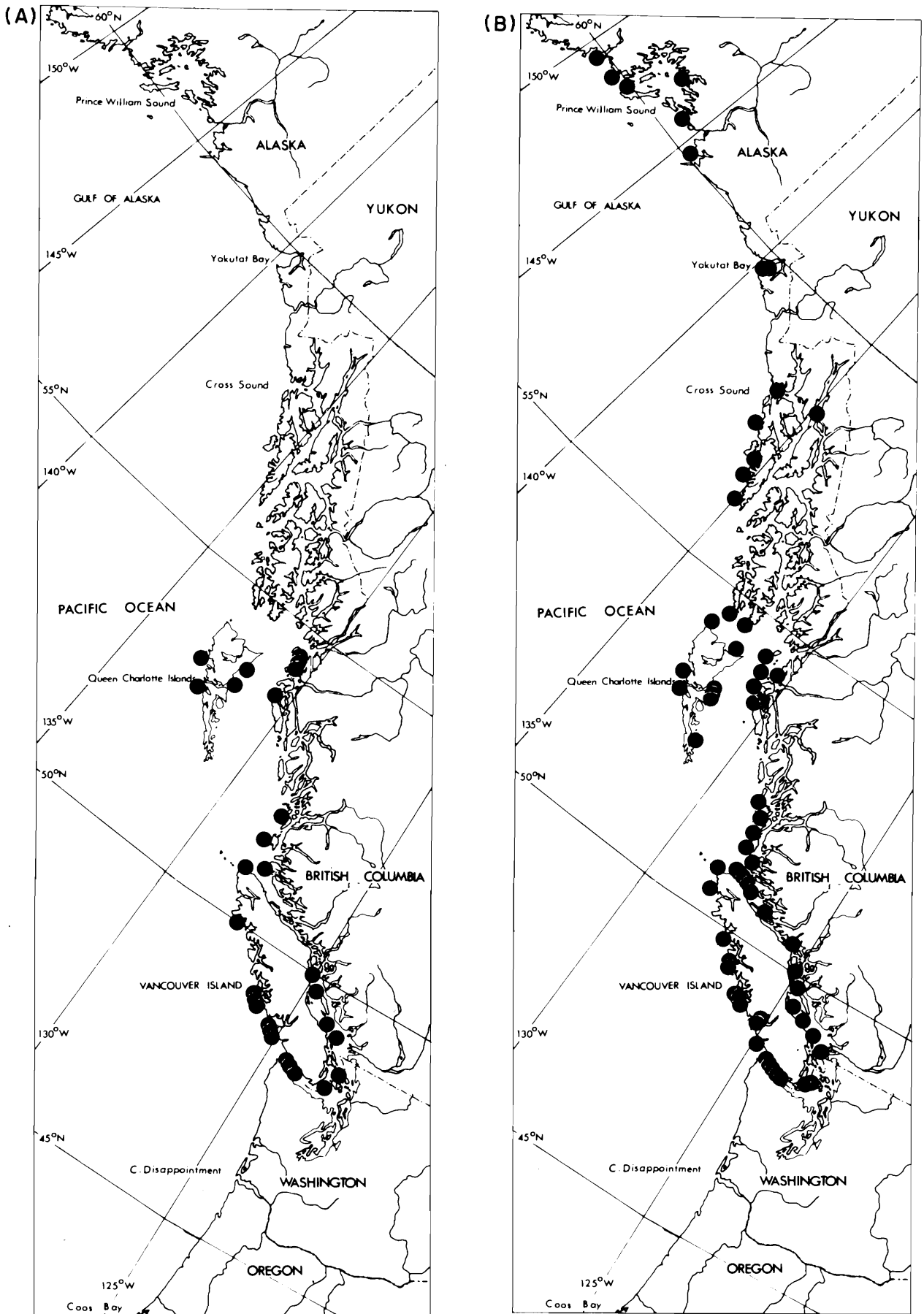


FIG. 14. Regional localities from which specimens of (A) *Idotea fewksi* and (B) *Idotea montereyensis* were examined.

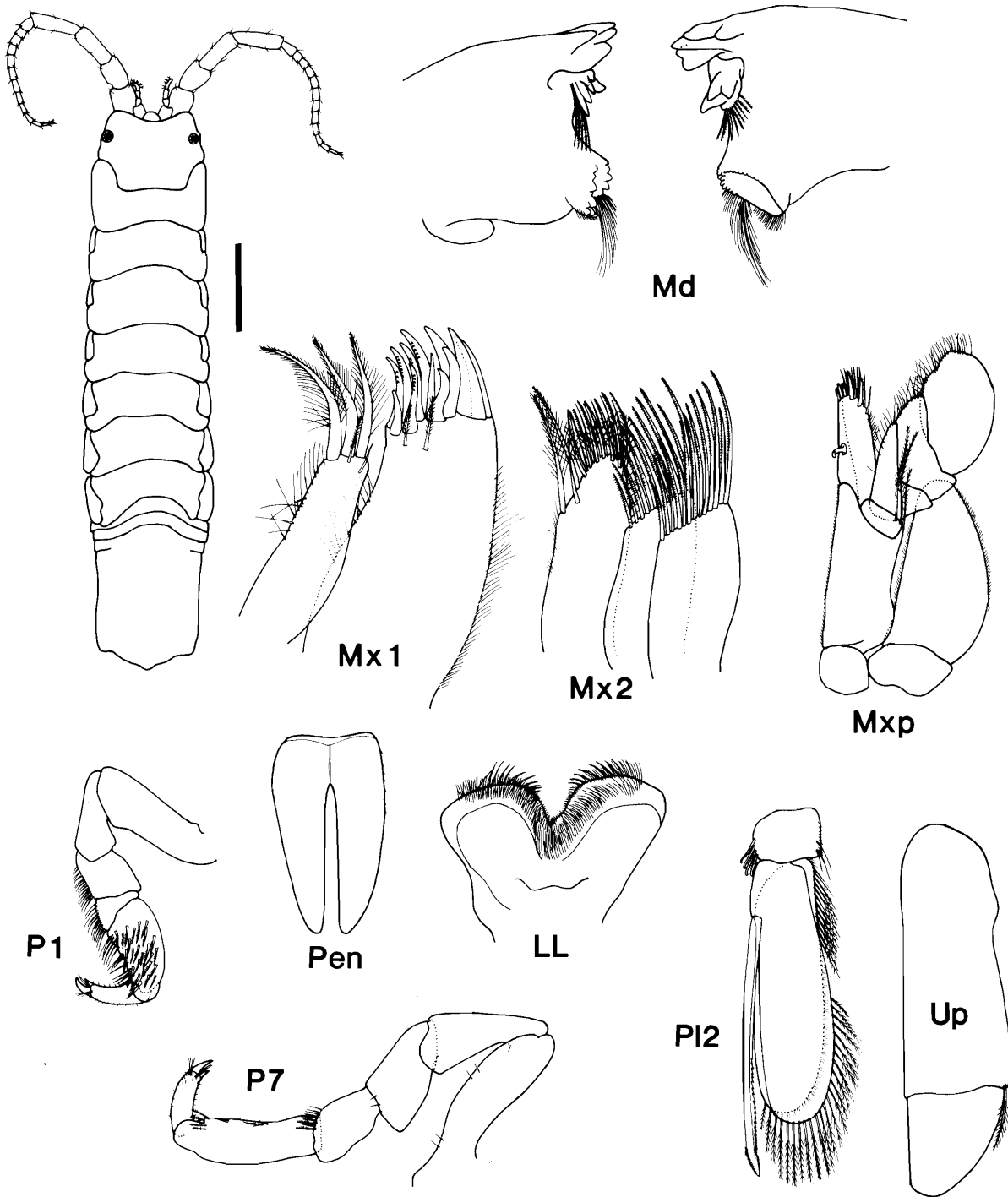


FIG. 15. *Idotea urotoma* Stimpson. Scale bar for whole animal = 3 mm. For explanation of abbreviations see Fig. 5.

long plumose setae. Pereopod 1 carpus and propodus with file-toothed setae. Pereopod 7 propodus with file-toothed and saw-toothed setae. Coxae 6 and 7 as long as pereonite, deep, coxa 7 posteriorly angular. Pleotelson, posterior margin with large median projection. Pleopod 2, appendix masculina extending beyond ramus and apically rounded with prominent spines on distal medial and subapical lateral margins. *Female*: Differs from male in having less parallel lateral thoracic margins. Measurements: male 38.0 mm; ovigerous female 25.0 mm.

**DISTRIBUTION:** Previously known from Port Gravina, Alaska, to Goshen Island, British Columbia (Rafi 1972). New records extend the range southward to Vancouver Island.

**Remarks**

*Idotea obscura* is very similar to *I. fewkesi*, as noted under that species; see also Rafi (1972).

*Idotea (Idotea) aleutica* Gurjanova, 1933

**Diagnosis**

Head anterior margin weakly biconvex; eyes moderately large, oval. Antenna 2 flagellum shorter than peduncle. Maxillipedal palp segment 4 laterally sparsely setose; basipodite with distolateral setae. Coxae 6 and 7 as long as pereonite. Pleotelson lateral margins straight or barely concave, posterolateral corners rounded, median projection quite broad and blunt. Appen-

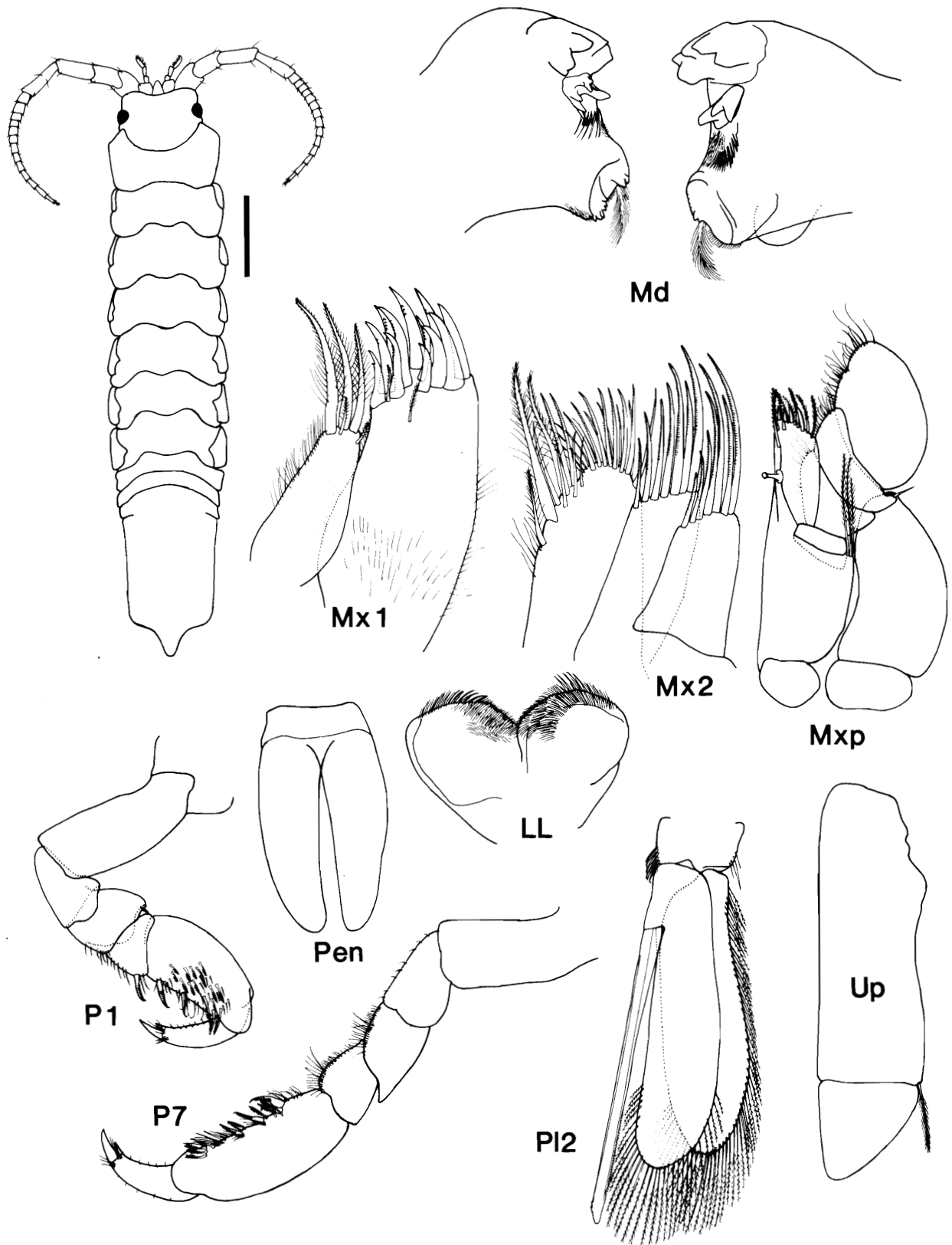


FIG. 16. *Idotea obscura* Rafi. Scale bar for whole animal = 5 mm. For explanation of abbreviations see Fig. 5.

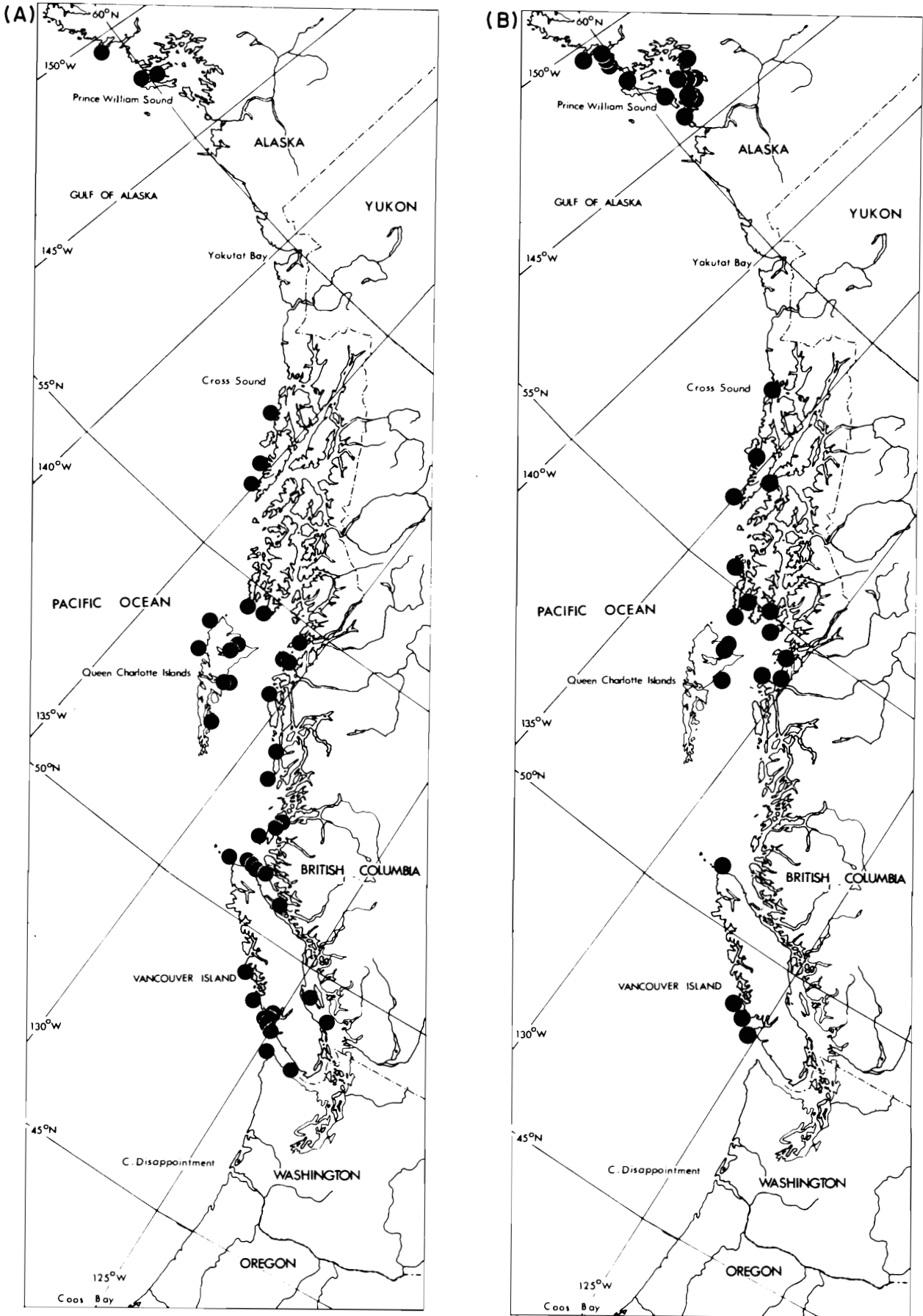


FIG. 17. Regional localities from which specimens of (A) *Idotea urotoma* and (B) *Idotea obscura* were examined.

dix masculina slender, just longer than pleopod rami, and turned outward at its apex. A large species, up to 75 mm.

**DISTRIBUTION:** From Iturup Island to the Bering Strait and south to Washington (Kussakin 1982).

#### Remarks

See under *I. fewkesi*. One specimen was examined, from the Komandorskiye Islands (USNM).

*Synidotea* Harger, 1876

#### Diagnosis

Cephalon laterally entire; antenna 1 shorter than antenna 2; antenna 2 flagellum multisegmented; maxilla 1 exopod with 11 apical teeth, endopod with 2 plumose and 1 simple seta; maxilla 2 exopod in female with comb setae on both lobes, in male outer lobe larger, folded, and with extremely long plumose setae; maxilla 2 endopod with plumose and simple setae; maxilliped endite small and without apical teeth, palp 3-segmented;

pereopods ambulatory; coxae not visible dorsally; penes fused, linguiform or distally emarginate; abdomen 2-segmented, segments separated by partial suture and forming a pleotelson; uropod ramus as broad as peduncle which bears 3 distolateral plumose setae.

#### Remarks

As already noted, maxilla 2 in this genus has a different form in the male and female. These different forms were illustrated by Kussakin (1982) for different species, but he apparently did not notice their relation to the sex of the specimens illustrated.

The ornamentation of the dorsal surface of the body varies widely among species, from smooth to strongly sculptured with tubercles and rugosities. There is also considerable intraspecific variation. We did not have enough specimens on hand to investigate the variation in any depth. However, since this character is used to distinguish the species, it should be further studied to clarify the true specific differences.

### Key to the *Synidotea* of the northeastern North Pacific

1. Pleotelson posteriorly pointed and entire. Head anterior margin strongly incised, dorsal surface with low tubercles, including 1 in front of each eye and 3 in line between the eyes . . . . . *S. nodulosa*  
Pleotelson posteriorly truncate, notched or emarginate. Head not as above . . . . . 2
2. Lateral margins of pereonites smoothly rounded to straight and closely contiguous. Body without tubercles . . . . . 3  
Lateral margins of at least some pereonites angular, at least 4 pereonites separated laterally. Body with tubercles . . . . . 4
3. Pleotelson, lateral margins straight to slightly concave, terminally subtruncate to slightly emarginate. Head with low transverse ridges on either side of midline between eyes . . . . . *S. nebulosa*  
Pleotelson, lateral margins convex, terminally notched. Head with 1 pair of low preocular tubercles and 1 pair of small tubercles between the eyes . . . . . *S. consolidata*
4. Dorsal tubercles low, missing from pereonites 5–7. Eyes large, pigmented area occupying at least half length of head. Lateral margins of pereonite 1 barely extending beyond lateral level of eyes . . . . . *S. angulata*  
All pereonites with strong dorsal tuberculation. Eyes normal, pigmented area occupying no more than 1/3 length of head. Lateral margins of pereonite 1 extending well beyond lateral level of eyes . . . . . 5
5. Preocular horns extending anteriorly beyond margin of head. Pleotelson with no more than 1 dorsal tubercle . . . . . 6  
Preocular horns extending obliquely laterally, reaching no farther than anterior margin of head. Pleotelson with 2 or more dorsal tubercles . . . . . 7
6. Pleotelson posterior border with shallow excavation. Pereonites 1 and 2 laterally rounded. . . . . *S. ritteri*  
Pleotelson posterior border with triangular notch. Pereonites 1 and 2 laterally angular . . . . . *S. cornuta*
7. Pleotelson with clump of 6 anterodorsal tubercles. Frontal margin of head biconvex. Pereon segments with sharply conical median tubercles and well-developed lateral rugosities . . . . . *S. minuta*  
Pleotelson with two median anterodorsal tubercles. Frontal margin of head straight, with deep median notch. Pereon segments with conical median tubercles, and tubercles or weak rugosities laterally . . . *S. pettiboneae*

*Synidotea nodulosa* (Krøyer, 1846)

#### Diagnosis

Head with 4 tubercles between eyes, 2 on either side of midline and 2 median; the median tubercles frequently fused at bases to form a longitudinal median carina. Preocular tubercles do not reach anterior margin of head. Postcephalic lobe, pereonites, and anterior pleotelson each with median dorsal tubercle. Lateral (pereonites) and median (head and pleotelson) small excrudescences also present. Pleotelson more or less evenly tapering toward its bluntly pointed posterior end; uropods similarly tapered. A largish species, to 24 mm.

**DISTRIBUTION:** Circum arctic-boreal. In the North Pacific, from British Columbia through the Aleutians to Kamchatka (Kussakin 1982).

*Synidotea nebulosa* Benedict, 1897

#### Diagnosis

Frontal margin of head more or less acutely concave; preocular tubercles small to absent. Dorsal surface of head and pereonites transversely ridged but without tubercles. Posterior of pleotelson subtruncate to emarginate. Eyes situated on dorsal (rather than lateral) surface of head. A largish species, to 26 mm.

**DISTRIBUTION:** North Pacific, from Washington to the Sea of Okhotsk, and Chukchi Sea, Kamchatka, and the Kuriles (Kussakin 1982).

*Synidotea consolidata* Stimpson, 1856

Figs. 18 and 20

**MATERIAL EXAMINED:** Nearly 300 specimens from south-

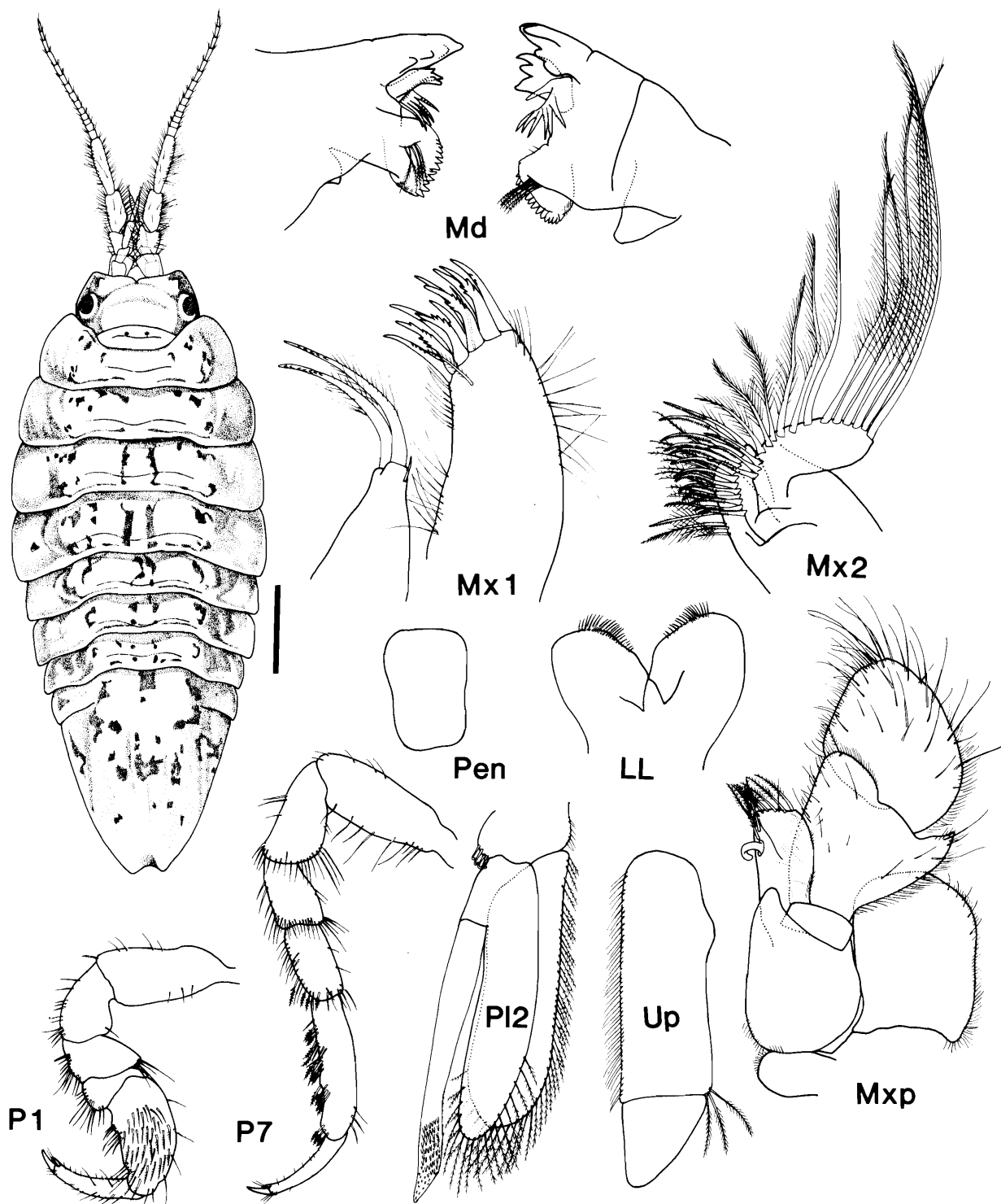


FIG. 18. *Synidotea consolidata* Stimpson. Scale bar for whole animal = 4 mm. For explanation of abbreviations see Fig. 5.

eastern Alaska, Queen Charlotte Islands, British Columbia mainland, Vancouver Island, and Juan de Fuca Strait (NMC, PBS). Intertidal to 14 m.

**Diagnosis**

**Male:** Supra-antennal margin of cephalon with median notch; preocular tubercles small, submarginal; usually 2 small tubercles between eyes; postcephalic lobe with transverse carina.

Eyes round, sublaterally situated. Maxilliped palp, segments 2 and 3 with long lateral and surface setae; epipod setose laterally. Pereonites 1-7 with median transverse carina, devoid of tubercles. Pereopod 1 with brush and saw-toothed setae. Pereopod 7 with saw-toothed setae. Pleotelson, posterior border with median concavity. Pleopod 2, appendix masculina curved medially, apex pointed and densely covered with spinules. **Female:** Differs from male in having low cephalic tubercles

and median transverse carina on postcephalic lobe only. Measurements: male 16.0 mm; ovigerous female 10.0 mm.

**DISTRIBUTION:** Previously known from southeastern Alaska to central California (Brusca and Wallerstein 1979, as *C. bicuspidata*; Kussakin 1982). New records fill in the range on the British Columbia coast.

#### Remarks

*Synidotea consolidata* is readily distinguished from its northeastern North Pacific congeners by its lack of body tubercles and rugosities and by its medially curved and densely spinulose appendix masculina.

Differences in the transverse ridges (carinae) on pereonites 1–7 were noted; some collections contained animals with elevated transverse ridges, whereas others had animals with less prominent ridges. The degree of prominence of the ridges does not appear to be related to the size or sex of the specimens. In view of the very close similarities of other characters in the specimens examined, it seems better to retain them all within *S. consolidata*.

The relationship between *S. consolidata*, *S. bicuspidata*, *S. marmorata* (Packard, 1867), and *S. macginitei* (Maloney, 1933) was discussed by Menzies and Miller (1972), who concluded that *S. bicuspidata* was the valid species of which the others were all synonyms. These authors looked only at collections from Puget Sound southward, and therefore did not realize that their specimens were different from the true *S. bicuspidata*, a predominantly arctic circumpolar species. Kussakin (1982) examined a large number of *S. bicuspidata* as well as Californian specimens of *S. consolidata* (originally identified as the synonymous *S. macginitei*). He showed that the two species differ in a number of characters and should be accepted as separate valid species. Our examination of arctic specimens of *S. bicuspidata* leads us to agree with Kussakin that there is a boreal species, *S. consolidata*, recorded from Monterey Bay north to southeastern Alaska, and an arctic species, *S. bicuspidata*, with circumpolar distribution extending into the Bering and Okhotsk seas.

One reason for the confusion surrounding these two species was Benedict's (1897) identification of *S. pettiboneae* (so named by Hatch in 1947) as *S. consolidata*. This led to rejection of the validity of the latter species on grounds that, it is now apparent, are spurious. It is unfortunate that Kussakin (1982, Fig. 173A) included Benedict's figure, actually of *S. pettiboneae*, in his description of *S. consolidata*.

#### *Synidotea angulata* Benedict, 1897 Figs. 19 and 20

*Synidotea angulata* Benedict, 1897; Richardson 1899, 1900, 1905; Hatch 1947; Kussakin 1982.

**MATERIAL EXAMINED:** British Columbia: Queen Charlotte Sound, 2 females, stns. V3 (1959), H37 (1964); Barkley Sound, 8 males, 8 females, 5 immature, stns. P21, P22 (1975), B18, B25 (1976), B17, B18 (1977); Strait of Georgia, 1 immature, stn. B2 (1977) (NMC). From 6 to 73 m.

**SYNTYPES:** Washington: off Destruction Island, 1 male, 1 female, Albatross stn. 2869 (USNM 20506).

**OTHER SPECIMENS EXAMINED:** California, Monterey Bay, 10 specimens (USNM).

#### Diagnosis

**Male:** Supra-antennal margin of cephalon angularly concave; 1 pair each of anterolateral, anteromedial, and posteromedial low tubercles; postcephalic lobe with 1 median tubercle. Eyes

very large, round, and laterally situated. Maxilliped palp and epipodite laterally setose. Lateral margin of pereonite 1 with median lobe, of pereonites 2–4 angularly rounded, and of 5–7 almost straight; dorsal surface of all pereonites with transverse carina and 4–6 lateral rugosities; pereonites 1–4 with median tubercles. Pereopod 7 with brush and saw-toothed setae. Pleotelson, posterior border with slight median concavity; posterolateral borders may have a few serrations. Pleopod 2, appendix masculina extending well beyond the ramus, with distal lateral spinules. **Female:** Differs from male in having slender and weakly setose pereopods, and dorsolateral surface of pereonites with fewer rugosities. Measurements: male 11.2 mm; ovigerous female 7.6 mm.

**DISTRIBUTION:** Previously known from Washington and California (Kussakin 1982). New records extend the range to Vancouver Island, British Columbia.

#### Remarks

*Synidotea angulata* was described by Benedict (1897) from the Pacific coast of Washington. Subsequent records (Richardson 1899, 1905; Hatch 1947) did not include further morphological information except that Hatch noted slight intraspecific variations, especially in the lateral margins of the pereonites and in the median excavation of the pleotelson. The present specimens from British Columbia are identical with the type specimens in all characters, including pattern and type of dorsal sculpturing, the large well-pigmented eyes, and the tapering margins of the telson. The Californian specimens have similar mouthparts and appendages, but are larger (up to 20 mm), have much less well-defined dorsal sculpturing, eyes that are very pale, and telson with broad, serrate posterior margins and more convex lateral margins. These characters are also apparent in Richardson's (1905) and Kussakin's (1982) descriptions of material from California.

#### *Synidotea ritteri* Richardson, 1904 Figs. 21 and 24

**MATERIAL EXAMINED:** Southeastern Alaska, Kayak Island, 1 female, stn. A75 (1961); western Vancouver Island, 2 males, 9 females, stns. P6 (1955), P702 (1970), CL1028, CL1030 (1971); Washington, San Juan Islands, 1 immature, stn. W1 (1966) (NMC). Intertidal.

**OTHER SPECIMENS EXAMINED:** Oregon, Cape Kiwanda, 2 females, stn. W63 (1966); California, Dillon Beach, 3 specimens (NMC).

#### Diagnosis

**Male:** Supra-antennal margin of cephalon with median excavation; preocular horns large, projecting anteriorly well beyond the frontal margin; 1 pair of median spiniform tubercles anterior to eyes; 1 pair of median tubercles posterior to eyes; postcephalic lobe with small tubercles. Eyes small but forming part of lateral contour. Maxilliped palp and epipodite lateral margins setose. Pereonites 1 laterally rounded, pereonites 2–7 laterally straight; dorsolateral surface of pereonites 2–7 with rugosities; dorsal tubercles on pereonites 1–7 prominent to absent. Pereopod 7, merus, carpus, and propodus with comb setae. Pleotelson, posterior border with shallow median concavity. Pleopod 2, appendix masculina dorsoventrally flattened, tapering distally to form a narrow, pointed apex, central part of lateral margin serrate, dorsal surface scaly. **Female:** Differs from male in having two dorsal tubercles on pereonites 1–7, slender pereopods, and pleotelson much narrower than pereon. Measurements: male 12.0 mm; ovigerous female 7.2 mm.

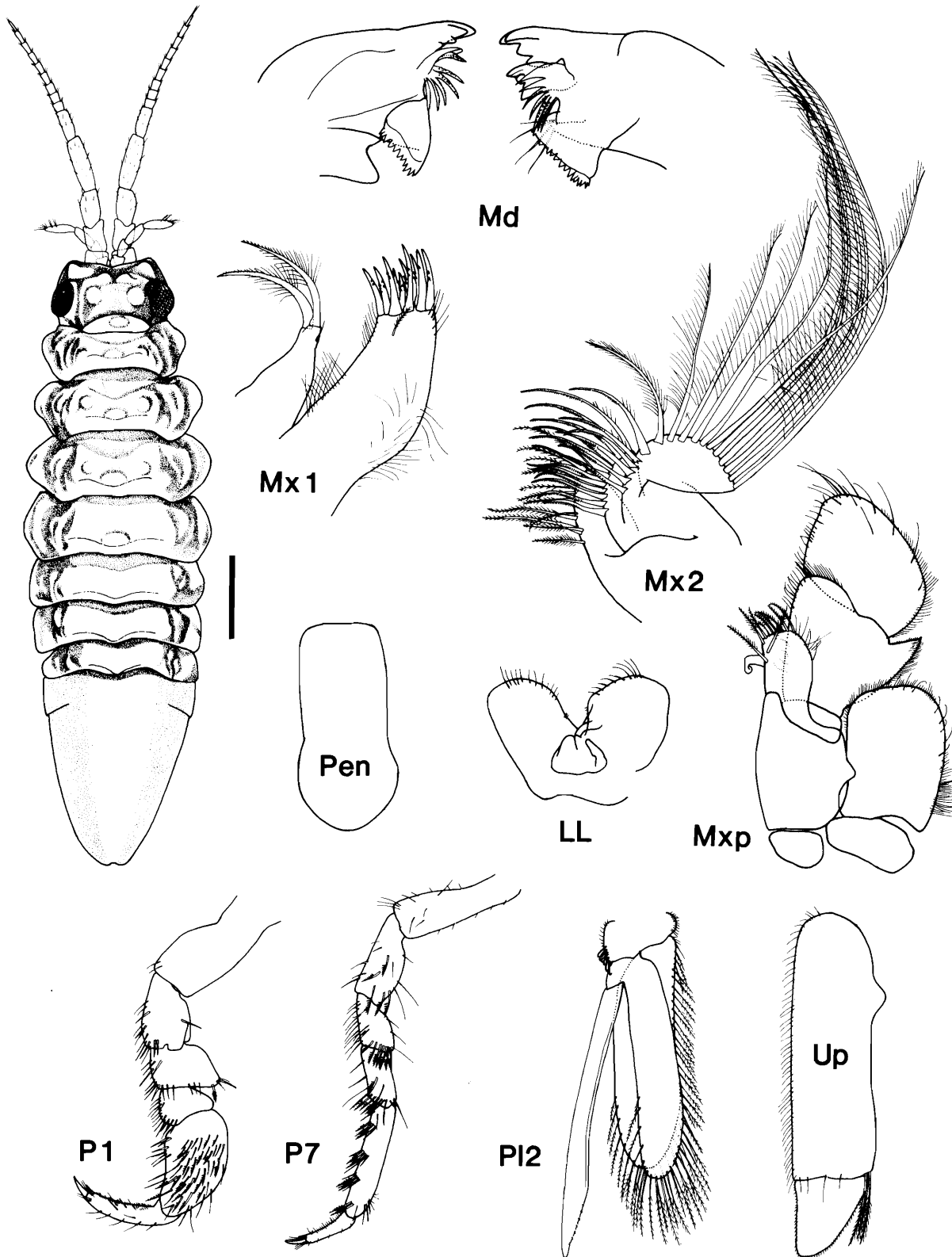


FIG. 19. *Syndotea angulata* Benedict. Scale bar for whole animal = 2 mm. For explanation of abbreviations see Fig. 5.

**DISTRIBUTION:** Previously recorded from Cross Sound, Alaska (Coyle and Mueller 1981) and Vancouver Island south to California (Kussakin 1982). New records fill in the range through the northeastern North Pacific region to southeastern Alaska.

**Remarks**

Of the 16 specimens of this species in the NMC collection, two intersexes, with neither genital papillae nor brood plates, were found with a style on the endopod of pleopod 2, extending slightly beyond the rami. This is similar to that shown on the

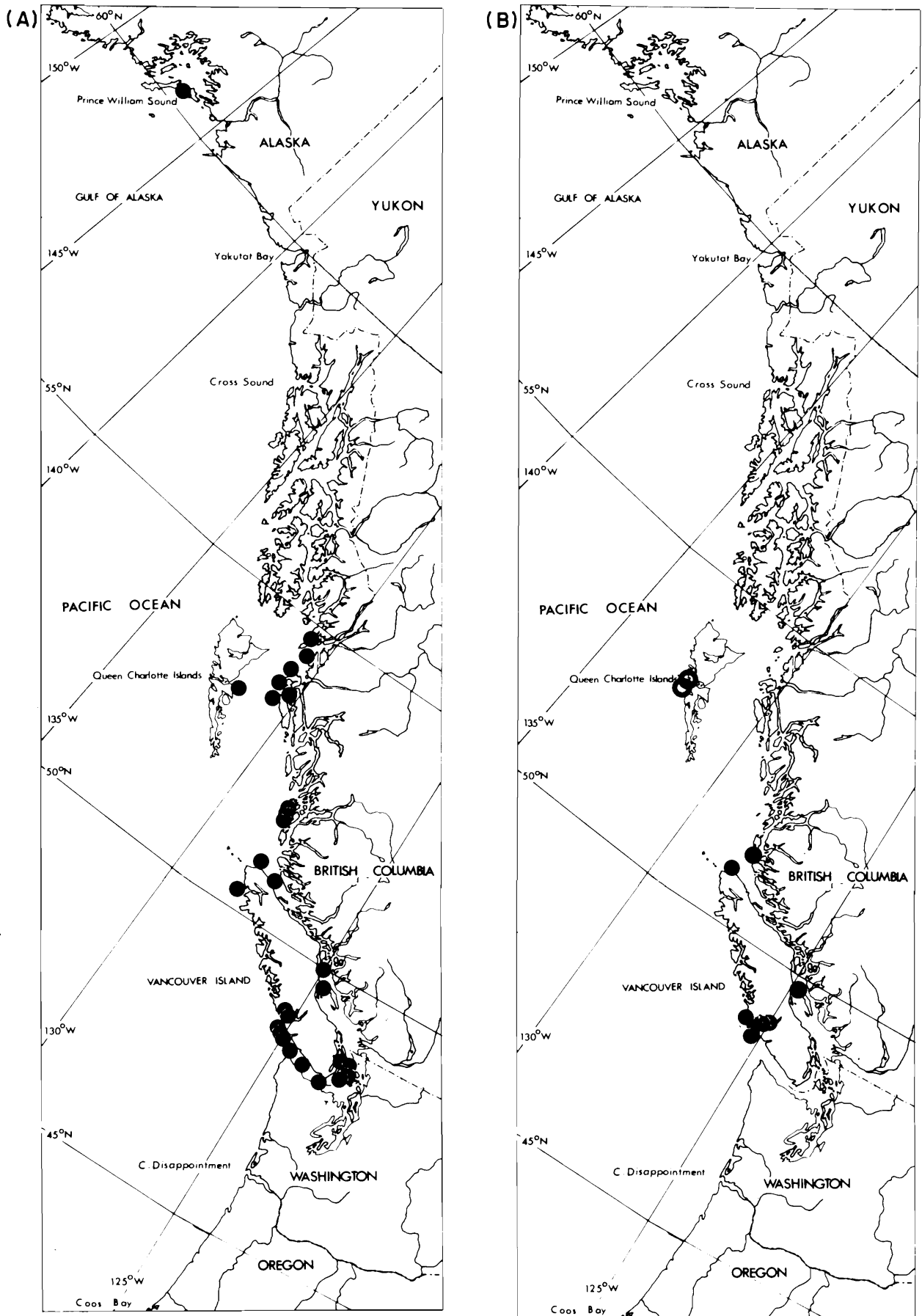


FIG. 20. Localities from which specimens of (A) *Synidotea consolidata* and (B) *Synidotea angulata* (●) and *S. minuta* (○) were examined.

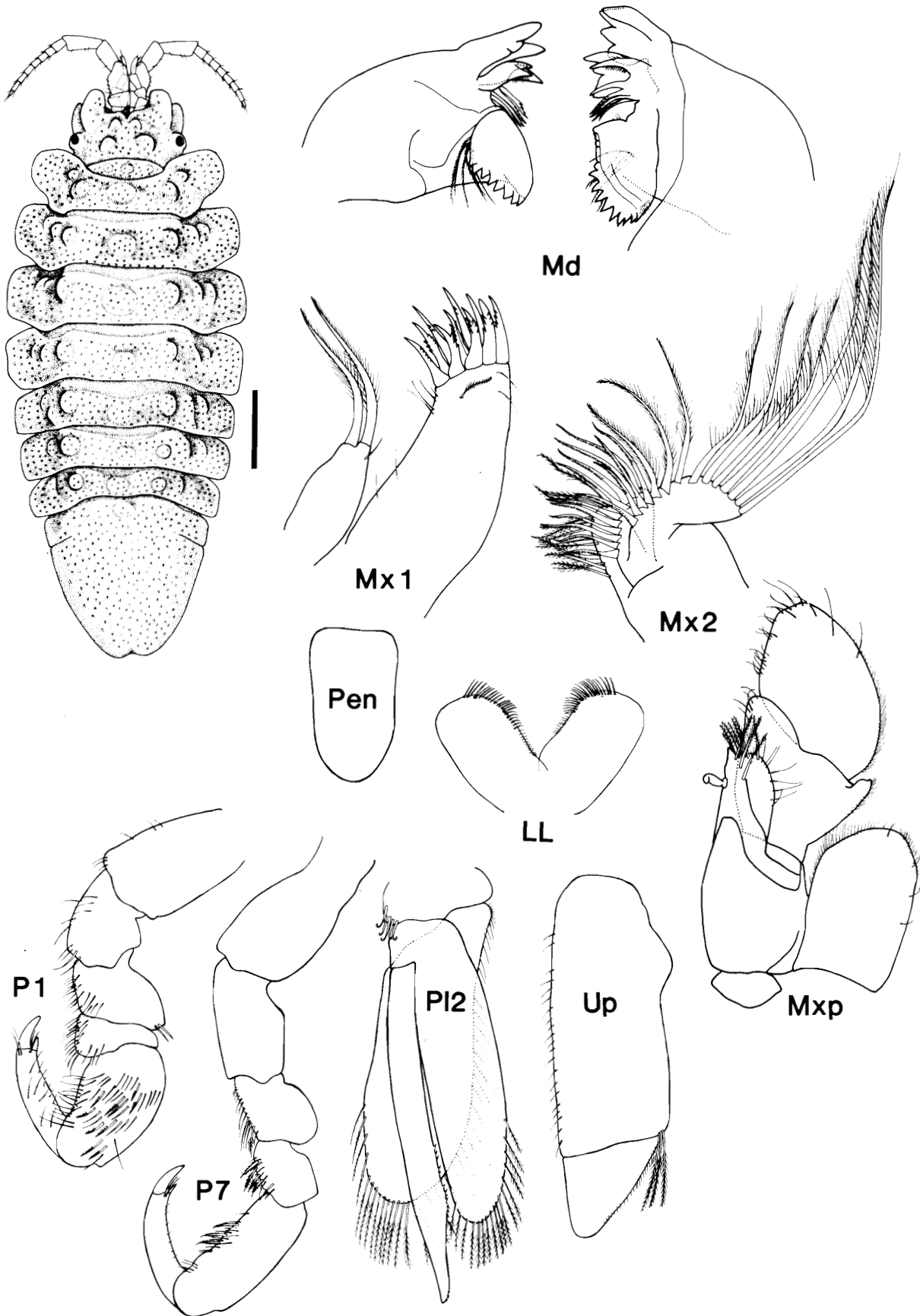


FIG. 21. *Syndidotea ritteri* Richardson. Scale bar for whole animal = 3 mm. For explanation of abbreviations see Fig. 5.

male illustrated by Menzies and Miller (1972), but is by no means an appendix masculina; it appears that Menzies and Miller mistook this intersexual condition for the male.

The posteromedial tubercles of pereonites 1–7 are quite prominent in specimens from British Columbia, whereas specimens from California lack or have only low tuberculations on pereonites 1–4. The significance of this variation in body tuberculation is unknown.

*Synidotea cornuta* n.sp.

Figs. 22 and 24

**MATERIAL EXAMINED:** Holotype: female, south shore intertidal of Houston Steward Channel, Queen Charlotte Islands, B.C. (52°4.2'N, 131°2.0'W), 16 July 1935 (NMC); collected by C. McLean Fraser, stn. 3537. The type specimen is deposited in NMC, catalogue No. NMCC1980-0509.

*Description*

*Female* (holotype, 8.0 mm): Supra-antennal margin of cephalon convex with shallow median excavation; anterolateral corners almost right-angled; preocular horns cylindrical, elongate, extending obliquely well beyond anterior margin; anteromedial tubercles submarginal; 1 pair of swollen posteromedial tubercles between eyes; postcephalic tubercle prominent. Eyes large-facetted, ovoid, forming part of lateral contour. Antenna 2, peduncle setose, segment 5 the longest; flagellum with 10 articles. Maxilla 2, endopod with plumose and simple setae, exopod with comb setae only. Maxilliped palp, segments 2 and 3 laterally setose, epipodite with lateral and distal setae.

Pereonites 1–3 laterally angular, 4 lateral margins round, 5–7 with straight lateral margins; pereonites all with mid-dorsal tubercles and 2–5 lateral tubercles. Pereopod 1, merus deeper than long, produced anteriorly into a lobe with plumose and simple setae overhanging carpus; all segments posteriorly setose. Pereopod 7, merus, carpus, and propodus setose with few saw-toothed and simple setae.

Pleotelson gradually tapering to deeply emarginate posterior border. Uropod with setose medial margin on peduncle and 3 long plumose setae at distolateral angle.

**DISTRIBUTION:** Known only from type locality.

**ETYMOLOGY:** The specific name, derived from the Latin word meaning "horned," refers to the long preocular horns.

*Remarks*

Although the single specimen of this species bears a resemblance to *S. ritteri*, *S. cornuta* is easily recognized by the cylindrical preocular horns, lateral expansion of ocular lobes, sharply pointed anterolateral margins of cephalon, maxilla 2 exopod devoid of plumose setae, and angular lateral margins of pereonites 1 and 2.

*Synidotea minuta* n.sp.

Figs. 20 and 23

**MATERIAL EXAMINED:** Holotype: male, south side of head of Gudal Bay, west coast of Graham Island, Queen Charlotte Islands, B.C. (53°14'14'N, 132°03'W), intertidal, 28 July 1957 (NMC); collected by E. L. Bousfield, stn. W11. Allotype: female, stream mouth at head of Gudal Bay, west coast of Graham Island, Queen Charlotte Islands, B.C. (53°14'N, 132°04'W), intertidal, 26 July 1957 (NMC); collected by E. L. Bousfield, stn. W9a. The type specimens are deposited in NMC, catalogue No. NMCC1980-0507 (holotype) and 0508 (allotype).

*Description*

*Male* (holotype, 6.8 mm): Supra-antennal margin of cephalon straight with slight median incision; anterolateral angles narrowly rounded, preocular tubercles submarginal, directed obliquely laterally; anteromedial tubercles elongate, 1 pair of posteromedial tubercles; postcephalic lobe with median conical and lower lateral tubercles. Eyes rounded, extending lateral margin of cephalon. Antenna 2 peduncle, segment 3 anterolateral corner produced, segments 4 and 5 with lateral setae; flagellum with 12 elongate setose articles. Maxilla 2, endopod with plumose and simple setae, exopod outer ramus with long plumose and comb setae, inner ramus with comb setae. Maxilliped palp, segment 3 laterally setose, epipodite with apical setae.

Pereonites 1–7, lateral margins angular; median dorsal tubercles prominent on all pereonites; pereonites 1–4 with 1 large and 3 small and pereonites 5–7 with 1 large and 4 small dorsolateral tubercles. Pereopod 1, all segments setose posteriorly; merus and propodus with setae anterodistally. Pereopod 7, ischium, merus, carpus, and propodus all setose.

Pleotelson with group of 6 proximal dorsomedial tubercles, lateral margins gradually tapering to deeply emarginate posterior border. Pleopod 2, appendix masculina extending well beyond ramus, laterally serrate on bulge distal to ramus, narrowing apically. Uropod with setose distal medial margin on peduncle and 3 plumose setae at distolateral angle. *Female* (allotype, 7.2 mm): Differs from male as follows: supra-antennal margin with deep median incision, preocular tubercles sharply conical; antenna 2 peduncle, segment 3 produced anterolaterally into a pointed lobe, flagellum with 11 articles; lateral margins of pereonites 1–4 sharply angular, those of 5–7 becoming progressively less angular; maxilla 2 with exopod typical of the family; pereopods slender, weakly setose.

**DISTRIBUTION:** Known only from type locality.

**ETYMOLOGY:** The species is named *minuta* for its small size.

*Remarks*

*Synidotea minuta* resembles *S. pettiboneae* in general body shape and cephalic tubercles but is readily distinguished from the latter by the strong conical tubercles on the pereon, more angular lateral margins of the pereonites, and less setose appendages.

*Synidotea pettiboneae* Hatch, 1947

Figs. 24 and 25

**MATERIAL EXAMINED:** British Columbia: 3 males, 2 females from Vancouver Island, stns. P6a, 1955; P714, 1970 (NMC). Intertidal.

*Diagnosis*

*Male:* Supra-antennal margin of cephalon straight with deep median notch; preocular horns directed obliquely laterally, barely extending to the frontal margin; 1 pair of median tubercles anterior to and 1 pair medial to eyes; postcephalic lobe with tubercles. Eyes small but bulging and extending outward as part of lateral contour. Maxilliped palp segment 3 and epipodite lateral margins setose. Lateral margins of pereonites 1 to 3 sharply angular, 4–7 progressively less angular; dorsolateral surface of pereonites with 3 tubercles; pereonites 1–7 with dorsal tubercles. Pereopod 7, merus, carpus, and propodus with saw-toothed setae. Pleotelson, anterodorsal surface with 2 median tubercles, posterior border with deep, median concavity. Pleopod 2, appendix masculina dorsoventrally flattened, extending beyond the ramus, apically pointed with medial and

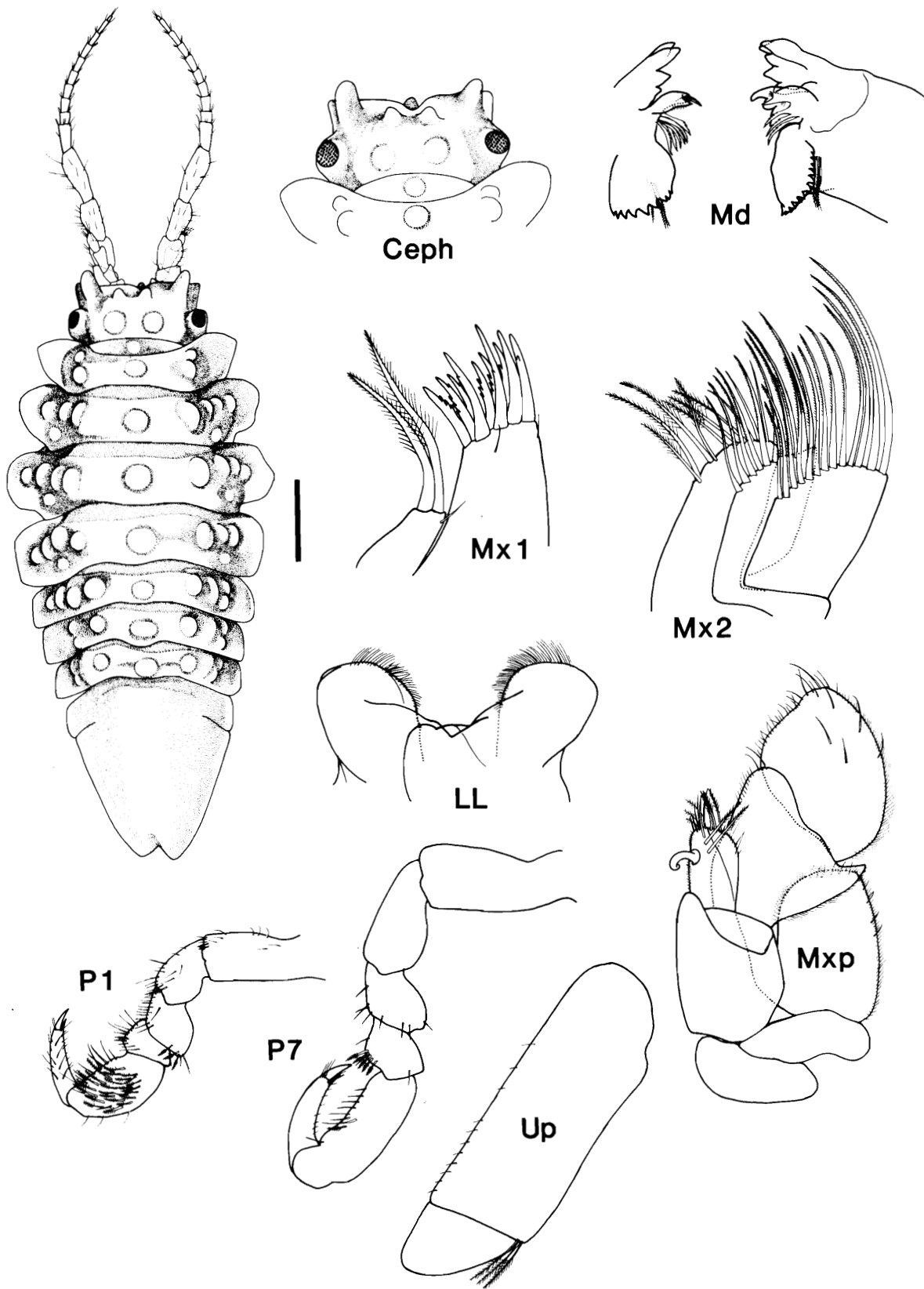


FIG. 22. *Syridotea cornuta* n.sp., female. Scale bar for whole animal = 2 mm. Ceph, cephalon; for explanation of other abbreviations see Fig. 5.

lateral spines. *Female*: Differs from male in less tuberculated body, weakly setose peduncle of antenna 2, and slender pereopods. Measurements: male 12.0 mm; ovigerous female 7.6 mm.

**DISTRIBUTION:** Previously known from Juan de Fuca Strait, Washington, to San Mateo County, California (Kussakin 1982). New records extend the range northward to Vancouver Island, British Columbia.

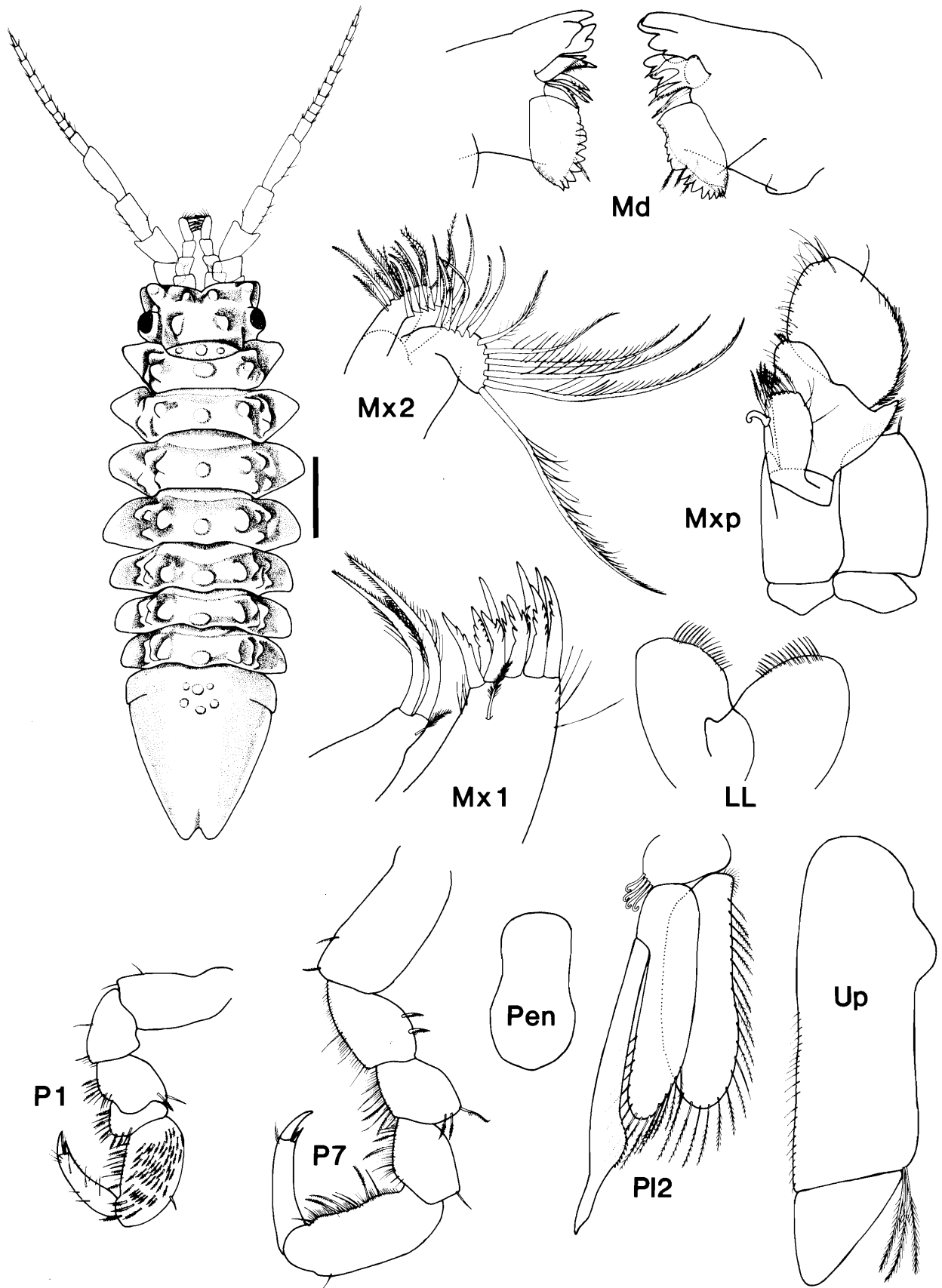


FIG. 23. *Synidotea minuta* n.sp. Scale bar for whole animal = 1.5 mm. For explanation of abbreviations see Fig. 5.

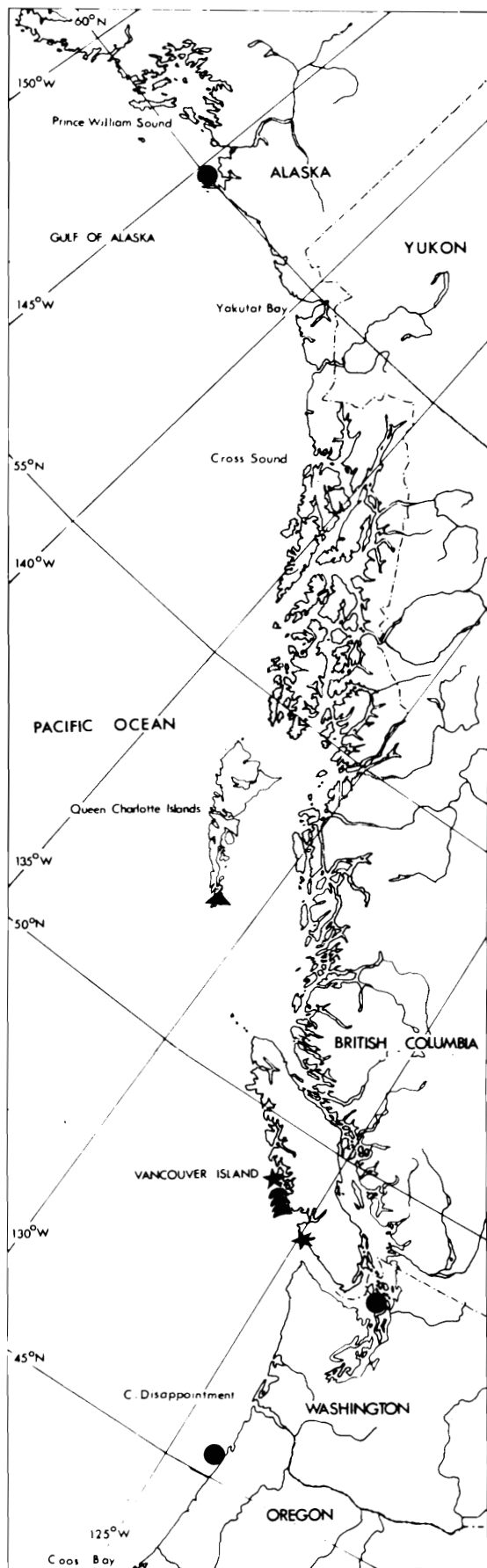


FIG. 24. Regional localities from which specimens of *Synidotea ritteri* (●), *S. cornuta* (▲), and *S. pettiboneae* (★) were examined.

#### Remarks

*Synidotea pettiboneae* is easily distinguished from its congeners by the presence of two prominent laterally projecting preocular horns, and tubercles on the anterior region of pleotelson. Menzies and Miller (1972) show the pereonites with a transverse row of 3 pointed tubercles. In specimens from Vancouver Island each pereonite bears 2 small lateral tubercles in addition to the 3 pointed tubercles.

*Edotia* Guérin-Méneville, 1844

#### Diagnosis

Cephalon laterally entire; antenna 1 longer than antenna 2; antenna 2 flagellum rudimentary, 2- to 4-segmented; maxilla 1 exopod with 11 apical teeth, endopod with 3 plumose setae; maxilla 2 exopod with comb setae on both lobes, endopod with plumose setae; maxilliped endite without apical teeth, palp 3-segmented; pereopods similar, prehensile; coxae imperfectly fused; penes fused and apically cleft; abdomen unsegmented to 3-segmented, segments partially fused; uropod, ramus much narrower than peduncle which bears a marginal series of long plumose distolateral setae.

#### Remarks

Since the appearance of Richardson's monograph (1905) with the spelling *Edotea* for this genus, it has been consistently misspelled by North American authors. It appears that Richardson originally made the error in her concurrent synopsis (1900) and key (1901) to the North American isopods. Zoological Record for 1902 implies that Ohlin (1901) also used *Edotea*, but this was not the case. Further search of the literature and reference works has not turned up any use of *Edotea* prior to Richardson (1900), and we assume that it was a lapsus calami.

*Edotia sublittoralis* (Menzies and Barnard, 1959)

Fig. 26,

MATERIAL EXAMINED: Barkley Sound, Vancouver Island: 1 female, off Bordelais Islet (48°48.5'N, 125°14'W) 46 m, 5 July 1976, stn. B18 (NMC); 1 female, mouth of Trevor Channel (48°48'N, 125°14'W) 36–40 m, 30 May 1977, stn. B18 (NMC).

#### Diagnosis

*Female*: Supra-antennal margin of cephalon convex; anterolateral angles produced to form hornlike projections; 2 cephalic tubercles fused posteriorly to a single large mid-dorsal oval swelling. Eyes semicircular and lateral. Antenna 1, peduncle segment 3 longer than either 1 or 2, flagellum with 4 long apical aesthetascs. Maxilliped palp, segment 3 laterally setose, epipodite laterally and apically setose. Pereonites 1–7, lateral margins with dorsal swellings; pereonites 1–3 lateral margins rounded, pereonite 4 posterolateral angles acute, pereonites 5–7 lateral margins straight. Pereopod 1 with cleft-toothed, saw-toothed, and unguiculate setae. Pleotelson gradually tapering to blunt apex; dorsal surface with 3 proximal swellings, of which central one is large and has 2 rugosities posteriorly on each side, and 1 large bulbous terminal swelling. Measurements: ovigerous female 3.8 mm.

DISTRIBUTION: Previously recorded from south of Point Conception to northern Mexico. New records extend the range to the west coast of Vancouver Island.

#### Remarks

The discovery of *E. sublittoralis* by Menzies and Barnard (1959) extended the known range of the previously South

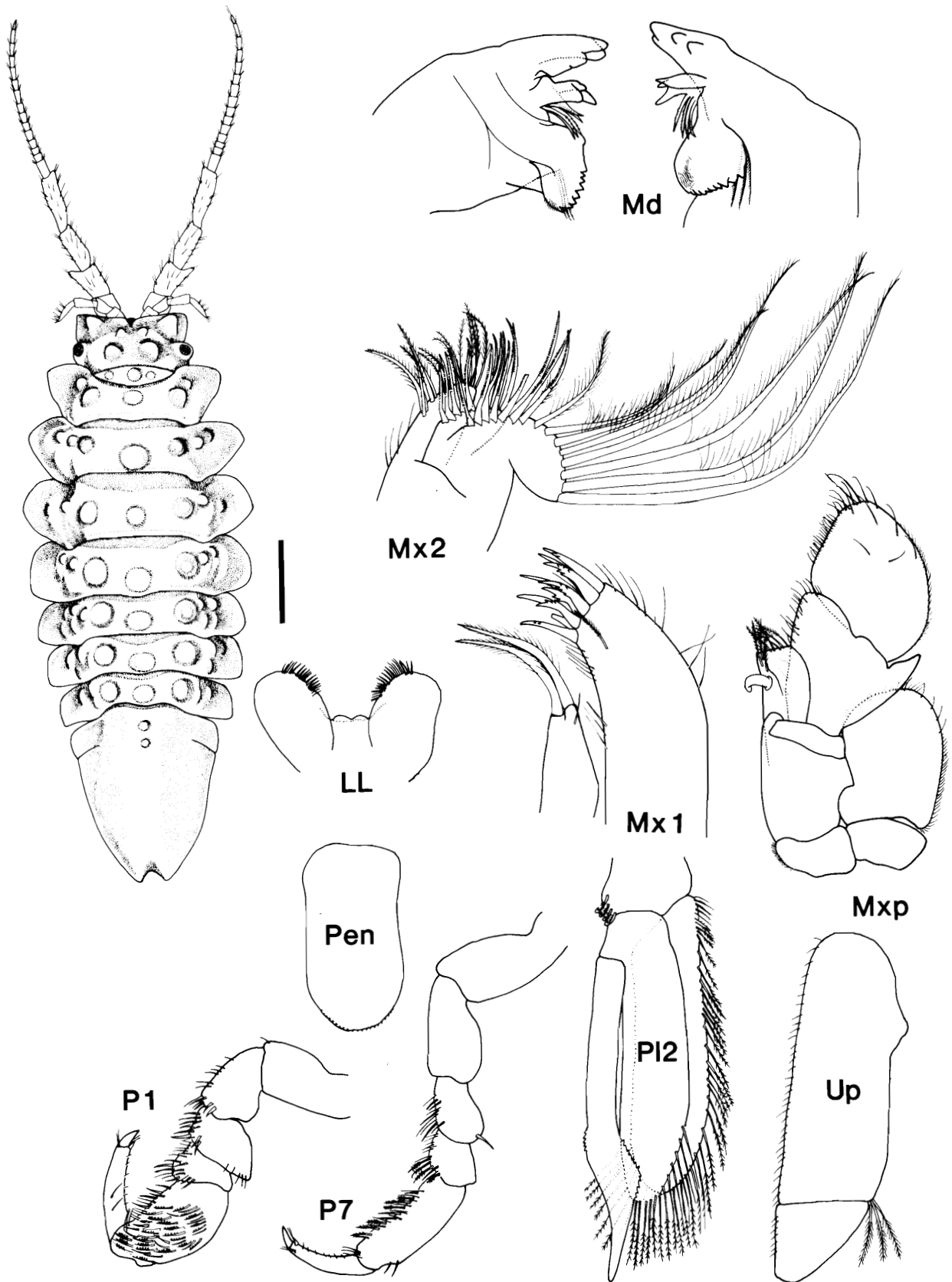


FIG. 25. *Synidotea pettiboneae* Hatch. Scale bar for whole animal = 2.5 mm. For explanation of abbreviations see Fig. 5.

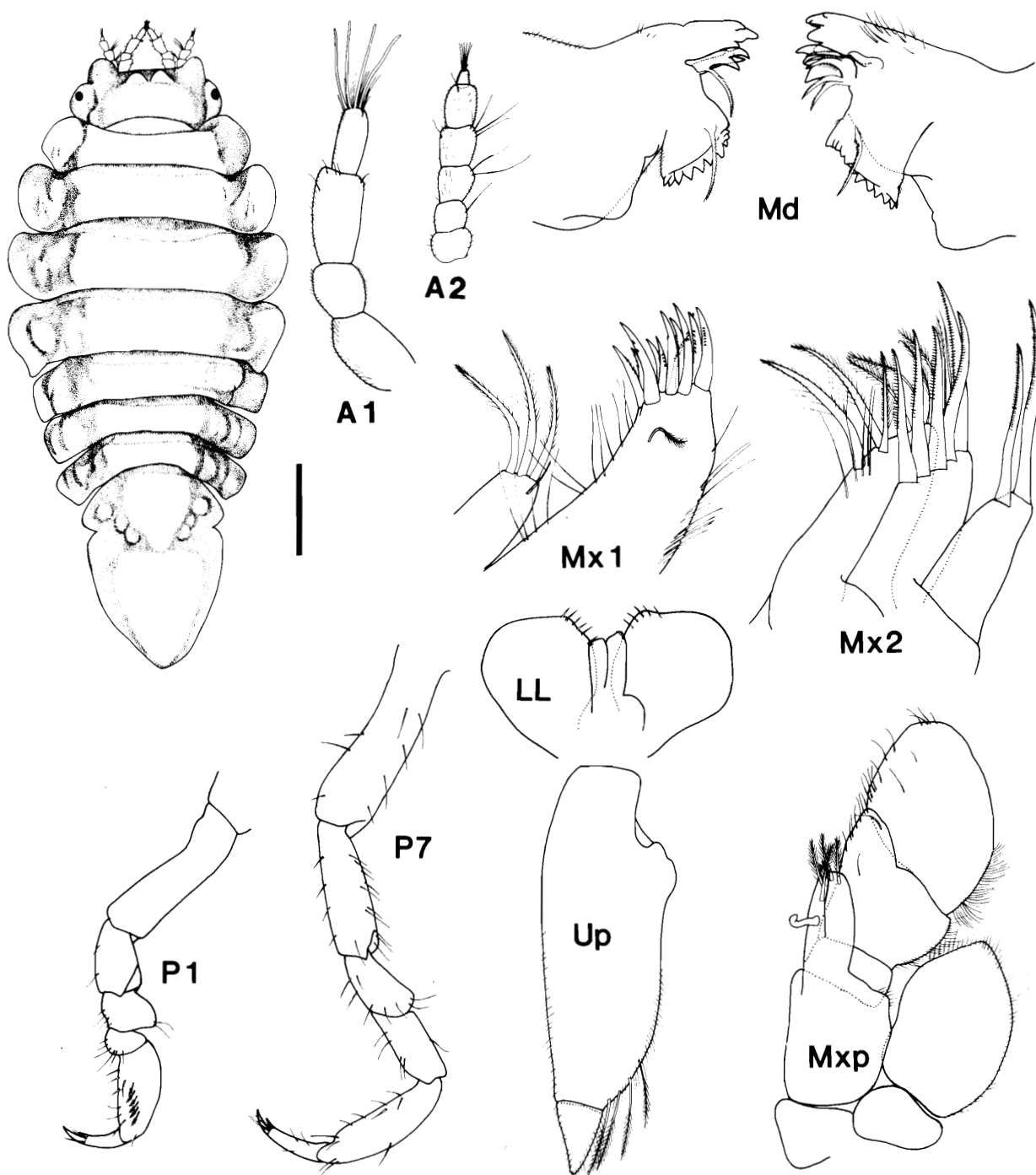


FIG. 26. *Edotia sublittoralis* (Menzies and Barnard), female. Scale bar for whole animal = 1.2 mm. A1, antenna 1; A2, antenna 2; for explanation of other abbreviations see Fig. 5.

Pacific and North Atlantic genus *Edotia* into the northeastern Pacific region.

A close comparison of the illustration and description of the holotype of *E. sublittoralis* with the Vancouver Island material reveals some differences. Menzies and Barnard (1959) described and illustrated the two cephalic tubercles, without indicating a swelling just behind them. Our specimens exhibit the cephalic tubercles as the anterior continuation of a posterior round swelling which covers almost the whole of the midcephalic

region. The flagellum of antenna 1 of our specimens bears 4 or 5 aesthetascs at the apex, whereas the holotype bears lateral as well as apical aesthetascs. Finally, pereonite 4 in our specimens forms an acute posterolateral angle which is absent in the holotype. Considering the disjunct distribution (lack of records between Vancouver Island and Point Conception) and the differences in some of the characters, the possibility is that we are dealing with a different, undescribed, species. The inclusion of our specimens in *E. sublittoralis* is dictated by the small



number of specimens in both the California and Vancouver Island collections, as well as by the lack of male specimens in either collection.

### Discussion

The known distributional ranges of the species of Idoteidae recorded from shallow waters of the northeastern North Pacific Ocean are shown in Table 1. *Saduria entomon* is not included in the table; it is a cold-water, circumpolar species which exhibits very sporadic southern distribution (Hatch 1947; Brusca and Wallerstein 1979). The ranges encompass a latitudinal span from at least 58°N (Prince William Sound) south to 23°N (Gulf of California). Some of the species are found throughout this region; others have restricted ranges. Most of the species reported herein were collected from within their previously known geographical range; however, for a few we have reported range extensions, some of which are considerable.

The 16 species of idoteids found in our study can be divided into two groups on the basis of their recorded distribution. One group comprises those species having a very broad distributional range, and the other, species with circumscribed distribution. The nine widely distributed species, *Idotea fewkesi*, *I. montereyensis*, *I. resecata*, *I. rufescens*, *I. schmitti*, *I. urotoma*, *I. wosnesenskii*, *Synidotea consolidata*, and *S. ritleri*, are found at least from southeastern Alaska to California north of Point Conception. They are all endemic to the North Pacific. *Idotea resecata* and *I. urotoma* have exceptionally broad ranges, being recorded from the Gulf of Alaska south to the Gulf of California (Brusca and Wallerstein 1979). *Idotea wosnesenskii* is reported from the Aleutian Islands (Richardson 1905) to the Pacific coast of Baja California (Brusca and Wallerstein 1979); a record of this species from the Gulf of California is doubtful (Brusca and Wallerstein 1979). Menzies (1950) considered *I. fewkesi* to be a Californian species, but records from Baja California to Alaska (Kussakin 1982) indicate that it is widespread.

Six of the species, *Idotea obscura*, *I. recta*, *Synidotea angulata*, *S. cornuta*, *S. minuta*, and *S. pettiboneae*, have more restricted distributional ranges. *Idotea obscura*, a northern species, is found from Prince William Sound to Vancouver Island. *Idotea recta* has a narrow range from the west coast of Vancouver Island to the San Juan Islands. *Synidotea angulata* and *S. pettiboneae*, both more southerly species, are found from Vancouver Island to central California. Two new species, *S. cornuta* and *S. minuta*, are known only from their type localities.

The last species, *Edotia sublittoralis*, has a widely disjunct distribution. Previously reported by Menzies and Barnard (1959) from Point Conception to the northern Mexican border, it was present at two localities on the west coast of Vancouver Island. It seems unlikely that these records reflect the actual distribution of this species. Either it has been overlooked in the intervening region owing to its small size, or two species are present on the North American Pacific coast.

Six species previously recorded from the northeastern North Pacific were not found in our study. *Saduria entomon* records have been either deep-water (about 100 m (Boone 1920)) or freshwater and low-salinity estuarine occurrences of this species; it may not occur in the relatively shallow marine waters under investigation. Three species that we did expect to find are the southern *Idotea stenops* (Oregon to California), the northern *Synidotea nebulosa* (Washington to Alaska, Sea of Okhotsk and Chukchi Sea), and the circumpolar *S. nodulosa* (British Columbia, Alaska and the Sea of Okhotsk, the Arctic, and

North Atlantic). *Idotea aleutica* could also be expected to be found in this region. Although we are certain that this species was not in the collections available to us, it is very similar to *I. fewkesi*, under which it is discussed. We have rejected the record for the last species, *I. aculeata*. It was reported by George and Strömberg (1968) from Juan de Fuca Strait, whereas all other records are from south of Point Conception. We have concluded that this was a misidentification of *I. recta*.

The majority of these Pacific isopod species thus exhibit considerable eurytopy. However, their overall distributions support the hypothesis of Hartman and Zahary (1983) that the division of the Eastern Pacific Boreal Region into northern and southern provinces occurs somewhere between Puget Sound and Dixon Entrance.

The northeastern North Pacific coast offers a variety of habitats and physical environments with rich and diverse assemblages of seaweeds. It is not certain which of the environmental factors determine the local distribution of the idoteids. The collections studied by us were the result of field activities where idoteids were collected incidentally with no special effort to document their specific habitat. However, the environmental data available can serve to define some parameters and to indicate subjects for future investigation. The species reviewed here were most frequently found in salinities greater than 15‰. *Idotea obscura*, *I. rufescens*, *I. schmitti*, and *I. urotoma*, collected from localities of 27–32‰, appear to be more stenohaline than *I. montereyensis* and *I. resecata* (15–32‰). The only other species for which we have sufficient data, *I. wosnesenskii*, is strongly euryhaline (5–32‰).

Many idoteids have a wide range of thermal tolerance. Studies by Brusca and Wallerstein (1979) show that the predominantly cool-water species *Idotea resecata* and *I. urotoma* can adapt readily to warm temperature. Their thermal tolerance makes it unlikely that temperature has a significant effect on their local distribution. The collection data that we have for the northern species show that they also are eurythermal. *Idotea obscura*, *I. rufescens*, and *I. schmitti* were however found in slightly cooler waters (up to 15°C) than *I. fewkesi*, *I. montereyensis*, *I. resecata*, *I. urotoma*, and *I. wosnesenskii* (up to 18°C).

Idoteids are essentially herbivorous with omnivorous tendencies (Naylor 1955, 1972; Sywula 1964). Cruz (1963), for example, demonstrated that *I. balthica* (Pallas) showed no preference for plant over animal food, and association of idoteids with other animals, particularly sessile invertebrates, suggests that they may be a common source of food (Naylor 1955; Menzies and Miller 1972).

Studies by Menzies (1950), Naylor (1955), Jones (1971), O'Clair (1977), and Brusca and Wallerstein (1979) and present data indicate that the species have a preferred plant, or plants, that serves as a substrate and as food. Thus, although the collection data for the species under review are not specific as to substrate, for some of the species at least, distribution appears to be correlated with the marine plants of the region. Four species, *I. obscura*, *I. fewkesi*, *I. wosnesenskii*, and *S. consolidata*, were recorded predominantly (i.e., more than 70% of occurrences) amongst *Zostera*. Three species, *I. urotoma*, *S. ritleri*, and *S. angulata*, were recorded mostly on laminarians (>65%), and two species, *I. schmitti* and *S. pettiboneae*, on *Phyllospadix* (>65%). In addition, more than 50% of the collections of *I. rufescens* and *I. resecata* were recorded from laminarians, and of *I. montereyensis* from *Phyllospadix*.

Virnstain and Howard (1987) found that the abundance,

though not the occurrence, of motile epifauna species differed significantly according to the macrophytic substrate rather than the site. They offered several hypotheses to explain their findings: refuge value; active selection for quality of food or architecture of the plant; and competitive displacement. However, Salemaa (1979, 1986) showed that algal architecture and site (i.e., wave exposure) were the most important factors affecting the microdistribution of idoteids. Individuals of different sizes and ages of the same species, *Idotea granulosa* Rathke, were not all found on *Fucus*, which would have provided the best food value, but inhabited the algae that were structurally most suited to their size, because of the mechanical sorting action of the waves.

It is thus apparent that to determine the specific habitat requirements of idoteids, not only are site and microhabitat data needed, but quantitative samples for all developmental stages are also required.

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