Additions to the milliped family Caseyidae. I. *Caseya richarti*, n. sp., and new records of previously described species in the genus *Caseya* Cook and Collins 1895 (Diplopoda, Chordeumatida, Caseyidae)

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Abstract

Caseya richarti, n. sp., from King Co., Washington, USA, is described from two nearby localities in King County, Washington (state), USA. The genus *Caseya* Cook and Collins 1895, which now includes 25 species and subspecies, occurs from Los Angeles Co, California, USA, north through the Sierra Nevada and Coast Ranges nearly to the Canadian border. New records are given expanding the range of *C. borealis* Gardner and Shelley 1989 in Washington, and further new records are provided for *Caseya megasoma* Gardner and Shelley 1989, C. *dorada* (Chamberlin 1941), *C. heteropa disjuncta* Gardner and Shelley 1989, *C. heteropa oraria* Gardner and Shelley 1989, and *C. heteropa montana* Gardner and Shelley 1989. Additional notes are provided on gonopod nomenclature and the status of subspecies in *Caseya.*

Key words: Caseyidae, *Caseya.* Washington, Oregon, California, subspecies

Introduction

The genus *Caseya* was established in 1895 by Cook & Collins for a unique new species from the San Francisco Bay area of California, *Caseya heteropa* Cook & Collins. As additional exploration and collection in western North America continued, species were added to *Caseya* by Chamberlin (1941), Causey (1952) and Loomis (1966). Two evidently closely related monotypic genera, *Placerna* and *Zantona,* were also described by Chamberlin (1941). The former genus was synonymized with *Caseya* in 1979 by Hoffman. In 1989, the family Caseyidae was reviewed by Gardner and Shelley, who added 18 new species and subspecies to *Caseya* and synonymized *Zantona* for a total of 24 species and subspecies, making *Caseya* the most speciose milliped genus in western North America. The Caseyidae, thanks to this review, are now among the best understood two or three chordeumatid milliped families in the world.

Except for a single species from northeastern Siberia, the family Caseyidae is endemic to North America north of Mexico. The region west of the Coast Ranges in California, Oregon, Washington (Gardner & Shelley 1989), British Columbia and Alaska (Shelley *et al.* 2007) is home to all but two of the North American species. Species richness in *Caseya* is greatest in central and northern California, where 15 of the species and subspecies occur; only *C. taliae* Gardner & Shelley is found in southern California. There is a distinct gap in collecting in the northern tier of California counties just south of the Oregon border, and no species now known to occur in California has been recorded from Oregon. Oregon hosts eight endemic species of *Caseya,* which presently appear to be confined between the crest of the Cascade Mountains and the Pacific coast; northern Oregon has only a single species recorded: *C. megasoma* Gardner and Shelley 1989, the distribution of which stops well short of the Columbia River, the boundary between Oregon and Washington. In Washing-

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ton, *C. borealis* Gardner and Shelley 1989 has been known from records closely clustered at the south end of Puget Sound (Fig. 1; maps in Gardner & Shelley 1989), and was the only Washington species of *Caseya*. We present here new records that show the species to be common and widespread throughout western Washington, from the Columbia River to the Strait of Juan de Fuca. The new species described below as *Caseya richarti,* n. sp., is the second species to be found in Washington.

Since 2000, WPL, assisted by Casey Richart, has been carrying out intensive sampling of millipeds in Washington. During this time, WAS sorted Berlese sample residues from the western states deposited in the Field Museum, Chicago, and examined new collections in the California Academy of Sciences, San Francisco. Interestingly, only a single new species of *Caseya,* described here as *C. richarti* n. sp., resulted from this effort, but many new records of *C. borealis* and several interesting ones of *C. dorada* and *C. heteropa* came to light.

As well as much new material of *Caseya,* many additional taxa of caseyids, including new species in established genera such as *Opiona* Chamberlin 1951, *Ochrogramma* Gardner & Shelley 1989, *Speoseya* Causey 1963, and a number of species representing new genera, were found. This paper is the first in a planned series supplementing the review by Gardner and Shelley (1989).
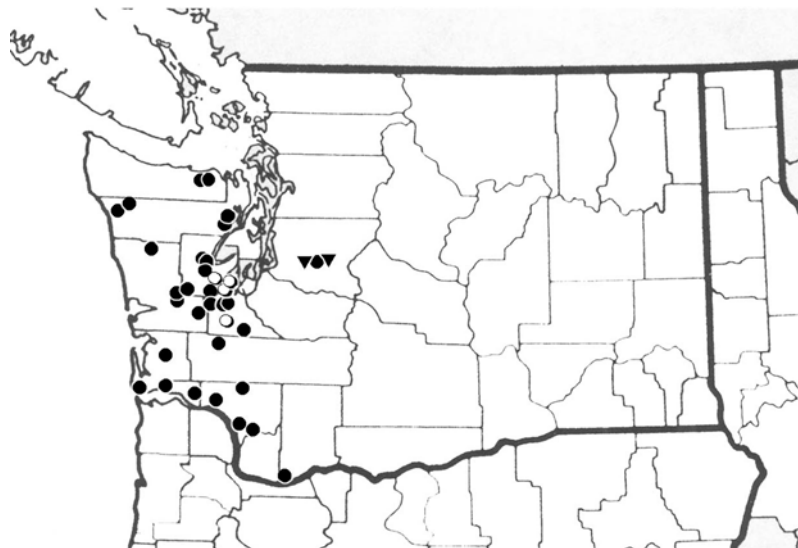

FIGURE 1. Map of Washington State, USA, showing distribution of *Caseya richarti* n. sp. (inverted triangles) and *C. borealis* Gardner & Shelley (filled dots are new records, open circles are literature records from Gardner and Shelley 1989).

Taxonomy

Order Chordeumatida Koch 1847

Suborder Striariidea Cook 1898

Superfamily Caseyoidea Verhoeff 1909

Family Caseyidae Verhoeff 1909

Caseya **Cook & Collins 1895**

Caseya Cook & Collins 1895:84; Hoffman, 1979:138; Gardner & Shelley, 1989:223.

In their review of the caseyids, Gardner and Shelley (1989) proposed a terminology for the gonopods of *Caseya* species that was based on a current, but incorrect, understanding of the homologies of the parts of the chordeumatidan gonopod. It is now generally accepted that in nearly all chordeumatidan gonopods, telopodite elements are absent, and the entire gonopod is developed from the coxa (in a few antholeucosomatid genera, a small, seta-tipped, articulated rod probably does represent the telopodite, but this structure is rare). Thus the gonopod parts can be attributed to either the angiocoxite (from the body of the coxa) or the colpocoxite (from the permanently extruded and sclerotized coxal gland). In their diagram of a dissected *Caseya heteropa disjuncta* gonopod (their Figs. 111–117), the following changes are required to bring the terminology of Gardner and Shelley (G&S) into compliance with today's interpretation; these changes are based on detailed study by WAS of the gonopods of all genera of Caseyidae and comparative work with 15 other families of Chordeumatida. The labeling on our Figures 2 and 3 reflect the changed terminology.

The telopodite of G&S is the colopocoxite (**tla**; blue). Strong evidence for this is found in the presence at the posterior base of this structure of a membranous region representing an unsclerotized part of the gland (**tll,** red); homologous (though much larger) structures appear in the related family Striariidae). While it seems clear the rest of the gonopod is angiocoxal, we can refer to the piece G&S called the colpocoxite as the angiocoxite *per se* (**ac**, red). The other elements of this extremely complicated structure, called by G&S the coxal plate, lateral lamina, (**ll,** violet) mesal lamina (**ml**, green) and flagellocoxite (**fc**, yellow), may, for clarity, retain those names with the understanding that they are very likely angiocoxitic in origin.

Similarly, the ninth legs (Fig. 9) are referred to by G&S as posterior gonopods, implying a role in spermatophore transfer. But clearly they serve for the most part only to secure the gonopods in place (Fig. 4) and protect them while they are retracted. For this reason we follow current usage and refer to these modified appendages as ninth legs. The telopodites of these legs are reduced to single, swollen, button-like structures (**t9,** red, Fig. 4; see also Fig. 9) that are easily visible to the naked eye and allow the collector to identify mature males.

Species of *Caseya* also have an elaborate set of modifications to the second, third, seventh, and tenth leg-pairs. The second coxae bear long, caudally curved, setose gonapophyses associated with the seminal pore (**ga,** Fig, 5). The third coxae are greatly swollen and extend ventrally as flattened, rounded lobes (Figs. 5, 6). Very heavy musculature is associated with these legs, so that preserved male *Caseya* often have a "hunchbacked" appearance at the third and fourth diplosegments due to their strong contraction. The coxae of the seventh legs are also enlarged and display a number of blunt processes (Fig. 7), while the tenth coxae carry prominent coxal glands and yet another distinctive set of processes (Fig. 8). These modifications were briefly described for the genus as a whole by Gardner and Shelley (1989), but curiously only the second legs were sporadically illustrated for some of the species, and the descriptions under the species accounts of the modified legs are quite brief. Indeed, the tenth legs, with their strongly modified coxae, are described only as "enlarged" and bearing coxal glands. Our experience with many, but not all, of the species of *Caseya* tells us that these modifications contain taxonomic information and differ between species. Certainly the complex gonopods remain the prime characters whereby *Caseya* species may be identified, but in many cases the other modifications are easier to see. These modifications may also be useful phylogenetically, and so should be fully described and illustrated in the future, as we have done for *C. richarti* n. sp. below.

Finally, Gardner and Shelley (1989) unequivocally established the diagnostic utility of the cyphopods in Caseyidae, allowing the identification of females not accompanied by males. These structures should be illustrated as well, and a new survey of their structure, which seems quite varied though it is often difficult to reconcile the posterior and lateral views of the structures depicted by Gardner and Shelley (1989), would be very useful. In particular, the form of the receptacle would seem to be diagnostic for most species, and there are accessory sclerotizations of the membranous capsule surrounding the cyphopods that may be of systematic value. From our brief study of the matter, it would seem that an anterior view of the receptacle (Fig. 10) gives the most information.
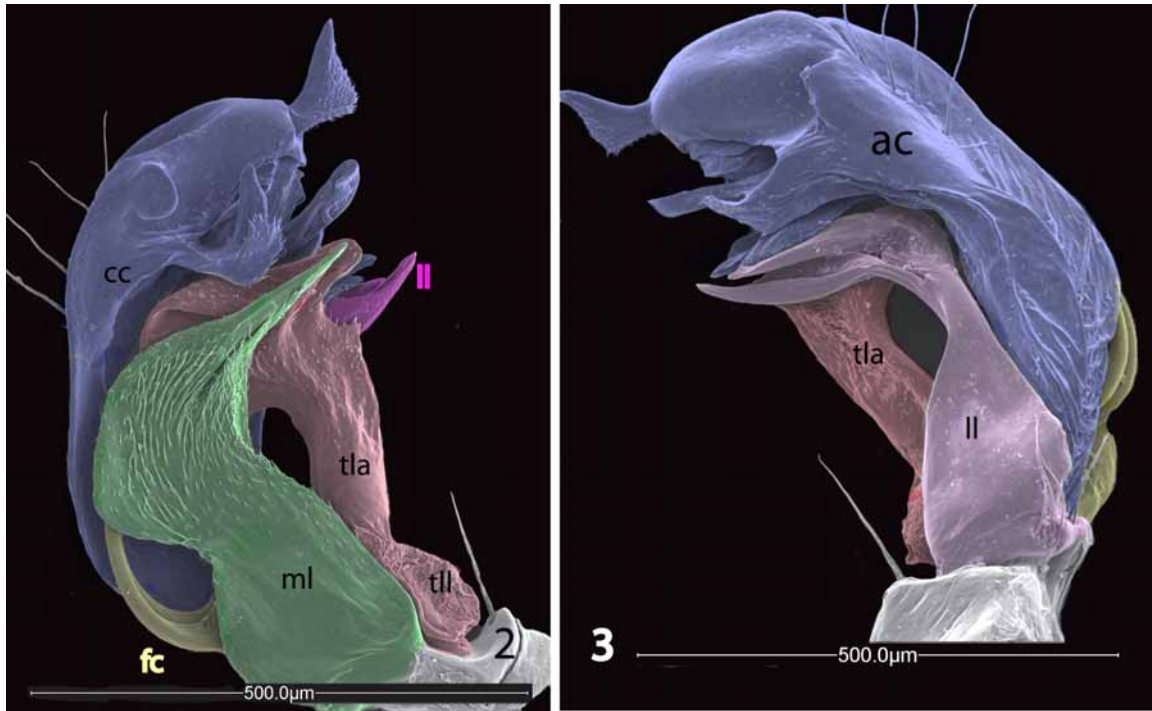
FIGURE 2, 3. *Caseya richarti* n. sp. male. 2. Left gonopod, mesal view. 3. Same, lateral view. **ac,** angiocoxite (blue); **fc,** flagellocoxite (yellow); **ll,** lateral lamina (violet); **ml,** mesal lamina (green); **tla,** colpocoxite lamina(red); **tll,** membranous lobe of colpocoxite (red).

Caseya richarti, new species
Figs. 2–10

Types: Male holotype, one male and two female paratypes from WASHINGTON: *King Co.*: Holder Creek, 1.5 miles north of Hobart, Issaquah exit on Route 18, N47°27.135', W121°57.217', elevation 700' asl, 25 February 2004, W. P. Leonard, C. Richart (FMNH). Male paratype from same state and county, Interstate Highway 90 at Snoqualmie River, Twin Falls/Iron Horse trailhead, N47° 23.86', W121° 29.02', elevation 1250' asl, 25 February 2004, W. P. Leonard, C. Richart (FMNH).

Diagnosis: Similar to, and sympatric only with *C. borealis*, from which it can be distinguished by the form of the gonopod. In *richarti,* the angiocoxite has a nearly deltoid terminal process; this is missing in *borealis.* The angiocoxite of *borealis* has a strong distoventral hump which causes the terminus of the coxite to be directed dorsally; in *richarti* the curve of the anterior edge of the angiocoxite is smooth and even. Seen in lateral view, the angiocoxite of *richarti* also has a much stronger lateral flange than in *borealis*, while in *richarti* the mesal flange or process is much stronger than in *borealis.* The terminal process in *richarti* somewhat resembles that of *Caseya paradoxa* G & S, but the rest of the gonopod looks entirely different, and *paradoxa* is far to the south in Mariposa Co., California. Coloration is also slightly different between *richarti* and *borealis,* but this may be variable. In *borealis,* the impression is of a light tan base color with two narrow, paramedian purplish-brown stripes and a purplish-brown spot on the ventrolateral edge of each metazonite; in *richarti* the ground color is a little darker, the stripes much wider, and the spots much larger. In the field *richarti* gives the impression of a dark animal with a pale median stripe. The anterior five segments and head of *richarti* are nearly all darker purplish-brown, and in *borealis* the striping extends much further anteriorly. While females of *borealis* also show the striped pattern, females of *richarti* are entirely dark, and in the field show no apparent pale median stripe. Females may also be separated by the two processes on the cyphopod receptacle in *richarti*; these are absent in *borealis.*
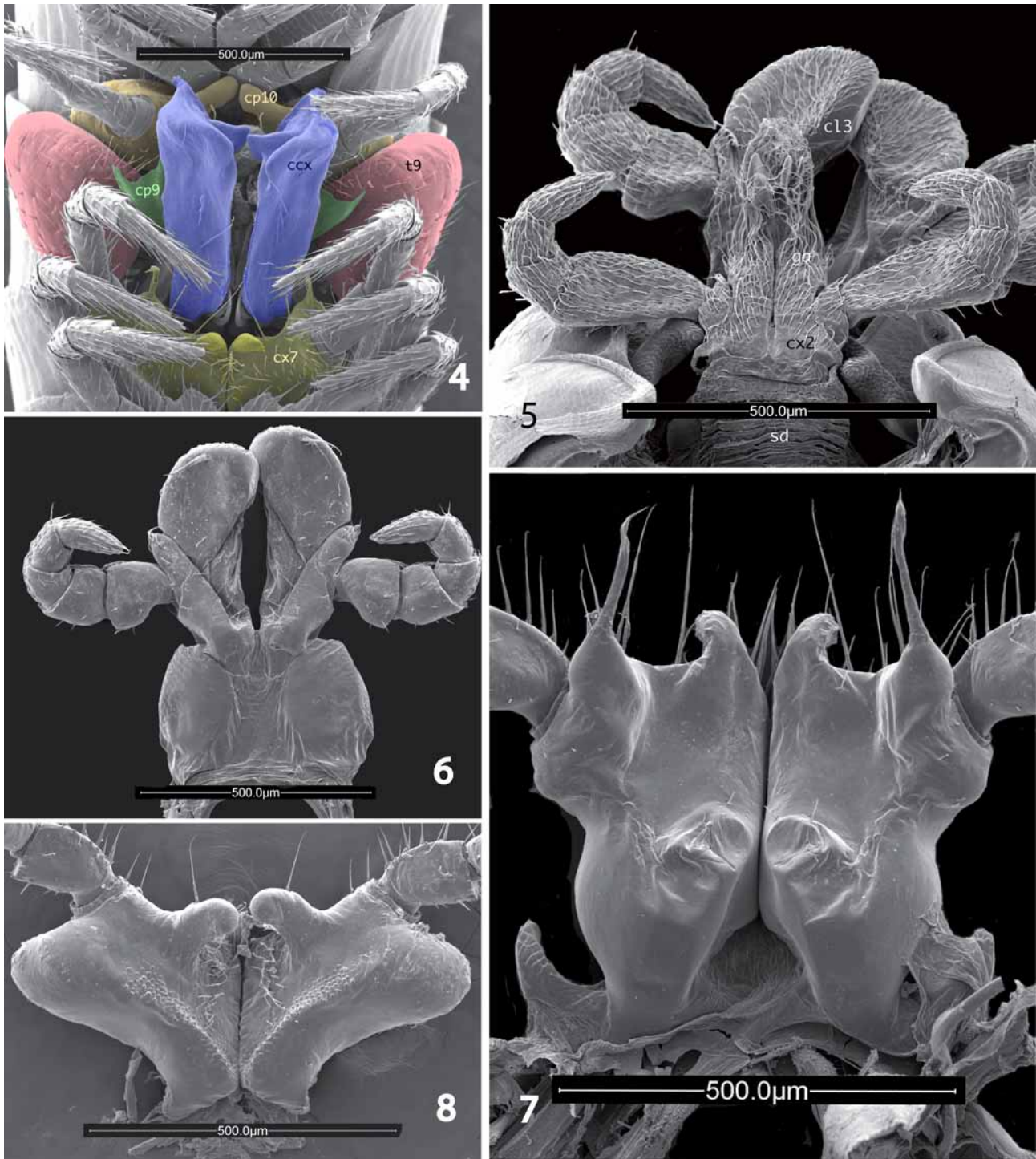
FIGURE 4–8. *Caseya richarti* n. sp. male. 4. Gonopod complex, ventral view, posterior at top. 5. Second and third leg-pair, anterior view. 6. Third legpair, posterior view. 7. Seventh legpair, posterior view. 8. Tenth legpair, posterior view. **ccx,** angiocoxite of right gonopod (blue); **cp9,** coxite of left ninth leg (green); **cp10,** process from coxae of right leg 10 (orange); **cx7,** coxa of right leg 7 (yellow); **cx2,** coxa of right leg 2; **cl3,** coxal lobe of left leg 3; **ga,** gonapophysis of right leg 2; **t9,** teolopodite of leg 9 (red).

Description: Male: 10 mm long, 1.0 mm wide. Oval eyepatch with 22 ocelli. Color pattern as described above in Diagnosis. Second legs (Fig. 5) with gonapophyses shorter than telopods, apically hooked, densely setose, telopods with six podomeres, reduced in size. Third legs (Figs. 5, 6) with large, blocky sternum, coxae with anteriorly projecting, flattened lobe more massive than telopods, body of coxa extends beyond coxa/tro-

chanter articulation to setose tip; coxal lobe densely setose anteriorly, glabrous posteriorly but with subapical group of long, decurved setae; lobe appears only lightly sclerotized mesally. Legs 4 and 5 normal. Coxae 6 somewhat enlarged. Seventh legs (Figs. 4, 7) with enlarged, elaborately lobed coxae; posterior basal lobe lightly sclerotized, lateral apical process with pore near tip, mesoapical lobe blunt, curved.
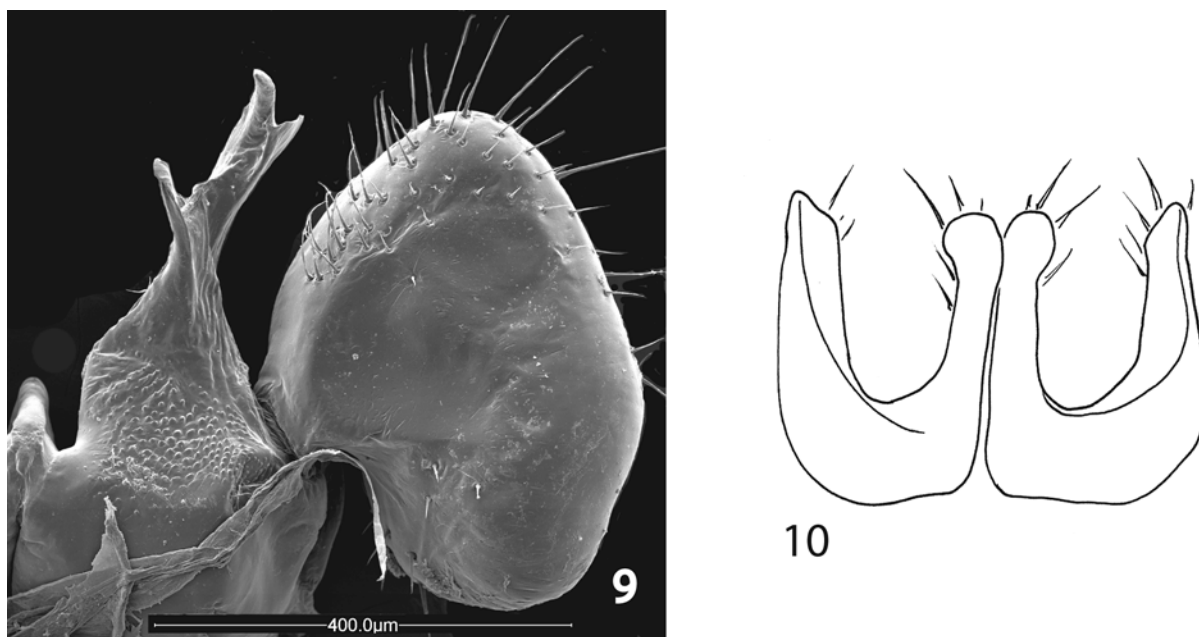

FIGURE 9–10. *Caseya richarti* n. sp. 9. Right leg 9 of male, anterior view. 10. Cyphopod receptacles of female, anterior view.

Gonopods in lateral view (Fig. 3) with single seta posterior on sternal plate, lateral lamella apically bifurcate, with basal setal group. Angiocoxite with strongly projecting lateral shelf, anterior row of four long setae; terminus complex but with prominent subdeltoid apical process densely set with short cuticular fimbriae. In mesal view (Fig. 2), mesal lamella bifurcate but distal bifurcation much broader than proximal, colpocoxite with membranous basal region, colpocoxite lamella typical of genus, sheathing double-branched flagellocoxite. Angiocoxite bearing two mesal subapical branches, anteriormost knoblike, posteriormost curved, itself two-branched.

Ninth legs (Fig. 9) typical of *Caseya* species; coxal process very similar to that of *C. borealis*; telopodite swollen, oblate-reniform. Tenth leg coxae (Fig. 8) in posterior view with posteriorly directed processes and median setose region, broadly expanded laterally, openings of coxal glands on anterior side.

Female: 10 mm long, 1.1 mm wide. Oval eyepatch with 22 ocelli, color entirely dark purplish brown with slightly lighter mottling. Legpair 3 with elongate coxae; sternum produced laterally, with triangular median process. Cyphopod receptacle U-shaped, with two processes, the lateral broadly flattened laterally, the mesal finger-like; both setose on posterior surface (Fig. 10).

Etymology: It is our pleasure to dedicate this species to Casey Richart, which required the addition of only two letters to his full name. Richart has accompanied WPL on many collecting trips, and secured all of the known specimens of this new species. We wish him well as he embarks on a promising career in systematic biology.

Notes: The intensive collecting mentioned above has been confined mostly to the Coast Ranges, with occasional excursions to the western slopes of the Cascades, where *C. richarti* was found. *Caseya borealis* was also collected near the two *C. richarti* localities. Further collecting may reveal that both of these species have much wider distributions in the Cascade Mountains, especially north of the Snoqualmie River.

TABLE 1. New collection records for *Caseya borealis* from Washington State.

Collection locality	Latitude / Longitude	Elev. (ft. ASL)	Coll. Date	Collectors
Clallam Co.: Deer Park Road, 6.1 mile S of US 101	N48° 1.19' W123° 20.62'	1123'	14-VI-03	WPL
Clallam Co.: Olympic National Park, 3.1 mile S of Port Angeles, road to Hurricane Ridge	N48° 04.406' W123° 25.951'	1100'	10-XI-03	WPL
Clallam Co.: Olympic National Park, Heart of the Hills Campground	N48° 02.137' W123° 25.581'	581'	10-XI-03	WPL
Cowlitz Co.: 1.2 mile E of I-5, Kalama River	N46° 2.84' W122° 50.22'	70'	22-III-03	WPL
Cowlitz Co.: Germany Creek, 5.3 mile N SR4	N46° 15.065' W123° 08.006'	400'	11-XI-04	WPL
Cowlitz Co.: Germany Creek, 5.5 mile N of SR 4	N46° 15.065' W123° 08.006'	350'	8-XII-03	WPL
Cowlitz Co.: SR 503, 11.4 mile E of Interstate 5	N45° 58.013' W122° 32.989'	410'	7-III-04	WPL
Cowlitz Co.: SR 504, 2.1 mile E of Toutle	N46° 20.090' W122° 42.399'	500'	1-III-04	WPL, C. Richart
Grays Harbor Co.: 3.0 mile N SR12 on Middle Satsop Rd.	N47° 01.992' W123° 31.553'	70'	26-III-04	WPL
Grays Harbor Co.: Canyon River, 6.0 mile W, 1.25 mile N of Matlock	N47° 17.12' W123° 31.65'	500'	17-I-03	WPL
Grays Harbor Co.: Canyon River, 6.0 mile W, 1.5 mile N of Matlock	N47° 26.018' W123° 52.041'	500'	26-V-03	WPL
Grays Harbor Co.: Inner Creek at Quinault Lake Loop Road,	N47° 30.015' W123° 46.093'	400'	13-II-05	WPL, C. Richart
Grays Harbor Co.: Porter Creek Rd. and B-line, 3.1 mile E of Porter, Capitol State Forest	N46° 58.217' W123° 16.357'	100'	24-I-05	WPL
Jefferson Co.: Alder Creek, 1.5 mile N of Hoh River,	N47° 49.043' W124° 3.030'	450'	1-III-03	WPL
Dosewallups River, 7.0 mile W of US 101, Jefferson Co.	N47° 45.961' W123° 01.213'	260'	10-XI-03	WPL
Jefferson Co : Falls View Campground, Olympic National Forest, 7.8 mile N of Brinnon	N47° 47.39' W122° 55.66'	450'	22-II-03	WPL
Jefferson Co.: Nolan Creek at US 101	N47° 45.003' W124° 19.019'	100'	1-III-02	WPL
King Co.: Exit 38 on I-90, near Olallie State Park	N47° 26.651' W121° 40.081'	1250'	23-II-04	WPL, C. Richart
Lewis Co.: 604 Roswell Road, Centralia	N46° 43.339' W122° 56.664'	280'	5-I-03	C. Richart
Mason Co.: Beerbower Rd. at Schafer State Park Rd., beside Schafer SP	N47° 06.004' W123° 23.024'	50'	31-XII-04	WPL
Mason Co.: Kennedy Creek	N47° 05.023' W123° 05.045'	40'	30-III-03	WPL
Mason Co.: Kennedy Creek, 0.6 mile upstream of US 101	N47° 05.428' W123° 05.723'	40'	8-II-03	WPL

TABLE 1. (continued)

Collection locality	Latitude / Longitude	Elev. (ft. ASL)	Coll. Date	Collectors
Mason Co.: Potlatch State Park	N47° 21.043' W123° 09.030'	60'	17-II-03	WPL
Mason Co.: Mount Rose Trailhead, Olympic National Park	N47° 29.74' W123° 16.09'	805'	25-XI-03	WPL
Mason Co.: Skokomish Valley Road 4.5 mile W of US 101	N47° 19.06' W123° 10.35'		15-II-03	WPL
Mason Co.: Skokomish Valley Road at US 101	N47° 19.06' W123° 10.35'	100'	15-II-03	WPL
Mason Co.: SR 119, 6.0 mile W of US 101 at Hoodsport	N47° 26.047' W123° 12.035'	750'	17-II-03	WPL
Pacific Co.: 2.0 mile W of Astoria Bridge on US 101	N46° 15.415' W123° 55.501'	10'	2-I-04	WPL, C. Richart
Pacific Co.: Trap Creek, 1.1 mile S of SR 12	N46° 32.41' W123° 37.52'	400'	3-V-03	WPL
Pacific Co.: Trap Creek, 1.1 mile S of SR 12	N46° 32.41' W123° 37.52'	400'	31-I-03	WPL
Skamania Co.: Cape Horn	N45° 34.029' W122° 11.086'	400'	19-XI-04	WPL
Thurston Co.: 4000 Road, Capitol State Forest	N47° 01.324' W123° 07.076'	1294'	27-IX-03	WPL
Thurston Co.: The Evergreen State College campus, Olympia			II-03	C. Richart
Thurston Co.: The Evergreen State College campus, Olympia	N47° 4.09' W122° 58.72'	140'	22-III-03	WPL
Thurston Co.: The Evergreen State College, Olympia	N47° 4.51' W122° 57.65'	150'	14-II-03	WPL
Thurston Co.: The Evergreen State College, Olympia	N47 04.089 W122 58.043	150'	16-III-03	WPL
Thurston Co.: The Evergreen State College, Olympia	N47° 4.51' W122° 57.65'	150'	26-I-03	WPL
Thurston Co.: Hospital Creek, 5.0 mile S, 3.0 mile E of Vail	N46° 46.39' W122° 35.17'	700'	12-X-03	WPL
Thurston Co.: Hospital Creek, above confluence with Skookumchuck River	N46° 46.396' W122° 35 133'	700'	15-XII-03	WPL, K. McAllister
Thurston Co.: McAllister Creek, S of Steilacoom Road	N47° 03.042' W122° 42.079'	100'	11-XII-04	WPL
Thurston Co.: McAllister Springs	N47° 02.837' W122° 43.722'	60-123'	7-II-04	WPL, C. Richart
Thurston Co : McAllister Springs	N47° 02.946' W122° 43.678'	60-123'	22-II-04	WPL
Thurston Co.: Mission Creek, Priest Point Park, Olympia	N47° 4.02' W122° 53.50'	70'	17-V-03	WPL
Thurston Co.: Priest Point Park, Olympia	N47° 04.057' W122° 53.085'	70'	2-II-03	WPL

to be continued.

TABLE 1. (continued)

Collection locality	Latitude / Longitude	Elev. (ft. ASL)	Coll. Date	Collectors
Thurston Co.: Priest Point Park, Olympia	N47° 04.057' W122° 53.085'	70'	16-II-03	WPL
Thurston Co.: Tolmie State Park	N47° 7.07' W122° 46.69'	140'	9-II-03	WPL
Thurston Co.: Watershed Park, Olympia	N47° 7.07' W122° 46.69'	140'	11-II-03	WPL
Thurston Co.: Woodard Bay Natural Resource Conservation Area	N47° 7.82' W122° 51.21'	50'	2-III-03	WPL
Wahkiakum Co.: 11.7 mile up Elochoman Valley Rd. from SR 4	N46° 19.007' W123° 15.702'	450'	28-III-04	C. Richart
Wahkiakum Co.: Lower Hendrickson Canyon	N46° 22.158' W123° 39.950'	90'	23-I-04	WPL, M. Leonard, C. Richart, B. Pyle, K. Novoselic

Caseya borealis Gardner & Shelley 1989

Caseya borealis Gardner & Shelley 1989:231.

The original localities given by Gardner & Shelley (1989) are included on the map (open symbols, Fig. 1). The type locality is 4 miles north of Shelton, Mason Co., Washington. Table 1 provides the new records, all of which are based on the inclusion of at least one mature male specimen in the sample. It is a point of interest that the Columbia River appears to form a definite southern boundary to the range of this species. The most northerly Oregon record for any *Caseya* is for *C. megasoma* in southern Tillamook Co., approximately 70 miles south of the river. Northeastern Oregon has been reasonably well-collected, and caseyids belonging to the genera *Vasingtona* Chamberlin 1941, *Opiona* Chamberlin 1951 and *Ochrogramma* Gardner and Shelley 1989 have all been found there. Some of the same species of these three genera are also both north and south of the Columbia. It appears therefore that the gap in the distribution of *Caseya* species in northern Oregon, and the Columbia River as a barrier to the southerly dispersal of *C. borealis* are real phenomena. It would not be a surprise to find *C. borealis* on Vancouver Island; *Opiona columbiana* Chamberlin 1951 has a distribution in Washington similar to that of *C. borealis,* and the former species is found on Vancouver Island, the British Columbia mainland, the Queen Charlotte Islands and coastal Alaska (Shelley *et al.* 2007)

Because these collections record only sexually mature individuals, they provide some hints of the life history of the species. Mature males first appear in the collections in September and October (single records in each month) become more abundant in November, December and January (7, 4 and 7 records respectively) and reach peak abundance in February (17 records) and March (10 records). Evidently some few males survive as late as June, when a single collection was made. These observations reinforce the point made earlier (*i.e.*, Shear & Leonard 2003) that chordeumatidan millipeds in the Pacific Northwest of North America are active and mature in the cool, wet winter, passing the warm, dry summer as juveniles, possibly aestivating deep in the soil. Specimens were collected at altitudes ranging from 40 ft. (12.2 m) to 1294 ft. (394.4 m) above sea level (asl). Nearly all collections were associated with mixed forests including deciduous trees, and many were made close to streams, rivers, or other permanent sources of water.

All specimens listed in Table 1 will be deposited in the Field Museum of Natural History, Chicago (FMNH).

Caseya megasoma **Gardner & Shelley 1989**

Caseya megasoma Garnder & Shelley 1989:252.

The type locality for *C. megasoma* is along Oregon Rt. 34 at the Benton/Lincoln Co. line. Gardner and Shelley (1989) list two additional Benton Co. localities and a more northerly occurrence in Tillamook Co. However, their map (their Fig. 223) shows only two Benton Co. localities, one of which is on the Lincoln Co. boundary, and also a Lincoln Co. locality near the estuary of the Alsea River. *Caseya westcotti* Gardner & Shelley 1989 is also known from a Lincoln Co. locality well separated from the main body of that species' distribution; future collecting may show the two species to be broadly sympatric.

   New Record: Oregon: *Benton Co.:* Clemons Park, 0.3 mi on Seely Creek Road from Oregon Rt. 34, North Fork of Alsea River, N44°24.55' W123°34.07', 400' asl, 4 December 2005, W. P. Leonard, C. Richart (FMNH).

Caseya dorada **(Chamberlin 1941)**

Placerna dorada Chamberlin 1941:10.
Caseya dorada, Gardner & Shelley, 1989:234.

The type locality for this species is 9 miles north of Placerville, El Dorado Co., California; Gardner and Shelley (1989) presented numerous records from Nevada, Sacramento, El Dorado, Placer, Amador and Calaveras Cos. Gardner and Shelley (1989) stated that *C. dorada* was both common and abundant throughout its range; dense populations were found near El Dorado living in loose shale covered with deciduous leaf litter. The species may occur syntopically with *C. heteropa montana* Gardner and Shelley 1989, but is considerably smaller, 10–11 mm long, while *heteropa montana* is about 20 mm long. The overlap in the distribution of the two as shown by Gardner & Shelley occurs only in the far southwestern corner of El Dorado Co. The May record from Riverton given below is the latest in the year that this species has been collected. The records given by Gardner and Shelley (1989) are all from the period November to March, except for a single April collection.

   New Records: California: *Butte Co.,* near Stringtown Hill, northeast of Oroville, 19 December 1955, 8 February 1956, R. O Schuster (FMNH). *El Dorado Co.,* 2.0 mi. west of Riverton, 18 May 1961, R. O. Schuster; Riverton, 30 April 1954, R. O. Schuster (FMNH).

Caseya heteropa montana **Gardner & Shelley 1989**

Caseya heteropoa montana Gardner & Shelley 1989:264.

The type locality is 6 miles south of El Dorado, El Dorado Co., California. According to the records published by Gardner & Shelley (1989), this subspecies primarily occupies a compact area of the western slopes of the Sierra Nevada, from southernmost El Dorado Co. to Yosemite National Park in Mariposa Co. *Caseya h. montana* is also recorded from Butte and Colusa Cos., quite far removed (ca. 60 and 110 miles respectively) from the northern end of the main distribution in El Dorado Co. It may be that further collecting will link these populations with the more coherent Sierra Nevada distribution. At the northern end of the Sierra Nevada part of its range it is sympatric and sometimes syntopic with *C. dorada* (see above) and at the southern end with *C. paradoxa* Gardner and Shelley 1989 and *C. prionota* Gardner and Shelley 1989. The distribution of *C. taliae* Gardner and Shelley 1989 and *C. sequoia* Gardner and Shelley 1989 are to the southeast (Gardner & Shelley, 1989, Fig. 224). Our new record from Yolo Co. is indicative of broader sympatry with *C. dorada.* Again, pre-

vious samples were taken from November to March, and the Yolo Co. record below is the latest in the year this species has been collected.

New Record: California: *Yolo Co.,* West Sacramento, 11 April 1961, M. E. Irwin (FMNH; the locality label says "Inyo Co." but this is in error).

Caseya heteropa oraria Gardner and Shelley 1989

Caseya heetropa oraria Gardner & Shelley 1989:263.

Type locality: Caspar Little Lake Road, 5 mi NE of Mendocino, Mendocino Co., California. The subspecies probably occurs throughout Mendocino and Humboldt Cos.; in Humboldt Co. it is sympatric with *C. guttata* Gardner and Shelley 1989, a smaller animal with a spotted color pattern. The September collection listed below is unusually early.

New Records: California: *Humboldt Co.:* Humboldt Redwoods State Park, Founder's Grove, in redwood duff, 28 October 1990, D. Ubick, W. Rauscher (CAS). *Mendocino Co.*: Jackson State Forest, 0.5 mi west of Camp Dunlap, 400' asl, 16 September 1990, D. Ubick (CAS).

Caseya heteropa disjuncta Gardner & Shelley 1989

Caseya heteropa disjuncta Gardner & Shelley 1989:262.

Type locality: 3 miles west of Forestville, Sonoma Co., California. This subspecies is broadly sympatric in the region north of San Francisco Bay with *C. h. heteropa,* but Gardner & Shelley found no intergrading specimens. The record below is the first from Marin Co., and broadens the sympatry of the two subspecies. Specimens have been collected from November to March.

New Records: California: *Marin Co.:* 6.0 mi. E of Point Reyes Station, 1 March 1960, A. Grigarick et al (FMNH). *Napa Co.:* 5.0 mi. W of Spanish Flat, 1 March 1961, R. O. Schuster (FMNH).

Comment on subspecies in *Caseya heteropa*

Gardner & Shelley (1989) designated four subspecies of *Caseya heteropa,* but stated : "*Caseya heteropa* is highly variable, and though specific intergrade material is lacking, four general forms are so similar that we consider them races of a single widespread species (Gardner & Shelley 1989, p. 259)" We have not re-investigated the situation, but based on an examination of our specimens and the drawings presented in the review, suspect that the "subspecies" of *C. heteropa* are more likely full species. As the authors indicate, they represent morphologically distinct (though variable) populations. In the case of *C. h. heteropa* and *C. h. disjuncta,* the subspecies are sympatric (despite the subspecific epithet of the latter form) in Sonoma and Marin Cos., California.

Subspecies should not be recognized on the relative degree of morphological difference alone, but are biologically defined as recognizable populations of a species not reproductively isolated from one another. If sympatric it would be expected that they would either merge and lose their distinctiveness, or demonstrate a hybrid zone along the boundary of adjacent ranges, where intermediates would be found. Both the other subspecies, *C. h. oraria* and *C. h. montana,* have ranges that are separated from each other and from the previous two "subspecies" by considerable geographic gaps. We are of the opinion that in the absence of intermediates even where two of the "subspecies" are sympatric, the possible geographic isolation of the other two, and the

phenotypic distinctiveness of all four populations, the evidence suggests that four reproductively isolated populations, hence full species, are involved. We express this opinion to stimulate, perhaps by someone "on the ground," a restudy of the situation. If intermediate forms can be found, the four should remain as subspecies, but if they remain distinct either in sympatry or allopatry, they should be considered species. Without such information, however, we defer to the first revisors and retain subspecies status for the four populations.

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