

EVOS PROPOSAL SUMMARY PAGE

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Project No. G-030642

Date Received 9/3/02; TC approved 11/25/02

Project Title: Database on the Marine Invertebrate Macrofauna of Prince William Sound: An Addition to the University of Alaska Museum's ARCTOS Network

Project Period: FY 03-04

Proposer: Nora R. Foster
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EVOS Funding: \$19,200

Matching Funds:

Study Location: Prince William Sound

Trustee Agency: ADF&G

ABSTRACT

Data sets that present basic taxonomic and biogeographic information at the species level for 1876 plant and animal species from Prince William Sound were compiled as part of research on potential introductions of nonindigenous species. This proposal seeks funding to edit the data on the 1343 invertebrate species, and to make the literature and specimen records of their occurrences available on the University of Alaska Museum's ARCTOS web-accessible database.

I. INTRODUCTION

Biological surveys in Prince William Sound have documented the presence of over 1645 animal species in Prince William Sound. However, most research and restoration efforts have focused on a very small set of species, primarily vertebrates, and those invertebrate species with economic value. The scientific validity of long-term monitoring of biodiversity responses to environmental change in the GEM program depends on both accurate species-level identifications, and better resolution of data on species distributions.

Data sets describing biodiversity of Prince William Sound invertebrates have been compiled as part of an investigation of ballast-water mediated introductions of species into Port Valdez/Prince William Sound (Appendix I) (Foster and Feder, 2002). This large amount of information will be an important contribution to research, restoration and monitoring if the data can be made available to a wider group of users.

In FY 2003-2004, Nora Foster will verify the accuracy of the information already compiled, and other taxonomic experts will be asked to review several data sets. The data sets will be converted to a database format, and made available on a website, hosted by the University of Alaska Museum, (part of the Arctic Archival Observatory project: <http://arctos.museum.uaf.edu>). The data sets will also be linked to GEM's web site. In that time frame, we will seek funding for the continuing maintenance of the on-line data so that new revisions of taxa, new bibliographic information, and new species distribution information can be incorporated.

This project makes extensive use of the UAM specimens obtained as part of Project no. 02608 funded by EVOS in FY 2002: *Permanent Archiving of Specimens Collected in Nearshore Habitats*... As a result of that project, 4070 specimens, representing nearly 200 species from critical habitats in Prince William Sound have been incorporated into the University of Alaska Museum, and at least 10 species names have been recorded from the area, and 100 specimens have been re-identified (Foster in prep.). This project will also have strong ties to work proposed by Brenda Konar to GEM and the Census of Marine Life for *Alaska Natural Geography in Shore Areas* (ANaGISA), where reference specimens and their associated data will be needed to assure accurate identifications.

II. NEED FOR THE PROJECT

A. Statement of Problem

In the summary of a major study on potential introductions of nonindigenous species into Prince William Sound, Hines et al. (2000:viii) raise the points that: "Taxonomy and biogeography of species in Alaska marine ecosystems have received poor levels of study and understanding" and that: "In general the poor resolution of taxonomic and biogeographic data in Alaskan marine ecosystems is a substantial impediment for analysis of environmental impacts."

In the 1970s and early 80s environmental surveys and monitoring in Prince William Sound resulted in numerous compilations of species lists. The previously mentioned study (Foster 2000) drew on species lists from Cooney et al. (1973) and Cooney and Coyle (1988):plankton, Feder et al. (1976):sediments, Feder and Bryson-Schwafel (1988):the intertidal zone, Feder and

Jewett(1987):subtidal benthos, Feder and Keiser (1980):intertidal biology, Feder and Matheke (1980):benthic infauna, Feder et al. (1979):benthos of Resurrection and Aialik bays, Feder and Paul (1973):the intertidal zone, Feder and Paul (1980):Cook Inlet, Hoberg (1986):benthic infauna, and Jewett and Feder (1977):Port Valdez.

Species names from field guides and taxonomic revisions of characteristic northeastern Pacific taxa were also consulted, for example Banse and Hobson (1968) (benthic errantiate polychaetes), Barnard (1969) (gammaridean amphipods), Butler (1980) (shrimp), Coan et al. (2000) (bivalve mollusks), Dick and Ross (1988) (Bryozoa), Lambert (1981, 1997) (sea stars and sea cucumbers), and Schultz (1969) (isopods).

Rapid community assessments, focal taxonomic collections, and fouling plate surveys in Prince William Sound in 1998 and 1999 were intended to detect well-established nonindigenous species, especially in areas at risk for invasion (Hines and Ruiz 2000). Taxonomic experts who participated in the field work in Prince William Sound and the Kenai Peninsula contributed names and distribution information for marine plants (G. Hansen), Cnidaria and Ctenophora (C. Mills), opisthobranch gastropods (J. Goddard), polychaete annelids (J. Kudenov), Crustacea (J. Chapman and J. Cordell), Bryozoa (J. Winston), and urochordates (G. and C. Lambert).

B. Rationale/Link to Restoration

“In establishing the GEM Program, the Trustee Council explicitly recognized that complete recovery from the oil spill may not occur for decades and that full restoration of injured resources will most likely be achieved through long-term observation and, as needed, restoration actions. The Council further recognized that conservation and improved management of injured resources and services will require substantial ongoing investment to improve understanding of the marine and coastal ecosystems that support the resources, as well as the people, of the spill region. In addition, prudent use of the natural resources of the spill area without compromising their health and recovery requires increased knowledge of critical ecological information about the northern Gulf of Alaska. This knowledge can only be provided through a long-term monitoring and research program that will span decades, if not centuries.”

C. Link to GEM Program Document

This proposal responds to the Phase II Invitation, by pulling together and refining a large body of existing data on intertidal/subtidal biota. Sources include the 1964 earthquake report, the OCSEAP studies, monitoring in Port Valdez, EVOS damage assessment, and the NIS studies of 1998-2000. The proposed project responds to the request for proposals “to make important regional data sets or bodies of literature more readily accessible to researchers in the biological and physical sciences, to natural resource managers, to resource-dependent people such as subsistence and commercial fishers, or to educators in the natural sciences” FY 03 Phase II Invitation, p. 8.

Further, this project responds to the need to search for existing, relevant data on Gulf nearshore habitats stated in the EVOS/GEM document resulting from the meeting on planning for habitat mapping.

III. PROJECT DESIGN

A. Objectives

1. Contact additional taxonomic experts, send out draft data sets for their critique.
2. Edit data tables
3. Format the data sets so that they are accessible to users of the ARCTOS network, and so they can be revised as new information becomes available.

B. Procedures

1. Contact additional taxonomic experts, send out draft data sets for their critique.

The following taxonomic experts have other fauna surveys, and have been approached will provide editorial comment on appropriate sections:

Jerry Kudenov (University of Alaska Anchorage, polychaete annelids)

Jeff Cordell (Santa Barbara State University, opisthobranch gastropods)

Jon Norenburg (Smithsonian, nemerteans)

Claudia Mills (University of Washington, Cnidaria)

Sarah Cohen (Harvard University, Urochordata)

Judy Winston (Virginia Museum of Natural History, Bryozoa)

Jeff Goddard (University of Washington, pericarid crustacea)

2. Edit data tables

The occurrence of each species in the study area as presented in Foster and Feder, 2000 (examples appended) will be checked against museum specimens or citations in the peer-review literature and comments from other experts mentioned will be incorporated. Additional specimens data obtained as part EVOS Trustee Council Project no. 02608: *Permanent Archiving of Specimens Collected in Nearshore Habitats...* will be incorporated.

3. Format the data sets so that they are accessible to users of the ARCTOS network, and so they can be revised as new information becomes available.

The data sets that will be added to the ARCTOS website are in the form of seven separate Excel worksheets for Cnidaria and Ctenophora, Annelida, Mollusca, Arthropoda, Bryozoa, Echinodermata, and miscellaneous invertebrate taxa. In their draft format, there are 58 pages of tables.

All information will be migrated from the spreadsheet format to into ARCTOS data base format, latitude, longitude, depth, (with maximum error) and date information will be added for UAM specimens, Information on species occurrence from literature citations or observations will be incorporated to the detail that this information is available.

C. Statistical Methods

N/A

D. Description of the Sampling Area

Literature and collecting records from Port Bainbridge, east to Orca Inlet, and south and east to the outer coasts of Montague and Hinchinbrook islands were used in the preparation of the data sets discussed.

E. Coordination and Collaboration with Other Efforts

The proposed work is a contribute to and gain from Brenda Konar's proposal to GEM and the Census of Marine Life for *Alaska Natural Geography in Shore Areas* (ANaGISA). The data sets will help that project's scientists to find relevant identification manuals, learn which species to expect and in which general habitats, know when a genus has one or more undescribed species, identify where there are gaps in taxonomic knowledge, and to eliminate erroneous names. Sampling done by the ANaGISA project is expected to contribute additional species records to the project.

IV. Schedule

A. Objectives

- Objective 1. Contact additional taxonomic experts, send out draft data sets for their critique.
To be met by January, 2003
- Objective 2. Edit data tables
To be met by July, 2003
- Objective 3. Format the data sets so that they are accessible to internet users, and so they can be revised as new information becomes available.
To be met by October, 2003

B. Measurable Project Tasks

FY 03, 1st quarter (October 1, 2002 – December 31, 2002)

November 25: Project funding approved by Trustee Council

December 15: Contact additional taxonomic experts, send out draft data sets for their critique

FY 03, 2nd quarter (January 1, 2003- March 31, 2003)

January 13-17: Annual EVOS Workshop (joint symposium with GLOBEC and NMFS)

March 1: Responses form taxonomic experts expected

FY 03, 3rd quarter (April 1, 2003- June 1, 2004)

June 30: Complete data set editing

FY 03, 4th quarter (July 1, 2004-September 30, 2004)

September 30: Complete converting files to database format test on website

V. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

Resource Management Applications

The detailed species level information in these data sets will help resource to select species by taxon, geographic distribution, or habitat, and to begin a literature search. Scientists working in other high-latitude regions where environmental stress is a growing concern can use the data sets to compare species abundance, biogeographic patterns, and taxonomic composition. Data on origin can help separate potential introduced nuisance species, an identified problem that has arisen through human activities

VI. PUBLICATIONS AND REPORTS

The final product will be available as a web- based database. A poster *Biodiversity of Prince William Sound: Marine Invertebrates*, will be prepared for the EVOS workshop and other relevant meetings to explain the data sets and the importance of invertebrate fauna to the region.

VII. PROFESSIONAL CONFERENCES

Other relevant professional conferences at which the poster and project could be presented include the Arctic Science Conference and meetings concerned with the problem of introduced species.

VIII. PERSONNEL

A. Principal Investigator

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B. Other Key Personnel

Gordon H. Jarrell (UA Museum)

Responsibilities: Assure that data generated by this project is compatible with other Museum cataloging projects, especially the Arctic Observatory database; design computer printed labels and data interfaces for input and query of the database.

IX. Principal Investigator Qualifications

Nora R. Foster
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EXPERIENCE:

1999-present Coordinator, Aquatic Collection, University of Alaska Museum (part-time affiliate)
1997-present Taxonomic consultant, self-employed
1997 Project Manager/Biologist, Prince William Sound Science Center, Cordova, Alaska
1981-1997 Coordinator, Aquatic Collection University of Alaska Museum

EDUCATION:

University of Alaska B. S. 1969 Biological Sciences
University of Alaska M. S. 1979 Biological Oceanography

Selected Reports and Publications

Hines, A. H., Ruiz, G. M., J. Chapman, G. I. Hansen, J. T. Carlton, N. R. Foster, and H. M. Feder. 2000. Biological Invasions of Cold-water Ecosystems: Ballast-mediated Introductions in Port Valdez/Prince William Sound, Alaska Final Project Report.

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Appendix I

Excerpts from Foster and Feder 2000

***Biological Invasions of Cold-Water Coastal Ecosystems: Ballast-Mediated
Introductions in Port Valdez/Prince William Sound, Alaska***

Final Project Report

Chapter 10 Biodiversity of Prince William Sound

December 15, 2000

Presented to:

Regional Citizens' Advisory Council of Prince William Sound

U.S. Fish and Wildlife Service

National Sea Grant Program

Alaska Sea Grant Program, University of Alaska Fairbanks

Oregon Sea Grant Program, Oregon State University

Sea River Maritime, Inc.

Arco Marine, Inc.

British Petroleum Institute

Alyeska Pipeline Company

Presented by:

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Aquatic Collection, University of Alaska Museum

Fairbanks, Alaska

Howard M. Feder

Institute of Marine Science

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Biodiversity of Prince William Sound

Summary

Basic taxonomic, biogeographic, and habitat information for 1876 species of marine plants and animals of Prince William Sound were compiled into structured data sets. This species inventory is intended as a baseline from which biodiversity responses to future environmental changes can be assessed measured. The data sets include 39 possibly undescribed species, 89 range extensions, and 17 nonindigenous species. Two hundred thirty-one marine plant species, mostly algae, are present. Twenty invertebrate phyla are represented, and Annelida, Mollusca, and Crustacea account for over 60% of the invertebrates. Vertebrates include 175 fish, 14 mammal, and 113 bird species. The fauna and flora of Prince William Sound is a mixture of species with biogeographic affinities that overlap the northeastern and northwestern Pacific as well as the Arctic and Atlantic regions.

Purpose

A single inventory of Prince William Sound biodiversity is currently lacking. This gap in taxonomic and biogeographic knowledge is an impediment to efforts to monitor environmental change, to understand the diversity of plant and animal life and to clarify biogeographic relationships among the living organisms in the rich waters of Prince William Sound and the adjacent shelf of the northern Gulf of Alaska. (Hines et al. 2000) The purpose of this report is to compile a database for the plant and animal species of Prince William Sound. The project is one component of a research project on potential introductions of nonindigenous species into Prince William Sound, especially through the discharge of ballast water from oil tankers traveling into Port Valdez. Annotated species lists were developed for the project to help taxonomic experts establish a current baseline for the status of nonindigenous species in Prince William (Hines et al. 2000).

Working versions of the data sets were compiled by M. Fry and expanded by N. Foster with assistance by M. Hoberg, and review by K. Coyle (zooplankton), J. Goddard (opisthobranch gastropods), J. Kudenov (polychaete annelids), G. Lambert (urochordates), P. Lambert (echinoderms), C. Mecklenberg (fishes), C. Mills (Cnidaria and Ctenophora), J. Norenburg (nemerteans) and others. Additional polychaete identifications were accomplished for this report by J. Kudenov. The draft versions of the data sets were included in the final project report (Hines et al. 2000).

Scope

Taxonomic

The data sets list free-living macrophytes and animals . Protists and most endoparasites are outside the scope of the project.

Geographic

Prince William Sound waters are well-defined We have used literature and collecting records from Port Bainbridge east to Orca Inlet, and south and east to the outer coasts of Montague and Hinchinbrook islands. However, for some taxa, (e.g. Bryozoa), the fauna of adjacent areas (northeastern Gulf of Alaska and Kodiak Island waters) are better documented and some records for those areas are included. Migratory birds and marine mammals that inhabit Prince William Sound waters seasonally are included in the data set. Planktonic Cnidaria and Crustacea from the northern Gulf of Alaska listed in the data sets occur in Prince William Sound rarely, with their presence dependent on oceanographic conditions.

Methods

Literature sources

A large number of species included in the data sets are based on their listing in the environmental surveys of the Gulf of Alaska, Prince William Sound, and Port Valdez in the late 1970's and early 80's. We compiled species lists from Cooney et al. (1973) and Cooney and Coyle (1988):plankton, Feder et al. (1976):sediments, Feder and Bryson-Schwafel (1988):the intertidal zone, Feder and Jewett(1987):subtidal benthos, Feder and Keiser (1980):intertidal biology, Feder and Matheke (1980):benthic infauna, Feder et al. (1979):benthos of Resurrection and Aialik bays, Feder and Paul (1973):the intertidal zone, Feder and Paul (1980):Cook Inlet, Hoberg (1986):benthic infauna, Jewett and Feder (1977):Port Valdez, and Rogers et al. (1986):nearshore fishes.

Species names from field guides and taxonomic revisions of characteristic northeastern Pacific taxa have been added, for example Banse and Hobson (1968) (benthic errantiate polychaetes), Barnard (1969) (gammaridean amphipods), Butler (1980) (shrimp), Coan et al. (2000) (bivalve mollusks), Dick and Ross (1988) (Bryozoa), Lambert (1981, 1997) (sea stars and sea cucumbers), and Schultz (1969) (isopods). For detailed information on the geographical ranges, we have relied on the same taxonomic revisions and regional publications. However, this information in a consistent format has been difficult to obtain for many species. When specific reference to a species' occurrence in Prince William Sound was not available, we used Austin (1985). We have also deleted inaccurate records that have crept into the literature, and have made changes in nomenclature based on reviews and taxonomic revisions accomplished after the environmental surveys mentioned above.

Biogeographic analyses presented here use conventions based on a global system developed by the World Conservation Union and described in Kelleher et al. (1995) (Figures 1-3). The biogeographic summaries are based on numbers of species for which we have confident identifications, leaving out unidentified or undescribed species. Some of the analyses exclude birds, because the migratory habits of some species fit poorly into the bioregional classification used for algae, invertebrates and fishes.

Specimens and observations

The second major source for names of Prince William Sound species is the collections of the University of Alaska Museum (UAM). Names of algae, mollusks, bryozoans, and fishes were entered from specimen catalogues. Voucher specimens for many of the species listed in the environmental studies are in the UAM Aquatic Collection, but may not be catalogued. A large number of specimens was also collected in 1990-1995 by Dr. Stephen Jewett as part of damage assessment after the 1989 Exxon Valdez oil spill. While not accessioned into the UAM, these specimens were available for this study. Each species entry should be traceable to a specimen identified to the species level by an expert. Citing specimens from other museum collections, however, goes beyond the scope of the project.

Rapid community assessments, focal taxonomic collections, and fouling plate surveys in Prince William Sound in 1998 and 1999 were intended to detect well-established nonindigenous species, especially in areas at risk for invasion (Hines and Ruiz 2000). Taxonomic experts who participated in the field work in Prince William Sound and the Kenai Peninsula contributed names and distribution information for marine plants (G. Hansen), Cnidaria and Ctenophora (C. Mills), opisthobranch gastropods (J. Goddard), polychaete annelids (J. Kudenov), Crustacea (J. Chapman and J. Cordell), Bryozoa (J. Winston), and urochordates (G. and C. Lambert).

Results

The data sets

The data sets comprising the bulk of this report are in the form of separate Excel™ worksheets for algae and vascular plants, Cnidaria and Ctenophora, Annelida, Mollusca, Arthropoda, Bryozoa, Echinodermata, miscellaneous invertebrate taxa, fishes, birds, mammals. Data are presented in tabular form, one species per row.

The following data fields, as columns, are common to all data sets:

- ***Family, Genus, Species***

An attempt has been made to use the currently accepted name.

- ***Other Name***

The column contains family, genus or species names under which the taxon has appeared in the cited literature, museum catalogs, or specimens labels, which may not reflect revisions made in the past 20 years.

- A *Source* for the name

UAM specimen available in the University of Alaska Museum Aquatic Collection

EVOS specimen archived as part of Exxon Valdez oil spill damage assessment studies

Other sources are in Literature Cited section of this report.

- ***Habitat***

For most invertebrates the following conventions are used:

I intertidal Inf infauna P plankton

ST subtidal Epi epifauna

Abbreviations used in the fish, bird and mammal sections will be given with the Summary Information for those taxa.

- ***Bioregion***

An “x” marks the presence of a species in the large scale bioregions:

Northwestern Pacific (NWP), Arctic (AR), and Northeastern Atlantic (NWA)

(Figures 1, 2). Occurrence of each species within the northeastern Pacific bioregion is further designated by Roman numerals denoting a small scale bioregion (Figure 3).

- ***Origin***

For species that represent a new collecting record or nonindigenous species, “origin” indicates the area closest to Prince William Sound from which the species is likely to have spread.

- ***NIS status***

nr range extension within Alaska to Prince William Sound

NR new record for Alaska

C cryptogenic

definite definite nonindigenous species

possible likely a nonindigenous species

- ***Reference to Distribution***

Literature source for distributional information.

Summary information for major taxa

Marine Plants

Red, brown, and green algae account for over 90% of the 231 marine plants listed in the data set. Ten taxa could not be determined to the species level. The non-vascular plant species lists is based on G. Hansen's (2000) report and cataloged UAM specimens. Records of Chrysophyta and Ascomycota are based on Feder and Keiser 1980, and Feder and Bryson-Schwafel 1988. Additional distribution information is derived from Scagel et al. 1986 and Lindstrom 1977. Ten vascular plants species are included. The surfgrasses and eelgrass are obvious vascular plants, but a few other species are included because of their presence in the upper intertidal and splash zones. Sources used are Scheel et al. 1997; Hulten 1968, and Hansen 2000. Hansen (2000) found 17 new distributional records for marine plants in Prince William Sound. There is one undescribed species, a *Coilodesme* and six species are possibly introduced.

Cnidaria and Ctenophora

One hundred two species of Cnidaria and Ctenophora are listed in this report. Twenty-seven of the taxa have been identified to the generic level, and not to species. Anthozoa are probably under-counted, because they are difficult to identify based on preserved specimens. The hydrozoans and scyphozoans include 34 species, four of which, the hydrozoans *Tiaropsis multicirrata*, *Eperetmus typus*, *Gonionemus vertens* and *Proboscoidactyla flavicirrata*, are distributional range extensions (Mills 2000). Thirty species records are derived from T. Cooney's (1987) compilation of Gulf of Alaska plankton.

C. Annelida

The region's polychaete annelid fauna is particularly rich, with 233 species in 46 families. Kudenov (2000) has noted three range extensions, for *Phyllodoce medipapillata*, *Chaetozone senticosa*, and *Rhynchospio glutaea*. Some species of *Eumida*, *Scoloplos*, *Exogone*, *Nephtys*, *Glycera*, and the archaeannelid *Polygordius* are likely to be undescribed. Seven taxa, including members of the Spirorbidae have not been identified below the generic level. Nineteen new records from the UAM collection and Exxon Valdez oil spill specimens represent range extensions.

Hirudinea and Oligochaeta are not included in the data sets, because we lack reliable identifications for specimens found in Prince William Sound. At least one species of marine leech is present in UAM samples from the adjacent Gulf of Alaska. Kozloff (1987) lists 14 leech species with distributions from Oregon north. Oligochaetes have been collected, but no effort has been made to identify them to family or lower taxon. Austin (1985) lists eight oligochaete species whose ranges include Alaska or southeast Alaska.

Information on distribution, habitat, and nomenclatural changes have been drawn from Austin (1985), Banse and Hobson (1968), Berkeley and Berkeley (1948, 1952), Hobson and Banse (1981), Kudenov (2000) and Ushakov (1955).

D. Mollusca

Three hundred fifteen mollusk species, representing all classes except monoplacophorans, are included in the data set. There is one aplacophoran, and 108 bivalves, 179 gastropods, 17 polyplacophorans, three scaphopods, and eight cephalopods. Mollusks in the UAM comprise one of the chief sources for the data set. Information on nomenclature and distribution derives from Austin (1985), Baxter (1987), Behrens (1991), Coan et al. (2000), and Turgeon et al. (1998).

The shelled fauna is quite well known, but opisthobranchs, because they require special techniques to collect and preserve, have not been adequately documented in Alaska. It is not surprising to find potentially undescribed species and geographical range extensions within the Prince William Sound fauna. A paper describing range extensions for 11 species of opisthobranchs is in preparation by J. Goddard and N. Foster.

Arthropoda

Chelicerata and Pycnogonida are relatively scarce in Prince William Sound compared to Crustacea. Seven of the ten pycnogonid species are included in the data set based on UAM specimens, One Acarina and one pseudoscorpion are frequently observed in the high intertidal zone of southeastern and south-central Alaska.

Crustacea make up about 28% of the animal species listed in the data set. We list 172 copepods, (including planktonic species from the Gulf of Alaska which may be present occasionally in Prince William Sound), 105 decapods, 105 amphipods, 21 cumacean, 19 isopods, and smaller numbers of others.

Several taxa (e.g. Ostracoda) are probably very much under-counted. Six copepods, one amphipod, and two ostracods are identified to the family level, and no further. A large number of small crustacea, mostly harpacticoid copepods and amphipods have not been identified to

species. Two species, the amphipod *Jassa sp./marmorata* and the copepod *Leimia vaga* are possible NIS, but this number probably represents an underestimate. Cordell (2000) pointed out that “Harpacticoid copepods may be particularly likely to be transported and introduced because as a group they have successfully occupied almost all benthic and epibenthic habitats. ... The paucity of studies of harpacticoid taxonomy in the northeastern Pacific makes it nearly impossible to determine whether or not a given species has been introduced without extensive distribution or genetic studies.” We have not included an inventory of parasitic cirripedia or isopods, but several species of these were recorded by Hines et al. (2000).

Sources for information of Crustacea include Barnard 1969 (amphipods), Butler 1980 (shrimp), Hart 1982 (crabs), and Schultz 1969 and Squires and Figueria 1974 (isopods). J. Chapman (2000) contributed to the information on Pericarida, and J. Cordell (2000) to our knowledge of the harpacticoid Copepoda. Records for the planktonic crustacea derive from unpublished data compiled from T. Cooney’s Sound Ecosystem Analysis project of 1994-1998. We found eleven new records for the occurrence of Crustacea.

The third major group of Arthropoda, marine and brackish water insects, have not been surveyed in any detail in the area. For insects, Austin (1985) lists eight Coleoptera, and 12 Diptera with ranges that include Alaska.

E. Echinodermata

Ninety-nine echinoderm species, representing all five classes are listed. Principal sources for taxonomic and distributional information are D`yakonov (1954) (ophiuroids), Lambert (1981, 1997) (Asteroidea and Holothuroidea). No range extensions or possibly undescribed species were noted for Prince William Sound.

Bryozoa

Bryozoa are abundant in Alaskan waters and prevalent in the fouling community. The data set consists of 74 species, which is probably an underestimate. Nineteen identifications are confident only to the generic level. Sources for distribution data include Dick and Ross (1988), Hines and Ruiz (2000), Kluge (1962), as well as cataloged specimens in the UAM collection. J. Winston (2000) contributed the identifications and distributional information for 22 species. *Schizoporella unicornis* is regarded as a nonindigenous species, native to the northwestern Pacific. Ten species are possible new records for Alaska, range extensions form either the Arctic or Pacific region.

Miscellaneous Invertebrates

Ninety-five taxa, representing twelve different phyla make up this data set. Nemerteans, chaetognaths, brachiopods, and urochordates , and are fairly well-known or have received the attention of the project’s taxonomists. (Lambert 2000; Mills 2000). However, it is clear that sponges, flatworms, and nematodes are undercounted. The nonindigenous sponge, *Cliona thosina* was recorded by the fouling community survey (Hines and Ruiz 200).

Phylum	taxa reported in this study
Porifera	4
Platyhelminthes	none identified to species
Nemertea	54
Sipunculida	3
Priapulida	1
Echiuridae	1
Phoronidae	none identified to species
Brachiopoda	3
Chaetognatha	5
Tardigrada	1
Urochordata	28

Gnathostomulida, Gastrotrichida, Kinorhyncha have not been documented.

Fishes

The 175 species we list represent 33 families. The fish data set uses records for fish specimens catalogued in the University of Alaska Museum, as well as published and manuscript sources. (Baxter unpublished manuscript, Hart 1973). Name changes derive from and Humann (1996). Two species, the American shad, *Alosa sapidissima*, and the Atlantic Salmon, *Salmo salar* are nonindigenous.

Mecklenberg, (letter of 10/30/00) recognizes an undescribed cottid, possibly a *Malacocottus*. It has been identified incorrectly as *Thecopterus aleuticus*.

The following habitat descriptors used in the data sets are based on usage in Eschmeyer et al (1983)and Eschmeyer (1990) and Hart (1973).

ANA	anadromous	BW	brackish	D	dermesal
E	eelgrass	Epip	epipelagic	Est	estuaries
FW	freshwater	I	intertidal	KB	kelp bed

NS	nearshore	Off	offshore	Pel	pelagic
PB	pebble bottom	RI	rocky intertidal		
RST	rocky subtidal	SAB	sand bottom		
SB	softbottom	ST	subtidal		
SW	saltwater				

Birds

The rich bird fauna of Prince William Sound, the northern Gulf of Alaska coast and Copper River Delta has been described in detail by Isleb and Kessel (1973, 1989). From their checklist, we have selected 114 species with habitats designated “beaches and tidal flats, rocky shores, and reefs, inshore waters, and offshore waters”.

The American Ornithologists’ Union’s (1983) Check-list of North American Birds, was used to update common and scientific names. Usage of terms that define status: migrant, visitor, breeder and resident is derived from Isleb and Kessel (1973).

Nsh	nearshore	m	migrant
Pel	pelagic	v	visitor
Int	intertidal	r	rare
		b	breeder

Mammals

Eleven marine mammal species are well known from Prince William Sound. We also include the river otter, and black and brown bear because of their use of marine resources (salmon, intertidal animals). Wynne (1992) and UAM mammal collection records were used as a source for species names. Distribution, community, and status are inferred from range maps in Wynne (1992).

Discussion

The data sets contain entries for 1878 taxa, of which all but 180 are species-level identifications. Thirty-nine species are recognized as possibly undescribed. Eighty-nine species had not previously been reported in Prince William Sound, and represent distributional range extension. (Table 1.) These species were probably overlooked in previous environmental surveys, because of their small size, cryptic appearance, similarity to more well-known species, or lack of taxonomic experts to work with them. Eighteen species are likely to represent nonindigenous species. At least 97 species are uncertain in origin (cryptogenic). Over 70% of the

animals (1343) are invertebrates. Arthropods (24.3%), mollusks (16.8%), and polychaete annelids (12.4%) make up the largest number of total species. (Table 2. Figure 4).

The marine biota of Prince William Sound is a mix of species with ranges that overlap several biogeographic provinces. Forty-nine percent of the biota for which reliable data are available are northeast Pacific species, not found north or west of Bering Strait. Over one third of the species (43.4 %) have geographic ranges that extend into the northwestern Pacific. Fewer species have distributions that overlap the north Atlantic 19.65% and/or Arctic 16.9%. The biogeographic affinities vary greatly among the phyla.

We caution users of these data sets that in spite of our best efforts the information is only as good as our sources. We were unable to obtain data, or found few reliable records, for five major groups of animals: sponges, Anthozoa, Nematoda, Oligochaeta, Hirudinea, Ostracoda and insects. Two factors account for this, lack of taxonomic experts, and the need for specialized collection and preservation techniques. Further, even among several well-known taxonomic groups, we found few sources of authentic information and so we have had to rely on unpublished reports and manuscripts. We hope that using these data sets will not perpetuate erroneous records. In critical situations, users are advised to rely on museum records and consultation with other experts.

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**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET**

Budget Category:	Proposed FY 03					
Personnel	\$13.6					
Travel	\$0.4					
Contractual	\$0.0					
Commodities	\$0.1					
Equipment	\$0.0					
Subtotal	\$14.1					
Indirect	\$3.5					
Project Total	\$17.6					
with 9% GA (\$1.6)	\$19.2					
Other Funds						
Comments:						
<p>UAF negotiated F&A rate with ONR for organized sponsored research is 50.4% MTDC. Trustee Council agreed F&A rate for UA is 25% TDC</p> <p>EVOS workshop estimated travel costs = \$440.</p>						

FY03

Prepared: 08-2002
Received 9/4/02 (revised)

Project Number: G-030642 (TC approved 11/25/02)
Project Title: Database on the Marine Invertebrate Macrofauna of Pince William Sound: An addition to the University of Alaska

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET**

Personnel Costs:			Months Budgeted	Monthly Costs	Overtime
Name	Description				
N.Foster	Corrdinator, Aquatic Collection		4.0	3.4	
		Subtotal	4.0	3.4	C
Personnel Total					
Travel Costs:		Ticket Price	Round Trips	Total Days	Days Per Die
Description					
N.Foster RT Fairbanks-Anchorage to attend Restoration Workshop		0.2	1	2	C
Travel Total					

FY03

Prepared: 08-2002

Project Number:
 Project Title: Database on the Marine Invertebrate Macrofauna of Pince William Sound: An addition to the University of Alaska Museum's ARCTOS Network

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET

Contractual Costs:	
Description	
none requested	
	Contractual Tot
Commodities Costs:	
Description	
proejct supplies	
	Commodities Tot

FY03

Prepared: 08-2002

Project Number:
Project Title: Database on the Marine
Invertebrate Macrofauna of Pince William
Sound: An addition to the University of Alaska
Museum's ARCTOS Network

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET**

New Equipment Purchases:		Number of Units	U Pri
Description			
	none requested		
Indicate replacement equipment purchases with an R.		New Equipment To	
Existing Equipment Usage:		Numb of Un	
Description			

FY03

Prepared: 08-2002

Project Number:
Project Title: Database on the Marine
Invertebrate Macrofauna of Pince William
Sound: An addition to the University of Alaska
Museum's ARCTOS Network

PHYLUM/ CLASS	FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP
Cnidaria: Anthozoa	Actiniidae	<i>Anthopleura</i>	<i>artemesia</i>		Feder and Bryson- Schwafel 1988	I	II III IV	
Cnidaria: Anthozoa	Actiniidae	<i>Cribirnopsis</i>	unidentified		Rosenthal 1977	ST/Epi		
Cnidaria: Anthozoa	Actiniidae	<i>Urticina</i>	<i>crassicornis</i>		Feder and Jewett 1987	I/ST/Epi	II III IV	
Cnidaria: Anthozoa	Actinostolida e	<i>Stomphia</i>	unidentified		Scheel et al. 1997	ST/Epi		
Cnidaria: Anthozoa	Carophyllidae	<i>Carophyllia</i>	<i>alaskensis</i>		UAM	ST	II III IV	
Cnidaria: Anthozoa	Cerianthidae	<i>Pachyerciant hus</i>	unidentified		UAM	ST		
Cnidaria: Anthozoa	Epizoanthida e	<i>Epizoanthus</i>	unidentified		UAM	ST		
Cnidaria: Anthozoa	Halcalvidae	<i>Peachia</i>	unidentified		Feder and Matheke 1980	ST		
Cnidaria: Anthozoa	Metridiidae	<i>Metridium</i>	<i>senile</i>		Feder and Jewett 1987	I/ST/Epi	II	x
Cnidaria: Anthozoa	Metridiidae	<i>Metridium</i>	unidentified		NRF observation	ST		
Cnidaria: Anthozoa	Pennatulidae	<i>Ptilosarcus</i>	<i>gurneyi</i>		Feder et al. 1979	ST	II III IV	
Cnidaria: Anthozoa	Primnoidae	<i>Callogorgia</i>	unidentified		UAM	ST		
Cnidaria: Anthozoa	Primnoidae	<i>Primnoa</i>	unidentified		UAM	ST		
Cnidaria: Anthozoa	Virgularidae	<i>Acanthoptilu m</i>	<i>ptile?</i>		Feder and Matheke 1980	ST	II III	
Cnidaria: Anthozoa	Virgularidae	<i>Stylatula</i>	<i>elongata?</i>		Rosenthal 1977	ST	II III IV V	
Cnidaria: Hydrozoa	Aeginidae	<i>Aegina</i>	<i>citrea</i>	<i>A. rosea</i>	Cooney 1987	P	II III IV V VI	x
Cnidaria: Hydrozoa	Aequoreidae	<i>Aequorea</i>	<i>aequorea v. albida</i>		Mills 2000	ST	II III IV	
Cnidaria: Hydrozoa	Aequoreidae	<i>Aequorea</i>	unidentified		Cooney:SEA	ST		
Cnidaria: Hydrozoa	Aequoreidae	<i>Aequorea</i>	<i>victoria/ A. aequorea v. aequorea</i>		Mills 2000	ST	II III IV	

BIOREGION

FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP	AR
Ampharetida e	<i>Ampharete</i>	<i>acutifrons</i>		EVOS	ST/Inf	II III IV		
Ampharetida e	<i>Ampharete</i>	<i>finmarchia</i>	<i>A. arctica</i>	Feder et al. 1979	ST/Inf	II III IV	x	x

Ampharetida				Feder and Matheke					
e	<i>Amphicteis</i>	<i>gunneri</i>		1980	ST/Inf	II III IV		x	
Ampharetida		<i>scaphobranch</i>		Feder et al.					
e	<i>Amphicteis</i>	<i>hiata</i>		1979	ST/Inf	II III IV			
Ampharetida				Feder et al.					
e	<i>Anobothrus</i>	<i>gracilis</i>		1979	ST/Inf	II III IV			x
Ampharetida				Feder and Matheke					
e	<i>Lysippe</i>	<i>labiata</i>		1980	ST/Inf	II III IV			
Ampharetida		cf. <i>M.</i>		Feder et al.					
e	<i>Melinna</i>	<i>cristata</i>		1979	ST/Inf	II III IV			x
Ampharetida				Feder and Matheke					
e	<i>Melinna</i>	<i>cristata</i>		1980	ST/Inf	II III IV			x
Ampharetida				Feder and Matheke					
e	<i>Melinna</i>	<i>elisabethae</i>		1980	ST/Inf	II III IV			
Ampharetida	<i>Pseudosabel</i>			EVOS	ST/Inf	II III IV			x
e	<i>lides</i>	<i>lineata</i>	<i>Asabellides</i>						
Ampharetida	<i>Pseudosabel</i>		<i>Asabellides</i>						
e	<i>lides</i>	<i>sibirica</i>	<i>littoralis</i>	UAM	ST/Inf	II III IV			
Ampharetida									
e	<i>Sosanella</i>	unidentified		UAM					
Aphroditidae	<i>Aphrodita</i>	<i>japonica</i>		UAM	ST/Inf	II III IV		x	
Arabellidae	<i>Drilonereis</i>	<i>falcata minor</i>		Feder and Matheke					
				1980	ST/Inf	II III IV			
Arabellidae	<i>Drilonereis</i>	<i>longa</i>		UAM	ST/Inf	II		x	
Arenicolidae	<i>Abarenicola</i>	<i>pacifica</i>		Feder and Bryson-Schwafel					
				1988	I/ST/Inf	II III IV		x	
Capitellidae	<i>Barantolla</i>	<i>americana</i>		EVOS	I/ST/Inf	II III IV			
Capitellidae	<i>Capitella</i>	<i>capitata</i>		Feder and Bryson-Schwafel					
	<i>Heteromastus</i>			1988	I/ST/Inf	II		x	x
Capitellidae	<i>s</i>	<i>filiformis</i>		EVOS	ST/Inf	II III IV V			x
Capitellidae	<i>s</i>	unidentified		EVOS	I/ST/Inf				
Chaetopteridae	<i>Mesochaetopus</i>	<i>taylori</i>		EVOS	ST/Inf	II III IV			
Chaetopteridae	<i>Spiochaetopus</i>	<i>costarum</i>		Feder and Matheke					
				1980	ST/Inf	x		x	x
Chrysopetalidae	<i>Chrysopetalum</i>	<i>occidentale</i>		Kudenov					
				2000		II III IV V VI		x	
Cirratulidae	<i>Chaetozone</i>	<i>senticosa</i>		Kudenov					
				2000	ST/Inf	II IV V			
Cirratulidae	<i>Chaetozone</i>	<i>setosa</i>		Feder and Matheke					
				1980	ST/Inf	x		x	x
Cirratulidae	<i>Cirratulus</i>	<i>cingulatus</i>		Kudenov					
				2000	ST/Inf	II III IV			

CLASS	FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP
Aplacophora	Chaetodermatidae	<i>Chaetoderm</i>	<i>robustum</i>		UAM	ST/Inf	II III IV	
Bivalvia	Anomiidae	<i>Pododesmus</i>	<i>macroschisma</i>		UAM	ST/Epi	II III IV	
Bivalvia	Astartidae	<i>Astarte</i>	<i>borealis</i>		UAM	ST/Inf	II	x
Bivalvia	Astartidae	<i>Astarte</i>	<i>compacta</i>	<i>A. polaris</i> <i>A.</i>	UAM	ST/Inf	II III IV	
Bivalvia	Astartidae	<i>Astarte</i>	<i>elliptica</i>	<i>alaskensis</i>	UAM	ST/Inf	II	x
Bivalvia	Astartidae	<i>Astarte</i>	<i>esquimaulti</i>		UAM	ST/Inf	II III	x
Bivalvia	Astartidae	<i>Astarte</i>	<i>ovata</i>	<i>A. borealis</i>	UAM	ST/Inf	II	x
Bivalvia	Cardiidae	<i>Clinocardium</i>	<i>blandum</i>	<i>C. fucanum</i>	Coan et al. 2000	I/ST/Inf	II III IV	
Bivalvia	Cardiidae	<i>Clinocardium</i>	<i>californiense</i>		UAM	I/ST/Inf	II III IV	x
Bivalvia	Cardiidae	<i>Clinocardium</i>	<i>ciliatum</i>		UAM	I/ST/Inf	II	x
Bivalvia	Cardiidae	<i>Clinocardium</i>	<i>nuttallii</i>		UAM	I/ST/Inf	II III IV	x
Bivalvia	Cardiidae	<i>Serripes</i>	<i>groenlandicus</i>		UAM	I/ST/Inf	II	x
Bivalvia	Cardiidae	<i>Serripes</i>	<i>laperousii</i>		UAM	I/ST/Inf	II	x
Bivalvia	Cardiidae	<i>Serripes</i>	<i>notabilis</i>		UAM	ST/Inf	II III IV	x
Bivalvia	Carditidae	<i>Cyclocardia</i>	<i>crebricosta</i>		UAM	ST/Inf	II III IV	x
Bivalvia	Carditidae	<i>Cyclocardia</i>	<i>ventricosa</i>		UAM	ST/Inf	II III IV	
Bivalvia	Carditidae	<i>Miodontiscus</i>	<i>prolongatus</i>		Coan et al. 2000	ST/Inf	II III IV	x
Bivalvia	Cuspidariidae	<i>Cardiomya</i>	<i>behringensis</i>		Coan et al. 2000	ST/Inf	II III IV	x
Bivalvia	Cuspidariidae	<i>Cardiomya</i>	<i>pectinata</i>		UAM	ST/Inf	II III IV	
Bivalvia	Cuspidariidae	<i>Cardiomya</i>	<i>planetica</i>		UAM	ST/Inf	II III IV	
Bivalvia	Glycymeridae	<i>Glycymeris</i>	<i>septentrionalis</i>		EVOS	ST/Inf	II III IV	
Bivalvia	Hiatellidae	<i>Hiatella</i>	<i>arctica</i>		UAM Coan et al. 2000	I/ST/Epi/Inf	x	x
Bivalvia	Hiatellidae	<i>Panomya</i>	<i>ampla</i>		UAM Coan et al. 2000	ST/Inf	II III IV	x
Bivalvia	Hiatellidae	<i>Panomya</i>	<i>norvegica</i>	<i>P. arctica</i>	UAM Coan et al. 2000	ST/Inf	II	x
Bivalvia	Lasaeidae	<i>Kellia</i>	<i>subbicularis</i>	<i>Kelliidae</i>	UAM Coan et al. 2000	ST/Inf	II III IV	
Bivalvia	Lasaeidae	<i>Mysella</i>	<i>planata</i>		UAM Coan et al. 2000	ST/Inf	II III IV	x
Bivalvia	Lasaeidae	<i>Neaeromya</i>	<i>compressa</i>	<i>Pseudopythina</i>	UAM	I/ST/Inf	II III IV	

Bivalvia	Lasaeidae	<i>Rochefordia</i>	<i>tumida</i>	<i>Mysella</i>	UAM	ST/Inf	II III IV	
Bivalvia	Limatulidae	<i>Limatula</i>	<i>attenuata</i>	<i>L. subauriculata</i>	Coan et al. 2000	ST/Epi	II III IV	x
Bivalvia	Lucinidae	<i>Lucina</i>	<i>tenuisculpta</i>	<i>Parvilucina</i>	UAM	ST/Inf	II III IV	
Bivalvia	Lucinidae	<i>Lucinoma</i>	<i>annulatum</i>		UAM	ST/Inf	II III IV	
Bivalvia	Lyonsiidae	<i>Entodesma</i>	<i>navicula</i>	<i>E. saxicola</i>	UAM	I/Epi/Inf	II III IV	x
Bivalvia	Lyonsiidae	<i>Lyonsia</i>	<i>bracteata</i>		UAM	ST/Inf	II III IV	
Bivalvia	Mactridae	<i>Mactromeris</i>	<i>polynyma</i>		UAM	I/ST/Inf	II	
Bivalvia	Mactridae	<i>Tresus</i>	<i>capax</i>		Coan et al. 2000	I/ST/Inf	II III IV	
Bivalvia	Mactridae	<i>Tresus</i>	<i>nuttallii</i>		UAM	I/ST/Inf	II III IV	
Bivalvia	Mallettiidae	<i>Malletia</i>	<i>pacifica</i>	<i>M. cuneata</i>	UAM	ST/Inf	II III IV	
Bivalvia	Myidae	<i>Cryptomya</i>	<i>californica</i>		Coan et al. 2000	I/ST/Inf	II III IV	x
Bivalvia	Myidae	<i>Mya</i>	<i>arenaria</i>		UAM	I/Inf	II III IV	
Bivalvia	Myidae	<i>Mya</i>	<i>truncata</i>		UAM	I/ST/Inf	II	x
Bivalvia	Mytilidae	<i>Crenella</i>	<i>decussata</i>		UAM	I/ST/Epi	II	x
Bivalvia	Mytilidae	<i>Dacrydium</i>	<i>vitreum</i>		UAM	ST/Inf	II	x
Bivalvia	Mytilidae	<i>Modiolus</i>	<i>modiolus</i>		UAM	ST/Inf	II	x
Bivalvia	Mytilidae	<i>Musculus</i>	<i>discors</i>		UAM	ST/Inf	II	x
Bivalvia	Mytilidae	<i>Musculus</i>	<i>glacialis</i>	<i>M. corrugatus</i>	UAM	ST/Inf	II	x
Bivalvia	Mytilidae	<i>Musculus</i>	<i>niger</i>		UAM	ST/Inf	II	x

HIGHER TAXON	FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP
Arachnida: Acarina		<i>Nemolagus</i>	<i>littoralis</i>		Foster/Hoberg-observation	I/Epi		
Arachnida: Pseudoscorpionida		unidentified	unidentified		UAM	I/epi		
Crustacea: Amphipoda	Acanthonotomatidae	<i>Odius</i>	<i>carinatus</i>		EVOS	ST/Epi	II	
Crustacea: Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>birulai</i>		Feder and Matheke 1980	I/ST/Inf	II III IV	x
Crustacea: Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>brevisimulata</i>		EVOS	ST	II III IV	
Crustacea: Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>caryei</i>		EVOS	ST	II III IV	

Crustacea:									
Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>pugetica</i>		EVOS	ST	II III IV		
Crustacea:					Feder and				
Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>eschrichti</i>		1980	ST/Inf	II III IV	x	
Crustacea:					Feder and				
Amphipoda	Ampeliscidae	<i>Ampelisca</i>	<i>macrocephala</i>	<i>A. careyi</i>	1980	ST/Inf	II III IV		
Crustacea:					Feder and				
Amphipoda	Ampeliscidae	<i>Haploops</i>	<i>tubicola</i>		1980	ST/Inf	II	x	
Crustacea:					Chapman				
Amphipoda	Amphitoidae	<i>Ampithoe</i>	<i>kussakini</i>		2000	I/Inf	II III IV	x	
Crustacea:					Chapman				
Amphipoda	Amphitoidae	<i>Ampithoe</i>	<i>sectimanus</i>		2000	I/Inf	II III IV		
Crustacea:					Feder and				
Amphipoda	Amphitoidae	<i>Ampithoe</i>	<i>simulans</i>		1988	I/ST	x	x	
Crustacea:					Chapman				
Amphipoda	Amphitoidae	<i>Peramphithoe</i>	<i>eoae</i>	<i>Ampithoe mea</i>	2000	I/Inf	II III IV		
Crustacea:					Chapman				
Amphipoda	Amphitoidae	<i>Peramphithoe</i>	<i>humeralis</i>	<i>Ampithoe</i>	2000	I/Inf	II III IV		
Crustacea:					EVOS				
Amphipoda	Anisogammaridae	<i>Anisogammarus</i>	<i>pugettensis</i>			ST/Epi	II III IV	x	
Crustacea:					Chapman				
Amphipoda	Anisogammaridae	<i>Eogammarus</i>	<i>confervicolus</i>	<i>Anisogammarus</i>	2000	I/Inf	II III IV		
Crustacea:					Chapman				
Amphipoda	Anisogammaridae	<i>Eogammarus</i>	<i>oclaini</i>		2000	I/Inf	II III IV		
Crustacea:					Chapman				
Amphipoda	Anisogammaridae	<i>Eogammarus</i>	unidentified		2000	I/ST			
Crustacea:					Chapman				
Amphipoda	Anisogammaridae	<i>Locustogammarus</i>	<i>locustoides</i>		2000	I/Inf	II III IV		
Crustacea:					Chapman				
Amphipoda	Anisogammaridae	<i>Spinulogammarus</i>	<i>subcarinatus</i>		2000	I?	II III IV		
Crustacea:					EVOS				
Amphipoda	Aoridae	<i>Aoroides</i>	<i>columbiae</i>			ST	II III IV	x	
Crustacea:					EVOS				
Amphipoda	Atylidae	<i>Atylus</i>	<i>collingi</i>			ST	II III IV	x	
Crustacea:					Chapman				
Amphipoda	Calliopiidae	<i>Calliopiella</i>	unidentified	<i>Paracalliopiella</i>	2000	I/Inf			
Crustacea:					Cooney 1987				
Amphipoda	Calliopiidae	<i>Calliopiopus</i>	<i>behringi</i>			I/ST	II III	x	
Crustacea:					Chapman				
Amphipoda	Calliopiidae	<i>Calliopiopus</i>	<i>carinatus?</i>		2000	I/Inf	II III IV		

CLASS	FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP
Asteroidea	Asteriidae	<i>Evasterias</i>	<i>troschellii</i>		Feder and Bryson-Schwafel 1988	I/ST/Epi	II III IV	
Asteroidea	Asteriidae	<i>Leptasterias</i>	<i>hexactis</i>		UAM	I/ST/Epi	II III IV	
Asteroidea	Asteriidae	<i>Orthasterias</i>	<i>koehleri</i>		UAM	ST	II III IV	
Asteroidea	Asteriidae	<i>Pisaster</i>	<i>ochraceus</i>		UAM	I/ST/Epi	II III IV	

Astroidea	Asteriidae	<i>Pycnopodia</i>	<i>helianthoides</i>		Feder and Bryson-Schwafel 1988	I/ST/Epi	II III IV	
Astroidea	Asteriidae	<i>Rathbunaster</i>	<i>californianus</i>		UAM	ST	II III IV	
Astroidea	Asteropseidae	<i>Dermasteria</i>	<i>imbricata</i>	Poraniidae	UAM	I/ST/Epi	II III IV	
Astroidea	Astropectinidae	<i>Dipsacaster</i>	<i>borealis</i>		UAM	ST	II III IV	
Astroidea	Astropectinidae	<i>Leptychaster</i>	<i>anomalus</i>		Feder and Matheke 1980	ST	II III IV	
Astroidea	Astropectinidae	<i>Leptychaster</i>	<i>arcticus</i>		UAM	ST	II III IV	x
Astroidea	Astropectinidae	<i>Leptychaster</i>	<i>pacificus</i>		Lambert 1981	ST	II III IV	
Astroidea	Benthopectinidae	<i>Luidiaster</i>	<i>dawsoni</i>		UAM	ST	II III IV	
Astroidea	Benthopectinidae	<i>Nearchaster</i>	<i>aciculosus</i>		UAM	ST	II III IV	
Astroidea	Echinasteridae	<i>Henricia</i>	<i>aspera</i>		UAM	ST	II III IV	
Astroidea	Echinasteridae	<i>Henricia</i>	<i>asthenactis</i>		Lambert 1981	ST	II III IV	
Astroidea	Echinasteridae	<i>Henricia</i>	<i>leviuscula</i>		UAM	ST	II III IV	
Astroidea	Echinasteridae	<i>Henricia</i>	<i>longispina</i>		Lambert 1981	ST	II III IV	x
Astroidea	Echinasteridae	<i>Henricia</i>	<i>sanguinolenta</i>		UAM	ST	II III	x
Astroidea	Echinasteridae	<i>Poraniopsis</i>	<i>inflata</i>		UAM	ST	II III IV	x
Astroidea	Goniasteridae	<i>Ceramaster</i>	<i>arcticus</i>		UAM	ST	II III IV	
Astroidea	Goniasteridae	<i>Ceramaster</i>	<i>patagonicus</i>		Lambert 1981	ST	II III IV V VI VII VIII IX	
Astroidea	Goniasteridae	<i>Gephyreaster</i>	<i>swifti</i>	Radiasteridae	Feder and Jewett 1987	ST	II III IV	
Astroidea	Goniasteridae	<i>Hippasteria</i>	<i>spinosa</i>		UAM	ST	II III IV	
Astroidea	Goniasteridae	<i>Mediaster</i>	<i>aequalis</i>		UAM	ST	II III IV	
Astroidea	Goniasteridae	<i>Pseudarchaster</i>	<i>parelii</i>		UAM	ST	II	x
Astroidea	Goniopectinidae	<i>Ctenodiscus</i>	<i>crispatus</i>	Ctenodiscidae	UAM	ST	I II III IV V VI VII IX	x
Astroidea	Luidiidae	<i>Luidia</i>	<i>foliolata</i>		UAM	ST	II III IV	
Astroidea	Pedicellasteridae	<i>Pedicellaster</i>	<i>magister</i>	Heliasteridae	UAM	ST	II III IV	x
Astroidea	Pterasteridae	<i>Diplopteraster</i>	<i>multipes</i>		UAM	ST	II III IV V	x
Astroidea	Pterasteridae	<i>Pteraster</i>	<i>militaris</i>		UAM	ST	II III IV	x
Astroidea	Pterasteridae	<i>Pteraster</i>	<i>tesselatus</i>		UAM	ST	II III IV	

Astroidea	Solasteridae	<i>Crossaster</i>	<i>papposus</i>		UAM	ST	II III IV	x
Astroidea	Solasteridae	<i>Lophaster</i>	<i>furcilliger</i>		UAM	ST	II III IV	
Astroidea	Solasteridae	<i>Solaster</i>	<i>dawsoni</i>		UAM	ST	II III IV	x
Astroidea	Solasteridae	<i>Solaster</i>	<i>endeca</i>		UAM	ST	II III IV V	
Astroidea	Solasteridae	<i>Solaster</i>	<i>paxillatus</i>		UAM	ST	II III IV	x
Astroidea	Solasteridae	<i>Solaster</i>	<i>stimpsoni</i>		Lambert 1981	ST	II III IV	x
Crinoidea	Antedonidae	<i>Florometra</i>	<i>serratissima</i>		Austin 1985	ST	II III IV V	
Crinoidea	Antedonidae	<i>Florometra</i>	<i>asperrima</i>	<i>Helimetra</i> <i>gracilis</i>	UAM	ST	II III IV V	x
Crinoidea	Antedonidae	<i>Psathyromet</i> <i>ra</i>	<i>fragilis</i>		Austin 1985	ST	II III IV V	x
Crinoidea	Antedonidae	<i>Retiometra</i>	<i>alascana</i>		Austin 1985	ST	II III IV	

ORDER	FAMILY	GENUS	SPECIES	OTHER NAMES	SPECIMEN or SOURCE	HABITAT	NEP	NWP
Cheilostomat a: Anasca	Beaniidae	<i>Beania</i>	<i>mirabilis</i>		UAM	ST	II III IV V VI VII VIII IX	x
Cheilostomat a: Anasca	Bugulidae	<i>Bugula</i>	<i>californica</i>		Hines and Ruiz 2000	I	II III IV	
Cheilostomat a: Anasca	Bugulidae	<i>Bugula</i>	<i>pacifica</i>		Hines and Ruiz 2000	I	II III IV	
Cheilostomat a: Anasca	Bugulidae	<i>Bugula</i>	unidentified		Hines and Ruiz 2000	I		
Cheilostomat a: Anasca	Bugulidae	<i>Dendrobeani</i> <i>a</i>	<i>curvirostrata</i>		Hines and Ruiz 2000	I	II III IV V VI	
Cheilostomat a: Anasca	Bugulidae	<i>Dendrobeani</i> <i>a</i>	<i>lichenoides</i>		UAM	I	II III IV	
Cheilostomat a: Anasca	Bugulidae	<i>Dendrobeani</i> <i>a</i>	<i>murrayana</i>		UAM	ST	II	x
Cheilostomat a: Anasca	Calloporidae	<i>Calloporella</i>	<i>craticula</i>	<i>Callopora</i>	Hines and Ruiz 2000	I/ST	II	x
Cheilostomat a: Anasca	Calloporidae	<i>Calloporella</i>	<i>lineata</i>	<i>Callopora</i>	UAM	I/ST	II	x
Cheilostomat a: Anasca	Calloporidae	<i>Calloporella</i>	" <i>lineata</i> "		Hines and Ruiz 2000	I/ST	II	x
Cheilostomat a: Anasca	Calloporidae	<i>Tegella</i>	<i>aquilirostris</i>		Hines and Ruiz 2000	I/ST	II III IV	x

Cheilostomat a: Anasca	Calloporidae	<i>Tegella</i>	<i>armifera</i>		Hines and Ruiz 2000	I/ST	II III IV	x
Cheilostomat a: Anasca	Calloporidae	<i>Tegella</i>	<i>robertsonae</i>		UAM	ST	II III IV V VI	x
Cheilostomat a: Anasca	Cryptosulida e	<i>Cryptosula</i>	<i>okadai</i>		Hines and Ruiz 2000	I	II III IV	x
Cheilostomat a: Anasca	Cryptosulida e	<i>Harmeria</i>	<i>scutulata</i>	Hippothoidae	UAM	I/ST	II	x
Cheilostomat a: Anasca	Electridae	<i>Cauloramphus</i>	<i>pseudospinifer</i>		Hines and Ruiz 2000	I	II III IV	x
Cheilostomat a: Anasca	Electridae	<i>Electra</i>	unidentified		UAM	I		
Cheilostomat a: Anasca	Flustridae	<i>Terminoflustra</i>	<i>membranacea</i> <i>otruncata</i>		UAM	I/ST	II	x
Cheilostomat a: Anasca	Hincksinidae	<i>Cauloramphus</i>	<i>"variegata"</i>	<i>C. spiniferum</i>	UAM	I/ST	II III IV V	x
Cheilostomat a: Anasca	Membraniporidae	<i>Conopeum</i>	sp. (<i>chesapeake</i> <i>nsis?</i>)		Hines and Ruiz 2000	I/ST	II III IV V	x
Cheilostomat a: Anasca	Membraniporidae	<i>Membranipora</i>	<i>membranipora</i>		Hines and Ruiz 2000	I/ST	II III	x
Cheilostomat a: Anasca	Membraniporidae	<i>Membranipora</i>	<i>serrilamella</i>		UAM	I/ST	x	x
Cheilostomat a: Anasca	Microporidae	<i>Micropora</i>	unidentified		UAM	I/ST		

AR	NWA	ORIGIN	NIS STATUS	REFERENC E to DISTRIBUTI ON
				Austin 1985
x				Austin 1985
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		British columbia	NR?	Austin 1985
	x			Austin 1985 Wrobel and Mills 1998
				Wrobel and Mills 1998

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			Austin 1985
x			Austin 1985

				Coan et al. 2000
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		Lambert 1981
		Austin 1985

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	x	British Columbia	nr?	Austin 1985
				Austin 1985
				Austin 1985
		British Columbia	NR?	Austin 1985
				Dick and Ross 1988
x	x			Kluge 1962
x	x			Kluge 1962
x	x		C	Kluge 1962
	x			Austin 1985
				Austin 1985

				Austin 1985
				Osburn 1950
				Dick and Ross 1988
x	x	Arctic	nr?	Dick and Ross 1988
				Dick and Ross 1988
x	x			Dick and Ross 1988
	x			Austin 1985
x	x			Austin 1985
x	x			Kluge 1962
x	x	N Pacific	nr?	Austin 1985