Fraser River
Action Plan


# FRASER RIVER BASIN BENTHIC INVERTEBRATE CATALOGUE

## CONTINENTAL AND OCEANOGRAPHIC DATA INFORMATION SYSTEM

DOE FRAP 1994-17

Environment Canada Environnement Canada

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## Abstract

This manuscript describes a catalogue of benthic invertebrate studies performed within the Fraser River drainage system. It is one of several catalogues that make up the Continental Oceanographic Data Information System (CODIS). Datasets were critically appraised and the methodology used in obtaining the data was assigned a rating based on suitability and completeness of the documentation. Summary information for each study was included. Preliminary analysis of the data showed that 46% of studies were performed in the estuary. Seventy-six percent of the datasets rated did not contain enough information to evaluate quality assurance/quality control. However, it appears that the overall quality of the data evaluated is high or very high.

## Introduction

This report documents the compilation and treatment of information obtained from benthic invertebrate studies performed in the Fraser River drainage system. This information was used to produce a catalogue of benthic invertebrate studies as part of the Continental Oceanographic Data Information System (CODIS). CODIS is a personal computer-based data information system with extensive searching and reporting capabilities. The Fraser River Benthic Invertebrate catalogue is only one of a series of catalogues contained in CODIS which cover a variety of disciplines and geographical regions. It is the second catalogue created for the Fraser River basin, the first dealing with organic contaminants (Fyles *et al.*, 1993).

In creating the Fraser River Benthic Invertebrate catalogue, the authors attempted to assemble and summarize all available documentation describing benthic invertebrate studies in the Fraser River watershed. Information was derived from all types of journal articles and published and unpublished reports from academic, industrial and government sources. Each study was grouped or divided into one or more datasets (collections of data united by common methodology and sampling history) and rated for data quality using peer reviewed protocols and decision trees. No actual data were included in the summary information and therefore the database includes only data about data (metadata). The CODIS software will allow the user to extract information using a number of parameters such as location, data quality and collection method. These and other parameters will be searchable individually or in combination.

## Scope

With few exceptions (e.g. protozoa), all reports pertaining to any aspect of the study of benthic invertebrates were included in this catalogue, as long as they were performed within the boundaries of the study area. This included studies which were qualitative and/or quantitative, using any conceivable sampling method. For the purposes of this catalogue, invertebrates were considered benthic if they were found within the substrate, on the substrate or near the surface of the substrate (e.g. an epibenthic sled may sample several inches of the water column adjacent to the substrate). Studies describing

invertebrates as gut contents of fish and birds were excluded. Studies which identified invertebrates as gut contents of other invertebrates were included as a measurement of the predators' diets. Laboratory studies were generally not included unless the invertebrates were collected within the study area and the results could be specifically applied or related to the area(s) where the organisms were sampled.

**Study Area**

The study area was generally defined as the complete Fraser River drainage system or basin (Fig. 1). This included all lakes, ponds, rivers, streams and tributaries that eventually drain into the Fraser, as well as the Fraser River itself. The Fraser estuary was part of the study area and included Sturgeon Bank north to Point Grey, Roberts Bank, Boundary Bay and Mud Bay. In addition to the estuary, the study area was further subdivided into several smaller regions comprised of the Lower Fraser, Middle Fraser, Upper Fraser, Thompson and Nechako (Fig. 1). The Lower Fraser region included all areas east of the estuary from Steveston on the main arm and east of Sea Island in the north arm, to Hope. The Middle Fraser included the area north of Hope up to and including Prince George. The Upper Fraser covered the area upstream of Prince George while the Nechako and Thompson included the complete drainages of those systems to where they join the Fraser River at Prince George and Lytton respectively.

**Data Acquisition**

The information contained in this catalogue was obtained over a period of eight months. Our initial search was based on 'A Bibliography of Scientific Information on the Fraser River Basin Environmental Quality' (Missler 1992). This comprehensive document lists, alphabetically by author, manuscripts and reports of studies performed in the Fraser River basin up to June 1992. Several CD ROM databases including Waves, Aquatic Sciences and Fisheries Abstracts (ASFA) and Aquaref were also included as part of our initial search. Based on title and/or abstract, appropriate documents were identified. These documents

were obtained from many sources including the libraries at Simon Fraser University (SFU), University of British Columbia (UBC), University of Victoria

(UVic), Environment Canada, Department of Fisheries and Oceans (DFO) and B.C. Hydro and through extensive use of the interlibrary loan system (ILL) at SFU. Other documents were gathered from personal contacts at Environment Canada and DFO. For those reports not available from the above sources, attempts were made to contact the author(s) directly. As the collection process continued, more individuals were identified as potential data sources and contacted (Appendix 1.1). Many previously unidentified or unpublished reports were obtained in this manner. A careful cross-reference check of the reference sections of incoming documents was ongoing throughout the cataloguing process and helped make the collection as complete as possible. As a final check for completeness, several on-line databases were searched including Elias, ASFA and CISTI's Monographs.

On occasion, we were unsuccessful in obtaining certain documents despite extensive efforts. These reports do not appear in the catalogue itself but are listed in Appendix 1.2. Apart from these few, most of the studies meeting our criteria should be found in this catalogue up to a cut-off date of July 1, 1993.

A total of 148 individual documents, comprising 168 unique datasets, have been included in the database. A bibliography of all documents catalogued can be found in Appendix 1.3.

**Taxonomy**

Most datasets catalogued contained taxonomic lists of species collected or studied. These lists were painstakingly combined to create a master taxa list for use by the CODIS software. However, this master taxa list is useful in its own right as it represents an attempt to identify all invertebrate species found in the Fraser River basin. The list contains over 1200 entries and a complete classification of each including phylum, class, order, family, genus and species, where available (Appendix 2.1).

As the majority of studies did not have species described in the same detail as the master taxa list, it was necessary to fill in the missing information using appropriate taxonomic keys. Given the age of some of the studies and the volatility of taxonomic classification, the authors attempted to update and standardize where possible so as not to have several names for the same organism. In those cases where updates were made, the original name appears in parentheses. In some instances there may be two species with very similar

names, which may actually be the same species. Only those cases that could be verified were updated. Occasionally it was not possible to supply order or family classification for organisms that were listed by genus and species only. These taxa could not be found in the keys used and were listed as in the original document with missing classifications labeled NS (not specified). Many species classifications are in a state of flux, but in this catalogue we attempted to standardize where possible based on the keys used. A complete listing of the those keys is found in Appendix 2.2.

**Data Appraisal**

In addition to the summary information contained in this catalogue, all datasets were assigned a data quality rating based on an objective evaluation. A series of protocols was developed for use in this evaluation. The protocols were used in conjunction with a semi-hierarchical six-point rating scale. The following categories were rated individually for each dataset: collection, storage, analysis and quality assurance/quality control (QA/QC). The complete dataset was also assigned an overall score based on the 'weakest link' or lowest score of the individual categories.

For consistency, this rating scale is similar to those used in other CODIS catalogues. The scores 0, 1, 3 and 4 are hierarchical. The rating scale is described as semi-hierarchical because a score of 2 simply indicates that there was insufficient information to assess the data quality and is not better than a 1 or worse than a 3. An additional score of 9 was used in two ways. If a particular category was given a 9 rating, that indicated that the particular category was unimportant or not applicable for that dataset. In this situation a rating of 9 had no effect on the overall rating. If a complete dataset was given an overall rating of 9, it was usually a temporary rating and indicated that the dataset had not yet been rated.

To enable realistic comparisons of data quality within this catalogue, the rating protocols were designed in a manner that treated each dataset objectively and in the same fashion. The protocols include a collection of four decision trees with accompanying guidelines and assist in the generation of a rating for each category within a dataset. The guidelines help the cataloguer answer the questions in the decision trees and are a product of personal knowledge and a

review of the pertinent literature. As comprehensive as the protocols are, they were never intended to be a handbook of benthic study methods and one is directed to the original references for more detail. The protocols were extensively tested, modified and ultimately sent to recognized experts for peer review. The final draft of the entire protocol document can be found in Appendix 3.1.

While all efforts were made to maintain objectivity, some aspects of the rating process were subjective in nature. For example, the assignment of a rating of 9 to a category was subjective and required the cataloguer to consider the intent of the study. Ideally, only objective rating criteria should be used but due to the nature and variability of some biological measurements, some level of interpretation may be required from the cataloguer. In addition, the rating system was intended to be used as a guide for the appraisal of study methods and was not an absolute statement of data quality. Those datasets assigned a low overall rating can still be potential sources of useful data.

**Data Cataloguing**

The final act in the creation of the Fraser River Basin Benthic Invertebrate catalogue was primarily a process of transferring summary data and rating information from each dataset into the CODIS database program. The first stage of this process was the creation of the data summary forms (Appendix 4.1). These forms were patterned after those used in the Fraser River Organic Contaminants catalogue (Fyles *et al.*, 1993) and provided the cataloguer with a standard format for extracting information from the datasets.

In transferring the data to the summary forms, certain rules and conventions were followed to ensure consistency (Appendix 4.2). For example, if a dataset referred to June as its start date we took this to mean June 1. After completion of the summary forms for each dataset, the information from these forms was entered into the database.

To simplify the data entry process into CODIS, most information was entered in a numerical format. Each comment, description, reference and taxon was assigned a particular number in a look-up list or file. This had the advantage of increasing the speed of data entry and reducing the number of typing errors. The disadvantage was that no data could be entered until all the look-up lists were complete. The creation of the look-up lists was itself a formidable task and was

ongoing as datasets were rated and transferred to the summary forms. After all the information was condensed to numerical format, the inputting process was reasonably simple. The CODIS software displays a series of input screens for each dataset and the inputer needed only to enter the numbers in the appropriate box. The processing number (P#), which was assigned to each dataset when it was collected, was always entered into the comments field of the first input screen.

**Quality Assurance/Quality Control**

As part of a QA/QC program, several measures were taken to ensure that the data appraisal and data entry were reliable and consistent. After completion of the data input process, the entire Fraser River Benthic Invertebrate catalogue was double-checked against the data forms to identify and correct any inputting errors. To check for rating consistency over time, a random assortment of datasets rated early in the cataloguing process were re-rated near the end of the project by the original cataloguer. To check for consistency between cataloguers, a random sample of datasets was re-rated by another cataloguer. In both of these cases, the number of datasets re-rated represented 10% of the total number of datasets. There was a 91.3% agreement between datasets rated early and late and a 94.4% agreement between cataloguers. In addition to these measures, a random selection of datasets was double-checked by the authors of the CODIS Fraser River basin organic contaminants catalogue (Appendix V).

**Summary of Findings**

A detailed analysis of the data contained in the Fraser River Basin Benthic Invertebrate catalogue was not the intent of this document. However, the CODIS software will allow the user to extract information using a variety of search strategies geared to individual needs.

For the purposes of this report, the authors have provided a cursory look at some basic characteristics of the Fraser River benthic invertebrate data.

(1.) The majority of the studies were found in the estuary (46%). This reflects the impact assessment of urban development in

that area as well as the importance of the estuary as a highly productive environment for fish and wildlife.

(2.) The large percentage of studies in the middle Fraser and the Thompson consisted mainly of the annual surveys performed as a requirement of pulp mill operation near Prince George, Quesnel and Kamloops (Fig. 2).

(3.) Over half of the studies were benthic community surveys combining density and species identification (Fig. 3).

(4.) Methods used to collect the organisms varied (Fig. 4).

(5.) Most of the datasets were of very high quality (rating of 4) in the areas of collection, storage and analysis (Fig. 5).

(6.) However, using the 'weakest link' criteria for assigning an overall rating, 77% of the datasets were given a 2 rating overall. A full 76% of the datasets did not supply enough information to enable the cataloguers to assess the QA/QC category. Of the 24% that did supply QA/QC information, 95% were ranked 3 or 4 which suggests that the overall quality of the data is high or very high.

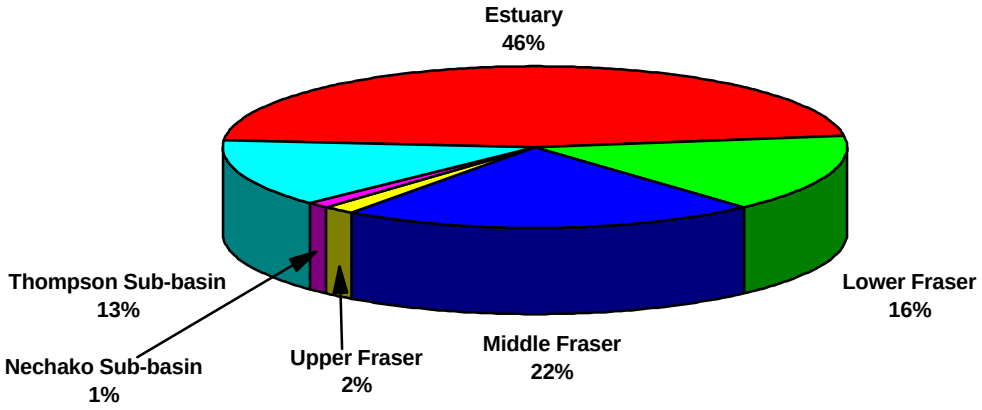



Fig. 2. Breakdown of datasets by regions.

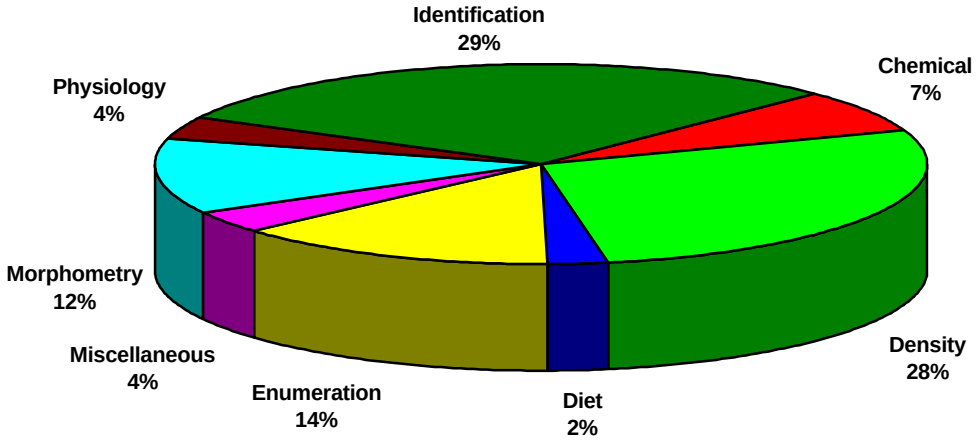



Fig. 3. Breakdown of datasets by parameter.

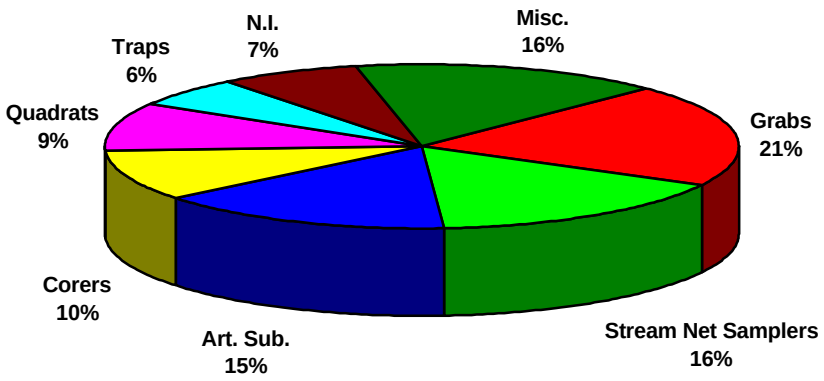
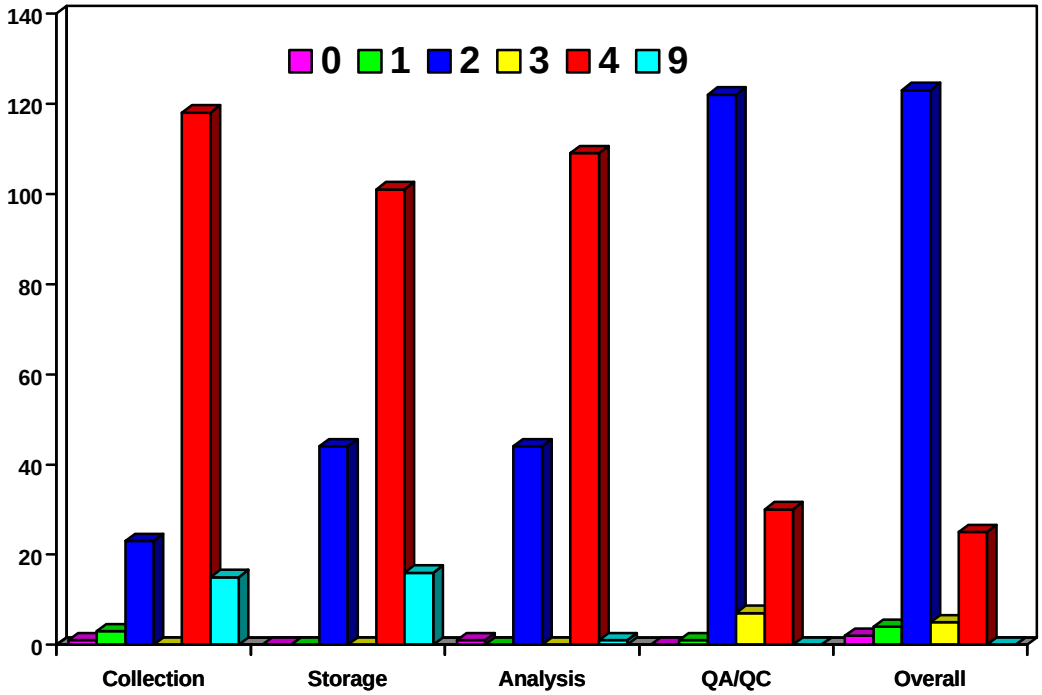



Fig. 4. Breakdown of datasets by collection method.
N.I.= not important Art. Sub.= artificial substrate




. Fig. 5. Rating distribution

**Acknowledgments**

The authors appreciate the funding provided by the Environmental Conservation Branch of Environment Canada. Bev Raymond and George Derkson of Environment Canada provided much useful information and data. The aid of Jenny O'Grady and Andrew Fabro of Environment Canada Library was very much appreciated. Dr. A.P. Farrell (SFU), Dr. T.M. Fyles (UVic) and Dr. J.S. Richardson provided useful advice and support. Blair King must receive special thanks for his patient help and advice at many stages of the process.

## References

Fyles, T.M., B. King and P.R. West. 1993. Continental and Oceanographic Data Information System CODIS version 1.0. Protocols, software, compilation and appraisal of meta-data of organic contaminants in the Fraser River Basin. Prepared for Environment Canada, North Vancouver, B.C. DOE - FRAP 1993-24.

Missler, H. 1992. A bibliography of scientific information on Fraser River basin environmental quality. Prepared on contract for Environment Canada, Conservation and Protection, North Vancouver, B.C.

# Appendix I: Data Acquisition

## 1.1 List of Contacts

## 1.2 Unobtained Known Documents

## 1.3 Documents Catalogued

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**Unobtained Known Documents**

B.C. Research. 1976. A preliminary study on the effects of a cable burying operation upon intertidal organisms on Roberts Bank, B.C. Report prepared for B.C. Hydro Engineering and Environmental Resources Group.

Dwernychuk, L.W. 1984. Water quality and benthic macroinvertebrate studies in the Fraser River near Prince George, B.C. 1963 - 1981

IEC International Environmental Consultants Ltd. 1978. Chemical and biological survey of Boss and Ryan Creeks.

McGreer, E.R. and G.A. Vigers. 1979. Identification of heavy metals in organisms within an area of the Fraser River Estuary receiving a major municipal industrial and stormwater discharge.

Triton Environmental Consultants, Ltd. Four years of unpublished data on the Nechako Fisheries Conservation Program. (Was not released due to confidentiality.)

**Documents catalogued and corresponding Dataset Identification (DS_ID) and processing numbers**


19725031 P#41 Albright, L.J., T.G. Northcote, P.C. Oloffs and S.Y. Szeto. 1975. Chlorinated hydrocarbon residues in fish, crabs and shellfish of the lower Fraser River, its estuary, and selected locations in Georgia Strait, British Columbia - 1972-73. Pesticides Monitoring Journal **9**(3): 134-140.

19815001 P#60 Anderson, S. 1982. 1980-81 Thompson River biological survey - Savona and Walhachin. Prepared for Weyerhaeuser Canada, Ltd.

19815005 P#166 Anderson, S.M. 1982. 1980-81 Thompson River biological survey addendum. Prepared for Weyerhaeuser Canada, Ltd.

19795009 P#58 Anderson, S.M. 1980. 1979-80 Thompson River biological survey Savona and Walhachin. Prepared for Weyerhaeuser Canada, Ltd.

19795008 P#1010 Anderson, E.P., I.K. Birtwell, S.C. Byers, A.V. Hincks and G.W. O'Connell. 1981. Environmental effects of harbour construction activities at Steveston, British Columbia. Part 1 Main Report. Can. Tech. Rep. Fish. Aquat. Sci. 1070, 1071 and 1072.

19815010 P#1107 Archibald, D. 1982. Interim report summarizing 1981 activities on Roberts Bank dredge and aquatic monitoring program. Prepared for National Harbours Board and DFO.

19725036 P#22 Bawden, C.A., W.A. Heath and A.B. Norton. 1973. A preliminary baseline study of Roberts and Sturgeon Banks. Westwater Research Centre Technical Report No. 1. UBC.

19815003 P#88A Beak Consultants, Ltd. 1982. Biological and water quality survey of the Fraser River, 1981. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19815004 P#88B Beak Consultants, Ltd. 1982. Biological and water quality survey of the Fraser River, 1981. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19815007 P#75 Beak Consultants, Ltd. 1982. Biological and water quality survey of the Fraser and Quesnel Rivers, 1981. Prepared for Cariboo Pulp and Paper Company.

19805016 P#76 Beak Consultants, Ltd. 1981. Biological and water quality survey of the Fraser and Quesnel Rivers, 1980. Prepared for Cariboo Pulp and Paper Company.

19805018 P#82 Beak Consultants, Ltd. 1981. Biological and water quality survey of the Fraser River, 1980. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19785009 P#1021 Beak Consultants, Ltd. 1981. Environmental impact statement of proposed improvements to the Fraser River shipping channel. Prepared for Public Works Canada.

19795010 P#77 Beak Consultants, Ltd. 1980. Biological and water quality survey of the Fraser and Quesnel Rivers, 1979. Draft. Prepared for Cariboo Pulp and Paper Company.

19795012 P#83 Beak Consultants, Ltd. 1980. Biological and water quality survey of the Fraser River, 1979. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19785013 P#78 Beak Consultants, Ltd. 1979. Biological survey of the Fraser and Quesnel Rivers, 1978. Prepared for Cariboo Pulp and Paper Company.

19785014 P#84 Beak Consultants, Ltd. 1979. Biological and water quality survey of the Fraser River, 1978. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19775033 P#85 Beak Consultants, Ltd. 1978. Biological survey of the Fraser River, 1977. Prepared for Prince George Pulp and Paper Ltd.

19775023 P#79A Beak Consultants, Ltd. 1978. Biological surveys of the Fraser and Quesnel Rivers, 1977. Prepared for Cariboo Pulp and Paper Company.

19775024 P#79B Beak Consultants, Ltd. 1978. Biological surveys of the Fraser and Quesnel Rivers, 1977. Prepared for Cariboo Pulp and Paper Company.

19765029 P#80A Beak Consultants, Ltd. 1977. Biological surveys of the Fraser and Quesnel Rivers, 1976. Prepared for Cariboo Pulp and Paper Company.

19765030 P#80B Beak Consultants, Ltd. 1977. Biological surveys of the Fraser and Quesnel Rivers, 1976. Prepared for Cariboo Pulp and Paper Company.

19765027 P#86A Beak Consultants, Ltd. 1977. Biological survey of the Fraser River, 1976. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19765028 P#86B Beak Consultants, Ltd. 1977. Biological survey of the Fraser River, 1976. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19765026 P#1030 Beak Consultants, Ltd. 1977. Hat Creek project: Fisheries and benthos study. Draft. Prepared for B.C.Hydro and Power Authority.

19755024 P#81A Beak Consultants, Ltd. 1976. Biological surveys of the Fraser and Quesnel Rivers, 1975. Prepared for Cariboo Pulp and Company.

19755025 P#81B Beak Consultants, Ltd. 1976. Biological surveys of the Fraser and Quesnel Rivers, 1975. Prepared for Cariboo Pulp and Paper Company.

19755023 P#87 Beak Consultants, Ltd. 1976. Biological survey of the Fraser River near Prince George, B.C. September-October 1975. Prepared for Prince George Pulp and Paper, Northwood Pulp and Timber Ltd., and Intercontinental Pulp Co.

19735023 P#68 Beak Consultants, Ltd. 1974. Biological surveys of the Fraser and Quesnel Rivers June-July and September-October, 1973. Prepared for Cariboo Pulp and Paper Company.

19745023 P#69A Beak Consultants, Ltd. 1974. The 1974 biological surveys of the Fraser and Quesnel Rivers. Prepared for Cariboo Pulp and Paper Company.

19745024 P#69B Beak Consultants, Ltd. 1974. The 1974 biological surveys of the Fraser and Quesnel Rivers. Prepared for Cariboo Pulp and Paper Company.

19735020 P#164 Beak Consultants, Ltd. 1974. Biological and water quality survey of the Thompson River, October-November. 1973. Report for Dupont of Canada, Ltd.

19705001 P#72 Beak Consultants, Ltd. 1971. Project K4023. 1970 Pre-operational biological survey. Prepared for Cariboo Pulp and Paper Company.

19775032 P#1105 Beak-Hinton Consultants, Ltd. 1977. Environmental impact assessment of Roberts Bank port expansion. Vol. 4. Appx. B: The existing biological environment. Prepared for National Harbours Board, Port of Vancouver.

19845024 P#63B Becker, E.S. 1985. Results from receiving water testing carried out December 12, 1984. Prepared for Scott Paper, Ltd.

19835010 P#63A Becker, E.S. 1984. Results from receiving water testing carried out December 14, 1983. Prepared for Scott Paper, Ltd.

19735019 P#1122 Bernard, F.R. 1975. Vancouver International Airport environmental effects study subtidal macrofauna. **In**: D.A. Goodman (ed.) Fisheries resources and food web components of the Fraser River estuary and an assessment of the impacts of proposed expansion of the Vancouver International Airport and other developments of these resources. Department of Environment. Fisheries and Marine Service.

19775016 P#186 Bindra, K.S. and K.J. Hall. 1977. Geochemical partitioning of trace metals in sediments and factors affecting bioaccumulation in benthic organisms. Draft.

19795011 P#102 Bisson, P. and S. Anderson. 1980. 1978-79 Thompson River biological survey. Prepared for Weyerhaeuser Canada, Ltd.

19845015 P#40 Breen, P.A. 1987. Mortality of Dungeness crabs caused by lost traps in the Fraser River estuary, British Columbia. N. Amer. J. Fish. Manag. **7**: 429-435.

19845020 P#145 Breen, P.A. 1985. Ghost fishing by Dungeness crab traps: A preliminary report. pp. 51-55. **In**: 1983 and 1984 invertebrate management advice, Pacific Region. G.J. Jamieson (ed.) Can. MS Rep. Fish. Aquat. Sci. 1848: 107p.

19845018 P#152 Breen, P.A. 1985. Preliminary analysis of Fraser delta tagged crab returns, May-November 1984. pp.41-50. **In**: 1983 and 1984 invertebrate management advice, Pacific Region. G.J. Jamieson (ed.) Can. MS Rep. Fish. Aquat. Sci. 1848: 107p.

19905023 P#162 British Columbia Ministry of Environment. 1990. Maud Creek Drainage.

19765018 P#1002 B.C. Research. 1977. Environmental studies at Iona Island. Report No. 3 (1976). Prepared for the Greater Vancouver Sewerage and Drainage District.

19745022 P#1006 B.C. Research. 1975. Environmental studies at Iona Island. Report No. 2 (1974). Prepared for the Greater Vancouver Sewerage and Drainage District.

19725030 P#1100 B.C. Research. 1973. Project report for the Greater Vancouver Sewerage and Drainage District, 1973 Environmental studies at Iona Island.

19775011 P#39 Brown, D.A., C.A. Bawden, K.W. Chatel and T.R. Parsons. 1977. The wildlife community of Iona Island Jetty, Vancouver, B.C., and heavy metal pollution effects. Env. Conserv. **4**(3): 213-216.

19845012 P#1023 Burd, B.J., D. Moore and R.O. Brinkhurst. 1987. Distribution and abundance of macrobenthic infauna from Boundary and Mud Bays near the British Columbia / U.S. border. Can. Tech. Rep. Hydrogr. Ocean Sci. 84.

19785008 P#1031 Canada, Department of Fisheries and Oceans. 1979. Environmental considerations relating to marina development in the Roberts Bank causeway area of the Fraser River estuary.

19845019 P#119 Carey, J.H., M.E. Fox and J.H. Hart. 1988. Identity and distribution of chlorophenols in the North Arm of the Fraser River estuary. Water Pollution Research Journal of Canada **23**(1): 31-44.

19845022 P#1111 Carey, J.H., M.E. Fox and J.H. Hart. 1986. The distribution of chlorinated phenols in the North Arm of the Fraser River estuary. National Water Research Institute, Environment Canada, Internal Report No. 86-45.

19735018 P#1117 Chang, B.D. 1975. Some factors affecting distribution and productivity in the estuarine amphipod, *Anisogammarus pugettensis*. M.Sc. thesis. UBC.

19855102 P#179 Chapman, P.M. 1985. Effects of gut sediment contents on measurements of metal levels in benthic invertebrates - a cautionary note. Bull. Environ. Contam. Toxicol. **35**: 345-347.

19775026 P#117 Chapman, P.M. 1979. Seasonal movements of subtidal benthic communities in a salt wedge estuary as related to interstitial salinities. Ph.D. thesis. UVic.

19775030 P#1101 Chapman, P.M. and R.O. Brinkhurst. 1981. Seasonal changes in interstitial salinities and seasonal movements of subtidal benthic invertebrates in the Fraser River estuary, B.C. Est., Coastal and Shelf Sci. **12**: 49-66.

19805014 P#1016 Chapman, P.M and R.O. Brinkhurst. 1980. Salinity tolerances in some selected aquatic oligochaetes. Int. Revue ges. hydrobiol. **65**(4): 499-505.

19775012 P#174 Chapman, P.M., L.M. Churchland, P. Thomson and E. Michnowsky. 1980. Heavy metal studies with oligochaetes. p.477-502. **In**: Brinkhurst, R.O. and D.G.Cook (eds.). 1980. Proceedings of the first international symposium on aquatic oligochaete biology, held in Sidney, British Columbia, Canada, May 1-4, 1979. Plenum Publishing Corp., New York.

19775028 P#1007 Chapman, P.M., L.M. Churchland, P. Thomson and E. Michnowsky. 1979. Heavy metals in sediments and benthic organisms in the lower Fraser River, B.C. An interim report. Draft.

19825004 P#1102 Chapman, P.M., M.A. Farrell and R.O. Brinkhurst. 1982. Effects of species interactions on the survival and respiration of *Limnodrilus hoffmeisteri* and *Tubifex tubifex* (Oligochaeta, Tubificidae) exposed to various pollutants and environmental factors. Water Research **16**: 1405-1408.

19845016 P#10 Colodey, A.G. 1986. Investigations in Boundary Bay and Georgia Strait following a chlorophenol spill. Environment Canada. Regional Program Report 86-18.

19855104 P#139 D'Amours, D. 1987. Trophic phasing of juvenile chum salmon (*Oncorhynchus keta* Walbaum) and harpacticoid copepods in the Fraser River estuary, British Columbia. Ph.D. thesis. Department of Oceanography, U.B.C.

19765023 P#1029 DeMill, D.A. 1984. Heavy metals in Fraser River estuary clams. Draft. Environment Canada. Regional Program Report No. 84-17.

19755022 P#13 Derkson, G. 1980. Water quality and macroinvertebrate community structure of Bessette Creek, B.C.: An interior stream adjacent to a sewage lagoon. Environmental Protection Branch.

19905022 P#14 Derkson, G. and S. Lundvall. 1992. Sediment quality triad assessment of the biological impacts of metal contamination on Sinmax Creek. Draft. Environment Canada.

19885027 P#167 Dudgeon, D. and J.S. Richardson. 1988. Dietary variation of predaceous caddisfly larvae (Trichoptera: Rhyacophilidae, Polycentropodidae and Arctopsychidae) from British Columbia streams. Hydrobiologia **160**: 33-43.

19835008 P#1114 Duncan, M.J. 1983. Benthic study of proposed Fraser River sand-storage site on south shore of Steveston Island, B.C. 1983. B.C. Research Project Report 201-767. Prepared for Public Works Canada.

19895081 P#64 Dwernychuk, L.W. 1990. The receiving environment of the upper Fraser River: A pilot environmental effects monitoring program examining physical/chemical/biological elements of the system related to pulpmill effluents. 1989. Vol. 1. Report/Tables/Figures/Plates and Vol. 2. Appendices. Prepared for Northwood Pulp and Timber, Ltd., Prince

George Pulp and Paper, Ltd., International Pulp Company, Ltd., Quesnel River Pulp Company, Cariboo Pulp and Paper Company, Environment Canada and British Columbia Ministry of Environment.

19875033 P#67 Dwernychuk, L.W. 1988. Effects of TMP/CTMP and bleached kraft pulp mill effluent on water quality and benthic macroinvertebrate communities in the Fraser River near Quesnel, B.C.: 1987. Prepared for Cariboo Pulp and Paper Company and Quesnel River Pulp Company.

19865040 P#65 Dwernychuk, L.W. 1987. Effects of kraft pulpmill effluent on water quality and benthic macroinvertebrate communities in the Fraser River near Prince George, B.C. 1986. Prepared for Prince George Pulp and Paper, Ltd., Intercontinental Pulp Company, Ltd., and Northwood Pulp and Timber Ltd.

19855105 P#66 Dwernychuk, L.W. 1986. Biological and water quality studies in the Fraser River near Quesnel, B.C. - 1985. Prepared for Quesnel River Pulp Company.

19845013 P#1024 Dwernychuk, L.W. 1985. Water quality and benthic macroinvertebrate studies in the Fraser River near Prince George. 1984. Prepared for Prince George Pulp and Paper, Ltd., Intercontinental Pulp Company, Ltd., and Northwood Pulp and Timber Ltd.

19845023 P#73 Dwernychuk, L.W. 1985. Biological and water quality studies in the Fraser River near Quesnel, B.C. - 1984. Prepared for Cariboo Pulp and Paper Company and Quesnel River Pulp Company.

19775009 P#1116 Envirocon, Ltd. 1978. Don and Lion Islands marine terminal environmental impact studies. Prepared for Rivtow Straits, Ltd.

19735024 P#1115 F.F. Slaney and Co. 1974. Environmental program, Roberts Bank and the Fraser estuary. Prepared for Fisheries and Marine Service, Department of the Environment.

19825005 P#1120 Fisheries and Oceans Canada. 1982. A short term study on the presence of fish and dungeness crabs at Canoe Pass, Roberts Bank. July 22- Aug. 27, 1982. In: Environmental impact assessment of construction of a natural gas pipeline across Roberts Bank. Vol. 1: Summary. Appendix 3.

19775029 P#1112 Graham, C.C. and L.R. Russell. 1979. An investigation of juvenile salmonid utilization of the delta-lake front area of the Adams River, Shuswap Lake. Fisheries and Marine Service MS Report No. 1508.

19795007 P#184 Griffiths, R.W. 1981. The effect of trout predation on the abundance and production of stream insects. M.Sc. thesis. Department of Zoology. UBC.

19630064 P#188 Hamilton, A.L. 1965. An analysis of a freshwater benthic community with special reference to the Chironomidae. Ph.D. thesis. Department of Zoology. UBC.

19865043 P#63E Hamilton, J.R. 1986. Results from receiving water testing carried out March 5, 1986. Prepared for Scott Paper, Ltd.

19865042 P#63D Hamilton, J.R. 1985. Results from receiving water testing carried out January 14, 1986. Prepared for Scott Paper, Ltd.

19855106 P#63C Hamilton, J.R. 1985. Results from receiving water testing carried out November 4, 1985. Prepared for Scott Paper, Ltd.

19715011 P#133 Harbo, R.M. and I.K. Birtwell. 1977. Mercury content of some marine organisms from coastal waters of southern British Columbia. Department of fisheries and the environment. Technical Report No. PAC/T-77-5.

19715012 P#146 Harbo, R.M., I.K. Birtwell and O.E. Langer. 1983. Trace metals in marine organisms from coastal waters of southern British Columbia (1971 to 1976). Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1691.

19845021 P#5 Harding, L., M. Pomeroy, A. Colodey and L.L. Grooms. 1988. Fraser River estuary marine environmental monitoring results. 1984-1986. Environment Canada. Regional Program Report: PR 87-18.

19670047 P#180 Hargrave, Barry T. 1970. Distribution, growth, and seasonal abundance of *Hyalella azteca* (Amphipoda) in relation to sediment microflora. J. Fish. Res. Bd. Canada **27**: 685-699.

19690072 P#183 Hargrave, Barry T. 1970. The effect of a deposit-feeding amphipod on the metabolism of benthic microflora. Limnology and Oceanography **15**: 21-30.

19775027 P#115 Harrison, B.J. 1981. The biological determinants of the structure of harpacticoid copepod communities on an estuarine intertidal flat (Fraser River Delta, B.C.). Ph.D. thesis. UBC.

19775018 P#126 Hillaby, B.A. 1981. The effects of coal dust on ventilation and oxygen consumption in the Dungeness crab, *Cancer magister*. Can. Tech. Rep. Fish. Aquat. Sci. 1033: vi+18p.

19690070 P#1119A Hoebel, M.F. 1978. The role of meiofauna in the benthic community of a small oligotrophic lake. Ph.D. thesis, UBC.

19715010 P#1119B Hoebel, M.F. 1978. The role of meiofauna in the benthic community of a small oligotrophic lake. Ph.D. thesis, UBC.

19775013 P#59 Holmes, D.W. 1979. Review of sampling data from south Thompson River at Chase 1977/78 and 1978/79. Prepared for Weyerhaeuser Ltd.

19825007 P#74 IEC Beak. 1983. Biological and water quality surveys Fraser River, 1982. Prepared for Cariboo Pulp and Paper Company and Quesnel River Pulp Company.

19510029 P#176 Jamieson, G.S. 1985. The Dungeness crab, *Cancer magister*, fisheries of British Columbia. **In**: Proceedings of symposium on Dungeness crab biology and management, Alaska sea grant report **85**(3): 37-60.

19785015 P#1017 Johnston, N.T. 1981. The feeding ecology of *Neomysis mercedis* Holmes in the Fraser River estuary. MSc. thesis. U.B.C.

19785010 P#49 Johnston, N.T. and D.C. Lasenby. 1982. Diet and feeding of *Neomysis mercedis* Holmes (Crustacea, Mysidacea) from the Fraser River estuary, British Columbia. Can. J. Zool. **60**: 813-824.

19775014 P#56 Johnston, N.T. and T.G. Northcote. 1989. Life history variation in *Neomysis mercedis* Holmes (Crustacea, Mysidacea) in the Fraser River estuary, British Columbia. Can. J. Zool. **67**: 363-372.

19690073 P#173 Kellerhals, P. and J.W. Murray. 1969. Tidal flats at Boundary Bay, Fraser River delta, British Columbia. Bulletin of Canadian Petroleum Geology **17**(1): 67-91.

19735022 P#1027 Kelso, B.W. 1973. A biological assessment of the Thompson River system during the low flow period of April, 1973. Pollution Abatement Branch. Report Number EPS 5-PR-73-9.

19815011 P#1028 Kelso, B. and M. Jones. 1983. A data report on water quality and biological data from the receiving waters of the area around the Placer Mining development, Endako Mines Division, Francois Lake. Environment Protection Branch. Regional Program Report No. 83-07.

19815009 P#1032 Kistritz, R.U. and B.J. Harrison. 1983. Environmental impact assessment of construction of a natural gas pipeline across Roberts Bank. Vol. 3. The impact of pipeline construction on the aquatic ecosystem of Roberts Bank. Prepared for BC Hydro.

19735021 P#132 Langer, O.E. and M.D. Nassichuk. 1975. Selected biological studies of the Thompson River system. Environment Canada. Fisheries and Marine Service. Technical report series No. PAC /T-75-22.

19805012 P#35 Levings, C.D. 1982. Short term use of a low tide refuge in a sandflat by juvenile chinook, (*Oncorhynchus tshawytscha*), Fraser River estuary. Can. Tech. Rep. Fish. Aquat. Sci. No. 1111.

19755021 P#1012 Levings, C.D., R. Armour and N.G. McDaniel. 1978. A trench through mudflat communities of macroinvertebrates on Roberts Bank, Fraser River delta, B.C. Fish. Mar. Serv. MS Rep. 1501: 51p.

19765024 P#1103A Levings, C.D. and B.D. Chang. 1977. A preliminary study of the influence of current velocities on estuarine benthos, especially *Anisogammarus confervicolus*, in the Fraser River estuary (South Arm). Fish. Res. Bd. Can. MS Rep. No. 1424.

19765025 P#1103B Levings, C.D. and B.D. Chang. 1977. A preliminary study of the influence of current velocities on estuarine benthos, especially *Anisogammarus confervicolus*, in the Fraser River estuary (South Arm). Fish. Res. Bd. Can. MS Rep. No. 1424.

19765031 P#1103C Levings, C.D. and B.D. Chang. 1977. A preliminary study of the influence of current velocities on estuarine benthos, especially *Anisogammarus confervicolus*, in the Fraser River estuary (South Arm). Fish. Res. Bd. Can. MS Rep. No. 1424.

19865041 P#122 Levings, C.D., K. Conlin and B. Raymond. 1991. Intertidal habitats used by juvenile chinook salmon (*Oncoryhnchus tshawytscha*) rearing in the North Arm of the Fraser River estuary.

19735025 P#1025 Levings, C.D. and J.-B. Coustalin. 1975. Zonation of intertidal biomass and related benthic data from Sturgeon and Roberts Banks, Fraser River estuary, British Columbia. Fisheries and Marine Service Technical Report No. 468.

19805010 P#24 Levy, D.A., T.G. Northcote and R.M. Barr. 1982. Effects of estuarine log storage on juvenile salmon. Westwater Research Centre. Technical Report No. 26.

19805011 P#1110 Levy, D.A., T.G. Northcote, K.J. Hall and I. Yesaki. 1989. Juvenile salmonid responses to log storage in littoral habitats of the Fraser River estuary and Babine Lake. Can. Spec. Publ. Fish. Aquat. Sci. 105.

19865036 P#165 Macdonald, J.S., R.U. Kistritz, and M. Farrell. 1990. An examination of the effects of slough habitat reclamation in the lower Fraser River, British Columbia: Detrital and invertebrate flux, rearing and diets of juvenile salmon. Can. Tech. Rep. Fish. Aquat. Sci. No. 1731: 59p.

19300005 P#177 MacKay, Donald C.G. 1943. The brachyuran crabs of Boundary Bay, British Columbia. The Canadian Field Naturalist **57**(9): 147-152.

19685001 P#181 McCauley, V.J.E. and K. Tsumura. 1974. Calorific values of Chironomidae (Diptera). Can. J. Zool. **52**: 581-586.

19805015 P#1009 McEwan, E.H. and D.K. Gordon. No date. Benthic invertebrates of Boundary Bay and Roberts Bank, British Columbia. CWS and Environment Canada.

19775015 P#51 McGreer, E.R. 1983. Growth and reproduction of *Macoma balthica* (L.) on a mudflat in the Fraser River estuary, British Columbia. Can. J. Zool. **61**: 887-894.

19775017 P#128 McGreer, E.R. 1982. Factors affecting the distribution of the bivalve *Macoma balthica* (L.) on a mudflat receiving sewage effluent, Fraser River estuary, British Columbia. Marine Environ. Res. **7**: 131-149.

19775008 P#114A McGreer, E.R. 1979. Factors affecting the distribution of the bivalve, *Macoma balthica* (L.) on a mudflat receiving sewage of the bivalve, *Macoma balthica* (L.) on a mudflat receiving sewage effluent and on an unpolluted mudflat, Fraser River estuary, British Columbia. M.Sc. thesis. UBC.

19775025 P#114B McGreer, E.R. 1979. Growth and reproduction of *Macoma balthica* (L.) on a mudflat in the Fraser River estuary, British Columbia. **In**: Studies of the bivalve, *Macoma balthica* (L.) on a mudflat receiving sewage effluent and on an unpolluted mudflat, Fraser River estuary, British Columbia. M.Sc. thesis. UBC.

19640056 P#1121 Mathias, J.A. 1967. Population energetics of two amphipod species in Marion Lake. M.Sc. thesis. Department of Zoology. UBC.

19835009 P#1118 Miller, P.A. 1985. The role of habitat heterogeneity in the community dynamics of an eelgrass-associated assemblage of gammarid amphipods. M.Sc. thesis. Department of Zoology. UBC.

19785012 P#148 Munro, K.A., S.C. Samis and M.D. Nassichuk. 1985. The effects of hatchery effluents on water chemistry, periphyton and benthic invertebrates of selected British Columbia streams. Can. MS Rep. Fish. Aquat. Sci. No. 1830.

19510030 P#151 Northcote, T.G. 1952. An analysis of variation in quantitative sampling of bottom fauna in lakes. M.A. thesis. Department of Zoology, UBC.

19725033 P#20 Northcote, T.G., N.T. Johnston and K. Tsumura. 1976. Benthic, epibenthic and drift fauna of the lower Fraser River. Westwater Research Centre. Technical Report No. 11.

19560037 P#136 Northcote, T.G. and P.A. Larkin. 1956. Indices of productivity in British Columbia lakes. J. Fish. Res. Bd. Canada. **13**(4): 515-540.

19745021 P#1104 Otte, O. and C.D. Levings. 1975. Distribution of macroinvertebrate communities on a mud flat influenced by sewage Fraser River estuary, British Columbia. Fisheries and Marine Service Technical Report No. 476.

19725032 P#48 Parsons, T.R., C.A. Bawden and W.A. Heath. 1973. Preliminary survey of mercury and other metals contained in animals from the Fraser River mudflats. J. Fish. Res. Bd. Can. **30**: 1014-1016.

19755020 P#1113 Pearce, B.C. and J. McBride. 1977. A preliminary study on the occurrence of coal dust in Roberts Bank sediments and the effects of coal dust on selected fauna. Water Quality Division. Technical Report Series No. PAC/T-77-17.

19815002 P#7 Pomeroy, W.M. 1983. Receiving environment studies conducted in the vicinity of Iona Island sewage treatment plant, Vancouver, B.C. Department of Environment. Regional Program Report 83-10.

19775022 P#45 Pomeroy, W.M. and C.D. Levings. 1980. Association and feeding relationships between *Eogammarus confervicolus* (Amphipoda, Gammaridae) and benthic algae on Sturgeon and Roberts Banks, Fraser River estuary. Can. J. Fish. Aquat. Sci. **37**: 1-10.

19765021 P#107 Reid, Crowther and Partners, Ltd. 1978. Report on environmental studies for the McGregor diversion project. Vol. 1. Text, Vol. 2. Tables and figures, and Vol. 3. Appendices. Prepared for B.C. Hydro and Power Authority.

19875032 P#170 Richardson, J.S. 1992. Food, microhabitat, or both? Macroinvertebrate use of leaf accumulations in a montane stream. Freshwater Biology **27**: 169-176.

19865038 P#168 Richardson, J.S. 1991. Seasonal food limitation of detritivores in a montane stream: An experimental test. Ecology **72**(3): 873-887.

19865037 P#169 Richardson, J.S. and W.E. Neill. 1991. Indirect effects of detritus manipulations in a montane stream. Can. J. Fish. Aquat. Sci. **48**: 776-783.

19845017 P#91 Rosberg, G.E. and S.C. Byers. 1985. Fisheries and aquatic studies for the proposed Fraser Richmond Terminal Development. Fraser River Harbour Commission.

19630066 P#1001 Servizi, J.A. and R.A. Burkhalter. 1970. Selected measurements of water quality and bottom-dwelling organisms of the Fraser River system 1963 to 1968. International Pac. Salm. Fish. Comm.

19775020 P#185A Sharma, J. 1978. Taxonomy and ecology of some free-living marine nematodes from British Columbia. M.Sc. thesis. SFU.

19775021 P#185B Sharma, J. 1978. Taxonomy and ecology of some free-living marine nematodes from British Columbia. M.Sc. thesis. SFU.

19805013 P#187 Sibert, J.R., T.J. Brown and B.A. Kask. 1982. Meiofauna counts from the Fraser River, 1980 and 1981 Fraser foreshore core samples. Can. Data Rep. Fish. Aquat. Sci. No. 342.

19805017 P#154 Sibert, J.R., T.J. Brown and B.A. Kask. 1982. Meiofauna counts from the Fraser River delta, 1980 and 1981, sled samples. Can. Data Rep. Fish. Aquat. Sci. No. 341.

19815006 P#123 Smith, A.L. 1981. Comparison of macrofaunal invertebrates in sand dollar (*Dendraster excentricus*) beds and in adjacent areas free of sand dollars. Mar. Biol. **65**: 191-198.

19875034 P#161 Stogram, W. 1991. Fairless Creek drainage near Blackdome mine. Data from files of Environmental Protection, Williams Lake Office.

19630065 P#156 Stone, D., T.C. Griffing and M.C. Knight. 1974. Biological monitoring of the Fraser River near Prince George, B.C. Pulp Paper Mag. Can. **75**(C): T110-T116.

19855103 P#57 Swain, L.G. 1986. A 1985 survey of metals, PCB's and chlorophenols in the sediments, benthic organisms and fish of the lower Fraser River. Ministry of Environment, Water Management Branch.

19895080 P#32 Swain, L.G. and D.G. Walton. 1990. Report on the 1989 Boundary Bay monitoring program. Prepared for Fraser Port and the Province of British Columbia.

19875035 P#33 Swain, L.G. and D.G. Walton. 1988. Report on the 1987 benthos and sediment monitoring program. Prepared for Fraser Port and the Province of British Columbia.

19765020 P#141A Swinbanks, D.D. 1979. Environmental factors controlling floral zonation and the distribution of burrowing and tube-dwelling organisms of Fraser delta tidal flats, British Columbia. Ph.D. thesis. Department of Geology. UBC.

19765019 P#141B Swinbanks, D.D. 1979. Environmental factors controlling floral zonation and the distribution of burrowing and tube-dwelling organisms of Fraser delta tidal flats, British Columbia. Ph.D. thesis. Department of Geology. UBC.

19765019 P#43 Swinbanks, D.D. and J.W. Murray. 1981. Biosedimentological zonation of Boundary Bay tidal flats, Fraser River delta, British Columbia. Sedimentology **28**: 201-237.

19775010 P#1109 Swinbanks, D.D. and J.L. Luternauer. 1987. Burrow distribution of Thalassinidean shrimp on a Fraser delta tidal flat, British Columbia. J. of Paleontology **61**(2): 315-332.

19765017 P#1018 Thompson, J.A.J. and D.W. Paton. 1978. Heavy metals in benthic organisms from Point Grey dumpsite, Vancouver, B.C. - A preliminary report. Pacific Marine Science Report 78-11. Institute of Ocean Sciences. Unpublished manuscript.

19915007 P#93 Thut, R.N. 1991. Thompson River water quality surveys - 1990/1991. Prepared for Weyerhaeuser Canada, Ltd.

19905024 P#92 Thut, R.N. 1990. Thompson River water quality surveys - 1989/1990. Prepared for Weyerhaeuser Canada, Ltd.

19885028 P#96 Thut, R.N. 1988. Thompson River water quality surveys - 1987/1988. Prepared for Weyerhaeuser Canada, Ltd.

19865044 P#97 Thut, R.N. 1987. Thompson River water quality surveys - 1986/1987. Prepared for Weyerhaeuser Canada, Ltd.

19865039 P#62 Thut, R.N. 1986. Thompson River water quality surveys - 1985/1986. Prepared for Weyerhaeuser Canada, Ltd.

19825006 P#61 Thut, R.N. 1983. Benthic invertebrate fauna of the lower Thompson River (1974-1983). Prepared for Weyerhaueser Canada, Ltd.

19725034 P#70A T.W. Beak Consultants, Ltd. 1973. Pre-operational biological surveys of the Fraser and Quesnel Rivers, June-July and Septemeber-October, 1972.

19725035 P#70B T.W. Beak Consultants, Ltd. 1973. Pre-operational biological surveys of the Fraser and Quesnel Rivers, June-July and September-October, 1972.

19715013 P#71 T.W. Beak Consultants, Ltd. 1972. Pre-operational biological survey of the Fraser and Quesnel Rivers at Quesnel, British Columbia - 1971. Prepared for Cariboo Pulp and Paper Company.

19765022 P#1008 Vermeer, K. and D.B. Peakall. 1979. Trace metals in sea ducks of the Fraser River delta intertidal area, British Columbia. Mar. Poll. Bull. **10**(7): 189-193.

19895082 P#95 Weyerhaeuser Canada, Ltd. 1989. Thompson River water quality surveys - 1988/1989.

19855107 P#98 Weyerhaeuser Canada, Ltd. 1985. Thompson River water quality surveys - 1984/1985.

19815008 P#101 Weyerhaeuser Canada, Ltd. 1983. 1981-1982 Thompson River biological survey - Savona and Walhachin.

19785011 P#103 Weyerhaeuser Canada, Ltd. 1978. Summary and interpretation of results of 1977-78 biological survey of the Thompson River at Savona and Walhachin.

19845014 P#172 Williams, G.L., J. Villamere and G. Smith. 1984. An environmental assessment of the proposed Bridgeport Harbour Market foreshore development, Richmond, B.C. Hatfield Consultants Ltd. Prepared for North Fraser Harbour Commission, Richmond, B.C. 60p.

19685003 P#178A Winterbourn, Michael J. 1971. The life histories and trophic relationships of the Trichoptera of Marion Lake, British Columbia. Can. J. Zool. **49**: 623-635.

19685004 P#178B Winterbourn, Michael J. 1971. The life histories and trophic relationships of the Trichoptera of Marion Lake, British Columbia. Can. J. Zool. **49**: 623-635.

19685002 P#182 Winterbourn, Michael J. 1971. An ecological study of *Banksiola crotchi* Banks (Trichoptera, Phryganeidae) in Marion Lake, British Columbia. Can. J. Zool. **49**: 637-645.

# Appendix II: Taxonomy

## 2.1 Benthic Taxa

## 2.2 Taxonomic Keys Used

## Benthic Taxa

| # | PHYLUM | CLASS | ORDER | FAMILY | GENUS | SPECIES |
|---|---|---|---|---|---|---|
| 1 | Annelida | Hirudinea | NS | NS | NS | sp. |
| 2 | Annelida | Oligochaeta | NS | NS | NS | sp. |
| 3 | Annelida | Oligochaeta | NS | Aelosomatidae | Aelosoma | sp. |
| 4 | Annelida | Oligochaeta | Lumbriculida | Enchytraeidae | NS | sp. |
| 5 | Annelida | Oligochaeta | Lumbriculida | Lumbriculidae | NS | sp. |
| 6 | Annelida | Oligochaeta | Lumbriculida | Lumbriculidae | Kincaidiana | hexatheca |
| 7 | Annelida | Oligochaeta | Lumbriculida | Lumbriculidae | Lumbriculus | sp. |
| 8 | Annelida | Oligochaeta | Rhynchobdellida | Glossiphoniidae | Helobdella | sp. |
| 9 | Annelida | Oligochaeta | Tubificida | NS | NS | sp. |
| 10 | Annelida | Oligochaeta | Tubificida | Enchytraeidae | NS | sp. |
| 11 | Annelida | Oligochaeta | Tubificida | Enchytraeidae | Enchytraeus | sp. |
| 12 | Annelida | Oligochaeta | Tubificida | Enchytraeidae | Marionina | charlottensis |
| 13 | Annelida | Oligochaeta | Tubificida | Enchytraeidae | Marionina | sp. |
| 14 | Annelida | Oligochaeta | Tubificida | Enchytraeidae | Marionina | subterranea |
| 15 | Annelida | Oligochaeta | Tubificida | Naididae | NS | sp. |
| 16 | Annelida | Oligochaeta | Tubificida | Naididae | Amphichaeta | sannio |
| 17 | Annelida | Oligochaeta | Tubificida | Naididae | Amphichaeta | sp. |
| 18 | Annelida | Oligochaeta | Tubificida | Naididae | Chaetogaster | crystalinus |
| 19 | Annelida | Oligochaeta | Tubificida | Naididae | Chaetogaster | sp. |
| 20 | Annelida | Oligochaeta | Tubificida | Naididae | Dero | sp. |
| 21 | Annelida | Oligochaeta | Tubificida | Naididae | Naidum | sp. |
| 22 | Annelida | Oligochaeta | Tubificida | Naididae | Nais | bretscheri |
| 23 | Annelida | Oligochaeta | Tubificida | Naididae | Nais | communis |
| 24 | Annelida | Oligochaeta | Tubificida | Naididae | Nais | elinguis |
| 25 | Annelida | Oligochaeta | Tubificida | Naididae | Nais | pseudobtusa |
| 26 | Annelida | Oligochaeta | Tubificida (Plesiopora) | Naididae | Nais | sp. |
| 27 | Annelida | Oligochaeta | Tubificida | Naididae | Ophidonais | serpentina |
| 28 | Annelida | Oligochaeta | Tubificida | Naididae | Paranais | frici |
| 29 | Annelida | Oligochaeta | Tubificida | Naididae | Paranais | litoralis |
| 30 | Annelida | Oligochaeta | Tubificida | Naididae | Paranais | osborni |
| 31 | Annelida | Oligochaeta | Tubificida | Naididae | Paranais | sp. |
| 32 | Annelida | Oligochaeta | Tubificida | Naididae | Pristina | forelli |
| 33 | Annelida | Oligochaeta | Tubificida | Naididae | Pristina | osborni |
| 34 | Annelida | Oligochaeta | Tubificida | Naididae | Pristina | sp. |
| 35 | Annelida | Oligochaeta | Tubificida | Naididae | Specaria | fraseri |
| 36 | Annelida | Oligochaeta | Tubificida | Naididae | Specaria | josinae |
| 37 | Annelida | Oligochaeta | Tubificida | Naididae | Stylaria | sp. |
| 38 | Annelida | Oligochaeta | Tubificida | Naididae | Vejdovskyella | comata |
| 39 | Annelida | Oligochaeta | Tubificida | Naididae | Vejdovskyella | intermedia |
| 40 | Annelida | Oligochaeta | Tubificida | Tubificidae | NS | sp. |
| 41 | Annelida | Oligochaeta | Tubificida | Tubificidae | Bothrioneurum | vejdovskyanum |
| 42 | Annelida | Oligochaeta | Tubificida | Tubificidae | Limnodriloides | sp. |
| 43 | Annelida | Oligochaeta | Tubificida | Tubificidae | Limnodrilus | hoffmeisteri |
| 44 | Annelida | Oligochaeta | Tubificida | Tubificidae | Limnodrilus | profundicola |
| 45 | Annelida | Oligochaeta | Tubificida | Tubificidae | Limnodrilus | sp. |
| 46 | Annelida | Oligochaeta | Tubificida | Tubificidae | Limnodrilus | udekemianus |
| 47 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubifex | sp. |
| 48 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubifex | tubifex |
| 49 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | brownae |
| 50 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | diazi |
| 51 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | gabriellae |
| 52 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | pseudogaster |
| 53 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | nerthoides |
| 54 | Annelida | Oligochaeta | Tubificida | Tubificidae | Tubificoides | wasselli |
| 55 | Annelida | Polychaeta | NS | NS | NS | sp. |
| 56 | Annelida | Polychaeta | Capitellida | Arenicolidae | Abarenicola | pacifica |
| 57 | Annelida | Polychaeta | Capitellida | Arenicolidae | Abarenicola | sp. |
| 58 | Annelida | Polychaeta | Capitellida | Capitellidae | NS | sp. |
| 59 | Annelida | Polychaeta | Capitellida | Capitellidae | Barantolla | americana |
| 60 | Annelida | Polychaeta | Capitellida | Capitellidae | Barantolla | californica |

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|---|---|---|---|---|---|---|
| 61 | Annelida | Polychaeta | Capitellida | Capitellidae | Capitella | capitata |
| 62 | Annelida | Polychaeta | Capitellida | Capitellidae | Capitella | sp. |
| 63 | Annelida | Polychaeta | Capitellida | Capitellidae | Heteromastus | sp. |
| 64 | Annelida | Polychaeta | Capitellida | Capitellidae | Mediomastus | californiensis |
| 65 | Annelida | Polychaeta | Capitellida | Capitellidae | Mediomastus | sp. |
| 66 | Annelida | Polychaeta | Capitellida | Maldanidae | NS | sp. |
| 67 | Annelida | Polychaeta | Capitellida | Maldanidae | Axiothella | rubrocincta |
| 68 | Annelida | Polychaeta | Capitellida | Maldanidae | Clymenella | californica |
| 69 | Annelida | Polychaeta | Capitellida | Maldanidae | Clymenella | sp. |
| 70 | Annelida | Polychaeta | Capitellida | Maldanidae | Evolymene | zonalis |
| 71 | Annelida | Polychaeta | Capitellida | Maldanidae | Praxillella | sp. |
| 72 | Annelida | Polychaeta | Cirratulida | Cirratulidae | NS | sp. |
| 73 | Annelida | Polychaeta | Cirratulida | Cirratulidae | Chaetozone | sp. |
| 74 | Annelida | Polychaeta | Cirratulida | Cirratulidae | Tharyx | parvus |
| 75 | Annelida | Polychaeta | Cirratulida | Cirratulidae | Tharyx | sp. |
| 76 | Annelida | Polychaeta | Cirratulida | Paraonidae | NS | sp. |
| 77 | Annelida | Polychaeta | Cirratulida | Paraonidae | Aricidea | lopezi |
| 78 | Annelida | Polychaeta | Cirratulida | Paraonidae | Aricidea | neosuecica |
| 79 | Annelida | Polychaeta | Cirratulida | Paraonidae | Paraonella | platybranchia |
| 80 | Annelida | Polychaeta | Cirratulida | Paraonidae | Paraonides | platybranchia |
| 81 | Annelida | Polychaeta | Cirratulida | Paraonidae | Paraonis | platybrachia |
| 82 | Annelida | Polychaeta | Cirratulida | Paraonidae | Paraonis | sp. |
| 83 | Annelida | Polychaeta | Cirratulida | Paraonidae | Tauberia (Levinsenia) | gracilis |
| 84 | Annelida | Polychaeta | Cossurida | Cossuridae | Cossura | longocirrata |
| 85 | Annelida | Polychaeta | Cossurida | Cossuridae | Cossura | sp. |
| 86 | Annelida | Polychaeta | Eunicida | Dorvilleidae | Dorvillea | japonica |
| 87 | Annelida | Polychaeta | Eunicida | Dorvilleidae | Dorvillea | sp. |
| 88 | Annelida | Polychaeta | Eunicida | Dorvilleidae | Protodorvillea | gracilis |
| 89 | Annelida | Polychaeta | Eunicida | Eunicidae | NS | sp. |
| 90 | Annelida | Polychaeta | Eunicida | Lumbrineridae | NS | sp. |
| 91 | Annelida | Polychaeta | Eunicida | Lumbrineridae | Lumbrineris | bicirrata |
| 92 | Annelida | Polychaeta | Eunicida | Lumbrineridae | Lumbrineris | cruzensis |
| 93 | Annelida | Polychaeta | Eunicida | Lumbrineridae | Lumbrineris | latreilli |
| 94 | Annelida | Polychaeta | Eunicida | Lumbrineridae | Lumbrineris | sp. |
| 95 | Annelida | Polychaeta | Eunicida | Onuphidae | NS | sp. |
| 96 | Annelida | Polychaeta | Eunicida | Onuphidae | Onuphis | iridescens |
| 97 | Annelida | Polychaeta | Eunicida | Onuphidae | Onuphis | sp. |
| 98 | Annelida | Polychaeta | Magelonida | Magelonidae | Magelona | sp. |
| 99 | Annelida | Polychaeta | Ophelliida | Opheliidae | NS | sp. |
| 100 | Annelida | Polychaeta | Ophelliida | Opheliidae | Armandia | brevis |
| 101 | Annelida | Polychaeta | Ophelliida | Opheliidae | Armandia | sp. |
| 102 | Annelida | Polychaeta | Opheliida | Opheliidae | Euzonus | williamsi |
| 103 | Annelida | Polychaeta | Opheliida | Opheliidae | Travisia | brevis |
| 104 | Annelida | Polychaeta | Opheliida | Opheliidae | Travisia | sp. |
| 105 | Annelida | Polychaeta | Opheliida | Scalibregmidae | Scalibregma | inflatum |
| 106 | Annelida | Polychaeta | Orbiniida | Orbiniidae | NS | sp. |
| 107 | Annelida | Polychaeta | Orbiniida | Orbiniidae | Leitoscoloplos | pugettensis |
| 108 | Annelida | Polychaeta | Orbiniida | Orbiniidae | Scoloplos | acmeceps |
| 109 | Annelida | Polychaeta | Orbiniida | Orbiniidae | Scoloplos | armiger |
| 110 | Annelida | Polychaeta | Orbiniida | Orbiniidae | Scoloplos | sp. |
| 111 | Annelida | Polychaeta | Oweniida | Oweniidae | Myriochele | heeri |
| 112 | Annelida | Polychaeta | Oweniida | Oweniidae | Myriochele | oculata |
| 113 | Annelida | Polychaeta | Oweniida | Oweniidae | Owenia | collaris |
| 114 | Annelida | Polychaeta | Phyllodocida | Chrysopetalidae | Paleanotus | bellis |
| 115 | Annelida | Polychaeta | Phyllodocida | Glyceridae | NS | sp. |
| 116 | Annelida | Polychaeta | Phyllodocida | Glyceridae | Glycera | capitata |
| 117 | Annelida | Polychaeta | Phyllodocida | Glyceridae | Glycera | sp. |
| 118 | Annelida | Polychaeta | Phyllodocida | Glyceridae | Hemipodus | borealis |
| 119 | Annelida | Polychaeta | Phyllodocida | Goniadidae | Glycinde | armigera |
| 120 | Annelida | Polychaeta | Phyllodocida | Goniadidae | Glycinde | picta |
| 121 | Annelida | Polychaeta | Phyllodocida | Goniadidae | Glycinde | sp. |
| 122 | Annelida | Polychaeta | Phyllodocida | Goniadidae | Goniada | brunnea |
| 123 | Annelida | Polychaeta | Phyllodocida | Hesionidae | NS | sp. |
| 124 | Annelida | Polychaeta | Phyllodocida | Hesionidae | Kefersteinia | cirrata |

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|---|---|---|---|---|---|---|
| 125 | Annelida | Polychaeta | Phyllodocida | Hesionidae | Micropodarke | dubia |
| 126 | Annelida | Polychaeta | Phyllodocida | Hesionidae | Ophiodromus | pugettensis |
| 127 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | NS | sp. |
| 128 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | assignis |
| 129 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | caeca |
| 130 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | caecoides |
| 131 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | californiensis |
| 132 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | ciliata |
| 133 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | cornuta franciscana |
| 134 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | longosetosa |
| 135 | Annelida | Polychaeta | Phyllodocida | Nephtyidae | Nephtys | sp. |
| 136 | Annelida | Polychaeta | Phyllodocida | Nereidae | NS | sp. |
| 137 | Annelida | Polychaeta | Phyllodocida | Nereidae | Cheilonereis | cyclurus |
| 138 | Annelida | Polychaeta | Phyllodocida | Nereidae | Platynereis | bicanaliculata |
| 139 | Annelida | Polychaeta | Phyllodocida | Nereidae | Platynereis | dumerilli |
| 140 | Annelida | Polychaeta | Phyllodocida | Nereidae | Nereis | limnicola |
| 141 | Annelida | Polychaeta | Phyllodocida | Nereidae | Nereis | procera |
| 142 | Annelida | Polychaeta | Phyllodocida | Nereidae | Nereis | sp. |
| 143 | Annelida | Polychaeta | Phyllodocida | Nereidae | Nereis | zonata |
| 144 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | NS | sp. |
| 145 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eteone | longa |
| 146 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eteone | sp. |
| 147 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eulalia (Eumida) | sanguinea |
| 148 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Eulalia | sp. |
| 149 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Phyllodoce | hartmani |
| 150 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Phyllodoce | mucosa |
| 151 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Phyllodoce | sp. |
| 152 | Annelida | Polychaeta | Phyllodocida | Phyllodocidae | Phyllodoce | williamsi |
| 153 | Annelida | Polychaeta | Phyllodocida | Pilargiidae | NS | sp. |
| 154 | Annelida | Polychaeta | Phyllodocida | Polynoidae | NS | sp. |
| 155 | Annelida | Polychaeta | Phyllodocida | Polynoidae | Harmothoe | imbricata |
| 156 | Annelida | Polychaeta | Phyllodocida | Polynoidae | Harmothoe | sp. |
| 157 | Annelida | Polychaeta | Phyllodocida | Polyodontidae (Peisidicidae) | Peisidice | aspera |
| 158 | Annelida | Polychaeta | Phyllodocida | Sigalionidae | Pholoe | minuta |
| 159 | Annelida | Polychaeta | Phyllodocida | Sphaerodoridae | NS | sp. |
| 160 | Annelida | Polychaeta | Phyllodocida | Sphaerodoridae | Sphaerodoropsis | sphaerulifer |
| 161 | Annelida | Polychaeta | Phyllodocida | Syllidae | NS | sp. |
| 162 | Annelida | Polychaeta | Phyllodocida | Syllidae | Exogone | louri |
| 163 | Annelida | Polychaeta | Phyllodocida | Syllidae | Syllis | heterochaeta |
| 164 | Annelida | Polychaeta | Phyllodocida | Syllidae | Syllis | sp. |
| 165 | Annelida | Polychaeta | Sabellida | Sabellidae | NS | sp. |
| 166 | Annelida | Polychaeta | Sabellida | Sabellidae | Branchiomma (Megalomma) | sp. |
| 167 | Annelida | Polychaeta | Sabellida | Sabellidae | Chone | ecaudata |
| 168 | Annelida | Polychaeta | Sabellida | Sabellidae | Fabricia | oregonica |
| 169 | Annelida | Polychaeta | Sabellida | Sabellidae | Manayunkia | aestuarina |
| 170 | Annelida | Polychaeta | Sabellida | Sabellidae | Manayunkia | sp. |
| 171 | Annelida | Polychaeta | Sabellida | Sabellidae | Manayunkia | speciosa |
| 172 | Annelida | Polychaeta | Sabellida | Spirorbidae | Spirorbis | sp. |
| 173 | Annelida | Polychaeta | Spionida | Chaetopterus | NS | sp. |
| 174 | Annelida | Polychaeta | Spionida | Spionidae | NS | sp. |
| 175 | Annelida | Polychaeta | Spionida | Spionidae | Branchiomma | burrardum |
| 176 | Annelida | Polychaeta | Spionida | Spionidae | Polydora | sp. |
| 177 | Annelida | Polychaeta | Spionida | Spionidae | Laonice | cirrata |
| 178 | Annelida | Polychaeta | Spionida | Spionidae | Malacoceros | arenicola |
| 179 | Annelida | Polychaeta | Spionida | Spionidae | Malacoceros | glutaeus |
| 180 | Annelida | Polychaeta | Spionida | Spionidae | Malacoceros | sp. |
| 181 | Annelida | Polychaeta | Spionida | Spionidae | Paraprionospio | pinnata |
| 182 | Annelida | Polychaeta | Spionida | Spionidae | Polydora | kempi japonica |
| 183 | Annelida | Polychaeta | Spionida | Spionidae | Polydora | ligni |
| 184 | Annelida | Polychaeta | Spionida | Spionidae | Polydora | socialis |
| 185 | Annelida | Polychaeta | Spionida | Spionidae | Prionospio | cirrifera |
| 186 | Annelida | Polychaeta | Spionida | Spionidae | Prionospio | malmgreni(s) |

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|---|---|---|---|---|---|---|
| 187 | Annelida | Polychaeta | Spionida | Spionidae | Prionospio | pinnata |
| 188 | Annelida | Polychaeta | Spionida | Spionidae | Prionospio | sp. |
| 189 | Annelida | Polychaeta | Spionida | Spionidae | Prionospio | steenstrupi |
| 190 | Annelida | Polychaeta | Spionida | Spionidae | Pygospio | elegans |
| 191 | Annelida | Polychaeta | Spionida | Spionidae | Scolelepis | foliosa |
| 192 | Annelida | Polychaeta | Spionida | Spionidae | Spio | filicornis |
| 193 | Annelida | Polychaeta | Spionida | Spionidae | Spio | sp. |
| 194 | Annelida | Polychaeta | Spionida | Spionidae | Spiophanes | berkeleyorum |
| 195 | Annelida | Polychaeta | Spionida | Spionidae | Spiophanes | bombyx |
| 196 | Annelida | Polychaeta | Spionida | Spionidae | Streblospio | benedicti |
| 197 | Annelida | Polychaeta | Sternaspida | Sternaspidae | Sternaspis | fossor |
| 198 | Annelida | Polychaeta | Sternaspida | Sternaspidae | Sternaspis | scutata |
| 199 | Annelida | Polychaeta | Terebellida | Ampharetidae | NS | sp. |
| 200 | Annelida | Polychaeta | Terebellida | Ampharetidae | Amage | anops |
| 201 | Annelida | Polychaeta | Terebellida | Ampharetidae | Ampharete | labrops |
| 202 | Annelida | Polychaeta | Terebellida | Ampharetidae | Amphicteis | sp. |
| 203 | Annelida | Polychaeta | Terebellida | Ampharetidae | Hobsonia | selecta |
| 204 | Annelida | Polychaeta | Terebellida | Pectinariidae | NS | sp. |
| 205 | Annelida | Polychaeta | Terebellida | Pectinariidae | Pectinaria | sp. |
| 206 | Annelida | Polychaeta | Terebellida | Terebellidae | Polycirrus | sp. |
| 207 | Annelida | Polychaeta | Terebellida | Trichobranchidae | Terebellides | stroemi |
| 208 | Annelida | Polychaeta | Terebellida | Ampharetidae | Ampharete | sp. |
| 209 | Annelida | Polychaeta | Terebellida | Terebellidae | Neoamphitrite | robusta |
| 210 | Arthropoda | Arachnida | NS | NS | NS | sp. |
| 211 | Arthropoda | Arachnida | Acariformes | NS | Trombidiformes | sp. |
| 212 | Arthropoda | Arachnida | Acariformes | Halacaridae | NS | sp. |
| 213 | Arthropoda | Arachnida | Hydracarina | Hydrachnidae | NS | sp. |
| 214 | Arthropoda | Arachnida | Hydracarina | Hygrobatidae | NS | sp. |
| 215 | Arthropoda | Arachnida | Hydracarina | Hygrobatidae | Hygrobates | sp. |
| 216 | Arthropoda | Arachnida | Hydracarina | Hygrobatidae | Megapus | sp. |
| 217 | Arthropoda | Arachnida | Hydracarina | Protziidae | Calonyx | sp. |
| 218 | Arthropoda | Arachnida | Hydrachnida (Hydracarina) | NS | NS | sp. |
| 219 | Arthropoda | Arachnida | Hydrachnida (Hydracarina) | Lebertiidae | Lebertia | sp. |
| 220 | Arthropoda | Arachnida | Hydrachnida (Hydracarina) | Sperchonidae | Sperchon | sp. |
| 221 | Arthropoda | Branchiopoda | Cladocera | NS | NS | sp. |
| 222 | Arthropoda | Branchiopoda | Cladocera | Bosminidae | Bosmina | longirostris |
| 223 | Arthropoda | Branchiopoda | Cladocera | Bosminidae | Bosmina | sp. |
| 224 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | NS | sp. |
| 225 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alona | affinis |
| 226 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alona | costata |
| 227 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alona | guttata |
| 228 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alona | quadrangularis |
| 229 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alona | rectangula |
| 230 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alonella | excisa |
| 231 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Alonella | nana |
| 232 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Camptocerus | rectirostris |
| 233 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Camptocerus | sp. |
| 234 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Chydorus | sphaericus |
| 235 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Eurycerus | lamellatus |
| 234 | Arthropoda | Branchiopoda | Cladocera | Chydoridae | Eurycerus | sp. |
| 237 | Arthropoda | Branchiopoda | Cladocera | Daphnidae | Ceriodaphnia | sp. |
| 238 | Arthropoda | Branchiopoda | Cladocera | Daphnidae | Daphnia | sp. |
| 239 | Arthropoda | Branchiopoda | Cladocera | Daphnidae | Simocephalus | sp. |
| 240 | Arthropoda | Branchiopoda | Cladocera | Holopedidae | Holopedium | sp. |
| 241 | Arthropoda | Branchiopoda | Cladocera | Macrothricidae | Ilyocryptus | sordidus |
| 242 | Arthropoda | Branchiopoda | Cladocera | Macrothricidae | Ilyocryptus | sp. |
| 243 | Arthropoda | Branchiopoda | Cladocera | Macrothricidae | Macrothrix | laticornis |
| 244 | Arthropoda | Branchiopoda | Cladocera | Podonidae | Evadne | polyphenoides |
| 245 | Arthropoda | Branchiopoda | Cladocera | Podonidae | Podon | nordmanni |
| 246 | Arthropoda | Branchiopoda | Cladocera | Sididae | Diaphanosoma | sp. |
| 247 | Arthropoda | Branchiopoda | Cladocera | Sididae | Sida | crystallina |

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|---|---|---|---|---|---|---|
| 248 | Arthropoda | Cirripedia | NS | NS | NS | sp. |
| 249 | Arthropoda | Cirripedia | Thoracica | NS | NS | sp. |
| 250 | Arthropoda | Cirripedia | Thoracica | Balanidae | Balanus | cariosus |
| 251 | Arthropoda | Cirripedia | Thoracica | Balanidae | Balanus | crenatus |
| 252 | Arthropoda | Cirripedia | Thoracica | Balanidae | Balanus | glandula |
| 253 | Arthropoda | Cirripedia | Thoracica | Balanidae | Balanus | sp. |
| 254 | Arthropoda | Copepoda | NS | NS | NS | sp. |
| 255 | Arthropoda | Copepoda | Calanoida | NS | NS | sp. |
| 256 | Arthropoda | Copepoda | Calanoida | NS | Acartia | longiremis |
| 257 | Arthropoda | Copepoda | Calanoida | Diaptomidae | Diaptomus | sp. |
| 258 | Arthropoda | Copepoda | Calanoida | Temoridae | Epischura | sp. |
| 259 | Arthropoda | Copepoda | Cyclopoida | NS | NS | sp. |
| 260 | Arthropoda | Copepoda | Cyclopoida | NS | Acanthocyclops | nanus |
| 261 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Cyclops | bicuspidatus |
| 262 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Cyclops | sp. |
| 263 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Eucyclops | agilis |
| 264 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Eucyclops | sp. |
| 265 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Macrocyclops | albidus |
| 266 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Macrocyclops | fuscus |
| 267 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Macrocyclops | sp. |
| 268 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Paracyclops | fimbriatus poppei |
| 269 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | Paracyclops | sp. |
| 270 | Arthropoda | Copepoda | Cyclopoida | Oithonidae | Oithona | spinirostris |
| 271 | Arthropoda | Copepoda | Harpacticoida | NS | NS | sp. |
| 272 | Arthropoda | Copepoda | Harpacticoida | NS | Alteutha | sp. |
| 273 | Arthropoda | Copepoda | Harpacticoida | NS | Cletocamptus | sp. |
| 274 | Arthropoda | Copepoda | Harpacticoida | NS | Kliopsyllus | sp. |
| 275 | Arthropoda | Copepoda | Harpacticoida | NS | Leimia | vaga |
| 276 | Arthropoda | Copepoda | Harpacticoida | NS | Proameira | simplex |
| 277 | Arthropoda | Copepoda | Harpacticoida | NS | Robertgurneya | diversa |
| 278 | Arthropoda | Copepoda | Harpacticoida | NS | Robertgurneya | hopkinsi |
| 279 | Arthropoda | Copepoda | Harpacticoida | NS | Scottopsyllus | sp. |
| 280 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Apodopsyllus | vermiculiformis |
| 281 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Ameira | longipes |
| 282 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Ameira | parvuloides |
| 283 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Ameira | sp. |
| 284 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Nitocra | spinipes armata |
| 285 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Pseudoleptomesochra | sp. |
| 286 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Psyllocamptus | minutus |
| 287 | Arthropoda | Copepoda | Harpacticoida | Ameiridae | Sarsameira | sp. |
| 288 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Attheyella | obtogamensis |
| 289 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Bryocamptus | hiemalis |
| 290 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Bryocamptus | zschokkei |
| 291 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Mesochra | pygmaea |
| 292 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Mesochra | sp. |
| 293 | Arthropoda | Copepoda | Harpacticoida | Canthocamptidae | Orthopsyllus | sp. |
| 294 | Arthropoda | Copepoda | Harpacticoida | Canuellidae | Scottolana | canadensis |
| 295 | Arthropoda | Copepoda | Harpacticoida | Cletodidae | Enhydrosoma | hopkinsi |
| 296 | Arthropoda | Copepoda | Harpacticoida | Cletodidae | Enhydrosoma | sp. |
| 297 | Arthropoda | Copepoda | Harpacticoida | Cletodidae | Huntemannia | jadensis |
| 298 | Arthropoda | Copepoda | Harpacticoida | Cletodidae | Huntemannia | sp. |
| 299 | Arthropoda | Copepoda | Harpacticoida | Cletodidae | Limnocletodes | behningi |
| 300 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | Leptastacus | constrictus |
| 301 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | Paraleptastacus | sp. |
| 302 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | Paraleptastacus | spinicauda |
| 303 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | Paraleptastacus | vermicularis |
| 304 | Arthropoda | Copepoda | Harpacticoida | Darcythompsoniidae | Leptocaris | sp. |
| 305 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amonardia | normani |
| 306 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amonardia | perturbata |
| 307 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amphiascoides | dimorphus |
| 308 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amphiascoides | sp. |
| 309 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amphiascopsis | cinctus |
| 310 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amphiascus | undosus |
| 311 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amphiasus | minutus |

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|---|---|---|---|---|---|---|
| 312 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Diosaccus | sp. |
| 313 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Diosaccus | spinatus |
| 314 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Robertsonia | propinqua |
| 315 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Schizopera | knabeni |
| 316 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Schizopera | sp. |
| 317 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Stenhelia | asetosa |
| 318 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Stenhelia | oblonga |
| 319 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Stenhelia | peniculata |
| 320 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Stenhelia | sp. |
| 321 | Arthropoda | Copepoda | Harpacticoida | Ectinosomatidae | NS | sp. |
| 322 | Arthropoda | Copepoda | Harpacticoida | Ectinosomatidae | Halectinosoma | sp. |
| 323 | Arthropoda | Copepoda | Harpacticoida | Ectinosomatidae | Microstella | rosea |
| 324 | Arthropoda | Copepoda | Harpacticoida | Ectinosomatidae | Microstella | sp. |
| 325 | Arthropoda | Copepoda | Harpacticoida | Ectinosomatidae | Pseudobradya | sp. |
| 326 | Arthropoda | Copepoda | Harpacticoida | Harpacticidae | Harpacticus | sp. |
| 327 | Arthropoda | Copepoda | Harpacticoida | Harpacticidae | Harpacticus | spinulosus |
| 328 | Arthropoda | Copepoda | Harpacticoida | Harpacticidae | Harpacticus | uniremis |
| 329 | Arthropoda | Copepoda | Harpacticoida | Harpacticidae | Zaus | aurelli |
| 330 | Arthropoda | Copepoda | Harpacticoida | Harpacticidae | Zaus | sp. |
| 331 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | NS | sp. |
| 332 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Echinolaophonte | armiger |
| 333 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Heterolaophonte | discophora |
| 334 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Heterolaophonte | hamondi |
| 335 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Heterolaophonte | (littoralis) longisetigera |
| 336 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Heterolaophonte | sp. |
| 337 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Heterolaophonte | variabilis |
| 338 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Paralaophonte | congenera congenera |
| 339 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Paralaophonte | pacifica |
| 340 | Arthropoda | Copepoda | Harpacticoida | Laophontidae | Pseudonychocamptus | spinifer |
| 341 | Arthropoda | Copepoda | Harpacticoida | Longipediidae | Longipedia | americana |
| 342 | Arthropoda | Copepoda | Harpacticoida | Parastenheliidae | Parastenhelia | hornelli |
| 343 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Danielssenia | typica |
| 344 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Microarthridion | littorale |
| 345 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Tachidius | discipes |
| 346 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Tachidius | incisipes |
| 347 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Tachidius | sp. |
| 348 | Arthropoda | Copepoda | Harpacticoida | Tachidiidae | Tachidius | triangularis |
| 349 | Arthropoda | Copepoda | Harpacticoida | Tegastidae | NS | sp. |
| 350 | Arthropoda | Copepoda | Harpacticoida | Tegastidae | Tegastes | triargularis |
| 351 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Dactylopodia | crassipes |
| 352 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Dactylopodia | sp. |
| 353 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Dactylopodia | vulgaris |
| 354 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Diarthrodes | unisetosus |
| 355 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Diarthrodis | sp. |
| 356 | Arthropoda | Copepoda | Harpacticoida | Tisbidae | Scutellidium | arthuri |
| 357 | Arthropoda | Copepoda | Harpacticoida | Tisbidae | Scutellidium | sp. |
| 358 | Arthropoda | Copepoda | Harpacticoida | Tisbidae | Tisbe | sp. |
| 359 | Arthropoda | Insecta | Coleoptera | NS | NS | sp. |
| 360 | Arthropoda | Insecta | Coleoptera | Amphizoidae | NS | sp. |
| 361 | Arthropoda | Insecta | Coleoptera | Chrysomelidae | NS | sp. |
| 362 | Arthropoda | Insecta | Coleoptera | Chrysomelidae (Chrysopetalidae) | Galerucella | sp. |
| 363 | Arthropoda | Insecta | Coleoptera | Curculionidae | NS | sp. |
| 364 | Arthropoda | Insecta | Coleoptera | Dryopidae | NS | sp. |
| 365 | Arthropoda | Insecta | Coleoptera | Dytiscidae | NS | sp. |
| 366 | Arthropoda | Insecta | Coleoptera | Elmidae | NS | sp. |
| 367 | Arthropoda | Insecta | Coleoptera | Elmidae | Heterelmis | sp. |
| 368 | Arthropoda | Insecta | Coleoptera | Elmidae | Heterlimnius | koebelei |
| 369 | Arthropoda | Insecta | Coleoptera | Elmidae | Heterlimnius | sp. |
| 370 | Arthropoda | Insecta | Coleoptera | Elmidae | Narpus | sp. |
| 371 | Arthropoda | Insecta | Coleoptera | Elmidae | Optioservus | sp. |
| 372 | Arthropoda | Insecta | Coleoptera | Elmidae | Rhizelmis | sp. |
| 373 | Arthropoda | Insecta | Coleoptera | Elmidae | Zaitzevia | sp. |

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|---|---|---|---|---|---|---|
| 374 | Arthropoda | Insecta | Coleoptera | Haliplidae | NS | sp. |
| 375 | Arthropoda | Insecta | Coleoptera | Helodidae | NS | sp. |
| 376 | Arthropoda | Insecta | Coleoptera | Hydraeniidae | NS | sp. |
| 377 | Arthropoda | Insecta | Coleoptera | Hydrophilidae | NS | sp. |
| 378 | Arthropoda | Insecta | Collembola | NS | NS | sp. |
| 379 | Arthropoda | Insecta | Collembola | Isotomidae | NS | sp. |
| 380 | Arthropoda | Insecta | Collembola | Isotomidae | Isotomurus | sp. |
| 381 | Arthropoda | Insecta | Collembola | Sminthuridae | Sminthurides | sp. |
| 382 | Arthropoda | Insecta | Diptera | NS | NS | sp. |
| 383 | Arthropoda | Insecta | Diptera | Anisopodidae | NS | sp. |
| 384 | Arthropoda | Insecta | Diptera | Athericidae | NS | sp. |
| 385 | Arthropoda | Insecta | Diptera | Athericidae | Atherix | pachypus |
| 386 | Arthropoda | Insecta | Diptera | Athericidae (Rhagionidae) | Atherix | sp. |
| 387 | Arthropoda | Insecta | Diptera | Athericidae | Atherix | variegata |
| 388 | Arthropoda | Insecta | Diptera | Blephariceridae | Agathon | sp. |
| 389 | Arthropoda | Insecta | Diptera | Blephariceridae | Blepharcocera | sp. |
| 390 | Arthropoda | Insecta | Diptera | Blephariceridae | Philorus | sp. |
| 391 | Arthropoda | Insecta | Diptera | Ceratopogonidae | NS | sp. |
| 392 | Arthropoda | Insecta | Diptera | Ceratopogonidae | Alluaudomyia | sp. |
| 393 | Arthropoda | Insecta | Diptera | Ceratopogonidae | Bezzia | sp. |
| 394 | Arthropoda | Insecta | Diptera | Ceratopogonidae | Dasyhelea | sp. |
| 395 | Arthropoda | Insecta | Diptera | Ceratopogonidae | Leptoconops | sp. |
| 396 | Arthropoda | Insecta | Diptera | Ceratopogonidae | Palpomyia | sp. |
| 397 | Arthropoda | Insecta | Diptera | Chaoboridae | NS | sp. |
| 398 | Arthropoda | Insecta | Diptera | Chaoboridae | Chaoborus | sp. |
| 399 | Arthropoda | Insecta | Diptera | Chironomidae | NS | sp. |
| 400 | Arthropoda | Insecta | Diptera | Chironomidae | Ablabesmyia | sp. |
| 401 | Arthropoda | Insecta | Diptera | Chironomidae | Brillia | retifinis |
| 402 | Arthropoda | Insecta | Diptera | Chironomidae | Brillia | sp. |
| 403 | Arthropoda | Insecta | Diptera | Chironomidae | Cardiocladius | sp. |
| 404 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | modestus |
| 405 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | sp. |
| 406 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | thumni |
| 407 | Arthropoda | Insecta | Diptera | Chironomidae | Cladotanytarsus | sp. |
| 408 | Arthropoda | Insecta | Diptera | Chironomidae | Corynoneura | scutellata |
| 409 | Arthropoda | Insecta | Diptera | Chironomidae | Corynoneura | sp. |
| 410 | Arthropoda | Insecta | Diptera | Chironomidae | Cricotopus | sp. |
| 411 | Arthropoda | Insecta | Diptera | Chironomidae | Cryptochironomus | digitatus |
| 412 | Arthropoda | Insecta | Diptera | Chironomidae | Cryptochironomus | sp. |
| 413 | Arthropoda | Insecta | Diptera | Chironomidae | Cryptotendipes | sp. |
| 414 | Arthropoda | Insecta | Diptera | Chironomidae | Cyphomella | sp. |
| 415 | Arthropoda | Insecta | Diptera | Chironomidae | Demicryptochironomus | sp. |
| 416 | Arthropoda | Insecta | Diptera | Chironomidae | Diamesa | sp. |
| 417 | Arthropoda | Insecta | Diptera | Chironomidae | Dicrotendipes (Limnochironomus) | sp. |
| 418 | Arthropoda | Insecta | Diptera | Chironomidae | Diplocladius | sp. |
| 419 | Arthropoda | Insecta | Diptera | Chironomidae | Endochironomus | sp. |
| 420 | Arthropoda | Insecta | Diptera | Chironomidae | Eukiefferiella | sp. |
| 421 | Arthropoda | Insecta | Diptera | Chironomidae | Glyptotendipes | sp. |
| 422 | Arthropoda | Insecta | Diptera | Chironomidae | Gymnometriocnemus | sp. |
| 423 | Arthropoda | Insecta | Diptera | Chironomidae | Harnischia | sp. |
| 424 | Arthropoda | Insecta | Diptera | Chironomidae | Heterotrissocladius | changi |
| 425 | Arthropoda | Insecta | Diptera | Chironomidae | Heterotrissocladius | grimshawi |
| 426 | Arthropoda | Insecta | Diptera | Chironomidae | Heterotrissocladius | sp. |
| 427 | Arthropoda | Insecta | Diptera | Chironomidae | Hydrobaenus | sp. |
| 428 | Arthropoda | Insecta | Diptera | Chironomidae | Krenosmittia | sp. |
| 429 | Arthropoda | Insecta | Diptera | Chironomidae | Limnophyes | sp. |
| 430 | Arthropoda | Insecta | Diptera | Chironomidae | Metriocnemus | sp. |
| 431 | Arthropoda | Insecta | Diptera | Chironomidae | Micropsectra | sp. |
| 432 | Arthropoda | Insecta | Diptera | Chironomidae | Microtendipes | pedellus |
| 433 | Arthropoda | Insecta | Diptera | Chironomidae | Microtendipes | sp. |
| 434 | Arthropoda | Insecta | Diptera | Chironomidae | Monodiamesa | sp. |
| 435 | Arthropoda | Insecta | Diptera | Chironomidae | Monodiamesa | bathyphila |

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|---|---|---|---|---|---|---|
| 436 | Arthropoda | Insecta | Diptera | Chironomidae | Nanocladius | sp. |
| 437 | Arthropoda | Insecta | Diptera | Chironomidae | Natarsia | sp. |
| 438 | Arthropoda | Insecta | Diptera | Chironomidae | Nilotanypus | fimbriatus |
| 439 | Arthropoda | Insecta | Diptera | Chironomidae | Orthocladinnae | sp. |
| 440 | Arthropoda | Insecta | Diptera | Chironomidae | Orthocladius | obumbratus |
| 441 | Arthropoda | Insecta | Diptera | Chironomidae | Orthocladius | sp. |
| 442 | Arthropoda | Insecta | Diptera | Chironomidae | Pagastiella | sp. |
| 443 | Arthropoda | Insecta | Diptera | Chironomidae | Paracladius | sp. |
| 444 | Arthropoda | Insecta | Diptera | Chironomidae | Paracladopelma | sp. |
| 445 | Arthropoda | Insecta | Diptera | Chironomidae | Parakiefferiella | sp. |
| 446 | Arthropoda | Insecta | Diptera | Chironomidae | Paralauterborniella | sp. |
| 447 | Arthropoda | Insecta | Diptera | Chironomidae | Paralauterborniella (Apedilum) | sp. |
| 448 | Arthropoda | Insecta | Diptera | Chironomidae | Paraphaenocladius | sp. |
| 449 | Arthropoda | Insecta | Diptera | Chironomidae | Paratanytarsus | sp. |
| 450 | Arthropoda | Insecta | Diptera | Chironomidae | Paratendipes | sp. |
| 451 | Arthropoda | Insecta | Diptera | Chironomidae | Pentaneura | sp. |
| 452 | Arthropoda | Insecta | Diptera | Chironomidae | Phaenopsectra | albescens |
| 453 | Arthropoda | Insecta | Diptera | Chironomidae | Phaenopsectra | sp. |
| 454 | Arthropoda | Insecta | Diptera | Chironomidae | Polypedilum | sp. |
| 455 | Arthropoda | Insecta | Diptera | Chironomidae | Potthastia | sp. |
| 456 | Arthropoda | Insecta | Diptera | Chironomidae | Procladius | sp. |
| 457 | Arthropoda | Insecta | Diptera | Chironomidae | Prodiamesa | sp. |
| 458 | Arthropoda | Insecta | Diptera | Chironomidae | Prodiamesa | olivacea |
| 459 | Arthropoda | Insecta | Diptera | Chironomidae | Psectrocladius | semicirculatus |
| 460 | Arthropoda | Insecta | Diptera | Chironomidae | Psectrocladius | sp. |
| 461 | Arthropoda | Insecta | Diptera | Chironomidae | Psectrotanypus | sp. |
| 462 | Arthropoda | Insecta | Diptera | Chironomidae | Pseudodiamesa | sp. |
| 463 | Arthropoda | Insecta | Diptera | Chironomidae | Rheocricotopus | sp. |
| 464 | Arthropoda | Insecta | Diptera | Chironomidae | Rheotanytarsus | sp. |
| 465 | Arthropoda | Insecta | Diptera | Chironomidae | Robackia | demeijeri |
| 466 | Arthropoda | Insecta | Diptera | Chironomidae | Saetheria | tylus |
| 467 | Arthropoda | Insecta | Diptera | Chironomidae | Stempellina | sp. |
| 468 | Arthropoda | Insecta | Diptera | Chironomidae | Stempellinella | sp. |
| 469 | Arthropoda | Insecta | Diptera | Chironomidae | Stictochironomus | sp. |
| 470 | Arthropoda | Insecta | Diptera | Chironomidae | Symbiocladius | sp. |
| 471 | Arthropoda | Insecta | Diptera | Chironomidae | Syndiamesa | pertinax |
| 472 | Arthropoda | Insecta | Diptera | Chironomidae | Syndiamesa | sp. |
| 473 | Arthropoda | Insecta | Diptera | Chironomidae | Synorthocladius | sp. |
| 474 | Arthropoda | Insecta | Diptera | Chironomidae | Tanypus | sp. |
| 475 | Arthropoda | Insecta | Diptera | Chironomidae | Tanytarsus | sp. |
| 476 | Arthropoda | Insecta | Diptera | Chironomidae | Thienemanniella | sp. |
| 477 | Arthropoda | Insecta | Diptera | Chironomidae | Thienemannimyia | sp. |
| 478 | Arthropoda | Insecta | Diptera | Chironomidae | Tribelos | sp. |
| 479 | Arthropoda | Insecta | Diptera | Chironomidae | Trichocladius | sp. |
| 480 | Arthropoda | Insecta | Diptera | Chironomidae | Xenochironomus | sp. |
| 481 | Arthropoda | Insecta | Diptera | Chironomidae | Zavrelia | brevicosta |
| 482 | Arthropoda | Insecta | Diptera | Chironomidae | Zavrelia | sp. |
| 483 | Arthropoda | Insecta | Diptera | Culicidae | NS | sp. |
| 484 | Arthropoda | Insecta | Diptera | Deuterophlebiidae | Deuterophlebia | colaradoclensis |
| 485 | Arthropoda | Insecta | Diptera | Deuterophlebiidae | Deuterophlebia | sp. |
| 486 | Arthropoda | Insecta | Diptera | Dixidae | NS | sp. |
| 487 | Arthropoda | Insecta | Diptera | Dixidae | Meringodixa | sp. |
| 488 | Arthropoda | Insecta | Diptera | Dolichopodidae | NS | sp. |
| 489 | Arthropoda | Insecta | Diptera | Dolichopodidae | Systemus | sp. |
| 490 | Arthropoda | Insecta | Diptera | Empididae | NS | sp. |
| 491 | Arthropoda | Insecta | Diptera | Empididae | Chelifera | sp. |
| 492 | Arthropoda | Insecta | Diptera | Empididae | Clinocera | sp. |
| 493 | Arthropoda | Insecta | Diptera | Empididae | Hemerodromia | sp. |
| 494 | Arthropoda | Insecta | Diptera | Empididae | Oreogeton | sp. |
| 495 | Arthropoda | Insecta | Diptera | Muscidae | NS | sp. |
| 496 | Arthropoda | Insecta | Diptera | Muscidae (Anthomyiidae) | Limnophora | sp. |
| 497 | Arthropoda | Insecta | Diptera | Psychodidae | NS | sp. |

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| 498 | Arthropoda | Insecta | Diptera | Psychodidae | Pericoma | sp. |
| 499 | Arthropoda | Insecta | Diptera | Simuliidae | NS | sp. |
| 500 | Arthropoda | Insecta | Diptera | Simuliidae | Cnephia | sp. |
| 501 | Arthropoda | Insecta | Diptera | Simuliidae | Prosimulium | sp. |
| 502 | Arthropoda | Insecta | Diptera | Simuliidae | Simulium | sp. |
| 503 | Arthropoda | Insecta | Diptera | Tabanidae | NS | sp. |
| 504 | Arthropoda | Insecta | Diptera | Tabanidae | Tabanus | sp. |
| 505 | Arthropoda | Insecta | Diptera | Tanyderidae | NS | sp. |
| 506 | Arthropoda | Insecta | Diptera | Tanyderidae | Protanyderus | margarita |
| 507 | Arthropoda | Insecta | Diptera | Tanyderidae | Protanyderus | sp. |
| 508 | Arthropoda | Insecta | Diptera | Tanyderidae | Protoplasa | sp. |
| 509 | Arthropoda | Insecta | Diptera | Tendipedidae | NS | sp. |
| 510 | Arthropoda | Insecta | Diptera | Tipulidae | NS | sp. |
| 511 | Arthropoda | Insecta | Diptera | Tipulidae | Antocha | sp. |
| 512 | Arthropoda | Insecta | Diptera | Tipulidae | Dicranota | sp. |
| 513 | Arthropoda | Insecta | Diptera | Tipulidae | Erioptera | sp. |
| 514 | Arthropoda | Insecta | Diptera | Tipulidae | Hexatoma | sp. |
| 515 | Arthropoda | Insecta | Diptera | Tipulidae | Limnophila | sp. |
| 516 | Arthropoda | Insecta | Diptera | Tipulidae | Tipula | sp. |
| 517 | Arthropoda | Insecta | Ephemeroptera | NS | NS | sp. |
| 518 | Arthropoda | Insecta | Ephemeroptera | Ametropodidae | Ametropus | ammophilus |
| 519 | Arthropoda | Insecta | Ephemeroptera | Ametropodidae | Ametropus | sp. |
| 520 | Arthropoda | Insecta | Ephemeroptera | Baetidae | NS | sp. |
| 521 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Baetis | insignificans |
| 522 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Baetis | sp. |
| 523 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Baetis | tricaudatus |
| 524 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Centroptilum | sp. |
| 525 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Neocloeon | sp. |
| 526 | Arthropoda | Insecta | Ephemeroptera | Baetidae | Pseudocloeon | sp. |
| 527 | Arthropoda | Insecta | Ephemeroptera | Behningiidae | NS | sp. |
| 528 | Arthropoda | Insecta | Ephemeroptera | Caenidae (Baetidae) | Caenis | sp. |
| 529 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | NS | sp. |
| 530 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Drunella | spinifera |
| 531 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | doddsi |
| 532 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | flavilinea |
| 533 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | fuscata |
| 534 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | grandis grandis |
| 535 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | grandis ingens |
| 536 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | inermis |
| 537 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | infrequens |
| 538 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | invaria |
| 539 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | proserpina |
| 540 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | serrata |
| 541 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | serrata micheneri |
| 542 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | sp. |
| 543 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella (Caudatella) | sp. |
| 544 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | spinifera |
| 545 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Serratella | tibialis |
| 546 | Arthropoda | Insecta | Ephemeroptera | Ephemeridae | Ephemera | sp. |
| 547 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | NS | sp. |
| 548 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Cinygma | sp. |
| 549 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Cinygmula | sp. |
| 550 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Epeorus (Iron) (Ironopsus) | longimanus |
| 551 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Epeorus (Iron) (Ironopsus) | sp. |
| 552 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Heptagenia | sp. |
| 553 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Ironodes | sp. |
| 554 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Ironopsus (Iron) (Epeorus) | sp. |
| 555 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Rhithrogena | sp. |
| 556 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Rhithrogena | hageni |
| 557 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Stenonema | sp. |

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| 558 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | NS | sp. |
| 559 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | Leptophlebia | sp. |
| 560 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | Paraleptophlebia | debilis |
| 561 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | Paraleptophlebia | gregalis |
| 562 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | Paraleptophlebia | sp. |
| 563 | Arthropoda | Insecta | Ephemeroptera | Leptophlebiidae | Paraleptophlebia | temporalis |
| 564 | Arthropoda | Insecta | Ephemeroptera | Siphlonuridae | NS | sp. |
| 565 | Arthropoda | Insecta | Ephemeroptera | Siphlonuridae | Ameletus | sp. |
| 566 | Arthropoda | Insecta | Ephemeroptera | Siphlonuridae | Edmundsius | sp. |
| 567 | Arthropoda | Insecta | Hemiptera | NS | NS | sp. |
| 568 | Arthropoda | Insecta | Hemiptera | Cicadellidae | NS | sp. |
| 569 | Arthropoda | Insecta | Hemiptera | Corixidae | NS | sp. |
| 570 | Arthropoda | Insecta | Hemiptera | Corixidae | Graptocorixa | sp. |
| 571 | Arthropoda | Insecta | Hemiptera | Corixidae | Hesperocorixa | sp. |
| 572 | Arthropoda | Insecta | Hemiptera | Corixidae | Trichocorixa | sp. |
| 573 | Arthropoda | Insecta | Hymenoptera | NS | NS | sp. |
| 574 | Arthropoda | Insecta | Lepidoptera | NS | NS | sp. |
| 575 | Arthropoda | Insecta | Lepidoptera | Cossidae | NS | sp. |
| 576 | Arthropoda | Insecta | Megaloptera | Sialidae | NS | sp. |
| 577 | Arthropoda | Insecta | Odonata | NS | NS | sp. |
| 578 | Arthropoda | Insecta | Odonata | Gomphidae | Ophiogomphus | sp. |
| 579 | Arthropoda | Insecta | Plecoptera | NS | NS | sp. |
| 580 | Arthropoda | Insecta | Plecoptera | Capniidae | NS | sp. |
| 581 | Arthropoda | Insecta | Plecoptera | Capniidae | Capnia | sp. |
| 582 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | NS | sp. |
| 583 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Alloperla | sp. |
| 584 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Hastaperla | sp. |
| 585 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Paraperla | sp. |
| 586 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Sweltsa | sp. |
| 587 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Triznaka | diversa |
| 588 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Utaperla | sp. |
| 589 | Arthropoda | Insecta | Plecoptera | Leuctridae | NS | sp. |
| 590 | Arthropoda | Insecta | Plecoptera | Leuctridae | Despaxia | augusta |
| 591 | Arthropoda | Insecta | Plecoptera | Leuctridae | Despaxia | sp. |
| 592 | Arthropoda | Insecta | Plecoptera | Leuctridae | Leuctra | sp. |
| 593 | Arthropoda | Insecta | Plecoptera | Leuctridae | Perlomyia | sp. |
| 594 | Arthropoda | Insecta | Plecoptera | Nemouridae | NS | sp. |
| 595 | Arthropoda | Insecta | Plecoptera | Nemouridae | Amphinemoura | sp. |
| 596 | Arthropoda | Insecta | Plecoptera | Nemouridae | Amphinemura | linda |
| 597 | Arthropoda | Insecta | Plecoptera | Nemouridae | Brachyptera | sp. |
| 598 | Arthropoda | Insecta | Plecoptera | Nemouridae | Eucapnopsis | sp. |
| 599 | Arthropoda | Insecta | Plecoptera | Nemouridae | Malenka | californica |
| 600 | Arthropoda | Insecta | Plecoptera | Nemouridae | Malenka | cornuta |
| 601 | Arthropoda | Insecta | Plecoptera | Nemouridae | Malenka | sp. |
| 602 | Arthropoda | Insecta | Plecoptera | Nemouridae | Nemoura | californica |
| 603 | Arthropoda | Insecta | Plecoptera | Nemouridae | Nemoura | cinctipes |
| 604 | Arthropoda | Insecta | Plecoptera | Nemouridae | Nemoura | sp. |
| 605 | Arthropoda | Insecta | Plecoptera | Nemouridae | Podmosta | sp. |
| 606 | Arthropoda | Insecta | Plecoptera | Nemouridae | Soyedina | producta |
| 607 | Arthropoda | Insecta | Plecoptera | Nemouridae | Zapada | cinctipes |
| 608 | Arthropoda | Insecta | Plecoptera | Nemouridae | Zapada | haysi |
| 609 | Arthropoda | Insecta | Plecoptera | Nemouridae | Zapada | sp. |
| 610 | Arthropoda | Insecta | Plecoptera | Perlidae | NS | sp. |
| 611 | Arthropoda | Insecta | Plecoptera | Perlidae | Acroneuria | sp. |
| 612 | Arthropoda | Insecta | Plecoptera | Perlidae | Claasenia | sabulosa |
| 613 | Arthropoda | Insecta | Plecoptera | Perlidae | Claasenia | sp. |
| 614 | Arthropoda | Insecta | Plecoptera | Perlidae | Hesperoperla | pacifica |
| 615 | Arthropoda | Insecta | Plecoptera | Perlodidae | NS | sp. |
| 616 | Arthropoda | Insecta | Plecoptera | Perlodidae | Arcynopteryx | sp. |
| 617 | Arthropoda | Insecta | Plecoptera | Perlodidae | Cultus | sp. |
| 618 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isogenoides | elongatus |
| 619 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isogenoides | sp. |
| 620 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isoperla | bilineata |
| 621 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isoperla | sp. |

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| 622 | Arthropoda | Insecta | Plecoptera | Perlodidae | Skwala | sp. |
| 623 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | NS | sp. |
| 624 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcella | badia |
| 625 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcella | regularis |
| 626 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcella | sp. |
| 627 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcys | dorsata |
| 628 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcys | princeps |
| 629 | Arthropoda | Insecta | Plecoptera | Pteronarcyidae | Pteronarcys | sp. |
| 630 | Arthropoda | Insecta | Plecoptera | Taeniopterygidae | Tainionema | sp. |
| 631 | Arthropoda | Insecta | Trichoptera | NS | NS | sp. |
| 632 | Arthropoda | Insecta | Trichoptera | Brachycentridae | NS | sp. |
| 633 | Arthropoda | Insecta | Trichoptera | Brachycentridae | Amiocentrus | sp. |
| 634 | Arthropoda | Insecta | Trichoptera | Brachycentridae | Brachycentrus | sp. |
| 635 | Arthropoda | Insecta | Trichoptera | Brachycentridae | Micrasema | sp. |
| 636 | Arthropoda | Insecta | Trichoptera | Calamoceratidae | Heteroplectron | californicum |
| 637 | Arthropoda | Insecta | Trichoptera | Glossosomatidae | NS | sp. |
| 638 | Arthropoda | Insecta | Trichoptera | Glossosomatidae | Agapetus | sp. |
| 639 | Arthropoda | Insecta | Trichoptera | Glossosomatidae | Anagapetus | sp. |
| 640 | Arthropoda | Insecta | Trichoptera | Glossosomatidae | Glossosoma | penitum |
| 641 | Arthropoda | Insecta | Trichoptera | Glossosomatidae | Glossosoma | sp. |
| 642 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | NS | sp. |
| 643 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Arctopsyche | grandis |
| 644 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Arctopsyche | sp. |
| 645 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Cheumatopsyche | sp. |
| 646 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Hydropsyche | sp. |
| 647 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Parapsyche | sp. |
| 648 | Arthropoda | Insecta | Trichoptera | Hydropsychidae | Symphitopsyche | sp. |
| 649 | Arthropoda | Insecta | Trichoptera | Hydroptilidae | NS | sp. |
| 650 | Arthropoda | Insecta | Trichoptera | Hydroptilidae | Hydroptila | sp. |
| 651 | Arthropoda | Insecta | Trichoptera | Hydroptilidae | Oxythira | sp. |
| 652 | Arthropoda | Insecta | Trichoptera | Lepidostomatidae | NS | sp. |
| 653 | Arthropoda | Insecta | Trichoptera | Lepidostomatidae | Lepidostoma | roafi |
| 654 | Arthropoda | Insecta | Trichoptera | Lepidostomatidae | Lepidostoma | sp. |
| 655 | Arthropoda | Insecta | Trichoptera | Lepidostomatidae | Lepidostomata | unicolor |
| 656 | Arthropoda | Insecta | Trichoptera | Lepidostomatidae | Onocosmeacus | sp. |
| 657 | Arthropoda | Insecta | Trichoptera | Leptoceridae | NS | sp. |
| 658 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Simulium | sp. |
| 659 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Mystacides | alafimbriata |
| 660 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Mystacides | sp. |
| 661 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Oecetis | inconspicua |
| 662 | Arthropoda | Insecta | Trichoptera | Limnephilidae | NS | sp. |
| 663 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Chyranda | centralis |
| 664 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Clistoronia | magnifica |
| 665 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Dicosmoecus | atripes |
| 666 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Dicosmoecus | sp. |
| 667 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Ecclisocosmoecus | scylla |
| 668 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Ecclisomyia | conspersa |
| 669 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Ecclisomyia | sp. |
| 670 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Glyphopsyche | irrorata |
| 671 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Halesochila | taylori |
| 672 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Hesperophylax | sp. |
| 673 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Homophylax | sp. |
| 674 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Hydatophylax | sp. |
| 675 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Lenarchus | vastus |
| 676 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Neothremma | sp. |
| 677 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Nemotaulius | sp. |
| 678 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Onocosmoecus | sp. |
| 679 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Psychoglypha | alascensis |
| 680 | Arthropoda | Insecta | Trichoptera | Molannidae | Molanna | sp. |
| 681 | Arthropoda | Insecta | Trichoptera | Philopotamidae | NS | sp. |
| 682 | Arthropoda | Insecta | Trichoptera | Philopotamidae | Wormaldia | anilla |
| 683 | Arthropoda | Insecta | Trichoptera | Philopotamidae | Wormaldia | sp. |
| 684 | Arthropoda | Insecta | Trichoptera | Phryganeidae | NS | sp. |
| 685 | Arthropoda | Insecta | Trichoptera | Phryganeidae | Banksiola | crotchi |

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| 686 | Arthropoda | Insecta | Trichoptera | Phryganeidae | Ptilostomis | ocellifera |
| 687 | Arthropoda | Insecta | Trichoptera | Polycentropodidae (Psychomyiidae) | Neureclipsis | sp. |
| 688 | Arthropoda | Insecta | Trichoptera | Polycentropodidae | Polycentropus | sp. |
| 689 | Arthropoda | Insecta | Trichoptera | Psychomyiidae | NS | sp. |
| 690 | Arthropoda | Insecta | Trichoptera | Psychomyiidae | Polycentropus | cinereus |
| 691 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | NS | sp. |
| 692 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | acropedes |
| 693 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | inculata |
| 694 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | sp. |
| 695 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | vaccua |
| 696 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | vagrita |
| 697 | Arthropoda | Malacostraca | Amphipoda | NS | NS | sp. |
| 698 | Arthropoda | Malacostraca | Amphipoda | Ampeliscidae | Ampelisca | agassizi |
| 699 | Arthropoda | Malacostraca | Amphipoda | Ampeliscidae | Ampelisca | careyi |
| 700 | Arthropoda | Malacostraca | Amphipoda | Ampeliscidae | Ampelisca | pugetica |
| 701 | Arthropoda | Malacostraca | Amphipoda | Ampeliscidae | Ampelisca | sp. |
| 702 | Arthropoda | Malacostraca | Amphipoda | Ampithoidae | Ampithoe | humeralis |
| 703 | Arthropoda | Malacostraca | Amphipoda | Ampithoidae | Ampithoe | lacertosa |
| 704 | Arthropoda | Malacostraca | Amphipoda | Ampithoidae | Ampithoe | sp. |
| 705 | Arthropoda | Malacostraca | Amphipoda | Ampithoidae | Ampithoe | valida |
| 706 | Arthropoda | Malacostraca | Amphipoda | Anisogammaridae | Anisogammarus | confervicolus |
| 707 | Arthropoda | Malacostraca | Amphipoda | Anisogammaridae | Anisogammarus | pugettensis |
| 708 | Arthropoda | Malacostraca | Amphipoda | Anisogammaridae | Anisogammarus | sp. |
| 709 | Arthropoda | Malacostraca | Amphipoda | Anisogammaridae | Eogammarus | confervicolus |
| 710 | Arthropoda | Malacostraca | Amphipoda | Anisogammaridae | Eogammarus | sp. |
| 711 | Arthropoda | Malacostraca | Amphipoda | Aoridae | NS | sp. |
| 712 | Arthropoda | Malacostraca | Amphipoda | Aoridae | Aoroides | columbiae |
| 713 | Arthropoda | Malacostraca | Amphipoda | Atylidae | Atylus | collingi |
| 714 | Arthropoda | Malacostraca | Amphipoda | Atylidae | Atylus | sp. |
| 715 | Arthropoda | Malacostraca | Amphipoda | Calliopiidae | Calliopius | laeviusculus |
| 716 | Arthropoda | Malacostraca | Amphipoda | Calliopiidae | Calliopius | sp. |
| 717 | Arthropoda | Malacostraca | Amphipoda | Caprellidae | Caprella | lacviuscula |
| 718 | Arthropoda | Malacostraca | Amphipoda | Caprellidae | Caprella | sp. |
| 719 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | ascherusicum |
| 720 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | brevis |
| 721 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | salmonis |
| 722 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | sp. |
| 723 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | spinicorne |
| 724 | Arthropoda | Malacostraca | Amphipoda | Crangonyctidae | Crangonyx | richmondensis occidentalis |
| 725 | Arthropoda | Malacostraca | Amphipoda | Crangonyetidae | NS | sp. |
| 726 | Arthropoda | Malacostraca | Amphipoda | Dexaminidae | Guernea | reduncans |
| 727 | Arthropoda | Malacostraca | Amphipoda | Gammaridae | NS | sp. |
| 728 | Arthropoda | Malacostraca | Amphipoda | Gammaridae | Gammarus | lacustris |
| 729 | Arthropoda | Malacostraca | Amphipoda | Gammaridae | Gammarus | sp. |
| 730 | Arthropoda | Malacostraca | Amphipoda | Gammaridae | Crangonyx | sp. |
| 731 | Arthropoda | Malacostraca | Amphipoda | Haustoriidae | Eohaustorius | washingtonianus |
| 732 | Arthropoda | Malacostraca | Amphipoda | Hyalidae | Allorchestes | angusta |
| 733 | Arthropoda | Malacostraca | Amphipoda | Hyalidae | Hyale | plumulosa |
| 734 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | NS | sp. |
| 735 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | Cheirimedia | sp. |
| 736 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | Photis | brevipes |
| 737 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | Photis | oligochaeta |
| 738 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | Photis | sp. |
| 739 | Arthropoda | Malacostraca | Amphipoda | Isaeidae | Protomedia | fasciculata |
| 740 | Arthropoda | Malacostraca | Amphipoda | Ischyroceridae | Ischyrocerus | anguipes |
| 741 | Arthropoda | Malacostraca | Amphipoda | Ischyroceridae | Ischyrocerus | insidiosum |
| 742 | Arthropoda | Malacostraca | Amphipoda | Ischyroceridae | Ischyrocerus | sp. |
| 743 | Arthropoda | Malacostraca | Amphipoda | Lysianassidae | NS | sp. |
| 744 | Arthropoda | Malacostraca | Amphipoda | Lysianassidae | Lepidecreum | sp. |
| 745 | Arthropoda | Malacostraca | Amphipoda | Lysianassidae | Orchomene | pinguis |
| 746 | Arthropoda | Malacostraca | Amphipoda | Lysianassidae | Orchomene | sp. |
| 747 | Arthropoda | Malacostraca | Amphipoda | Melitidae | Melita | dentata |

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|---|---|---|---|---|---|---|
| 748 | Arthropoda | Malacostraca | Amphipoda | Oedicerotidae | NS | sp. |
| 749 | Arthropoda | Malacostraca | Amphipoda | Oedicerotidae | Monoculodes | sp. |
| 750 | Arthropoda | Malacostraca | Amphipoda | Oedicerotidae | Synchelidium | shoemakeri |
| 751 | Arthropoda | Malacostraca | Amphipoda | Oedicerotidae | Westwoodilla | caecula |
| 752 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Foxiphalus | sp. |
| 753 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Grandifoxus | sp. |
| 754 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Heterophoxus | oculatus |
| 755 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Paraphoxus | milleri |
| 756 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Paraphoxus | sp. |
| 757 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | Paraphoxus | spinosus |
| 758 | Arthropoda | Malacostraca | Amphipoda | Pleustidae | Parapleustes | pugettensis |
| 759 | Arthropoda | Malacostraca | Amphipoda | Podoceridae | NS | sp. |
| 760 | Arthropoda | Malacostraca | Amphipoda | Pontogeneiidae | Pontogeneia | intermedia |
| 761 | Arthropoda | Malacostraca | Amphipoda | Pontogeneiidae | Pontogeneia | rostrata |
| 762 | Arthropoda | Malacostraca | Amphipoda | Talitridae | Allorchestes | angustus |
| 763 | Arthropoda | Malacostraca | Amphipoda | Talitridae | Allorchestes | sp. |
| 764 | Arthropoda | Malacostraca | Amphipoda | Talitridae | Hyalella | azteca |
| 765 | Arthropoda | Malacostraca | Cumacea | NS | NS | sp. |
| 766 | Arthropoda | Malacostraca | Cumacea | Diastylidae | Diastylis | alaskensis |
| 767 | Arthropoda | Malacostraca | Cumacea | Diastylidae | Diastylopsis | sp. |
| 768 | Arthropoda | Malacostraca | Cumacea | Diastylidae | Diastylopsis | tenuis |
| 769 | Arthropoda | Malacostraca | Cumacea | Diastylidae | Oxyurostylis | |
| 770 | Arthropoda | Malacostraca | Cumacea | Lampropidae | Lamprops | fasicata |
| 771 | Arthropoda | Malacostraca | Cumacea | Lampropidae | Lamprops | quadriplicata |
| 772 | Arthropoda | Malacostraca | Cumacea | Lampropidae | Lamprops | sp. |
| 773 | Arthropoda | Malacostraca | Cumacea | Leuconidae | Eudorella | pacifica |
| 774 | Arthropoda | Malacostraca | Cumacea | Nannastacidae | Cumella | sp. |
| 775 | Arthropoda | Malacostraca | Cumacea | Nannastacidae | Cumella | vulgaris |
| 776 | Arthropoda | Malacostraca | Decapoda | NS | NS | sp. |
| 777 | Arthropoda | Malacostraca | Decapoda | Atelecyclidae | Telmessus | cheiragonus |
| 778 | Arthropoda | Malacostraca | Decapoda | Callianassidae | Callianassa | californiensis |
| 779 | Arthropoda | Malacostraca | Decapoda | Candridae | Cancer | gracilis |
| 780 | Arthropoda | Malacostraca | Decapoda | Candridae | Cancer | magister |
| 781 | Arthropoda | Malacostraca | Decapoda | Candridae | Cancer | productus |
| 782 | Arthropoda | Malacostraca | Decapoda | Cancridae | Cancer | sp. |
| 783 | Arthropoda | Malacostraca | Decapoda | Crangonidae | Crangon | alaskensis |
| 784 | Arthropoda | Malacostraca | Decapoda | Crangonidae | Crangon | communis |
| 785 | Arthropoda | Malacostraca | Decapoda | Crangonidae | Crangon | franciscorum |
| 786 | Arthropoda | Malacostraca | Decapoda | Crangonidae | Crangon (Crago) | nigricauda |
| 787 | Arthropoda | Malacostraca | Decapoda | Crangonidae | Crangon | sp. |
| 788 | Arthropoda | Malacostraca | Decapoda | Galatheidae | Munida | quadrispina |
| 789 | Arthropoda | Malacostraca | Decapoda | Grapsidae | Hemigrapsus | nudus |
| 790 | Arthropoda | Malacostraca | Decapoda | Grapsidae | Hemigrapsus | oregonensis |
| 791 | Arthropoda | Malacostraca | Decapoda | Grapsidae | Hemigrapsus | sp. |
| 792 | Arthropoda | Malacostraca | Decapoda | Hippolytidae | Heptacarpus | paludicola |
| 793 | Arthropoda | Malacostraca | Decapoda | Hippolytidae | Heptacarpus | stimpsoni |
| 794 | Arthropoda | Malacostraca | Decapoda | Hippolytidae | Hippolyte | clarki |
| 795 | Arthropoda | Malacostraca | Decapoda | Majidae | Oregonia | gracilis |
| 796 | Arthropoda | Malacostraca | Decapoda | Majidae | Pugettia | gracilis |
| 797 | Arthropoda | Malacostraca | Decapoda | Majidae | Pugettia | productus |
| 798 | Arthropoda | Malacostraca | Decapoda | Majidae | Pugettia | sp. |
| 799 | Arthropoda | Malacostraca | Decapoda | Paguridae | Pagurus | sp. |
| 800 | Arthropoda | Malacostraca | Decapoda | Pandalidae | Pandalopsis | dispar |
| 801 | Arthropoda | Malacostraca | Decapoda | Pandalidae | Pandalus | boerealis |
| 802 | Arthropoda | Malacostraca | Decapoda | Pandalidae | Pandalus | platyceros |
| 803 | Arthropoda | Malacostraca | Decapoda | Pandalidae | Pandalus | sp. |
| 804 | Arthropoda | Malacostraca | Decapoda | Pinnotheridae | Pinnixa | occidentalis |
| 805 | Arthropoda | Malacostraca | Decapoda | Pinnotheridae | Pinnixa | sp. |
| 806 | Arthropoda | Malacostraca | Decapoda | Pinnotheridae | Pinnixa | tubicola |
| 807 | Arthropoda | Malacostraca | Decapoda | Pinnotheridae | Scleroplax | granulata |
| 808 | Arthropoda | Malacostraca | Decapoda | Upogebiidae | Upogebia | pugettensis |
| 809 | Arthropoda | Malacostraca | Euphausiacea | NS | NS | sp. |
| 810 | Arthropoda | Malacostraca | Isopoda | NS | NS | sp. |
| 811 | Arthropoda | Malacostraca | Isopoda | Asellidae | NS | sp. |

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|---|---|---|---|---|---|---|
| 812 | Arthropoda | Malacostraca | Isopoda | Asellidae | Asellus | sp. |
| 813 | Arthropoda | Malacostraca | Isopoda | Bopyridae | Argeia | pugettensis |
| 814 | Arthropoda | Malacostraca | Isopoda | Flabellifera (suborder) | NS | sp. |
| 815 | Arthropoda | Malacostraca | Isopoda | Idoteidae | NS | sp. |
| 816 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Idotea | rufescens |
| 817 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Idotea | sp. |
| 818 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Pentidotea | resecata |
| 819 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Pentidotea | wosnesenskii |
| 820 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Synidotea | bicuspida |
| 821 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Synidotea | nebulosa |
| 822 | Arthropoda | Malacostraca | Isopoda | Munnidae | Munna | ubiquita |
| 823 | Arthropoda | Malacostraca | Isopoda | Pleurogoniidae | Pleurogonium | rubicundum |
| 824 | Arthropoda | Malacostraca | Isopoda | Sphaeromatidae | Gnorimosphaeroma | oregonense (oregonensis) |
| 825 | Arthropoda | Malacostraca | Isopoda | Sphaeromatidae | Gnorimosphaeroma | sp. |
| 826 | Arthropoda | Malacostraca | Leptostraca | Nebaliidae | Nebalia | pugettensis |
| 827 | Arthropoda | Malacostraca | Mysidacea | NS | NS | sp. |
| 828 | Arthropoda | Malacostraca | Mysidacea | NS | Archaeomsis | grebnitzkii |
| 829 | Arthropoda | Malacostraca | Mysidacea | Mysidae | Acanthomysis | macropsis |
| 830 | Arthropoda | Malacostraca | Mysidacea | Mysidae | Acanthomysis | sp. |
| 831 | Arthropoda | Malacostraca | Mysidacea | Mysidae | Neomysis | awatschensis |
| 832 | Arthropoda | Malacostraca | Mysidacea | Mysidae | Neomysis | mercedis |
| 833 | Arthropoda | Malacostraca | Mysidacea | Mysidae | Neomysis | sp. |
| 834 | Arthropoda | Malacostraca | Natantia | NS | NS | sp. |
| 835 | Arthropoda | Malacostraca | Tanaidacea | Paratanaidae | Leptochelia | dubia |
| 836 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | Sinelobus | stanfordi |
| 837 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | Tanais | sp. |
| 838 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | Tanais | sp. |
| 839 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | Tanais | stanfordi |
| 840 | Arthropoda | Ostracoda | NS | NS | NS | sp. |
| 841 | Arthropoda | Ostracoda | Halocyprida | Halocyprididae | Conchoecia | sp. |
| 842 | Arthropoda | Ostracoda | Myodocopida | Cylindroleberididae | Bathyleberis | sp. |
| 843 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | Euphilomedes | carcharodonta |
| 844 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | Euphilomedes | producta |
| 845 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | Euphilomedes | sp. |
| 846 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | Philomedes | sp. |
| 847 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | Scleroconcha | trituberulata |
| 848 | Arthropoda | Pycnogonida | NS | Ammotheidae | Achelia | nudiuscula |
| 849 | Arthropoda | Pycnogonida | NS | Phoxichilidiidae | Phoxichilidium | femoratum |
| 850 | Bryozoa | NS | NS | NS | NS | sp. |
| 851 | Chaetognatha | Sagittoidea | Aphragmophora | Sagittidae | Sagitta | elegans |
| 852 | Cnidaria | Anthazoa | Actiniaria | NS | NS | sp. |
| 853 | Cnidaria | Anthazoa | Actiniaria | Actiniidae | Anthopleura | artemisia |
| 854 | Cnidaria | Anthazoa | Ceriantharia | Cerianthidae | Pachycerianthus | fimbriatus |
| 855 | Cnidaria | Anthazoa | Pennatulacea | Pennatulidae | Ptilosarcus | gurneyi |
| 856 | Cnidaria | Hydrazoa | Hydroida | NS | NS | sp. |
| 857 | Cnidaria | Hydrazoa | Hydroida | Campanulariidae | Phialidium | sp. |
| 858 | Cnidaria | Hydrazoa | Hydroida | Clavidae | Cordylphora | sp. |
| 859 | Cnidaria | Hydrazoa | Hydroida | Hydridae | Hydra | sp. |
| 860 | Cnidaria | Hydrazoa | Hydroida | Proboscidactylidae | Proboscidactyla | flavicirrata |
| 861 | Cnidaria | Hydrazoa | Siphonophora | Diphyidae | Muggiaea | atlantica |
| 862 | Ctenophora | Tentaculata | Cydippida | Pleurobrachiidae | Pleurobrachia | sp. |
| 863 | Echinodermata | Asteroides | NS | NS | NS | sp. |
| 864 | Echinodermata | Asteroides | Forcipulatida | Asteriidae | Evasterias | troschelii |
| 865 | Echinodermata | Asteroides | Forcipulatida | Asteriidae | Pisaster | ochraccus |
| 866 | Echinodermata | Echinoidea | Clypeasteroida | Dendrasteridae | Dendraster | excentricus |
| 867 | Echinodermata | Echinoidea | Echinoida | Strongylocentrotidae | Stronglyocentrotus | sp. |
| 868 | Echinodermata | Echinoidea | Spatangoida | Schizasteridae | Brisaster | townsendi |
| 869 | Echinodermata | Holothuroidea | NS | NS | NS | sp. |
| 870 | Echinodermata | Holothuroidea | Apodida | Synaptidae | Leptosynopta | sp. |
| 871 | Echinodermata | Holothuroidea | Dendrochirotida | Cucumariidae | Cucumaria | miniata |
| 872 | Echinodermata | Holothuroidea | Dendrochirotida | Phyllophoridae | Pentamera | sp. |
| 873 | Echinodermata | Holothuroidea | Molpadiida | Molpadiidae | Molpadia | intermedia |

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|---|---|---|---|---|---|---|
| 874 | Echinodermata | Holothuroidea | Molpadiida | Molpadiidae | Molpadia | sp. |
| 875 | Echinodermata | Ophiuroidea | NS | NS | NS | sp. |
| 876 | Echinodermata | Ophiuroidea | Ophiurida | Amphiuridae | Amphioda | periereta |
| 877 | Echinodermata | Ophiuroidea | Ophiurida | Amphiuridae | Amphioda | sp. |
| 878 | Echinodermata | Ophiuroidea | Ophiurida | Amphiuridae | Amphioda | urtica |
| 879 | Echinodermata | Ophiuroidea | Ophiurida | Ophiuroidae | Ophiura | leptoctenia |
| 880 | Echiura | NS | Echiuroinea | Echiuridae | NS | sp. |
| 881 | Mollusca | Aplacophora | Chaetodermatida | Crystallophrissonidae | Crystallophrisson (Chaetoderma) | sp. |
| 882 | Mollusca | Bivalvia | NS | Sphaeriidae | NS | sp. |
| 883 | Mollusca | Bivalvia | NS | Sphaeriidae | Pisidium | sp. |
| 884 | Mollusca | Bivalvia | NS | Sphaeriidae | Sphaerium | nitidum |
| 885 | Mollusca | Bivalvia | NS | Sphaeriidae | Sphaerium | sp. |
| 886 | Mollusca | Bivalvia | NS | NS | NS | sp. |
| 887 | Mollusca | Bivalvia | Eulamellibranchia | Mactridae | Schizothaerus | nuttalli |
| 888 | Mollusca | Bivalvia | Myoida | Myidae | NS | sp. |
| 889 | Mollusca | Bivalvia | Myoida | Myidae | Cryptomya | californica |
| 890 | Mollusca | Bivalvia | Myoida | Myidae | Mya | arenaria |
| 891 | Mollusca | Bivalvia | Myoida | Myidae | Mya | sp. |
| 892 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Dacrydium | vitreum |
| 893 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Modiolus | modiolus |
| 894 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Musculus | sp. |
| 895 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Mytilus | edulis |
| 896 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Mytilus | sp. |
| 897 | Mollusca | Bivalvia | Nuculoida | Nuculidae | Acila | castrensis |
| 898 | Mollusca | Bivalvia | Nuculoida | Nuculidae | Acila | sp. |
| 899 | Mollusca | Bivalvia | Nuculoida | Nuculanidae | Nuculana | minuta |
| 900 | Mollusca | Bivalvia | Nuculoida | Yoldiidae | Yoldia | ensifera |
| 901 | Mollusca | Bivalvia | Nuculoida | Yoldiidae | Yoldia | thraciaformis |
| 902 | Mollusca | Bivalvia | Nuculoida | Yuldiidae | Yoldia | sp. |
| 903 | Mollusca | Bivalvia | Ostreoida | Ostreidae | Crassostrea | gigas |
| 904 | Mollusca | Bivalvia | Ostreoida | Ostreidae | Crassostrea | virginica |
| 905 | Mollusca | Bivalvia | Ostreoida | Ostreidae | Ostrea | lurida |
| 906 | Mollusca | Bivalvia | Ostreoida | Ostreidae | Ostrea | sp. |
| 907 | Mollusca | Bivalvia | Pholadomyoida | Lyonsiidae | Lyonsia | sp. |
| 908 | Mollusca | Bivalvia | Pholadomyoida | Pandoridae | Pandora | filosa |
| 909 | Mollusca | Bivalvia | Septibranchia | Cuspidariidae | Cardiomya | sp. |
| 910 | Mollusca | Bivalvia | Veneroida | Astartidae | Astarte | alaskensis |
| 911 | Mollusca | Bivalvia | Veneroida | Cardiidae | Cardium (Clinocardium) | corbis (nuttali?) |
| 912 | Mollusca | Bivalvia | Veneroida | Cardiidae | Clinocardium | nuttalli |
| 913 | Mollusca | Bivalvia | Veneroida | Cardiidae | Clinocardium | sp. |
| 914 | Mollusca | Bivalvia | Veneroida | Kelliidae | Kellia | suborbicularis |
| 915 | Mollusca | Bivalvia | Veneroida | Mactridae | Spisula | falicata |
| 916 | Mollusca | Bivalvia | Veneroida | Mactridae | Tresus | capax |
| 917 | Mollusca | Bivalvia | Veneroida | Mactridae | Tresus | nuttalli |
| 918 | Mollusca | Bivalvia | Veneroida | Montacutidae | Mysella | tumida |
| 919 | Mollusca | Bivalvia | Nuculoida | Nuculanidae | Nuculana | hamata |
| 920 | Mollusca | Bivalvia | Nuculoida | Yoldiidae | Yoldia | myalis |
| 921 | Mollusca | Bivalvia | Veneroida | Solenidae | Solen | sicarius |
| 922 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | balthica |
| 923 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | calcarea |
| 924 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | eliminata |
| 925 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | incongrua |
| 926 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | inconspicua |
| 927 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | nasuta |
| 928 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | secta |
| 929 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | sp. |
| 930 | Mollusca | Bivalvia | Veneroida | Tellinidae | Tellina | buttoni |
| 931 | Mollusca | Bivalvia | Veneroida | Tellinidae | Tellina | carpenteri |
| 932 | Mollusca | Bivalvia | Veneroida | Tellinidae | Tellina | modesta |
| 933 | Mollusca | Bivalvia | Veneroida | Tellinidae | Tellina | nucleoides |
| 934 | Mollusca | Bivalvia | Veneroida | Tellinidae | Tellina | sp. |
| 935 | Mollusca | Bivalvia | Veneroida | Thyasiridae | Adontorhina | cyclia |
| 936 | Mollusca | Bivalvia | Veneroida | Thyasiridae | Axinopsis (Axinopsida) | serricata |

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|---|---|---|---|---|---|---|
| 937 | Mollusca | Bivalvia | Veneroida | Thyasiridae | Axinulus | ferruginosus |
| 938 | Mollusca | Bivalvia | Veneroida | Thyasiridae | Thyasira | sp. |
| 939 | Mollusca | Bivalvia | Veneroida | Veneridae | Compsomyax | subdiaphana |
| 940 | Mollusca | Bivalvia | Veneroida | Veneridae | Humilaria | kennerleyi |
| 941 | Mollusca | Bivalvia | Veneroida | Veneridae | Protothaca | sp. |
| 942 | Mollusca | Bivalvia | Veneroida | Veneridae | Protathaca | staminea |
| 943 | Mollusca | Bivalvia | Veneroida | Veneridae | Psephidia | lordi |
| 944 | Mollusca | Bivalvia | Veneroida | Veneridae | Saxidomus | gigantea |
| 945 | Mollusca | Bivalvia | Veneroida | Veneridae | Tapes | philippinarum |
| 946 | Mollusca | Bivalvia | Veneroida | Veneridae | Transenella | tantilla |
| 947 | Mollusca | Bivalvia | Veneroida | Veneridae | Venerupis (Protothaca) | japonica |
| 948 | Mollusca | Gastropoda | NS | NS | NS | sp. |
| 949 | Mollusca | Gastropoda | NS | NS | Cerithium | moerchi |
| 950 | Mollusca | Gastropoda | NS | NS | Cerithium | sp. |
| 951 | Mollusca | Gastropoda | NS | NS | Collisella | sp. |
| 952 | Mollusca | Gastropoda | NS | Bulmidae | NS | sp. |
| 953 | Mollusca | Gastropoda | NS | Lymnaeidae | Lymnaea | sp. |
| 954 | Mollusca | Gastropoda | NS | Valvatidae | Valvata | sp. |
| 955 | Mollusca | Gastropoda | Archaeogastropoda | Trochidae | Margarites | sp. |
| 956 | Mollusca | Gastropoda | Archaeogastropoda | Trochidae | Solariella | varicosa |
| 957 | Mollusca | Gastropoda | Basommatophora | Ellobiidae | Ovatella | myosotis |
| 958 | Mollusca | Gastropoda | Cephalaspidea | Acteonidae | Acteocina | culcitella |
| 959 | Mollusca | Gastropoda | Cephalaspidea | Acteonidae | Acteocina | exima |
| 960 | Mollusca | Gastropoda | Cephalaspidea | Aglajidae | Aglaja | diomedea |
| 961 | Mollusca | Gastropoda | Cephalaspidea | Atylidae | Haminoea | vesicula |
| 962 | Mollusca | Gastropoda | Cephalaspidea | Bullidae | Bulla | gouldiana |
| 963 | Mollusca | Gastropoda | Cephalaspidea | Cylichnidae | Cylichna | alba |
| 964 | Mollusca | Gastropoda | Cephalaspidea | Cylichnidae | Cylichna | sp. |
| 965 | Mollusca | Gastropoda | Cephalaspidea | Gastropteridae | Gastropteron | pacificum |
| 966 | Mollusca | Gastropoda | Cephalaspidea | Gastropteridae | Gastropteron | sp. |
| 967 | Mollusca | Gastropoda | Cephalaspidea | Retusidae | Acteocina | culcitella |
| 968 | Mollusca | Gastropoda | Cephalaspidea | Retusidae | Retusa | harpae |
| 969 | Mollusca | Gastropoda | Cephalaspidea | Retusidae | Retusa | sp. |
| 970 | Mollusca | Gastropoda | Limnophila | Physidae | Physa | sp. |
| 971 | Mollusca | Gastropoda | Limnophila | Planorbidae | NS | sp. |
| 972 | Mollusca | Gastropoda | Limnophila | Planorbidae | Gyraulus | sp. |
| 973 | Mollusca | Gastropoda | Mesogastropoda | Calyptraeidae | Crepidula | adunca |
| 974 | Mollusca | Gastropoda | Mesogastropoda | Calyptraeidae | Crepidula | sp. |
| 975 | Mollusca | Gastropoda | Mesogastropoda | Cerithiidae | Bittium | attenuatum |
| 976 | Mollusca | Gastropoda | Mesogastropoda | Lacunidae | Lacuna | porrecta |
| 977 | Mollusca | Gastropoda | Mesogastropoda | Lacunidae | Lacuna | sp. |
| 978 | Mollusca | Gastropoda | Mesogastropoda | Lacunidae | Lacuna | variegata |
| 979 | Mollusca | Gastropoda | Mesogastropoda | Littorinidae | Littorina | sp. |
| 980 | Mollusca | Gastropoda | Mesogastropoda | Naticidae | Natica | clausa |
| 981 | Mollusca | Gastropoda | Mesogastropoda | Naticidae | Polinices | lewisii |
| 982 | Mollusca | Gastropoda | Mesogastropoda | Naticidae | Polinices (Lunatia) | pallida |
| 983 | Mollusca | Gastropoda | Mesogastropoda | Naticidae | Polinices | sp. |
| 984 | Mollusca | Gastropoda | Mesogastropoda | Potamididae | Batillaria | attramentaria |
| 985 | Mollusca | Gastropoda | Mesogastropoda | Potamididae | Batillaria | sp. |
| 986 | Mollusca | Gastropoda | Mesogastropoda | Rissoidae | Alvania | burrardensis |
| 987 | Mollusca | Gastropoda | Mesogastropoda | Rissoidae | Alvania | compacta |
| 988 | Mollusca | Gastropoda | Mesogastropoda | Rissoinidae | Risoina | newcombeii |
| 989 | Mollusca | Gastropoda | Neogastropoda | Columbellidae | Mitrella | gouldi |
| 990 | Mollusca | Gastropoda | Neogastropoda | Muricidae | Ceratostoma | foliatum |
| 991 | Mollusca | Gastropoda | Neogastropoda | Muricidae | Ocenebra | japonica |
| 992 | Mollusca | Gastropoda | Neogastropoda | Muricidae | Trophonopsis | sp. |
| 993 | Mollusca | Gastropoda | Neogastropoda | Muricidae | Urosalpinx | cinerca |
| 994 | Mollusca | Gastropoda | Neogastropoda | Nassariidae | Ilyanassa | obsoletus |
| 995 | Mollusca | Gastropoda | Neogastropoda | Nassariidae | Nassarius | mendicus |
| 996 | Mollusca | Gastropoda | Neogastropoda | Nassariidae | Nassarius | sp. |
| 997 | Mollusca | Gastropoda | Neogastropoda | Nucellidae | Nucella | lamellosa |
| 998. | Mollusca | Gastropoda | Neogastropoda | Pyrenidae (Columbellidae) | Mitrella | tuberosa |

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|---|---|---|---|---|---|---|
| 999 | Mollusca | Gastropoda | Neogastropoda | Pyrenidae (Columbellidae) | Nitidella | gouldi |
| 1000 | Mollusca | Gastropoda | Nudibranchia | NS | NS | sp. |
| 1001 | Mollusca | Gastropoda | Patellogastropoda | Acmeidae | NS | sp. |
| 1002 | Mollusca | Gastropoda | Pectinibranchia | Muricidae | Purpura | foliatum |
| 1003 | Mollusca | Gastropoda | Pyramidellacea | Pyramidellidae | Odostomia | sp. |
| 1004 | Mollusca | Gastropoda | Pyramidellacea | Pyramidellidae | Turbonilla | aurantia |
| 1005 | Mollusca | Gastropoda | Pyramidellacea | Pyramidellidae | Turbonilla | pedroana |
| 1006 | Mollusca | Gastropoda | Pyramidellacea | Pyramidellidae | Turbonilla | sp. |
| 1007 | Mollusca | Polyplacophora | NS | NS | NS | sp. |
| 1008 | Mollusca | Scaphopoda | Dentalia | Dentalidae | Dentalium | dalli |
| 1009 | Mollusca | Scaphopoda | Dentalia | Dentalidae | Dentalium | pretiosum |
| 1010 | Nematoda | NS | NS | NS | NS | sp. |
| 1011 | Nemertea | NS | NS | NS | NS | sp. |
| 1012 | Nemertea | Enopla | Hoplonemertea | Cerebratulidae | Cerebratulus | sp. |
| 1013 | Nemertea | Enopla | Hoplonemertea | Emplectonematidae | Emplectonema | gracile |
| 1014 | Nemertea | Enopla | Hoplonemertea | Emplectonematidae | Paranemertes | sp. |
| 1015 | Phoronida | NS | NS | NS | NS | sp |
| 1016 | Platyhelminthes | NS | NS | NS | NS | sp. |
| 1017 | Platyhelminthes | Neorhabdocoela | NS | NS | NS | sp. |
| 1018 | Platyhelminthes | Rhabdocoela | NS | NS | NS | sp. |
| 1019 | Platyhelminthes | Tricladia (planaria) | NS | NS | NS | sp. |
| 1020 | Platyhelminthes | Turbellaria | Polycladida | NS | NS | sp. |
| 1021 | Pogonophora | NS | NS | NS | NS | sp. |
| 1022 | Poriphera | Hexactinellida | Hexactinosa | Aphrocallistidae | Aphrocallistes | sp. |
| 1023 | Rotifera | NS | NS | NS | NS | sp. |
| 1024 | Rotifera | NS | NS | NS | Manfredium | sp. |
| 1025 | Rotifera | Digononta | Bdelloidea | Philodinidae | Dissotrocha | macrostyla |
| 1026 | Rotifera | Digononta | Bdelloidea | Philodinidae | Macrotrachela | plicata |
| 1027 | Rotifera | Digononta | Bdelloidea | Philodinidae | Rotaria | sp. |
| 1028 | Rotifera | Monogononta | Collothecacea | Collothecidae | Collotheca | sp. |
| 1029 | Rotifera | Monogononta | Flosculariacea | Testudinellidae | Testudinella | sp. |
| 1030 | Rotifera | Monogononta | Ploima | Dicranophoridae | Aspelta | sp. |
| 1031 | Rotifera | Monogononta | Ploima | Dicranophoridae | Dicranophorus | sp. |
| 1032 | Rotifera | Monogononta | Ploima | Dicranophoridae | Encentrum | sp. |
| 1033 | Rotifera | Monogononta | Ploima | Lecanidae | Lecane | sp. |
| 1034 | Rotifera | Monogononta | Ploima | Lecanidae | Monostyla (Lecane) | sp. |
| 1035 | Rotifera | Monogononta | Ploima | Notommatidae | Cephalodella | sp. |
| 1036 | Rotifera | Monogononta | Ploima | Notommatidae | Notommata | sp. |
| 1037 | Rotifera | Monogononta | Ploima | Notommatidae | Taphrocampa | sp. |
| 1038 | Rotifera | Monogononta | Ploima | Trichocercidae | Trichocerca | sp. |
| 1039 | Rotifera | Monogononta | Ploima | Trichotriidae | Trichotria | sp. |
| 1040 | Sipuncula | NS | NS | NS | NS | sp. |
| 1041 | Sipuncula | NS | Sipunculida | NS | NS | sp. |
| 1042 | Sipuncula | NS | Sipunculida | Goldfingiidae | Dendrostoma (Themiste) | sp. |
| 1043 | Sipuncula | NS | Sipunculida | Goldfingiidae | Goldfingia | sp. |
| 1044 | Tardigrada | NS | NS | NS | NS | sp. |
| 1045 | Urochordata | Larvacea | NS | Oikopleuridae | Oikopleura | sp. |
| 1048 | Annelida | Hirudinea | Rhynchobdellida | Pisicolidae | Pisicola | salmonsitica |
| 1049 | Nematoda | NS | Adenophorea | Axonolaimidae | Parascolaimus | sp. |
| 1050 | Nematoda | NS | Adenophorea | Axonolaimidae | Axonolaimus | spinosus |
| 1051 | Nematoda | NS | Monhysterida | Linhomoeidae | NS | sp. |
| 1052 | Nematoda | NS | Monhysterida | Linhomoeidae | Desmolaimus | sp. |
| 1053 | Nematoda | NS | Monhysterida | Linhomoeidae | Terschellingia | longicaudata |
| 1054 | Nematoda | NS | Monhysterida | Linhomoeidae | Linhomoeus | sp. |
| 1055 | Nematoda | NS | Monhysterida | Monhysteridae | NS | sp. |
| 1056 | Nematoda | NS | Monhysterida | Monhysteridae | Diplolaimella | sp. |
| 1057 | Nematoda | NS | Monhysterida | Monhysteridae | Monhystera | refringens |
| 1058 | Nematoda | NS | Monhysterida | Monhysteridae | Paramonhystera | sp. |
| 1059 | Nematoda | NS | Monhysterida | Monhysteridae | Theristus | sp. |
| 1060 | Nematoda | NS | Monhysterida | Monhysteridae | Rhynconema | sp. |
| 1061 | Nematoda | NS | Desmodorida | Desmodoridae | Microlaimus | dentatus |
| 1062 | Nematoda | NS | Desmodorida | Monoposthiidae | Monoposthia | costata |

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|---|---|---|---|---|---|---|
| 1063 | Nematoda | NS | Chromadorida | Comesomatidae | Sabatieria | sp. |
| 1064 | Nematoda | NS | Chromadorida | Comesomatidae | Sabatieria | clavicauda |
| 1065 | Nematoda | NS | Chromadorida | Chromadoridae | NS | sp. |
| 1066 | Nematoda | NS | Chromadorida | Chromadoridae | Chromadorina | sp. |
| 1067 | Nematoda | NS | Chromadorida | Chromadoridae | Innocuonema | clivosum |
| 1068 | Nematoda | NS | Chromadorida | Chromadoridae | Neochromadora | appiana |
| 1069 | Nematoda | NS | Chromadorida | Chromadoridae | Spilophorella | paradoxa |
| 1070 | Nematoda | NS | Chromadorida | Cyatholaimidae | NS | sp. |
| 1071 | Nematoda | NS | Chromadorida | Cyatholaimidae | Paracanthoncus | sp. |
| 1072 | Nematoda | NS | Enoplida | Tripyloididae | Tripyloides | gracilis |
| 1073 | Nematoda | NS | Enoplida | Oxystominidae | Oxystomina | sp. |
| 1074 | Nematoda | NS | Enoplida | Lauratonematidae | Lauratonema | pugiunculus |
| 1075 | Nematoda | NS | Enoplida | Enoplidae | Oxyonchus | sp. |
| 1076 | Nematoda | NS | Enoplida | Anoplostomatidae | Anoplostoma | sp. |
| 1077 | Nematoda | NS | Enoplida | Oncholaimidae | Oncholaimus | sp. |
| 1078 | Nematoda | NS | Enoplida | Oncholaimidae | Oncholaimus | vesicarius |
| 1079 | Nematoda | NS | Enoplida | Enchelidiidae | Eurystomina | sp. |
| 1080 | Nematoda | NS | Chromadorida | Cyatholaimidae | Marylynnia | sp. |
| 1081 | Nematoda | NS | Enoplida | Tripyloididae | Tripyloides | sp. |
| 1082 | Arthropoda | Copepoda | Calanoida | Diaptomidae | Diaptomus | ashlandi |
| 1083 | Arthropoda | Copepoda | Harpacticoida | Diosaccidae | Amonardia | sp. |
| 1084 | Mollusca | Gastropoda | Limnophila | Planorbidae | Gyraulus | parvus |
| 1085 | Mollusca | Gastropoda | Limnophila | Lymnaeidae | Fossaria | modicella |
| 1086 | Arthropoda | Insecta | Diptera | Chironomidae | Pentaneura | flavifrons |
| 1087 | Arthropoda | Insecta | Plecoptera | Taeniopterygidae | NS | sp. |
| 1088 | Arthropoda | Insecta | Plecoptera | Perlodidae | Divra | sp. |
| 1089 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Oecetis | sp. |
| 1090 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | bifilis |
| 1091 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Ceraclea (Athripsodes) | sp. |
| 1092 | Arthropoda | Insecta | Ephemeroptera | Siphlonuridae (Baetidae) | Ameletus | shepherdi |
| 1093 | Arthropoda | Insecta | Ephemeroptera | Heptageniidae | Rhithrogena | doddsi |
| 1094 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isoperla | gestivalis |
| 1095 | Arthropoda | Insecta | Plecoptera | Perlodidae | Arcynopteryx | parallela |
| 1096 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Oecetis | avara |
| 1097 | Arthropoda | Insecta | Diptera | Tipulidae | Antocha | saxicola |
| 1098 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Alloperla | borealis |
| 1099 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isoperla | capitata |
| 1100 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | yosemite |
| 1101 | Arthropoda | Arachnida | Hydracarina | Torrenticolidae | Torrenticola | sp. |
| 1102 | Arthropoda | Arachnida | Hydracarina | Hygrobatidae | Atractides | sp. |
| 1103 | Arthropoda | Branchiopoda | Cladocera | Daphnidae | Daphnia | rosea |
| 1104 | Arthropoda | Branchiopoda | Cladocera | Bosminidae | NS | sp. |
| 1105 | Arthropoda | Branchiopoda | Cladocera | Daphnidae | NS | sp. |
| 1106 | Arthropoda | Insecta | Plecoptera | Perlodidae | Isogenoides | colubrinus |
| 1107 | Arthropoda | Insecta | Diptera | Chironomidae | Synorthocladius | sp. |
| 1108 | Arthropoda | Insecta | Diptera | Chironomidae | Constempelina | sp. |
| 1109 | Platyhelminthes | Turbellaria | NS | NS | NS | sp. |
| 1110 | Mollusca | NS | NS | NS | NS | sp. |
| 1111 | Arthropoda | Malacostraca | Amphipoda | Corophiidae | Corophium | sp. |
| 1112 | Arthropoda | Malacostraca | Amphipoda | Pontogeneiidae | Pontogeneia | sp. |
| 1113 | Ctenophora | Tentaculata | Cydippida | Pleurobrachiidae | Pleurobrachia | pileus |
| 1114 | Cnidaria | Hydrazoa | Hydroida | Hydridae | Hydra | americana |
| 1115 | Cnidaria | Hydrazoa | NS | NS | NS | sp. |
| 1116 | Arthropoda | Crustacea | NS | NS | NS | sp. |
| 1118 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | NS | sp. |
| 1119 | Arthropoda | Malacostraca | Tanaidacea | Tanaidae | Leptochelia | savignyi |
| 1120 | Arthropoda | Malacostraca | Amphipoda | Haustoriidae | Eohaustorius | sp. |
| 1121 | Arthropoda | Copepoda | Calanoida | Temoridae | Eurytemora | sp. |
| 1122 | Arthropoda | Copepoda | Cyclopoida | Cyclopoidae | NS | sp. |
| 1123 | Mollusca | Bivalvia | Nuculoida | Nuculidae | Nucula | tenuis |
| 1124 | Arthropoda | Insecta | NS | NS | NS | sp. |
| 1125 | Arthropoda | Insecta | Trichoptera | Leptoceridae | Ceraclea | sp. |
| 1126 | Arthropoda | Insecta | Diptera | Tipulidae | Eriocera | sp. |

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|---|---|---|---|---|---|---|
| 1127 | Arthropoda | Insecta | Diptera | Chironomidae | Nilotanypus | sp. |
| 1128 | Arthropoda | Insecta | Trichoptera | Polycentropodidae | Polycentropus | variegatus |
| 1129 | Arthropoda | Insecta | Trichoptera | Arctopsychidae (Hydropsychidae) | Parapsyche | almota |
| 1130 | Arthropoda | Insecta | Trichoptera | Arctopsychidae (Hydropsychidae) | Parapsyche | elsis |
| 1131 | Annelida | NS | NS | NS | NS | sp. |
| 1132 | Tardigrada | NS | NS | Macrobiotidae | Macrobiotus | sp. |
| 1133 | Arthropoda | Insecta | Diptera | Tipulidae | Eriocera | spinosa |
| 1134 | Annelida | Hirudinea | Rhynchobdellida | Piscicolidae | NS | sp. |
| 1135 | Mollusca | Gastropoda | Mesogastropoda | Littorinidae | NS | sp. |
| 1136 | Mollusca | Gastropoda | Limnophila | Physidae | NS | sp. |
| 1137 | Mollusca | Gastropoda | NS | NS | Bythnia | sp. |
| 1139 | Urochordata | NS | NS | NS | NS | sp. |
| 1140 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | Paraleptastacus | unisetosus |
| 1141 | Arthropoda | Copepoda | Harpacticoida | Cylindropsyllidae | NS | sp. |
| 1142 | Arthropoda | Copepoda | Harpacticoida | Thalestridae | Parathalestris | californica |
| 1143 | Annelida | Polychaeta | Spionida | Spionidae | Pygospio | sp. |
| 1144 | Mollusca | Bivalvia | Eulamellibranchia | Mactridae | Schizothaerus | sp. |
| 1145 | Arthropoda | Insecta | Diptera | Chironomidae | Harnischia | amachaerus |
| 1146 | Arthropoda | Insecta | Diptera | Chironomidae | Polypedilum | tritum |
| 1147 | Arthropoda | Insecta | Diptera | Chironomidae | Polypedilum | simulans |
| 1148 | Arthropoda | Insecta | Diptera | Chironomidae | Polypedilum | nubeculosum |
| 1149 | Arthropoda | Insecta | Diptera | Chironomidae | Harnischia | potamogeti |
| 1150 | Arthropoda | Insecta | Diptera | Chironomidae | Sergentia | sp. |
| 1151 | Arthropoda | Insecta | Diptera | Chironomidae | Tribelos | sp |
| 1152 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | decorus |
| 1153 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | rempelii |
| 1154 | Arthropoda | Insecta | Diptera | Chironomidae | Stempellina | bausei |
| 1155 | Arthropoda | Insecta | Diptera | Chironomidae | Lundstroemia | sp. |
| 1156 | Arthropoda | Insecta | Diptera | Chironomidae | Larsia | acrocincta |
| 1157 | Arthropoda | Insecta | Diptera | Chironomidae | Psilotanypus | bellus |
| 1158 | Arthropoda | Insecta | Diptera | Chironomidae | Ablabesmyia | monilis |
| 1159 | Arthropoda | Insecta | Diptera | Chironomidae | Procladius | denticulatus |
| 1160 | Arthropoda | Insecta | Diptera | Chironomidae | Procladius | freemani |
| 1161 | Arthropoda | Insecta | Diptera | Chironomidae | Parakiefferiella | nigra |
| 1162 | Arthropoda | Insecta | Diptera | Chironomidae | Heterotanytarsus | sp. |
| 1163 | Arthropoda | Insecta | Diptera | Chironomidae | Trissocladius | sp. |
| 1164 | Arthropoda | Insecta | Diptera | Chironomidae | Cricotopus | tricinctus |
| 1165 | Arthropoda | Insecta | Diptera | Chironomidae | Protanypus | sp. |
| 1166 | Arthropoda | Insecta | Diptera | Chironomidae | Clinotanypus | sp. |
| 1167 | Arthropoda | Insecta | Diptera | Chironomidae | Tribelos | protextus |
| 1168 | Mollusca | Gastropoda | Limnophila | Planorbidae | Helisoma | sp. |
| 1170 | Annelida | Hirudinea | Rhynchobdellida | Glossiphoniidae | NS | sp. |
| 1171 | Annelida | Hirudinea | Gnathobdellida | Hirudinidae | NS | sp. |
| 1173 | Arthropoda | Insecta | Coleoptera | Elmidae | Elmis | sp. |
| 1174 | Arthropoda | Insecta | Coleoptera | Hydrophilidae | Hydrobius | sp. |
| 1175 | Arthropoda | Insecta | Plecoptera | Chloroperlidae | Haploperla | sp. |
| 1176 | Arthropoda | Insecta | Trichoptera | Hydopsychidae | Himalopsyche | sp. |
| 1177 | Arthropoda | Insecta | Trichoptera | Brachycentridae | Oligoplectrum | sp. |
| 1178 | Arthropoda | Insecta | Trichoptera | Philopotamidae | Dolophilodes (Trentonius, Sortosa) | sp. |
| 1179 | Arthropoda | Insecta | Diptera | Chironomidae | Constempellina | sp. |
| 1180 | Arthropoda | Insecta | Megaloptera | Sialidae | Sialis | sp. |
| 1181 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Drunella | grandis |
| 1182 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Drunella | doddsi |
| 1183 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Seratella | sp. |
| 1184 | Arthropoda | Insecta | Plecoptera | Perlodidae | Megarcys | sp. |
| 1185 | Arthropoda | Insecta | Plecoptera | Perlidae | Eccoptura | sp. |
| 1186 | Arthropoda | Insecta | Trichoptera | Polycentropodidae | NS | sp. |
| 1187 | Arthropoda | Insecta | Diptera | Chironomidae | Paramerina | sp. |
| 1188 | Arthropoda | Insecta | Collembola | Isotomidae | Semicerura | sp. |
| 1189 | Arthropoda | Arachnida | Hydrachnida (Hydracarina) | Pionidae | Piona | sp. |

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|---|---|---|---|---|---|---|
| 1190 | Arthropoda | Insecta | Ephemeroptera | Siphlonuridae | Siphlonurus | sp. |
| 1191 | Arthropoda | Insecta | Ephemeroptera | Ephemerellidae | Ephemerella | grandis |
| 1192 | Arthropoda | Insecta | Plecoptera | Perlodidae | Dirua | sp. |
| 1193 | Arthropoda | Insecta | Plecoptera | Nemouridae | Visoka | cataractae |
| 1194 | Arthropoda | Insecta | Plecoptera | Perlidae | Calineuria | californica |
| 1195 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Pseudostenophylax | sp. |
| 1196 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | angelita |
| 1197 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | vepulsa |
| 1198 | Arthropoda | Insecta | Trichoptera | Rhyacophilidae | Rhyacophila | tucula |
| 1199 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Apatania | sp. |
| 1200 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Moselyana | sp. |
| 1201 | Arthropoda | Insecta | Trichoptera | Limnephilidae | Clostoeca | sp. |
| 1202 | Arthropoda | Insecta | Collembola | Hypogastruridae | Xenylla | sp. |
| 1203 | Arthropoda | Insecta | Diptera | Tipulidae | Pedicia | sp. |
| 1204 | Arthropoda | Insecta | Diptera | Tipulidae | Elephantomyia | sp. |
| 1205 | Arthropoda | Insecta | Diptera | Empididae | Weidemannia | sp. |
| 1206 | Arthropoda | Insecta | Diptera | Chironomidae | Euryhapsis | sp. |
| 1207 | Arthropoda | Insecta | Hemiptera | Saldidae | NS | sp. |
| 1208 | Arthropoda | Insecta | Diptera | Chironomidae | Trissopelopia | sp. |
| 1209 | Arthropoda | Insecta | Diptera | Chironomidae | Pseudokiefferiella | sp. |
| 1210 | Arthropoda | Insecta | Diptera | Muscidae | Limnophora | sp. |
| 1211 | Arthropoda | Insecta | Coleoptera | Noteridae | NS | sp. |
| 1212 | Arthropoda | Arachnida | Hydracarina | Limnesiidae | Kawamuracarus | sp. |
| 1213 | Arthropoda | Arachnida | Hydracarina | Hygrobatidae | Atractides | sp. |
| 1214 | Arthropoda | Arachnida | Hydracarina | NS | Orbatei | sp. |
| 1215 | Arthropoda | Arachnida | Hydracarina | Torrenticolidae | Torrenticola | sp. |
| 1216 | Arthropoda | Arachnida | Hydracarina | Krendowskiidae | Krendowskia | sp. |
| 1217 | Arthropoda | Arachnida | Hydracarina | Unionicolidae | Neumannia | sp. |
| 1218 | Arthropoda | Arachnida | Hydracarina | Protziidae | Wandesia | sp. |
| 1219 | Platyhelminthes | Turbellaria | Tricladia | Planariidae | Polycelis | coronata |
| 1220 | Mollusca | Bivalvia | Mytiloida | Mytilidae | Musculus | substriatus |
| 1221 | Annelida | Polychaeta | Terebellida | Ampharetidae | Ampharete | arctica |
| 1222 | Mollusca | Bivalvia | Veneroida | Tellinidae | Macoma | inquinata |
| 1223 | Annelida | Polychaeta | Oweniida | Oweniidae | Owenia | fusiformis |
| 1224 | Arthropoda | Ostracoda | Myodocopida | Philomedidae | NS | sp. |
| 1225 | Arthropoda | Malacostraca | Isopoda | Idoteidae | Synidotea | sp. |
| 1226 | Arthropoda | Malacostraca | Tanaidacea | NS | NS | sp. |
| 1227 | Arthropoda | Malacostraca | Amphipoda | Phoxocephalidae | NS | sp. |
| 1229 | Nemertea | Enopla | Holonermetea | NS | NS | sp. |
| 1230 | Arthropoda | Malacostraca | Amphipoda | Haustoriidae | Pontoporeia | sp. |
| 1231 | Arthropoda | Malacostraca | Amphipoda | NS | Trichophoxus | sp. |
| 1232 | Arthropoda | Malacostraca | Amphipoda | Hyperiidae | Parathemisto | sp. |
| 1233 | Annelida | Polychaeta | Phyllodocida | Tomopteridae | Tomopteris | sp. |
| 1234 | Arthropoda | Malacostraca | Amphipoda | Hyperiidae | Hyperoche | sp. |
| 1235 | Arthropoda | Insecta | Diptera | Chironomidae | Stenochironomus | sp. |
| 1236 | Arthropoda | Insecta | Diptera | Chironomidae | Odontomesa | sp. |
| 1237 | Arthropoda | Insecta | Trichoptera | Teraeidae | NS | sp. |
| 1238 | Arthropoda | Branchiopoda | Cladocera | Lertodoridae | Leptodora | sp. |
| 1239 | Annelida | Polychaeta | Phyllodocida | Goniadidae | Glycinde | polygnatha |
| 1240 | Arthropoda | Annelida | Oligochaeta | Naididae | Pristina | aequiseta |
| 1241 | NO SPECIES | NO SPECIES | NO SPECIES | NO SPECIES | NO SPECIES | NO SPECIES |
| 1242 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | nais |
| 1243 | Arthropoda | Insecta | Diptera | Chironomidae | Chironomus | pectinatellae |
| 1244 | Echinodermata | Echinoidea | Echinoida | Strongylocentrotidae | Stronglyocentrotus | drobachiensis |
| 1245 | Annelida | Polychaeta | Opheliida | Opheliidae | Ophelia | sp. |
| 1246 | Mollusca | Bivalvia | Veneroida | Solenidae (Cultellidae) | Siliqua | patula |
| 1247 | Mollusca | Bivalvia | Veneroida | Tellinidae | NS | sp. |
| 1248 | Mollusca | Gastropoda | Mesogastropoda | Cerithiidae | Bittium | sp. |
| 1249 | Mollusca | Gastropoda | Archaeogastropoda | Trochidae | NS | sp. |
| 1250 | Mollusca | Gastropoda | Cephalaspidea (Tectibranchia) | Atyidae(Akeridae) | Haminoea | sp. |

**Taxonomic keys used in the development of the benthic taxa list**

Banse, K. and K.D. Hobson. 1974. Benthic errantiate polychaetes of British Columbia and Washington. Bull. Fish. Res. Board Canada 185: 111p.

Brinkhurst, R.O. 1986. Guide to the freshwater aquatic microdile oligochaetes of North America. Can. Spec. Publ. Fish. Aquat. Sci. 84: 259p.

Clifford, H.F. 1991. Aquatic invertebrates of Alberta. The University of Alberta Press. Edmonton.

Fulton, J. 1972. Keys and references to the marine Copepoda of British Columbia. Fish. Res. Board Can. Tech. Rep. 313.

Gosner, K.L. 1971. Guide to identification of marine and estuarine invertebrates. Wiley-Interscience, a division of John Wiley & Sons, Inc. New York.

Hobson, K.D. and K. Banse. 1981. Sedentariate and archiannelid polychaetes of British Columbia and Washington. Can. Bull. Fish. Aquat. Sci. 209: 144p.

Kask, B.A., J.R. Sibert and B. Windecker. 1982. A check list of marine and brackish water harpacticoid copepods from the Nanaimo estuary, southwestern British Columbia. Syesis **15**: 25-38.

Kozloff, E.N. 1987. Marine invertebrates of the Pacific northwest. University of Washington Press. Seattle.

Light, S.F. 1970. Intertidal invertebrates of the central California coast: S.F. Light's "Laboratory and field text in invertebrate zoology", revised by Ralph I. Smith and others. 2nd edition. University of California Press. Berkeley.

Merritt, R.E. and K.W. Cummins (eds.). 1984. An introduction to the aquatic insects of North America. 2nd edition. Kendall/Hunt Publishing Company. Dubuque, Iowa.

Pearse, V., J. Pearse, M. Buchsbaum and R. Buchsbaum. 1987. Living invertebrates. Blackwell Scientific Publications. Palo Alto, California.

Peckarsky, B.L., P.R. Fraissinet, M.A. Penton and D.J. Conklin, Jr. 1990. Freshwater macroinvertebrates of northeastern North America. Comstock Publishing Associates, a division of Cornell University Press. London.

Pennak, R.W. 1989. Fresh-water invertebrates of the United States: Protozoa to Mollusca. 3rd edition. Wiley-Interscience, a division of John Wiley & Sons, Inc. New York.

Ross, H.H. and G.J. Spencer. 1952. A preliminary list of the Trichoptera of British Columbia. Proc. Ent. Soc. Brit. Col. **48**: 43-51.

Sharma, J. 1978. Taxonomy and ecology of some free-living marine nematodes from British Columbia. M.Sc. thesis. Simon Fraser University, Burnaby, British Columbia.

# Appendix III: Data Appraisal

## 3.1 Protocol Document

# CONTINENTAL AND OCEANOGRAPHIC DATA INFORMATION SYSTEM

Protocols for Appraisal of Data on
Benthic Invertebrates in the Fraser River Basin

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July 28, 1993

This document describes a protocol for the evaluation of data quality of datasets concerning macrobenthic invertebrates. This assessment of data quality is a direct descendant of the approach used by the Arctic (ADCAP) and West Coast (WESCAP) Data Compilation and Appraisal Program of the Institute of Ocean Sciences, Fisheries and Oceans Canada and is directed to expanding the capabilities of the CODIS data information system. A six-level scheme is used to rate the quality of data ranging from "0" for unreliable data containing obvious methodological errors, to "4", for reliable data of general utility based on well documented standards. A "9" is assigned when data are not rated. The intention is to rate data quality of datasets from a variety of sources, not just published reports. Datasets are rated by a semi-hierarchical approach using decision trees. The goal of the decision trees is to provide a fully documented method for the objective assessment of data quality.

Our working definition of a dataset is a collection of measurements unified by one or more of the following characteristics: biological species, chemical species, physical matrix, geographical locations or sampling methodology. The measurements must be treated uniformly, ideally by a single agent or agency and should be internally consistent with respect to sampling methodology. The measurements need not always be of the same type.

The derivation of individual datasets from a data source (or sources) must strive to maintain the expectations of internal consistency of the original workers. The subdivision must also take into account some general guidelines:

-when subdividing a large data source into datasets, one should strive to maximize the size of the datasets obtained. Conversely, grouping of data from separate sources may give a consistent larger dataset.
-the datasets should be easy to derive from the original data sources
-datasets should have uniform quality rankings. A large dataset could be fragmented to maintain a high quality portion of a dataset distinct from a lower quality portion.

Datasets are assigned a unique number, consisting of the year of the first measurement in the dataset plus a four digit identifier (e.g. 1988####). Related datasets may be given an additional letter to indicate that a larger data source was involved in the generation of the dataset.

The goal of the appraisal process is to establish indices of data quality that reflect a range of possibilities:

-a wrong result due to some obvious error
-there are possible sources of error in the report, sufficient to raise doubt
-there is incomplete reporting of the methodology
-the dataset is internally consistent
-the ideal case where a dataset is internally consistent and standardized

The appraisal of Fraser River basin benthic invertebrate data will use a rating system and a protocol document to assess data quality. The rating system is similar to that used by earlier ADCAP/WESCAP and CODIS catalogues. The rating system is defined as follows:

0 Data are found (or judged) to be wrong. There are obvious errors.

1 Data are suspect and probably not internally consistent. Trends or patterns within the data are probably not real.

2 Insufficient information is available to assess the quality of the data.

3 Data are internally consistent. Trends or patterns within the data are probably real. Comparisons with other datasets may be difficult.

4 Data are internally consistent and are sufficiently standardized to permit comparison with other datasets of equal quality.

9 Data are not rated.

The protocol document consists of a collection of four decision trees and associated notes to assist in the answering of the questions posed by the decisions trees. It is not the intent of the authors to produce a handbook of benthic study methods and as such the users of this document are directed to selected references on the subject. Those individuals assigned the task of rating datasets will be expected to be educated in this discipline and use their experience in conjunction with the protocols and appropriate references to assess the data.

The authors have attempted to create a rating system that is of broad scope so it can be used for a wide range of study types. The questions in the decision trees have been developed to maintain objectivity when possible, given the many types of datasets expected. However, the rating scale requires a subjective evaluation for those datasets rated a "9". A "9" is assigned without the benefit of the decision trees where the whole dataset has yet to be rated or where a particular category was judged unimportant for that study. This use of the "9" score can be a temporary rating for a whole dataset or a permanent rating for a particular category within a dataset.

## DECISION TREES

### COLLECTION:

1. Is there sufficient documentation of collection methods and substrate such that repeatability by other qualified investigators is possible? (See guideline 1.)

N⇨2

2. Is equipment suitable for substrate being sampled, the organism(s) of interest and the purpose of the study? (See guideline 2.)

N⇨0

3. Are the procedures suitable for the equipment, the conditions under which the equipment is being used and the purpose of the study? (See guideline 3.)

N⇨1

Exit with a rating of 4.

### Guidelines for Collection Tree:

#### Guideline 1

The most important criterion for collection evaluation is whether or not sufficient documentation of methodology is provided such that another qualified investigator could repeat the collection process with the information given. By meeting this criterion, we ensure that there is adequate information to rate the collection process.

Examples of the type of information expected are:

-description of sampler and manner in which it is used (e.g. size of sampler, depth of sample and selectivity)
-description of substrate, water and weather conditions
-criteria for acceptance or rejection of samples
-organism(s) of interest
-time of year when sampling occurred

In those cases where samples are sorted and/or sieved in the field as part of the collection process, documentation including mesh sizes should be provided.

#### Guideline 2

There are numerous methods used to sample benthic invertebrates. Some of the more common methods include mechanical grab samplers, stream-net samplers, artificial substrates, core samplers, suction samplers, quadrats and traps. Recommendations for use of a particular method depends on a number of factors, such as organism(s) of interest, substrate, water conditions and the purpose of the study. In those cases where the investigator has chosen to create a unique sampling device, a detailed description of the sampler and its use should be provided.

Quadrats and frames can be used to quantitatively sample a fixed area within a larger study site. Various types of traps, trawls, or suction samplers may be used semi-quantitatively to sample benthic organisms. Other methods can be used in those studies that require qualitative sampling only. Examples of these include dip nets, kick nets, forceps, rakes, tongs, post-hole

diggers or bare hands. Photography may be used as a sampling tool either quantitatively or qualitatively.

For a more detailed description of types and usage of benthic sampling equipment, refer to the selected references given at the end of this section.

**Guideline 3**

The various types of equipment available for benthic invertebrate sampling require specific techniques for their proper use, depending on the type and size of the equipment and the sampling conditions. Grabs of similar designs can be found in a variety of weights and sizes, and the procedures for their use will depend on certain parameters. Heavier and larger grabs may require winch and/or hoist equipment, whereas smaller, lighter grabs may be hand operated. Heavier grabs are more suitable for use in adverse weather conditions and for deep sampling than are lighter grabs. If inspection of grab samples upon retrieval shows evidence of washout or leakage, samples should be rejected and criteria used for their rejection should be documented.

Certain aspects of the use of a stream net sampler should be taken into consideration, including:

-avoiding disturbance of substrate upstream of the sampler
-avoiding clogs in nets which may cause backwash
-placing nets in areas of sufficient water velocity and appropriate depths

When using stream-net samplers, acceptability criteria should be related to the consistency of the sampling procedures, i.e. samples should be collected using identical methods.

When artificial substrates are used, recommended colonization time is six to eight weeks and exposure times should be consistent within a study. Extreme care should be taken during retrieval of artificial substrates to minimize loss of organisms. Ideally, a fine mesh net should enclose apparatus during retrieval.

Because of the small surface area sampled with cores, measures must be taken to compensate for the problems associated with patchy distributions of fauna. A sufficient number of replicates must be taken to ensure samples are representative of the study site.

Equipment of all types should be rinsed after each use to avoid contamination of future samples.

**Selected References**

Beak *et al*., 1973; Eleftheriou and Holme, 1984; Gibbons *et al.*, 1993; Klemm *et al.*, 1990; Lewis and Stoner, 1981; Merritt *et al*., 1984; Peckarsky, 1984; Plafkin *et al*., 1989; Tetra Tech, Inc., 1989; Wainwright *et al*., 1987.

**STORAGE:**

1. Is there sufficient documentation of sample storage and treatment such that repeatability by other qualified investigators is possible? (See guideline 1.)

N⇨2

2. Considering the organism(s) of interest, are preservation, fixation and storage methods suitable? (See guideline 2.)

N⇨1

3. Considering the measurement(s) of interest, are preservation, fixation and storage methods suitable? (See guideline 2.)

N⇨1

Exit with a rating of 4.

**Guidelines for Storage Tree:**

**Guideline 1**

The most important criterion for storage evaluation is whether or not sufficient documentation of methodology is provided such that another qualified investigator could repeat the storage process with the information given. By meeting this criterion, we ensure that there is adequate information to rate the storage process.

Examples of the type of information expected are:

-fixative, if used, and whether buffered
-preservative type
-stain, if used
-relaxant, if used
-temperature, if frozen or refrigerated
-labeling procedures
-container type and material

**Guideline 2**

There are several aspects of storage that were considered in evaluating storage methodology. The use of formalin, alcohol and freezing are common methods of specimen storage but each may have an effect on the measurement of interest depending on the organism. Storage of molluscs in unbuffered formalin can lead to decalcification. Some contractile organisms such as leeches need to be narcotized prior to fixation to prevent shrinkage and distortion which can make identification difficult. Freezing of soft bodies organisms may also make identification difficult. Morphometric analyses should be performed prior to storage, as most methods affect weight and size.

The time between collection and preservation and the time to analysis was also considered. Organisms stored for extended periods should be in preservative of sufficient strength to prevent decomposition (e.g. 70% EtOH), while 5% glycerine may be added to maintain exoskeleton flexibility of some species for later examination. A stain (e.g. Rose Bengal) may be added to facilitate the sorting process but it is a matter of individual preference. A description of the container used should be provided.

For a more detailed description of storage methodology, refer to the selected references given at the end of this section.

**Selected References**

DeShon et al., 1989; Eleftheriou and Holme, 1984; Gibbons *et al*., 1993; Howmiller, 1972; Klemm *et al*., 1990; Mills *et al.*, 1982; Tetra Tech, Inc., 1989; Wainwright *et al*., 1987; Wiederholm and Eriksson, 1977.

**ANALYSIS:**

1. Is there sufficient documentation of analytical methodology such that repeatability by other qualified investigators is possible? (See guideline 1.)

N⇨2

2. If applicable, was the analytical equipment used calibrated against a known standard? (See guideline 2.)

N⇨1

3. Are the methods appropriate for the purpose of the study? (See guideline 3.)

N⇨0

Exit with a rating of 4.

**Guidelines for Analysis Tree:**

**Guideline 1**

The most important criterion for evaluating analysis is whether or not sufficient documentation of analytical procedures is provided such that another qualified investigator could repeat the analysis with the information given. By meeting this criterion, we ensure that there is adequate information to rate analysis.

Examples of the type of information expected are:

-complete description or referenced methodology should be provided
-descriptions of equipment should be complete (e.g. detection limits, resolving power, sieve mesh size)
-if applicable, a description of sorting, splitting or sub-sampling techniques should be provided
-if applicable, reference to taxonomic key(s) and/or experts used for identification

Due to the immense range of possible analytical approaches, cataloguers are often left to rely on complete documentation either in the form of references, fully described methodology, or some combination of these, as the basis for evaluation.

**Guideline 2**

Some indication should be provided that analytical equipment was routinely calibrated against a known standard.

**Guideline 3**

It is important to determine if valid results are being drawn from the methods employed in the study. For example flotation sorting techniques are not appropriate for heavier organisms such as molluscs or caddisflies in stone cases. Large mesh sieves can not be expected to collect all life stages of a particular species or may miss smaller organisms entirely which could bias estimates of community structure.

**Selected References**

Gibbons *et al.*, 1993; Klemm *et al.*, 1990; Wainwright *et al.*, 1987.

**QUALITY ASSURANCE / QUALITY CONTROL:**

1. Is there sufficient documentation to determine if QA/QC procedures were in use? (See guideline 1.)

N⇨2

2. Where applicable, were sub-samples checked to ensure that they were representative of the whole sample? (See guideline 2.)

N⇨1

3. Where applicable, were some portions of the samples re-examined to determine sorting efficiency? (See guideline 3.)

N⇨1

4. Where applicable, were taxonomic samples identified with a known key and/or by qualified individuals? (See guideline 4.)

N⇨1

5. Given the intent of the investigation, were sufficient replicates taken to ensure that study objectives were met? (See guideline 5.)

N⇨1

6. Were the methods used sufficiently standardized and/or tied to an appropriate reference to enable comparison with other high quality data? (See guideline 6.)

N⇨3

Exit with a rating of 4.

**Guidelines for QA/QC Tree:**

**Guideline 1**

Quality assurance and quality control (QA/QC) procedures guarantee the utility of the data. Quality assurance includes a wide range of procedures and practices that ensure an end product of known quality Quality control includes the techniques used to measure and assess data quality.

In order to evaluate QA/QC, documentation must be provided to enable the cataloguer to answer questions 2 through 6 of the QA/QC tree. Not all of questions 2 through 4 will be pertinent to all studies, and only those applicable should be considered.

Examples of the type of information expected are:

-regular equipment cleaning, maintenance and calibration
-replicate samples
-determination of minimum sample size
-re-sorting samples and an estimate of efficiency
-use of keys
-identification of organisms by qualified individuals
-maintenance and use of a taxonomic reference collection where applicable
-labeling techniques

**Guideline 2**

In those studies where sub-sampling is performed, a confirmation that sub-samples are representative of the original sample may include an initial comparison of selected sub-samples to the total sample or a check of sub-sample variability.

**Guideline 3**

Sorting efficiency may be determined by either re-sorting a portion of each sample, or by re-sorting, in their entirety, a percentage of all samples taken.

**Guideline 4**

In those studies where taxonomic identification is important, certain information should be provided. For example, specifying which keys were used and to what taxonomic levels were organisms identified, names of taxonomic experts employed and whether or not comparisons were made with archived reference collections.

**Guideline 5**

The appropriate level of sample replication depends on the objectives of the study and therefore cannot be standardized. However, three to five replicates per station are generally acceptable as a minimum for statistical comparisons. Single samples may be adequate for qualitative studies.

**Guideline 6**

To allow comparison with similar high quality studies, the methodology should follow recognized standard procedures and/or be completely described and/or refer to methods of previously published work. This permits confident cross-comparison of data with other studies.

**Selected References**

DFO, 1992; Gibbons *et al.*, 1993; Klemm *et al*. 1990; Plafkin *et al.*, 1989; Tetra Tech, Inc., 1989.

## REFERENCES

Beak, T.W., T.C. Griffing and A.G. Appleby. 1973. Use of artificial substrate samplers to assess water pollution. American Society for Testing and Materials. Special Technical Publication No. 528, pp. 227-241.

Clifford, H.F. 1991. Aquatic invertebrates of Alberta. University of Alberta Press. Edmonton, Alta.

Cummins, K.W. 1962. An evaluation of some techniques for the collection and analysis of benthic samples with special emphasis on lotic waters. Amer. Midl. Naturalist **67**: 477-504.

Department of Fisheries and Oceans. 1992. Aquatic environmental effects monitoring requirements. Annex 1. Aquatic environmental effects monitoring requirements at pulp and paper mills and off-site treatment facilities regulated under the Pulp and Paper Effluent Regulations of the Fisheries Act, May 20, 1992.

DeShon, J.E., J.T. Freda and M.J. Bolton. 1989. Macroinvertebrates. **In:** Biological criteria for the protection of aquatic life: Volume III: Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. State of Ohio, Environmental Protection Agency. Ecological Assessment Section, Division of Water Quality, Planning and Assessment.

Eleftheriou, A. and N.A. Holme. 1984. Macrofauna techniques. **In:** Methods for the Study of Marine Benthos. N.A. Holme and A.D. McIntyre (eds). pp. 140-216. Blackwell Scientific Publications, London.

Gibbons, W.N., M.D. Munn and M.D. Paine. 1993. Guidelines for monitoring benthos in freshwater environments. Report prepared for Environment Canada, North Vancouver, B.C. by EVS Consultants, North Vancouver, B.C. 81pp.

Howmiller, R.P. 1972. Effects of preservatives on weights of some common macrobenthos invertebrates. Trans. Am. Fish. Soc. **101**: 743-746.

Klemm, D.J., P.A. Lewis, F. Fulk and J.M. Lazorchak. 1990. Macroinvertebrate field and laboratory methods for evaluating the biological integrity of surface waters. EPA 600/4-90/030. U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Cincinnati, OH.

Lattin, J.D. 1963. Equipment and technique. In: Aquatic insects of California. R.L. Usinger (ed). pp. 50-67. University of California Press, Berkeley.

Lewis, F.G. III and A. W. Stoner. 1981. An examination of methods for sampling macrobenthos in seagrass meadows. Bull. Mar. Sci. **31**: 116-124.

Merritt, R.W., K.W. Cummins and V.H. Resh. 1984. Collecting, sampling and rearing methods for aquatic insects. In: R.W. Merritt and K.W. Cummins (eds.). An introduction to the aquatic insects of North America. Kendall/Hunt Publ. Co., Dubuque, IA. pp. 11-26.

Mills, E.L., K. Pittman and B. Munroe. 1982. Effect of preservation on the weight of marine benthic invertebrates. Can. J. Fish. Aquat. Sci. **39**: 221-224.

Mundie, J.H. 1971. Sampling benthos and substrate materials, down to 50 microns in size, in shallow streams. J. Fish. Res. Bd. Canada **28**: 849-860.

Peckarsky, B.L. 1984. Sampling the stream benthos. **In:** A manual on methods for the assessment of secondary productivity in fresh waters. 2nd ed. J.A Downing and F.H. Rigler (eds). IBP Handbook 17. Blackwell Scientific, Oxford. pp. 131-160.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid bioassessment protocols for use in streams and rivers: Benthic macroinvertetrates and fish. EPA /440/4-89/001. U.S. Environmental Protection Agency, Assessment and Watershed Protection Division, Washington, D.C.

Tetra Tech, Inc. 1989. Recommended protocols for sampling and analyzing subtidal benthic macroinvertebrate assemblages in Puget Sound. **In:** Recommended protocols for measuring selected environmental variables in Puget Sound. Puget Sound Estuary Program, U.S. Environmental Protection Agency and U.S. Army Corps of Engineers.

Wainwright, P.F., B.D. Smiley and A. Blyth. 1987. Arctic data compilation and appraisal. Volume 11. Beaufort Sea: Biological oceanography - Marine zoobenthos 1914 to 1986. Can. Data Rep. Hydrogr. Ocean Sci. No. 5.

Wiederholm, T. and L. Eriksson. 1977. Effects of alcohol preservation on the weights of some benthic invertebrates. Zoon **5**: 29-31.

# Appendix IV: Data Cataloguing

## 4.1 Data Summary Forms

## 4.2 Conventions Used

**FORM 1**

Processing # _____
Collection Date_____
Fraser Bib # _____

**Geographical Regions:**

| | | |
|---|---|---|
| Estuary | Lower | Middle |
| Upper | Nechako | Thompson |

**Author(s):**

**Title** (if available)**:**

**Reference/Source/Date:**

**Agency/Sponsor:**

**Processing # _____**

**CONCURRENT BIOLOGY**

| | Non-salmonids | Salmonids | Fish | Birds | Mammals | Plankton | Plants | |
|---|---|---|---|---|---|---|---|---|
| Age | | | | | | | | |
| Diet | | | | | | | | |
| Identification | | | | | | | | |
| Morphometrics | | | | | | | | |
| Biomass | | | | | | | | |
| Movements | | | | | | | | |
| Distribution | | | | | | | | |
| Enumeration | | | | | | | | |
| Parasites | | | | | | | | |
| Reproduction | | | | | | | | |
| Behaviour | | | | | | | | |
| Physiology | | | | | | | | |
| Histology | | | | | | | | |
| Toxicology | | | | | | | | |
| Genetics | | | | | | | | |
| | | | | | | | | |

**CONCURRENT PHYSICS**

| | | | |
|---|---|---|---|
| Water | Substrate | Weather | Other |

**CONCURRENT CHEMISTRY**

| | Freshwater | Seawater | Sediment | Biota |
|---|---|---|---|---|
| Inorganic | | | | |
| Organic | | | | |
| Water Quality | | | | |

**CONCURRENT LOCATION**

| | | | |
|---|---|---|---|
| Vancouver Island | Georgia Strait | Queen Charlottes | Northern B.C. |
| Interior B.C. | Coastal B.C. | Washington | Alberta |
| Yukon | Other | | |

**FORM 2**

**Processing #** _____

Data set ID _____

Evaluator _____

Station Note

Number of stations

Latitude of stations

Longitude of stations

Start Date (mm/dd/yy)

Stop Date (mm/dd/yy)

Project Note

Organism(s)

| Measurement Description(s) | | | | | |
|---|---|---|---|---|---|
| Number of samples | | | | | |
| Sieve mesh size | | | | | |
| Units | | | | | |
| Collection Equipment | | | | | |
| Substrate | | | | | |
| Analytical Equipment | | | | | |

Remarks:

Sufficiency of Documentation:

| Method Location | Data | Hardcopy Location |
|---|---|---|

**FORM 3**

Processing # _____

Data set ID _____

Date Rated _____

Evaluator _____

Collection Rating _____
Collection Note

Storage Rating _____
Storage Note

Analysis Rating _____
Analysis Note

QA / QC Rating _____
QA / QC Note

Overall Rating _____
Ratings Note

## Conventions used in cataloguing

Conventions used in data collection:

| | |
|---|---|
| Station note: | Brief description of actual sampling station. |
| Number of stations: | Number of stations where benthos were sampled within the boundaries of the study area. |
| Latitude and longitude coordinates: | Taken from the text when provided. If not available in the text, were taken from QUIKMap Geographic Information System or the British Columbia Gazetteer (1985). If several stations are within close proximity to one another, then a single central coordinate is provided for those stations. |
| Start and stop dates: | These dates consider only the sampling dates, and do not include time taken for analysis. If no date is given, January 1 and December 31 of the year of publication are given. If a range of months is given, the longest time span possible for the range is given. For example, April to July would be assigned the dates April 1 to July 31.<br><br>Often a season was given as the date of the study. In these cases, summer was considered to be from June 21 to September 20, autumn from September 21 to December 20, winter from December 21 to March 20 and spring from March 21 to June 20. |
| Project note: | Brief description of the intent of the study. |
| Number of samples: | Number of samples for a given location and /or measurement. |

Conventions used for entry into CODIS:

Dataset Identification Screen

- Trace ID is assigned the DS_ID code.
- Status is assigned "U".
- Processing number and F number from Missler (1992) (if available) are assigned to the Comments field.
- Sieve mesh size and information about common latitude and longitude coordinates for multiple samples are assigned to the description field.

Continental Benthos Stations Screen

- Depths are measured in meters.

## References

Energy, Mines and Resources Canada. 1985. Gazetteer of British Columbia. 3rd Edition. Geographical Services Division, Surveys and Mapping Branch. Ottawa.

# Appendix V: Quality Assurance/ Quality Control

## 5.1 A QA/QC Evaluation of the Catalogue

# Fraser River Basin Benthic Invertebrate Catalogue

## CODIS 2.0 Implementation

## A QA/QC Evaluation of the Catalogue

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June 30, 1994

**Summary**

This document accompanies the main report prepared by Jeff Johansen and Kelly Reis. Two issues are examined: the overall reliability of the data entered in the Continental Benthos catalogue, and the reliability of the data structures used to store the data. A sample of 18 datasets (of 168) were inspected using the View Datasets function of CODIS Development Version. The data entered were compared to the data of the primary data source. The overall error rate is very low: less than 0.4% overall. The main errors are associated with blanks in fields that the data entry person is required to type in full. Data entered using look-up lists is very reliable, with no errors detected in over 1500 taxonomic records examined.

The data structures are less well controlled. The main problems are with mixed use of some fields, under-utilization of some look-up lists, and a lack of protocol definitions for "methods" and "measurements". When reported, the data will provide a complete account that is representative of the data source, but the reporting will not be completely standardized.

**Overview**

This document accompanies the report prepared by Jeff Johansen and Kelly Reis concerning the acquisition, cataloguing, and appraisal of benthic data from the Fraser River Basin. The goals of this document are two-fold: 1) to present an external QA/QC examination of the catalogue prepared, and 2) to evaluate the structures of the CODIS 2.0 database as they relate to the organization of the Fraser Basin benthic data.

The procedures related to the first of these goals are similar to the QA/QC evaluation of the Fraser River Basin Organic Contaminants Catalogue contained in the final report on CODIS 1.0 (Fyles *et al.*, 1993). They involve a complete checking of a random sample of the datasets, from the primary source through to the data files in CODIS 2.0. Previously we used the reports generated by CODIS 1.0 as a tool for this process. This was not possible in this instance as the Development Version of CODIS 2.0 has internal flaws in the reporting functions. Rather, the "View Datasets" function of the CODIS 2.0 Development Version was used to inspect the data on a field-by-field basis. This effort in part duplicates the checking efforts that Jeff and Kelly discuss on page 8 of their report.

The second goal of evaluating the CODIS 2.0 data structures lie outside the normal QA/QC procedures. This area is more closely allied to the ongoing task of completing CODIS 2.0 in the context of a fully functional multi-discipline meta-database. In this section, the cataloguers are assumed to be capable of storing accurate information. What is important is where the information has been stored, and how it will be retrieved by an end-user. As a companion issue, the protocol definitions for the terms used in the data files will be examined.

Other aspects of the larger task of completing CODIS 2.0 include: an examination of the CODIS SQL logic by a programmer-analyst in the Academic Systems section of the University of Victoria (Dr. S. Wong), a documented screen-by-screen analysis of the CODIS Development version (Brian Smiley and T. Fyles), and an *ab initio* description of how the reporting and mapping functions of CODIS 2.0 should perform (B. Smiley, T. Fyles, B. King). The data structures are also being examined by B. King in the context of Ocean Chemistry data from the WESCAP 4 and 5 catalogues, which involve incomplete data on locations in the Georgia Basin and B.C. Offshore regions. All these analyses will be considered in establishing a plan for the reworking of the Development Version.

## QA/QC of the Data Appraisal/Data Entry process

There are 168 DS_IDs assigned to the Continental Benthos Catalogue. The "average" Continental Benthos dataset involves 3 different measurements, at 6 different locations, involving 15 different taxa. The random selection of DS_IDs in the Continental Chemistry catalogue was biased towards the smaller datasets due to the large size disparity between datasets (nuggets in sand). This problem is much less important in the Continental Benthos catalogue as no datasets involve more than 18 different measurements (2.4% of the CB_RATG file). Many datasets involve large numbers of taxa, but these will be randomly selected via the CB_RATG file. In the event, the selection process averages are very close to the global averages given above.

The reporting functions of the CODIS Development Version are insufficiently reliable for the exploration of the data. Rather, Microsoft ACCESS was used to prepare an ascending ordered list of the 168 DS_IDs and a set of 18 were selected using a list of random numbers from the interval 1-168. The DS_IDs selected are given in Table 1. Each DS-ID in turn was viewed using the "View Datasets" function. There are six types of ACCESS Forms for each dataset, with a number of entry positions for the data entry tasks:

| | |
|---|---|
| - Dataset Identification | 8 fields |
| - Regions | 1 or more fields |
| - References | 1 or more fields |
| - Locations | 13 fields plus 15 QUIKMap fields per station |
| - Ratings | 10 fields per measurement per assigned station |
| - Taxa | 1 field per taxon per assigned station |

The QUIKMap fields are set by the program to default values. Once a DS_ID has been assigned by the program, the relationships with all the other Forms are maintained. Thus mixing between DS-IDs in principle cannot occur (and in fact has not been detected in the Benthos catalogue). The data structure permits measurements to be "assigned" to station locations, allowing the data to be known at the level of a single station, rather than at the full dataset level. Moreover, the taxa can be assigned to each measurement, allowing the taxa at a station to be uniquely known to the user. This complicates the QA/QC analysis as the number of fields is determined by the data, not by the file structures. The Forms for each of the datasets selected were viewed in turn: accounting for all the assigned stations and taxa, a total of 217 Forms were examined, and compared with the primary documents and the ratings information provided on the form 3. The detected errors are summarized in Table 1. "Missing" means that the data were available in the primary document, but were not recorded on the ACCESS Form. "Error" means a wrong result was recorded; these were corrected as discovered. "Incomplete" means the data could have been more adequately described. The numbers of Forms involved per DS_ID, and the numbers of Taxa involved are given in Table 1.

**Table 1**: Summary of errors in the Continental Benthos data

| DS_ID | Ident. | Regions | Refs | Locns | Ratg | Taxa |
|---|---|---|---|---|---|---|
| 19510030 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/6 |
| 19640056 | 0/1 | 1/1 missing | 0/1 | 0/1 | 0/2 | 0/2 |
| 19685001 | 0/1 | 0/1 | 0/1 | 1/1 missing | 1/5 error | 0/10 |
| 19765019 | 0/1 | 0/1 | 0/1 | 0/2 | 0/2 | 0/8 |
| 19765021 | 0/1 | 0/1 | 0/1 | 0/1 | 0/2 | 0/64 |
| 19775010 | 0/1 | 0/1 | 0/1 | 0/1 | 0/2 | 0/2 |
| 19775017 | 0/1 | 0/1 | 0/1 | 0/1 | 0/7 | 0/1 |
| 19785011 | 1/1 missing | 0/1 | 0/1 | 0/1 | 0/6 | 0/36 |
| 19795010 | 0/1 | 0/1 | 0/1 | 0/7 | 0/7 | 0/352 |
| 19815010 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 |
| 19815011 | 0/1 | 0/1 | 0/1 | 0/1 | 0/1 | 0/71 |
| 19845012 | 1/1 missing | 0/3 | 0/1 | 0/15 | 0/15 | 0/750 |
| 19845015 | 1/1 missing | not in Fraser | 0/1 | 0/1 | 0/13 | 0/1 |
| 19845017 | 0/1 | 0/3 | 0/1 | 0/1 | 2/4 error | 0/27 |
| 19845021 | 0/1 | 0/1 | 0/1 | 0/3 | 0/4 | 0/72 |
| 19855106 | 0/1 | 0/1 | 1/1 incompl | 0/1 | 0/1 | 0/8 |
| 19865036 | 0/1 | 0/3 | 0/1 | 0/1 | 1/1 error | 0/12 |
| 19895080 | 2/1 error | 0/3 | 0/1 | 0/4 | 0/4 | 0/100 |
| totals | 5 errors 180 fields 2.8% | 1 error 26 fields 3.85% | 1 errors 18 fields 5.5% | 1 error 572 fields 0.17% | 4 errors 780 fields 0.51% | 0 errors 1529 taxa |

In addition to the errors described in Table 1, there are a number of systematic issues which might be considered as errors. For example: many of the primary documents indicated depth of sampling, but the appropriate location field was virtually never used. Clearly the cataloguers decided to ignore this type of information. Similarly, the vast majority of ratings forms examined did not have a "measurement method" assigned. In many cases the method is obvious from the nature of the study, but a default method might have been assigned in these cases. Both of these systematic errors are ignored in the analysis.

Of the 3105 fields plus taxa examined, only 12 errors were detected for an overall error rate of only 0.39%. There were no errors detected in the taxa, even though the data entry of taxonomic information is very tedious. The errors in the ratings fields were all of the same type - the wrong parameter was assigned to the measurement. This is a result of the Copy-Append function of the data entry process. In principle it could be avoided through software, as a measurement is assigned to a parameter by protocol, so this field where the errors occurred could be machine generated. The rest of the errors were missing information type errors, probably just a result of data entry laziness.

As with CODIS 1.0, this error analysis indicates the great strength of protocol controlled look-up lists. The highest errors rates are in "memo" fields where the data entry person must type text directly into a field. The low error rates are associated with rigidly fixed protocols. The meta-data are in very good condition in the files, with particularly high reliability in the taxonomic area.

**CODIS Data Structures and Protocols for Benthic data**

The analysis of structures and protocols is inherently anecdotal as it relies on the preferences of the analyst. The main questions to be answered are: does the data stored adequately reflect the primary data sources? is the data stored in a form which can be recovered? is the data stored in well-defined categories?

With respect to the structures reflecting the primary source information there is a clear problem with the current structure. The "DESCRIPT" field in the DS_ID file has been used by other disciplines for a general description of the project, and to expand on the project title in the "PROJECT" field. The cataloguers used the "DESCRIPT" field to store information on the sieve mesh size, apparently as they could find no other place to put this type of information that they regarded as important. A better solution would be to have an additional field associated with the measurement file that would describe the method more fully. Since the measurement field was underutilized (above), there should be no difficulty in solving both problems together.

Also related to how data are stored is the other use of the "DESCRIPT" field to indicate that station locations were averaged. This appears to have been done in cases where the data were of poor quality, or where the station-to-measurement relationship was not clear from the primary data source. In the Continental Chemistry catalogue the use of an alternate symbol for mapping, and a comment in the locations note file were used simultaneously to achieve the same result. In Continental Benthos, the location note file was used exclusively as an area names file. The area names file associated with DS_ID file was not used at all.

This dual use of the "DESCRIPT" field will interfere with a clean reporting, and is essentially a problem associated with the recovery of stored information. The other types of problems in this area are inadequate comments in the notes files to explain why poor ratings were assigned, and weak controls on the relationships between parameters and measurements. The appropriate files are appended.

Table 2 contains the terms used to store the information about the collection process, Table 3 does the same for storage. Table 4 begins to shift to comments on the rating of the analysis, but still contains some information on the analysis method, and some information related to QA/QC. The rating of the QA/QC process is described using the terms in Table 5, which are almost exclusively directed to why the studies fared poorly. The ratings notes (Table 6), used in other disciplines to summarize the overall rating, are used here in a variety of ways: mesh sizes information, general "seal of approval" comments, comments related to the purpose of the study. It is clear that the notes files require much closer control at the system manager level, to define what types of information are to be stored in each one. In general, all the comments provided are informative, and the composite picture will be an accurate reflection of the primary data source, but the reporting of the information will be irregular using any fixed reporting format.

A somewhat different problem is evident in Table 7 in which the parameter-measurement relationships are indicated. There are no standard definitions for parameters provided in the main report so it is difficult to establish why the measurement "density and identification" is associated with the "density" parameter, while "identification and enumeration" is associated with the "identification" parameter. Moreover, some datasets involve "density", "enumeration", and "identification" as three separate measurements. It appears form the data that the essence of the separate measurements is their association with specific locations. Studies at a single site, or datasets using composite station information use the compound measurement types such as "density and identification". This will ultimately pose a problem for a user interested in identification information, as several parameters are involved.

It is important to recognize that the data stored are generally in a useful and useable form. But at the same time, it is clear that much closer control over all the files is required. In general there should be a protocol definition for each file and

each field to ensure that the individual data entry people use the system in the same way. The data files as they stand are in a good position to be "cleaned-up" to conform with a protocol defined structure. This is not immediately required, as they are useable as they stand, but a fully functional CODIS would benefit from cleaner data.

**Table 2**: List of comments used in the collection note field (CB_COLLN.DBF)

| CODE # | COLLECT1 |
|---|---|
| 1 | not enough information |
| 2 | not important |
| 3 | not applicable |
| 4 | stratified sled sampler |
| 5 | quadrat |
| 6 | box corer |
| 7 | acceptable |
| 8 | ladder sampler |
| 9 | suction pump |
| 10 | epibenthic sled |
| 11 | Van veen grab |
| 12 | nylon net bag sampler |
| 13 | Ekman dredge |
| 14 | basket trap |
| 15 | method(s) referenced |
| 16 | Ponar grab |
| 17 | metal corer |
| 18 | open-ended box |
| 19 | quadrats along transect |
| 20 | burrow casts (resin casting techniques) |
| 21 | epibenthic stream sampler |
| 22 | Peterson grab |
| 23 | artificial substrate (Beak design) |
| 24 | Surber sampler |
| 25 | unsuitable sampling equipment |
| 26 | lost apparatus |
| 27 | Mundie sampler |
| 28 | mini-Ponar clam shell device |
| 29 | Smith-MacIntyre grab |
| 30 | otter trawl |
| 31 | observations from submersible |
| 32 | crab traps |
| 33 | prawn traps |
| 34 | by hand |
| 35 | plug |

| CODE # | COLLECT1 |
|---|---|
| 36 | modified circular sampler |
| 37 | Hester-Dendy multiple plate sampler |
| 38 | artificial substrate (not Beak design) |
| 39 | net at channel entrance |
| 40 | plankton sled |
| 41 | fine wire loop |
| 42 | Ekman-Birge dredge |
| 43 | modified Surber sampler |
| 44 | SCUBA diver |
| 45 | spoon |
| 46 | beach seine |
| 47 | "Shipek" model 860 sediment sampler and spade |
| 48 | shovel |
| 49 | fish net or bucket |
| 50 | glass tube (as corer) |
| 51 | modified transect method |
| 52 | emergence trap |
| 53 | net |
| 54 | dip net, fine mesh |
| 55 | bulb pipettes |
| 56 | collection of plant material |
| 57 | traps baited with seaweed |
| 58 | Hargrave sampler |
| 59 | Kajak corer |
| 60 | plexicore |
| 61 | ring nets |
| 62 | traps |
| 63 | the variety of methods used in collection and the time of day (sometimes at night) would definitely |
| 64 | Craib corer |
| 65 | K-B corer |
| 66 | questionairre and crab traps |
| 67 | not quantitative |
| 68 | adequate documentation |
| 69 | corer |
| 70 | Surber sampler mesh size too big (1024 um) |

| CODE # | COLLECT1 |
|---|---|
| 71 | require more information regarding sampling conditions |
| 72 | some samplers filled with gravel and sand |
| 73 | sampling generally unsuccessful |
| 74 | trawls and seines |
| 75 | modified circular sampler, Ekman dredge and Ponar grab in lake |
| 76 | not quantitative: sweep net and by hand |
| 77 | very general information: traps, dip nets and ring nets |
| 78 | not quantitative: net, submerged funnel traps |
| 79 | sediment sampling unit |
| 80 | plankton sled, adequate documentation |
| 82 | Ekman dredge, then in cylinders for experiments |
| 83 | Hess-type sampler (referenced) |
| 84 | Ekman dredge and core sampler; samples and their use well described |
| 86 | glass cylinder |
| 87 | leaf packs - alder or polyester |
| 88 | modified Surber sampler and emergence traps on artificial streams |
| 89 | Van veen and Peterson grabs |
| 90 | plexiglass corer in quadrat |
| 92 | Ekman dredge and aluminum pot on 2m wooden pole |
| 93 | Ponar grab and metal corer |
| 94 | net and sediment sampler |
| 95 | Ekman dredge, sampling generally unsuccessful |
| 96 | net over entire flow |
| 97 | submerged funnel trap |
| 98 | quadrats and plugs, low replication - results combined |
| 99 | modified Hess sampler, all Nitex cylinder |
| 100 | Hess sampler |
| 101 | sled-mounted bottom tow net |
| 102 | Peterson and Ponar grabs |
| 103 | leaf packs, alder |
| 104 | leaf packs, polyester |
| 105 | Craib corer and K-B corer |
| 106 | Peterson dredge, Ekman dredge and artificial substrate |
| 107 | quadrat and Ponar grab |
| 108 | Ponar grab and surber sampler |

| CODE # | COLLECT1 |
|---|---|
| 109 | Otter trawl and crab traps |
| 110 | investigator's own design |
| 111 | glass tube (as corer) and/or box corer |

**Table 3**: List of comments used in the storage note field (CB_STORN.DBF)

| CODE # | STORAGE |
|---|---|
| 1 | 10% buffered formalin |
| 2 | acceptable |
| 3 | formalin |
| 4 | freeze dried |
| 5 | frozen |
| 6 | not enough information |
| 7 | not enough information of sorting techniques |
| 8 | stain used |
| 9 | stored in 50% isopropanol |
| 10 | frozen on dry ice |
| 11 | 10% hexamine-buffered formalin |
| 12 | 10% formaldehyde |
| 13 | not applicable |
| 14 | air dried for mercury analysis |
| 15 | whirl-pak bags |
| 16 | some samples analyzed immediately |
| 17 | 5% neutral formalin |
| 18 | 70% isopropanol |
| 19 | 5% buffered formalin |
| 20 | 4% formalin |
| 21 | fixed in gluteraldehyde and water, stain used |
| 22 | 80% ethanol: organisms to be weighed killed with hot water |
| 23 | 10% formalin |
| 24 | dilute formalin and then 70% alcohol |
| 25 | formaldehyde: stain used |
| 26 | formaldehyde, then ethanol |
| 27 | formaldehyde |
| 28 | relaxed, fixed in 5% formalin-sea water, then transferred to glycerol-methanol mixture |
| 29 | 7% buffered formalin, then 70% isopropanol and 5% glycerol |
| 30 | 10% buffered formalin, stain used |
| 31 | 10% formalin, stain used |
| 32 | 10% formalin, then 50% isopropanol |
| 33 | formalin and then 70% ethanol, sometimes 70% ethanol only for adults |
| 34 | 4% filtered seawater-formaldehyde |

| CODE # | STORAGE |
|---|---|
| 35 | 10% formalin, then 50% propanol; stain used |
| 36 | formalin, stain used |
| 37 | fixed in 10% formalin, preserved in 70% isopropanol |
| 38 | fixed in 10% formalin, preserved in 70% alcohol |
| 39 | 5% formalin, stain used |
| 40 | 6% buffered formaldehyde |
| 41 | 5% formalin |
| 42 | 50% propanol |
| 43 | 6% buffered formalin |
| 44 | 70% alcohol |
| 45 | 70% ethanol |

**Table 4**: List of comments used in the analysis note field (CB_ANALN.DBF)

| CODE# | ANALYSIS NOTE |
|---|---|
| 1 | acceptable |
| 2 | adequate description of sediment sieving |
| 3 | elutriation after sorting |
| 4 | Folsom splitter |
| 5 | keys listed |
| 6 | keys not listed |
| 7 | methods referenced and/or described |
| 8 | no information on identification procedures |
| 9 | not enough information |
| 10 | not standard between control and treatment groups |
| 11 | satisfactory |
| 12 | sieve size not mentioned |
| 13 | subsampled by wet weight |
| 14 | taxonomic expert(s) named |
| 15 | no mention of how sub-samples were split |
| 16 | not mentioned how soon samples analyzed after collection |
| 17 | name of sorter(s) given |
| 18 | not applicable |
| 19 | analytical equipment routinely calibrated |
| 20 | elutriation for meiofauna |
| 21 | dioxin and furan samples sent away for analysis |
| 22 | vague reference for non-Hg metals |
| 23 | keys not listed for stomach contents |
| 24 | sugar flotation |
| 25 | tissue homogenates |
| 26 | sieve size given |
| 27 | flotation technique used |
| 28 | method(s) referenced and/or described, keys and/or taxonomic expert(s) named |
| 29 | keys listed and drawings supplied |

**Table 4**: List of comments used in the analysis note field (CB_ANALN.DBF)

| CODE# | ANALYSIS NOTE |
|---|---|
| 1 | acceptable |
| 2 | adequate description of sediment sieving |
| 3 | elutriation after sorting |
| 4 | Folsom splitter |
| 5 | keys listed |
| 6 | keys not listed |
| 7 | methods referenced and/or described |
| 8 | no information on identification procedures |
| 9 | not enough information |
| 10 | not standard between control and treatment groups |
| 11 | satisfactory |
| 12 | sieve size not mentioned |
| 13 | subsampled by wet weight |
| 14 | taxonomic expert(s) named |
| 15 | no mention of how sub-samples were split |
| 16 | not mentioned how soon samples analyzed after collection |
| 17 | name of sorter(s) given |
| 18 | not applicable |
| 19 | analytical equipment routinely calibrated |
| 20 | elutriation for meiofauna |
| 21 | dioxin and furan samples sent away for analysis |
| 22 | vague reference for non-Hg metals |
| 23 | keys not listed for stomach contents |
| 24 | sugar flotation |
| 25 | tissue homogenates |
| 26 | sieve size given |
| 27 | flotation technique used |
| 28 | method(s) referenced and/or described, keys and/or taxonomic expert(s) named |
| 29 | keys listed and drawings supplied |

**Table 6**: List of comments used in the ratings note field (CB_RATN.DBF)

| CODE | REMARKS |
|---|---|
| 1 | no definate QA/QC mentioned, although replicates of samples taken |
| 2 | solid study |
| 3 | a well documented study |
| 4 | reasonable population estimate survey |
| 5 | very basic study without much detail given |
| 6 | very little description of methodology |
| 7 | thorough basic study |
| 8 | ventilation method for determining "pausing" not standardized |
| 9 | well described study with some inconsistency in collection methodology |
| 10 | report mainly secondary information with brief study to confirm literature |
| 11 | simple community survey |
| 12 | several different collection types |
| 13 | too much variability of conditions in substrate effects section |
| 14 | no mention of QA/QC |
| 15 | generally good study |
| 16 | very crude productivity survey |
| 17 | extensive study of total environment but little methodology |
| 18 | written as a technical paper and rated in this context |
| 19 | very general paper and rated in this context |
| 20 | field section appears to have very inconsistent sampling methods that would have a bearing on the measurements of interest |
| 21 | a technique paper |
| 22 | a small section of a very large report, with little detail, dealing with benthic organisms in subtidal environment |
| 23 | well documented, no QA/QC mentioned |
| 24 | good as a general comment of crabs of Boundary Bay |
| 25 | 0.56 mm mesh, well documented |
| 26 | 0.18 mm mesh, well documented |

# Fraser River Basin Benthic Invertebrate Catalogue

# Continental and Oceanographic Data Information System (CODIS)

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December 1994

DOE FRAP 1994-17

**Table 7**: List of the measurements field (CB_MEAS.DBF)

| Parameter | CODE # | MEASUREMENT |
|---|---|---|
| Chemical | 10 | chlorinated hydrocarbons |
| | 11 | chlorophenol levels |
| | 14 | concentration of mercury |
| | 16 | contribution of gut sediment contents to tissue metal levels |
| | 22 | dioxins and furans |
| | 33 | heavy metals (not Hg) |
| | 54 | PCBs |
| | 55 | PCP and TCP (chlorophenols) |
| | 57 | ppm dry weight |
| | 72 | total heavy metals |
| | 73 | trace metal |
| | 76 | mercury content |
| | 79 | metals |
| | 89 | sewage effluent toxicity |
| | 90 | chlorine toxicity |
| | 95 | phthalate ester |
| | 96 | PAHs |
| | 97 | organochlorine pesticides |
| | 104 | dissolved oxygen |
| | 109 | heavy metal concentration, ectoderm |
| | 110 | heavy metal concentration, muscle |
| | 111 | heavy metal concentration, muscle and liver |
| Density | 17 | density |
| | 18 | density of adults |
| | 19 | density of eggs |
| | 36 | intertidal benthic macroinvertebrate density |
| | 37 | intertidal benthic meiofauna density |
| | 42 | macrofauna density |
| | 48 | meiofauna density |
| | 66 | shrimp burrow opening densities |
| | 69 | subtidal benthic macroinvertebrate density |
| | 71 | subtidal benthic meiofauna density |
| | 116 | density and identification |
| Diet | 3 | assimilation |
| | 21 | diet (relative abundances) |

| Parameter | CODE # | MEASUREMENT |
|---|---|---|
| | 25 | egestion rates |
| | 81 | diet |
| | 84 | gut contents |
| Enumeration | 1 | # burrow openings |
| | 6 | brood size |
| | 12 | clutch size |
| | 20 | depth distribution |
| | 23 | distribution |
| | 27 | emerged adults |
| | 28 | emigration |
| | 35 | immigration |
| | 49 | mortality |
| | 50 | number |
| | 51 | number caught |
| | 52 | number found dead |
| | 56 | population estimate |
| | 60 | relative numbers |
| | 64 | sex ratio |
| | 78 | % survival in relation to salinity |
| | 82 | catch per unit effort (CPUE) |
| | 93 | frequency distribution |
| | 103 | adults from submerged emergence traps at different depths |
| Miscellaneous | 7 | burrow morphology |
| | 8 | capture net mesh size |
| | 13 | collect and tag |
| | 29 | fishing of lost traps |
| | 41 | lethality |
| | 53 | observation only |
| | 58 | rate of sediment extrusion |
| | 59 | rate of sediment turnover by shrimp |
| | 62 | SCUBA transects |
| | 63 | sediment re-working |
| | 74 | visual effect on crabs |
| | 91 | variation within dredged sample |
| | 92 | variation at constant depth |

| Parameter | CODE # | MEASUREMENT |
|---|---|---|
| | 94 | comparison of variability of Ekman dredges (6" and 9") |
| Morphology | 2 | age |
| | 4 | biomass |
| | 5 | biomass (dry weight) |
| | 9 | catch weight |
| | 15 | condition factor |
| | 24 | dry weight of adults |
| | 26 | egg weight |
| | 31 | head capsule width |
| | 32 | head length |
| | 34 | height |
| | 38 | length |
| | 39 | length of 1st pair of walking legs |
| | 40 | length of cheliped or claw |
| | 44 | mean dry weight |
| | 45 | mean dry weight (flesh) |
| | 46 | mean dry weight >1.0 mm |
| | 65 | shell height |
| | 67 | size |
| | 70 | subtidal benthic macroinvertebrate wet weight analysis |
| | 75 | wet weight |
| | 80 | weight |
| | 98 | muscle weight |
| | 99 | hepatopancreas weight |
| | 100 | sex |
| | 101 | tissue weight |
| | 108 | dry weight |
| | 112 | dry mass |
| | 114 | width |
| | 115 | length (anterior-posterior, rostrum) |
| Physiology | 30 | growth |
| | 43 | mean direction of migration/movement |
| | 47 | mean velocity of movement |
| | 61 | respiration |
| | 68 | spawning cycle |

| Parameter | CODE # | MEASUREMENT |
|---|---|---|
| | 83 | shell hardness |
| | 85 | oxygen consumption |
| | 86 | ventilation rate |
| | 87 | activity |
| | 88 | swimming |
| | 102 | mean calorific values |
| | 105 | oxygen production of epibenthic algae |
| | 106 | total community respiration |
| | 107 | bacterial respiration |
| | 113 | gonad development |
| Identification | 77 | identification |
| | 117 | identification and enumeration |