DEPARTMENT OF ECOLOGY
State of Washington

Taxonomic Guides to Benthic Invertebrates of Puget Sound

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New Tools for Identifying Puget Sound Benthos

Taxonomic guides are being developed for Puget Sound benthos.

Guides for 152 taxa have been developed to date.

These guides will facilitate standardized taxonomy for future Puget Sound and Salish Sea benthos monitoring.

Links to Taxonomic Guides and More

You can learn more about our studies of the Puget Sound benthos at the following websites:

Taxonomic guides

PSEMP Sediment Monitoring data and reports

"Eyes Under Puget Sound" blog

Invertebrate and monitoring photos

Encyclopedia of Puget Sound - Benthic Invertebrates

Over 1200 unique taxa of benthic, or bottom-dwelling, invertebrates (also known as *benthos*) live in the soft sediments of Puget Sound. Benthos are a critical part of the Puget Sound food web.

The Washington State Department of Ecology (Ecology) has surveyed the condition of benthic invertebrate assemblages and their associated sediments throughout Puget Sound (see map below) since 1989 as part of the Puget Sound Ecosystem Monitoring Program (PSEMP) (Dutch et al., 2009).

Figure 1. *Gattyana cirrhosa*, a Puget Sound polychaete

Data from these surveys are used to calculate various sediment quality indicators (Dutch et al., 2014), including a Benthic Infaunal Index, which inform regional environmental managers and policy makers about sediment and benthos condition.

Figure 2. Puget Sound sediment monitoring study area (in white)

The Importance of Consistent Taxonomic Nomenclature

The PSEMP is a status and trends program which examines change in condition of the benthos over time. It is therefore essential that the *taxonomic nomenclature,* the scientific system used to name different taxa, is applied consistently to organisms collected from different locations over many years.

While the taxonomic work for our program has been conducted primarily by the same regional specialists since 1989, this will not always be the case. To ensure that the nomenclature remains consistent in future years, the literature and morphological features currently used to identify each animal must be documented by Ecology staff so that new taxonomists will generate consistent, comparable data.

Two types of products are being prepared to aid with consistency of future taxonomic work:
(1) voucher sheets, one for each recognized species.
(2) workshop notes, from trainings with regional taxonomists, including photographs of key taxonomic features, compiled for groups of related species.

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Taxonomic Voucher Sheets

Ecology staff and regional taxonomists have begun to develop voucher sheets for over 1200 recognized taxa of Puget Sound benthic invertebrates. Each sheet includes: (1) taxonomic nomenclature, (2) original and later descriptions, (3) a list of Ecology voucher specimens examined, (4) habitat information, (5) diagnostic characteristics, (6) characteristics of related species, (7) comments, and (8) citations of published taxonomic literature used to identify each taxon. Each sheet is verified by a regional expert prior to finalization. Voucher sheets developed to date are listed below. They are posted to Ecology's website and accessible through the "Taxonomic guides" link provided on the previous page.

Phylum Annelida

Ampharete acutifrons

Ampharete cf. *crassiseta*

Ampharete finmarchica

Ampharete goesi brazhnikovi

Ampharete labrops

Ampharete sp. N1

Aphelochaeta glandaria Complex

Aphelochaeta monilaris

Aphelochaeta sp. N5

Aphelochaeta sp. N6

Glycera americana

Glycera macrobranchia

Glycera nana

Glycera oxycephala

Glycera robusta

Hemipodia simplex

Monticellina serratiseta

(sheets completed by R.E. Ruff, Ruff Systematics)

Specimen Diagnostic Characteristics

Diagnostic Characteristics	Photo, Illustrations	Photo, Illustration Credit
Distinctive methyl green ventral transverse stripes on middle thoracic segments. Stain also retained on the tip of the prostomium.		Marine Sediment Monitoring Team, 1/2014
Anterior region inflated with about 10-20 crowded setigers		
Filiform branchiae beginning on the peristomium		

Figure 3. Example of diagnostic characteristics recorded on a voucher sheet for the polychaete *Aphelochaeta monilaris.*

Species Diagnostic Characteristics

Diagnostic Characteristics	Photo, Illustrations	Photo, Illustration Credit
Gnathopods 1 and 2 (♂,♀), palm transverse.	 *Cheirimedeia zotea* gnathopod 1 (♂)	J. Cordell
Gnathopod 2 (♂), different in form from gnathopod 1; segment 6 distally tapered, dactyl overlapping the palm by more than half its full length, segment 5 slightly broader than segment 6.	 *Cheirimedeia zotea* gnathopod 2 (♂)	J. Cordell

Figure 4. Example of diagnostic characteristics recorded on a voucher sheet for the amphipod *Cheirimedeia zotea.*

Phylum Arthropoda

Americhelidium millsi

Americhelidium pectinatum

Americhelidium rectipalmum

Americhelidium shoemakeri

Cheirimedeia zotea

Crangon alaskensis

Desdimelita californica

Desdimelita desdichada

Megamoera dentata

Megamoera subtener

Mesocrangon munitella

Protomedeia articulata

Protomedeia grandimana

(sheets finalized by Jeff Cordell, University of Washington)

Taxonomic Workshop Notes

Polychaete taxonomy workshops were conducted at Ecology's benthic laboratory from July 2013 through August 2014. These sessions were led by Kathy Welch[1], Ecology's taxonomic specialist. A total of 20 polychaete families and 127 species were reviewed during these workshops. They are listed in the table on the following page. Key morphological features for Puget Sound species were described and photographed, peer-reviewed taxonomic literature was consulted and referenced, and notes were generated. Notes for each workshop are posted to Ecology's website, accessible through the "Taxonomic guides" link provided on the previous page.

[1] recently retired from the Department of Ecology

Phylum Annelida: Polychaete families and species examined

Ampharetidae
- *Amage anops*
- *Ampharete labrops*
- *Anobothrus gracilis*

Apistobranchidae
- *Apistobranchus ornatus*
- *Apistobranchus tullbergi*

Capitellidae
- *Barantolla* nr. *americana*
- *Capitella capitata* Complex
- *Heteromastus filobranchus*
- *Mediomastus ambiseta*
- *Mediomastus californiensis*
- *Notomastus hemipodus*
- *Notomastus latericius*

Cirratulidae
- *Aphelochaeta glandaria* Complex
- *Aphelochaeta monilaris*
- *Aphelochaeta* sp. N5
- *Caulleriella pacifica*
- *Chaetozone acuta*
- *Chaetozone bansei*
- *Chaetozone commonalis*
- *Chaetozone setosa* Complex
- *Cirratulus robustus*
- *Cirratulus spectabilis*
- *Monticellina serratiseta*
- *Monticellina* sp. N1
- *Monticellina tesselata*
- *Tharyx parvus*
- *Tharyx* sp. N1

Cossuridae
- *Cossura bansei*
- *Cossura pygodactylata*

Hesionidae
- *Heteropodarke heteromorpha*
- *Microphthalmus* spp.
- *Micropodarke dubia*
- *Oxydromus pugettensis*
- *Podarkeopsis glabrus*

Lumbrineridae
- *Eranno bicirrata*
- *Lumbrineris californiensis*
- *Lumbrineris cruzensis*
- *Ninoe gemmea*
- *Scoletoma luti*

Magelonidae
- *Magelona longicornis*
- *Magelona berkeleyi*
- *Magelona sacculata*

Maldanidae
- *Axiothella rubrocincta*
- *Chirimia similis*
- *Chirimia* nr. *biceps*
- *Clymenura columbiana*
- *"Clymenura" gracilis*
- *Euclymene* cf. *zonalis*
- *Isocirrus longiceps*
- *Maldane sarsi*
- *Nicomache personata*
- *Nicomache lumbricalis*
- *Notoproctus pacificus*
- *Petaloproctus borealis*
- *Petaloproctus tenuis*
- *Praxillella gracilis*
- *Praxillella pacifica*
- *Rhodine bitorquata*

Nephtyidae
- *Bipalponephtys cornuta*
- *Nephtys caeca*
- *Nephtys caecoides*
- *Nephtys ferruginea*
- *Nephtys glabra*
- *Nephtys longosetosa*
- *Nephtys punctata*

Nereididae
- *Alitta virens*
- *Cheilonereis cyclurus*
- *Hediste limnicola*
- *Nereis procera*
- *Platynereis bicanaliculata*

Oenonidae
- *Drilonereis longa*
- *Notocirrus californiensis*

Orbiniidae
- *Leitoscoloplos pugettensis*
- *Naineris uncinata*
- *Naineris quadricuspida*
- *Phylo felix*
- *Scoloplos armiger*

Phyllodocidae
- *Eteone californica*
- *Eteone columbiensis*
- *Eteone leptotes*
- *Eteone pacifica*
- *Eulalia californiensis*
- *Eulalia quadrioculata*
- *Eumida longicornuta*
- *Hesionura coineaui difficilis*
- *Nereiphylla castanea*
- *Paranaitis polynoides*
- *Phyllodoce cuspidata*
- *Phyllodoce groenlandica*
- *Phyllodoce hartmanae*
- *Phyllodoce longipes*
- *Sige montereyensis*

Polynoidae
- *Gattyana cirrhosa*
- *Harmothoe imbricata*
- *Lepidasthenia berkeleyae*
- *Lepidasthenia longicirrata*
- *Malmgreniella bansei*
- *Tenonia priops*

Sabellariidae
- *Idanthyrsus saxicavus*
- *Neosabellaria cementarium*

Scalibregmatidae
- *Asclerocheilus beringianus*
- *Scalibregma californicum*
- *Travisia brevis*
- *Travisia pupa*

Sphaerodoridae
- *Sphaerodoropsis minuta*
- *Sphaerodoropsis sphaerulifer*

Spionidae
- *Boccardiella hamata*
- *Boccardia pugettensis*
- *Dipolydora brachycephala*
- *Dipolydora socialis*
- *Laonice cirrata*
- *Paraprionospio alata*
- *Polydora limicola*
- *Prionospio (Minuspio) lighti*
- *Prionospio (Prionospio) steenstrupi*
- *Pseudopolydora kempi*
- *Pygospio elegans*
- *Rhynchospio arenincola*
- *Scolelepis squamata*
- *Spio cirrifera*
- *Spiophanes berkeleyorum*
- *Spiophanes norrisi*

Terebellidae
- *Polycirrus californicus*
- *Artacama coniferi*
- *Lanassa venusta*
- *Amphitrite robusta*
- *Pista wui*

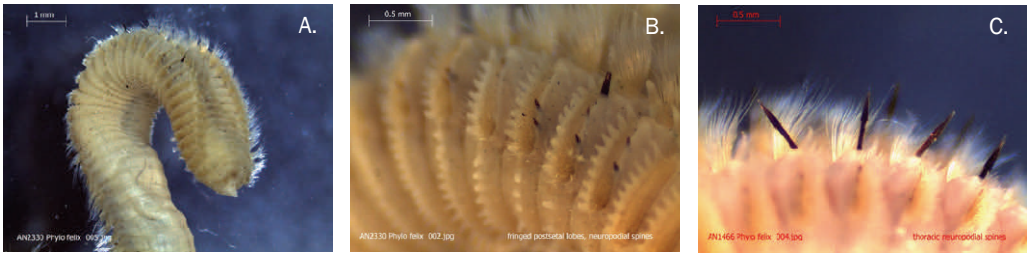

Figure 5. Examples of diagnostic characteristics recorded in workshop notes for the polychaete *Phylo felix*.

A. Anterior end, dorsolateral view; note pointed prostomium.

B. Fringed postsetal neuropodial lobes.

C. Thoracic neuropodial spines.

Summary and Future Work

This report describes two types of taxonomic products generated for PSEMP benthos monitoring. Descriptions have been generated for 152 soft sediment taxa to date. We emphasize that these tools are needed to maintain the consistency and integrity of long-term benthos data generated for this program and for other Puget Sound and greater Salish Sea benthos monitoring programs.

To accomplish this critical task, Ecology's Sediment Monitoring Team will (1) continue to create these documents for the remaining 1000+ taxa identified by the PSEMP and (2) encourage contributions and partnerships with other Salish Sea taxonomists and benthic ecologists.

References

Dutch, M., V. Partridge, S. Weakland, K. Welch, and E.R. Long. 2009. Quality Assurance Project Plan: The Puget Sound Assessment and Monitoring Program[2]: Sediment Monitoring Component. Washington State Department of Ecology, Olympia, WA. Publication 09-03-121. https://fortress.wa.gov/ecy/publications/summarypages/0903121.html.

Dutch, M., E.R. Long, S. Weakland, V. Partridge, and K. Welch. 2014. Sediment Quality Indicators for Puget Sound: Indicator Definitions, Derivations, and Graphic Displays. Unpublished report. www.ecy.wa.gov/programs/eap/sediment.

[2] Now called the Puget Sound Ecosystem Monitoring Program.

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This report is available on the Department of Ecology's website at https://fortress.wa.gov/ecy/publications/SummaryPages/1403201.html.

Data for this project are available at Ecology's Environmental Information Management (EIM) website at www.ecy.wa.gov/eim/index.htm. Search Study ID, PSAMP_SP.

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