

Numbers of Hawaiian Species: Supplement 2, Including a Review of Freshwater Invertebrates¹

LUCIUS G. ELDRIDGE² & SCOTT E. MILLER (Hawaii Biological Survey, Bishop Museum,
1525 Bernice Street, Honolulu, Hawaii 96817, USA)

This is Supplement 2 to our earlier tabulation of species known from Hawaii (Eldredge & Miller, 1995; Miller & Eldredge, 1996; also see Mlot, 1995). The Hawaii Biological Survey continues to work on the compilation of checklists and bibliographies; some short lists of invertebrates are included in this supplement, especially for those species inhabiting freshwater. This supplement should be viewed as a further interim report subject to future change. See Eldredge & Miller (1995) for definitions and scope and see Allison *et al.* (1995) for review of marine species.

From literature and unpublished sources, 22,077 species have been recorded from the Hawaiian Islands and surrounding waters. Of these, 8,805 are endemic to the Hawaiian Islands, and 4,373 are nonindigenous species. This is an ongoing count of the biota, e.g., the completed checklist of the foraminiferans totaled 755 species, rather than the 1000+ in the original estimate. Particular interest has been paid to the freshwater animals in this supplement [see Table 2 for taxa and citations].

Hawaii Biological Survey is in the process of posting species checklists in searchable interfaces for the Hawaiian organisms on the Internet at:

<http://www.bishop.hawaii.org/bishop/HBS/>

More than 15,000 species are currently available (including terrestrial arthropods, native and alien land and freshwater snails, Foraminifera, flowering plants, amphibians, reptiles, birds, and mammals; with more taxa to be added).

These numbers include significant refinements from the previous compilations. Future checklists are anticipated to further refine the number, particularly for fungi and algae. For most taxa, this list does not include undescribed species (unless they have been specifically mentioned in publications).

The lists given here for freshwater microcrustaceans (Cladocera, Ostracoda, Copepoda, Amphipoda) should be seen only as rough starting points. These groups have received little serious study in the Hawaiian Islands, most records resulting from early European workers (Baird, 1962; Daday, 1906; Sars, 1904; Stingelin, 1905; Vavra, 1906). Application of modern taxonomic characters and species concepts has vastly changed the names applied in some of these taxa (e.g., Frey, 1986) and comprehensive sampling will likely add many taxa.

Many gaps in knowledge in Hawaii's biota remain, and many species of protists, algae, fungi, worms, and arthropods need to be investigated.

1. Contribution No. 1997-002 to the Hawaii Biological Survey.

2. Executive Director, Pacific Science Association, P.O. Box 17801, Honolulu, Hawaii, 96817, USA

Table 1. Estimates of numbers of known species of the Hawaiian biota (based on Eldredge & Miller, 1995, Miller & Eldredge, 1996, and including this paper and other papers in *Records of the Hawaii Biological Survey for 1996*). Algae and fungi remain the same as previous editions, since the numbers are based on estimates, other categories are based on counts. The estimates for algae and fungi are for recorded species—the actual number may be much higher [see Lipscomb (1996) for discussion of microbial diversity]. Archaea and bacteria are not included.

Taxon	Total	Endemic	NIS
Algae (includes diatoms)	811	2	5?
Other protists	1106	2?	?
Fungi	1309	?	?
Lichens	723	240	?
Flowering plants	1935	850	902
Other plants	755	241	44
Cnidarians	355	75	10
Insects	7979	5246	2582
Other arthropods	811	269	473
Molluscs	1650	956	86
Annelids	307	80	30
Crustaceans	1181	55+	48
Echinoderms	278	150	0
Other invertebrates	1331	439	28+
Fish	1197	139	73
Amphibians	4	0	4
Reptiles	27	0	23
Birds	274	60	46
Mammals	44	1	19
Totals	22077	8805+	4373+

Archaea

Unidentified species of Archaea were reported from Pele's Vent, a deep-sea hydrothermal ecosystem near the summit of Loihi Seamount (Moyer, 1996). Archaea are microbes that, although sharing ancient metabolic genes with Bacteria, are a separate lineage more closely related to Eukaryotes (Bult *et al.*, 1996).

Marine algae

Five new species described; 2 new records from Hawaiian Islands reported; 1 new to the main Hawaiian Islands, previously reported from Kure Island (Abbott, 1996).

Table 2. Freshwater invertebrates known to occur in Hawaiian waters with major source of information. (HBS96 = papers in *Records of the Hawaii Biological Survey for 1996*).

Taxon	Species			Reference(s)/Notes
	Total	Endemic	NIS	
Sponges	1	0	?	Svihla, 1941/identification needs verification
Coelenterates	2	0	2	this paper
Platyhelminthes	2	1	1	this paper
Nemertines	1	0	1	this paper/undetermined spp.
Rotifers	31	?	?	Turner, 1996
Mollusks				
Gastropods*	32	10	22	Kay, 1979; Cowie <i>et al.</i> , 1995; Cowie, <i>HBS Records for 1996</i>
Bivalves	1	0	1	Burch, 1995
Helminth endoparasites**	12	?	?	Font, HBS96
Annelids				
Leeches	4	0	4	this paper
Polychaetes	1	0	1	Van Zwaluwenburg, 1948
Arthropods				
Insects	200+	139+	55	Howarth & Polhemus, 1991; Nishida, 1994
Branchiopods	18	0	?	this paper
Ostracods	8	?	?	this paper
Copepods	14	?	?	this paper
Amphipods***	12	9	?	this paper
Decapods***	16	9	4	this paper
Mites	2	0	2	Nishida, 1994
Tardigrades	22	?	?	Nishida, 1994
Bryozoans	2	0	2	Bailey-Brock & Hayward, 1984
* includes freshwater and brackish water species				
** includes platyhelminthes (9), nematodes (2), acanthocephalans (1) that are endoparasitic in native and introduced stream fishes				
*** includes anchialine species				

Protozoa

Foraminifera: revised number of species is 755 (Burch & Burch, 1995, *HBS Records for 1996*); **parasitic (marine invertebrates):** 8 unidentified species of ciliates (*Chromidina* and *Opalinopsis*) parasitic in cephalopods (Hochberg, 1990); **parasitic (terrestrial vertebrates):** *Haemoproteus iwa* described from great frigatebirds at Laysan and French Frigate Shoals (Work & Rameyer, 1996); avian malaria (*Plasmodium relictum*)

capistranoae) infections in Hawaiian crow (*Corvus hawaiiensis*) (Massey *et al.*, 1996); avian malaria experimentally tested in i'iwi (*Vestiaria coccinea*) and nutmeg manikins (*Lonchura punctulata*) (Atkinson *et al.*, 1995); **other Protozoa:** *Acanthocorbis camarensis* n. sp. (Hara *et al.*, 1996).

Fungi

Three new species and 6 new records of brown-spored agarics (Horak *et al.*, 1996).

Mosses

A series of recent papers create a net loss of 5 endemic species, addition of 9 indigenous species, and addition of 1 nonindigenous species (Darigo, 1996; Frahm, 1991; Hall *et al.*, 1995; Karlin & Andrus, 1995; Lewinsky, 1993; Vitt & Hoe, 1980; Zander & Hoe, 1979).

Freshwater diatoms

Two new species described, bringing Hawaii total to 213 taxa (species and varieties), overall percentage of endemism very low (about 2%) (McMillan & Rushforth, 1987).

Ferns

Human activity has led to the naturalization of 30 species (3 more than given in Eldredge & Miller, 1995), more than 260 species in cultivation (Wilson, 1996). Medeiros *et al.* (1996) added a new endemic species of fern ally, *Phlegmariurus stemmermannii*. See Wagner *et al.* (1995) for further information on ferns enumerated in Miller & Eldredge (1996).

Cnidaria

Add hydroid *Hydrichthys pietschi* parasitic on ceratioid fish *Ceratias holboelli* (Martin, 1975); 2 freshwater cnidarians were previously noted without identification—freshwater medusa *Craspedacusta sowerbii* Lankester, 1880 [nonindigenous, first record Edmondson, 1940: 313; Matthews, 1963: 18; 1966: 246] and freshwater polyp *Calpasoma dactyloptera* (Fuhrmann, 1939) [nonindigenous, first record Matthews, 1966: 246]. Add gorgonian *Narella ornata* Bayer (n. sp.) (Bayer, 1995); previously 1 species (*Physalia physalis*) of Siphonophora was reported; through an interpretation of siphonophore distribution maps, 12 additional species should be added as possibly being found in the Hawaiian region (Alvariño, 1971).

Platyhelminthes

Parasitic: *Anonchotaenia brasiliense* Fuhrmann, 1908, recorded from native drepaniid birds (Voge & Davis, 1953); *Hymenolepis lasionycteridis* n.sp. described from bats (*Lasiurus cinereus semotus*) in Hawaii (and North America) (Rausch, 1975); 8 species (cestodes) parasitic in cephalopods (Hochberg, 1990); *Paraechinophallus hyperogliphe*, n. sp., from fish *Hyperogliphe japonica* (Tkachov, 1979); new state record of *Cylindrotaenia allisonae* Schmidt, 1980 from gecko *Lepidodactylus lugubris* (Goldberg & Bursey,); *Ascocoyle tenuicollis* is a new record from both native stream gobioid and introduced fishes (Font,).

Checklist of known species of terrestrial and freshwater turbellarians

- Australopacifica subpallida* (Hyman, 1939) [= *Geoplana subpallida*; endemic, terrestrial; Hyman, 1939: 119; Ogren & Kawakatsu, 1991: 56]
- Bipalium kewense* Moseley, 1878 [nonindigenous, terrestrial; first Hawaiian record Woodworth, 1898: 302; Winsor, 1983: 61]
- Dugesia dorotocephala* (Woodworth, 1887) [nonindigenous, freshwater; Kawakatsu *et al.*, 1984: 1]
- Endeavouria septemlineata* (Hyman, 1939) [= *Geoplana septemlineata*; endemic, terrestrial; Hyman, 1939: 116; Ogren & Kawakatsu, 1991: 69]
- Oahuhawaiiiana kazukolinda* Kawakatsu & Mitchell, 1984 [endemic, freshwater; Kawakatsu & Mitchell, 1984: 487; see Sluys (1989) for detailed phylogenetic relationships]
- Parakontikia ventrolineata* (Dendy, 1892) [= *Geoplana ventrolineata*; nonindigenous, terrestrial; Waterhouse & Norris, 1987: 271; Winsor, 1991: 45]
- Platydemus manokwari* Beauchamp, 1963 [nonindigenous, terrestrial; Eldredge & Smith, 1994: 8]
- Rhynchodemus oahuensis* Hyman, 1939 [terrestrial; Hyman, 1939: 120]

Nemertinea

Specimens of *Prostoma* sp. have been reported (Weidenbach, 1995) from Hawaii; additional specimens are needed for a more definitive identification; Weidenbach reported *P. graecense* (known also as *P. rubrum*) from a single specimen [*P. rubrum* was suppressed by Gibson & Moore (1976)] (J. Norenburg, pers. comm.).

Acanthocephala

The unidentified species from freshwater fish (Font & Tate, 1994) has been identified as *Southwellina hispida* (Font,).

Nematoda

Pharyngodon lepidodactylus, n. sp. described (Burse & Goldberg, 1996) and new state record of *Skrjabinelazia machidai* Hasegawa, 1984 (Goldberg & Bursey,) parasitic in the mourning gecko *Lepidodactylus lugubris*; 3 unidentified larvae and 2 unidentified species parasitic in cephalopods (Hochberg, 1990); 1 new record from *nene* (*Branta sandvicensis*) (Baily & Black, 1995).

Annelida: Polychaeta

One species considered nonindigenous freshwater *Namalycastis abioma* (Müller in Grube, 1872) [= *Lycastis hawaiiensis* Johnson, 1903 (Van Zwaluwenburg, 1948; Bailey-Brock & Hartman, 1987: 297)].

Annelida: Hirudinea**Checklist of leech species known to occur in Hawaii**

Erpobdellidae

Barbronia weberi formosana (Oka, 1929) [freshwater, nonindigenous; Moore, 1946: 173; Soós, 1966a: 154, 1966b: 383]

Gastrostomobdella quinqueannulata Moore, 1946 [endemic, predaceous, terrestrial; Moore, 1946: 177; Soós, 1966a: 155; Meyer, 1968: 24]

Glossiphoniidae

Glossiphonia weberi lata Oka, 1910 [freshwater, nonindigenous; Moore, 1946: 172]

Ozobranchidae

Ozobranchus branchiatus (Menzies, 1791) [ectoparasitic, green turtles (*Chelonia mydas*); Balazs, 1980: 20; Choy *et al.*, 1989: 89]

Ozobranchus margo (Apathy, 1890) [ectoparasitic, green turtles (*Chelonia mydas*); Choy *et al.*, 1989: 89]

Piscicolidae

Aestabdella abditovesiculata (Moore, 1952) [= *Johanssonia abditovesiculata*; parasitic on marine fish (*Arothron hispidus*); Moore, 1952: 29; Soós, 1965: 438; Burreson, 1976: 789]

Cystobranchus sp. [parasitic on native freshwater fishes, nonindigenous; Font & Tate, 1994: 683]

Myzobdella lugubris Leidy, 1851 [parasitic on native freshwater fishes, nonindigenous; Font & Tate, 1994: 683]

Arthropoda: Insecta

The order Mallophaga was inadvertently omitted from Miller & Eldredge (1996), resulting in omission of 102 species, of which 5 are endemic and 44 nonindigenous. It is possible that many insect species currently considered adventive were actually introduced in early biological control programs (ca. 1890–1920). Swezey (1925: 369, 1931: 368) noted that early workers introduced “perhaps ten times as many” insects as were recorded as successful introductions up to that time, but records were not kept for most of the supposedly “failed” introductions.

Arthropoda: Pentastomida

The first Hawaiian record of the subphylum (phylum according to some authors) is *Raillietiella frenatus* Ali *et al.*, 1981, parasitic in lungs of mourning gecko *Lepidodactylus lugubris* (Goldberg & Bursey,).

Arthropoda: Crustacea: Branchiopoda

One species of Notostraca, not previously included—*Triops longicaudatus* (LeConte, 1846) should be added (Longhurst, 1955). Eighteen species of freshwater Cladocera (an increase from 4 in Eldredge & Miller, 1995) (Ueno, 1936; Sars, 1904; Stingelin, 1905; Brehm, 1937) are provisionally listed below. Korovchinsky (1996) provided a list

of “valid species” and “fair species” (those needing further study); only 3 of the 18 from Hawaii are listed. Twelve of the 18 names were checked against the revision of the Australian Cladocera (Smirnov & Timms, 1983). The status of the remaining species needs further investigation.

Checklist of freshwater Cladocera of Hawaii

Bosminidae

Bosmina meridionalis Sars, 1904 [= *B. hagemanni*, Makua, Oahu, and Kauai, Brehm, 1937: 335; valid species of Korovchinsky, 1996]

Chydoridae

Alona cambouei Guerne & Richard, 1893 [Molokai, Sars, 1904: 633; Lake Waiau, Hawaii, Ueno, 1936: 6; Kauai, Brehm, 1937: 335]

Alona davidi Richard, 1895 [Stingelin, 1905: 352]

Alona karua (Daday, 1898) [= *Alonella karua*, Ewa Reservoir, Oahu, Brehm, 1937: 335]

Alona sp. [Brehm, 1937: 335]

Chydorus sphaericus (Müller, 1785) [Wahiawa, Oahu, Brehm, 1937: 336; valid species but recognized as a species complex (Frey, 1986: 241)]

Camptocercus australis Sars, 1896 [Brehm, 1937: 335]

Dunhevedia crassa King, 1898 [Stingelin, 1905: 357]

Pleuroxus sp. [Wahiawa, Oahu, Brehm, 1937: 336]

Daphniidae

Ceriodaphnia dubia Richard, 1894 [Mauna Kea, Hawaii, Ueno, 1936: 4]

Ceriodaphnia cornuta Sars, 1885 [= *Ceriodaphnia rigaudi*, Stingelin, 1905: 341]

Simocephalus serrulatus (Koch, 1841) [= *Simocephalus capensis* G. O. Sars, Mauna Kea, Hawaii, Ueno, 1936: 3]

Simocephalus vetulus (Müller, 1776) var. *spinosulus* [n. var., Stingelin, 1905: 342]

Ilyocryptidae

Ilyocryptus longiremis Sars [Wahiawa, Oahu, Brehm, 1937: 335]

Macrothricidae

Macrothrix triserialis Brady, 1886 [= *Macrothrix chevreuxi* Guerne & Richard, Mauna Kea, Hawaii, Ueno, 1936: 5]

Macrothrix spinosa King, 1853 [Molokai; Sars, 1904: 633]

Moinidae

Moina micrura dubia Guerne & Richard, 1892 [Kauai, Brehm, 1937: 335]

Sididae

Latonopsis australis Sars, 1888 [Stingelin, 1905: 339; fair species]

Arthropoda: Crustacea: Ostracoda

Revised numbers total 202 species: 8 freshwater and 194 of marine origin of which 32 species are from drowned terraces around the main islands (Holden, 1967), 115 (25 new species, 10 new subspecies, 50 “sp.”) taxa from Cenozoic drill holes at Midway (Holden, 1976), 15 dredged species from *Challenger* Expedition (Brady, 1880), 26 inter-

stitial species (9 n. spp.) (Hartmann, 1991), 3 benthic species (Kornicker, 1976). Additional data without specific identifications pertaining to ostracod assemblages at Maunaloa Bay, Oahu (Izuka & Kaesler, 1986); zoogeography of Macrocyprididae (Madocks, 1977).

Checklist of the freshwater ostracods known from Hawaii

Cyprididae

Chlamydotheca unispinosa (Baird, 1862) [= *Cypris unispinosa* Baird 1862: 3; Tressler, 1949: 68]

Cyprinotus cingalensis Brady, 1885 [freshwater, Vavra, 1906: 424; misidentification; see Victor & Fernando, 1980: 1292]

Heterocypris makua (Tressler, 1937) [= *Cyprinotus makua* Tressler, 1937: 192; freshwater; Victor & Fernando, 1980: 1288]

Stenocypris major (Baird, 1859) [= *Stenocypris malcolmsoni* (Brady, 1886) Tressler, 1937: 202, 1949: 73; identification may not be correct, see Victor & Fernando, 1981: 156]

Cyprinopsidae

Cypridopsis cypera Tressler, 1937 [n. sp., Tressler, 1937: 204]

Cypridopsis dentatmarginata (Daday, 1906) [Tressler, 1937: 204]

Cypridopsis vidua (Müller, 1776) [Tressler, 1937: 204]

Entocytheridae

Ankylocythere sinuosa (Rioja, 1942) [freshwater drainage ditches, host nonindigenous crayfish *Procambarus clarkii*; Hart & Hart, 1974: 29]

Arthropoda: Crustacea: Copepoda

Add 4 shallow-water marine species including 3 new species of *Leptocaris* (Kunz, 1994); no freshwater copepods were identified in Eldredge & Miller (1995).

Checklist of freshwater copepods from the Hawaiian Islands

Order Cyclopoida

Bryocyclops anninae (Menzel, 1926) [Yeatman, 1984: 62; Evenhuis & Preston, 1995: 53]

Lernaea cyprinacea Linnaeus, 1758 [= *Lernaea carassi* Tidd, parasitic on goldfish and tadpoles, Bonnet, 1948: 7]

Macrocylops albidus (Jurine, 1820) [= *Cyclops albidus*, Molokai, Sars, 1904: 641]

Mesocyclops aspericornis (Daday, 1906) [= *Cyclops aspericornis* n. sp., pools and ditches between Waikiki and Honolulu, Oahu, Daday, 1906: 305; = *Cyclops leuckartii* Claus, Molokai, Sars, 1904: 641; = *Mesocyclops obsoletus* (Koch), mosquito predator, Bonnet & Mukaida, 1957: 99; Kiefer, 1981: 172]

Paracyclops poppei (Rehberg, 1880) [= *Cyclops fimbriatus* var. *poppei*, Molokai, Sars, 1904: 641]

Order Harpacticoida

- Cletocamptus deitersi* (Richard, 1897) [river between Waianae and Nanakuli, Oahu, Chappuis, 1934: 635]
- Elaphoidella bidens* (Schmeil, 1894) [= *Attheyella coronata* Sars, 1904 n. sp., Molokai, Sars, 1904: 641; = *Elaphoidella bidens coronata* (Sars), Palolo River (Kaimuki), Oahu, Chappuis, 1934: 632]
- Elaphoidella dispersa* Chappuis, 1934 [n. sp., river between Waianae and Nanakuli, Oahu, Chappuis, 1934: 633]
- Elaphoidella grandidieri* (Guerne & Richard, 1893) [= *Attheyella grandidieri*, Molokai, Sars, 1904: 639; Hawaiian Islands, Yeatman, 1984: 85]
- Epactophanes richardi* Mrazek, 1893 [Oahu, Evenhuis & Preston, 1995: 53]
- Leptocaris brevicornis* (Douwe, 1904) [euryhaline, sometimes found in inland freshwaters, Kauai, Kunz, 1994: 35]
- Nitokra pietschmanni* Chappuis, 1934 [n. ssp., Moanalua, Kahili River, Waimalui (Pearl Harbor), Honolulu Fishmarket, Waikiki, Waipahu, Aiea, Waianae Plantation Reservoir, Oahu, Chappuis, 1934: 634]
- Nitokra spinipes* Boeck, 1865 [drift in Paakea, Waiohue, Hanakapiai, Hawaii; Barnes & Shiozawa, 1985: 2119]
- Phyllognathopus viguieri* (Maupas, 1892) [Oahu, Yeatman, 1984: 74; Evenhuis & Preston, 1995: 53]

Arthropoda: Crustacea: Cirripedia

Three green turtle-associated barnacles—*Chelonibia testudinaria* (on carapace, plastron, head), *Platylepas hexastylus* (attached principally to skin regions), and *Stephanolepas muricata* (burrowing species)—to be added (Balazs, 1980).

Arthropoda: Crustacea: Stomatopoda

The 17 species of stomatopods are relatively well known in Hawaiian waters; however, recent generic revisions have changed many of the established names (Manning, 1995).

Checklist of stomatopod species known from Hawaiian waters (all marine)

Bathysquillidae

Bathysquilla microps (Manning, 1961)

Coronididae

Paravisquilla sinuosa (Edmondson, 1921) [= *Coronida sinuosa* Edmondson, 1921]

Gonodactylidae

Gonodactylaceus aloha (Manning & Reaka, 1981) [= *Gonodactylus aloha* Manning & Reaka, 1981]

Gonodactylus hendersoni (Manning, 1967) [= *Gonodactylus hendersoni* Manning, 1967; including Pacific records of *G. demani*]

Harpiosquillidae

Alima alba (Bigelow, 1893) [= *Squilla alba* Bigelow, 1893; *Alima hyalina* Leach, 1817]

Lysiosquillidae

Lysiosquilla sulcirostris Kemp, 1913 [not *Lysiosquilla maculata* (Fabricius, 1793)]

Lysiosquillina maculata (Fabricius, 1793) [= *Lysiosquilla maculata* (Fabricius, 1793)]

Nannosquillidae

Acanthosquilla multifasciata (Wood-Mason, 1895)

Odontodactylidae

Odontodactylus brevisrostris (Miers, 1884) [= *Gonodactylus hansenii* Pocock, 1893]

Odontodactylus hawaiiensis Manning, 1967

Protosquillidae

Echinosquilla guerini (White, 1861)

Pseudosquillidae

Pseudosquilla ciliata (Fabricius, 1787)

Pseudosquillisma guttata (Manning, 1972) [= *Pseudosquilla guttata* Manning, 1972]

Pseudosquillisma oculata (Brullé, 1837) [= *Pseudosquilla oculata* (Brullé, 1837)]

Squillidae

Busquilla quadraticauda (Fukuda, 1911) [= *Squilla boops* Kemp, 1911; *Oratosquilla quadraticauda* (Fukuda, 1911)]

Oratosquilla calumnia (Townsend, 1953) [= *Squilla calumnia* Townsend, 1953; *Squilla oratoria* DeHaan, 1844]

Pontiosquilla mauiana (Bigelow, 1931) [= *Chorida mauiana* (Bigelow, 1931)]

Arthropoda: Crustacea: Mysidacea

Revised numbers total 20 species: 13 species (Ortmann, 1906), 4 species (Tattersall, 1951), 1 possible nonindigenous species (Holmquist, 1979), 2 new species (Murano, 1995); population study of *Gnathophausia longispina* (Wilson & Boehlert, 1993).

Arthropoda: Crustacea: Tanaidacea

One newly recorded species (Muir,).

Arthropoda: Crustacea: Isopoda

Taiti & Howarth (1996) reviewed the terrestrial isopods with a total of 47 species. No isopods are known from freshwater habitats in Hawaii.

Arthropoda: Crustacea: Cumacea

One unidentified newly recorded species (Muir,).

Arthropoda: Crustacea: Amphiphoda

Green turtle-associated talitroid amphiphod—*Hyachelia tortugae*—found in buccal cavity and also on neck and hind flippers in association with superficial skin lesions (Balazs, 1980); 4 new records (Muir,).

Twelve species of amphiphods reported from fresh to brackish anchialine ponds (Barnard, 1977; Barnard & Barnard, 1983; Bousfield, 1990):

Checklist of Hawaiian amphipods from fresh to brackish anchialine habitats

- Carnarimelita janstocki* Bousfield, 1990
Gammarella amikai (Barnard, 1970) [= *Nuuanu amikai* Barnard, 1970]
Grandidierella dentimera Myers, 1970
Grandidierella koa Barnard, 1977
Grandidierella palama Barnard, 1977
Liagoceradocus lonomaka Barnard, 1977 [= *Hadzia (Liagoceradocus) lonomaka* Barnard, 1977]
Parahyale hawaiiensis (Dana, 1853)
Paramoera lokowai Barnard, 1977
Paramoera paakai Barnard, 1977
Paramoera rua Barnard, 1977
Rotomelita ana Barnard, 1977
Rotomelita loko Barnard, 1977

Arthropoda: Crustacea: Decapoda

New species for Hawaii—*Metapenaeopsis gaillardi* Crosnier, 1991 (n. sp.); *Aniculus hopperae* McLaughlin & Hoover, 1996 (n. sp.); *Rhynchocinetes rathbunae* Okuno, 1996 (n. sp.); new family record (Anchistiodidae), juvenile *Anchistiodes compressus* Paulson, deposited in Queensland Museum (A.J. Bruce, pers. comm.); *Harrovia truncata* Rathbun, 1906 is now *Cyrtocarcinus truncatus* (Rathbun, 1906) (Ng & Chia, 1994); *Pandalus brevis* Rathbun, 1906 is now *Bitias brevis* (Rathbun, 1906) (Crosnier & Franzen, 1994); 3 species of Axiidae are noted (Kensley, 1996).

Checklist of freshwater and anchialine decapod crustaceans from Hawaii

Infraorder Caridea

Alpheidae

- Metabetaeus lohena* Banner & Banner, 1960 [n. sp., anchialine, Banner & Banner, 1960: 299; Holthuis, 1973: 35]

Atyidae

- Antecaridina lauensis* (Edmondson, 1935) [first Hawaiian record, Holthuis, 1973: 19]
Atyoida bisulcata Randall, 1840 [= *Atya bisulcata* auctt., = *Ortmannia henshawi* Rathbun, 1900; Chace, 1983: 5]
Caridinia weberi deMan, 1892 [nonindigenous, established, Devick, 1991]
Halocaridina palahemo Kensley & Williams, 1986 [n. sp., anchialine and lava tubes, Kensley & Williams, 1986: 429]
Halocaridina rubra Holthuis, 1963 [n. sp., anchialine, Holthuis, 1963: 262; = *Caridina brevis* Rathbun, 1906: 919 and others]

Hippolytidae

- Calliasmata pholidota* Holthuis, 1973 [n. sp., anchialine, Holthuis, 1973: 37]
Ligur uvae (Borradaile, 1899) [first Hawaiian record, Maciolek, 1983: 609]

Palaemonidae (Palaemoninae)

- Macrobrachium grandimanus* (Randall, 1840) [= *Palaemon grandimanus* and *P. gracil-*

- imanus*, Randall, 1840: 142, 143; freshwater, rarely anchialine, Holthuis, 1973: 23]
Macrobrachium lar (Fabricius, 1798) [nonindigenous, established, Brock, 1960]
Macrobrachium rosenbergii (deMan, 1879) [nonindigenous, probably not established, Kanayama, 1967]
Palaemon debilis Dana, 1852 [anchialine, Holthuis, 1973: 22]
Palaemonidae (Pontoniinae)
Palaemonella burnsi Holthuis, 1973 [n. sp., anchialine, Holthuis, 1973: 24]
Procarididae
Vetericaris chaceorum Kensley & Williams, 1986 [n. sp., anchialine and lava tubes, Kensley & Williams, 1986: 419]
Procaris hawaiiiana Holthuis, 1973 [n. sp., anchialine, Holthuis, 1973: 12]
Infraorder Astacidea: Astacidae [crayfishes]
Procambarus clarkii (Girard, 1852) [nonindigenous, established, first record, Penn, 1954]
Infraorder Brachyura
Potamonidae [freshwater crabs]
Trichodactylus punctatus Eydoux & Souleyet [Rathbun, 1906:842 “without doubt erroneously attributed to the Hawaiian Islands by those authors”, members of this family have never been reported from the Hawaiian Islands]

Bryozoa and Entoprocta

The note in Eldredge & Miller (1995) for these 2 phyla was inadvertently confused. “Soule *et al.* (1987) provided only unidentified generic descriptions” was intended for Entoprocta. For Bryozoa, Soule *et al.* (1987) provided a list of some 180 species known from Hawaiian waters along with the source of the record and also included nearly 50 identified SEM photographs; for additional records see D.F. Soule *et al.* (1991); J.D. Soule *et al.* (1991), and D.F. Soule *et al.* (1992).

The 2 freshwater bryozoans are: *Hyalinella vaihiriae* Hastings, 1929 and *Plumatella repans*? (Bailey-Brock & Hayward, 1984).

Chordata

A second species—*Epigonichthys lucayanum* (Andrews, 1893)—of cephalochordate is added (Richardson & Eldredge,). Three newly recorded introduced lizards not previously included: *Anolis sagrei*, *A. equestris*, *Phelsuma guimbeaui* (Kishinami & Kishinami, 1996). Two new marine fish—*Aseraggodes borehami* Randall, 1996 and *A. therese* Randall, 1996 (Family Soleidae)—described from Hawaiian waters (Randall, 1996).

Acknowledgments

We thank the libraries of Bishop Museum, Hawaii Agriculture Research Center (formerly Hawaiian Sugar Planter' Association), Santa Barbara Museum of Natural History, Smithsonian Institution, University of California at Santa Barbara, and University of Hawaii at Manoa for access to literature. Various specialists have assisted in literature

search, analysis, and review, especially J. Clark, H. Dumont, F.G. Hochberg, R.B. Manning, R. Ogren, J. Reid, S. Rushforth, N.N. Smirnov, L. Winsor. This is an interim product from the project supported by the John D. and Catherine T. MacArthur Foundation and the U.S. Geological Survey, Biological Resources Division (formerly National Biological Service).

Our literature search has been assisted by databases produced by *Biological Abstracts*, CAB International, National Agriculture Library (U.S. Department of Agriculture), and *Zoological Record*.

Literature Cited

- Abbott, I.A.** 1996. New species and notes on marine algae from Hawai'i. *Pac. Sci.* **50**(2): 142–56.
- Allison, A., S.E. Miller & G.M. Nishida.** 1995. Hawaii Biological Survey: a model for the Pacific Region, p. 349–55. *In: Marine and coastal biodiversity in the tropical island Pacific Region*. Vol. 1: Species systematics and information management priorities. Program on Environment, East-West Center, Honolulu.
- Alvaríño, A.** 1971. Siphonophores of the Pacific with a review of the world distribution. *Bull. Scripps Inst. Oceanogr.* **16**: 1–432.
- Atkinson, C.T., K.L. Woods, R.J. Dusek, L.S. Sileo & W.M. Iko.** 1995. Wildlife disease and conservation in Hawaii: pathogenicity of avian malaria (*Plasmodium relictum*) in experimentally infected iiwi (*Vestiaria coccinea*). *Parasitology* **111**: S59–S69.
- Baily, T. & J. Black.** 1995. Parasites of wild and captive nene *Branta sandvicensis* in Hawaii. *Wildfowl* **46**: 59–65.
- Bailey-Brock, J.H. & O. Hartman.** 1987. Class Polychaeta, p. 216–454. *In: Devaney, D.M. & L.G. Eldredge, eds., Reef and shore fauna of Hawaii*. Section 2: Platyhelminthes through Phoronida and Section 3: Sipuncula through Annelida. Bishop Museum Press, Honolulu.
- . & **P.J. Hayward.** 1984. A freshwater bryozoan, *Hyalinella vaihiriae* Hastings (1929), from Hawaiian prawn farms. *Pac. Sci.* **38**: 199–204.
- Baird, W.** 1862. Descriptions of some new species of entomostracous Crustacea. *Ann. Mag. Nat. Hist.* (3) **10**(55):1–6.
- Balazs, G.H.** 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-7. 141 p.
- Banner, A.H. & D.M. Banner.** 1960. On *Metabetaeus* Borradaile, with a new species from Hawaii. *Pac. Insects* **14**: 299–303.
- Barnard, J.L.** 1977. The cavernicolous fauna of Hawaiian lava tubes. 9. Amphipoda (Crustacea) from brackish lava ponds. *Pac. Insects* **17**(2–3): 267–99.
- . & **C.M. Barnard.** 1983. *Freshwater Amphipoda of the world*. 2 vols. Hayfield Associates, Mt. Vernon, Virginia.
- Barnes, J.R. & D.K. Shiozawa.** 1985. Drift in Hawaiian streams. *Verh. Int. Ver. Limnol.*

22: 2119-2124.

- Bayer, F.M.** 1995. A new species of the gorgonian genus *Narella* (Anthozoa: Octocorallia) from Hawaiian Islands. *Proc. Biol. Soc. Wash.* **108**(1): 147-52.
- Bonnet, D.D.** 1948. Some parasitic copepods from Hawaiian fishes, p. 7. *Proc. Hawaiian Acad. Sci. Twenty-Third Annual Meeting*. University of Hawaii Press, Honolulu.
- . & **T. Mukaida.** 1957. A copepod predaceous on mosquito larvae. *Mosquito News* **17**(2): 99.
- Bousefield, E.L.** 1990. A new genus and species of hadzioidean amphipod crustacean from anchialine pools in Hawaii. *Beaufortia* **41**(4): 25-30.
- Brady, G.S.** 1880. Report on the Ostracoda dredged by H.M.S. *Challenger* during the years 1873-1876. *Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873-76*. Zoology I, Part III. 184 p.
- Brehm, V.** 1937. Notizen sur Süßwasserfauna der Hawaii-Inseln. [Mitteilung XXIII de Wallacea-Expedition Woltereck, 1931-1932.] *Int. Rev. Ges. Hydrobiol. Hydrogeogr.* **34**: 331-36.
- Brock, V.E.** 1960. The introductions of aquatic animals into Hawaiian waters. *Int. Rev. Ges. Hydrobiol.* **45**(4): 463-80.
- Bult, C.J., O. White, G.J. Olsen, L. Zhou, R.D. Fleischmann, G.G. Sutton, J.A. Blake, L.M. FitzGerald, R.A. Clayton, J.D. Gocayne, A.R. Kerlavage, B.A. Dougherty, J.-F. Tomb, M.D. Adams, C.I. Reich, R. Overbeek, E.F. Kirkness, K.G. Weinstock, J.M. Merrick, A. Glodek, J.L. Scott, N.S.M. Geoghagen, J.F. Weidman, J.L. Fuhrmann, D. Nguyen, T.R. Utterback, J.M. Kelley, J.D. Peterson, P.W. Sadow, M.C. Hanna, M.D. Cotton, K.M. Roberts, M.A. Hurst, B.P. Kaine, M. Borodovsky, H.-P. Klenk, C.M. Fraser, H.O. Smith, C.R. Woese & J. Craig Venter.** 1996. Complete genome sequence of the methanogenic Archaeon, *Methanococcus jannaschii*. *Science* **273**: 1058-1073.
- Burch, B.L. & T.A. Burch.** 1995. Sessile Foraminifera of the Hawaiian Archipelago: a preliminary survey. *Mar. Micropaleontol.* **26**: 161-70.
- Burch, T.A.** 1995. *Corbicula fuminea* Müller (Mollusca: Bivalvia) established on Oahu. *Bishop Mus. Occas. Pap.* **42**: 58.
- Burreson, E.M.** 1976. *Aestabdelta* gen. n. (Hirudinea: Piscicolidae) for *Johanssonia abd-ito-vesiculata* Moore 1952 and *Ichthyobdella platycephali* Ingram 1957. *J. Parasitol.* **62**(5): 789-92.
- Bursey, C.R. & S.R. Goldberg.** 1996. *Pharygodon lepidodactylus* sp. n. (Nematoda: Pharyngodonidae) from the mourning gecko, *Lepidodactylus lugubris* (Lacertilia: Gekkonidae), from Hawaii. *J. Helminthol. Soc. Wash.* **63**: 51-55.
- Chace, F.A., Jr.** 1983. The *Atya*-like shrimps of the Indo-Pacific Region (Decapoda: Atyidae). *Smithson. Contrib. Zool.* **384**: 1-54.
- Chappuis, P.A.** 1934. Süßwasser Harpacticiden aus dem hawaiischen Inselgebiet. *Bull. Soc. Sci. Cluj* **7**: 631-35.
- Choy, B.K., G.H. Balazs & M. Dailey.** 1989. A new therapy for marine turtles parasitized by the piscicolid leech, *Ozobranchus branchiatus*. *Herpetol. Rev.* **20**(4):

89–90.

- Cowie, R.H., N.L. Evenhuis & C.C. Christensen.** 1995. *Catalog of the native land and freshwater molluscs of the Hawaiian Islands*. Backhuys Publ., Leiden. vi + 248 p.
- Crosnier, A.** 1991. Crustacea Decapoda: Les *Metapenaeopsis* indo-ouest-pacifiques sans appareil stridulant (Penaeidae). Deuxième partie, p. 155–297. *In: Crosnier, A., ed., Résultats des Campagnes MUSORSTOM 9. Mém. Mus. Natl. Hist. Nat. (A)* **152**: 155–297.
- . & **C.H.J.M. Franssen.** 1994. Découverte de *Bitias brevis* (Rathbun, 1906) à Madagascar (Decapoda, Pandalidae). *Crustaceana* **66**(1): 45–52.
- Daday, E.** 1906. Untersuchungen über die Copepodenfauna von Hinterindien, Sumatra und Java, nebst einem Beitrag zur Copepodenkenntnis de Hawaii-Inseln. *Zool. Jahrb. (Syst.)* **24**: 175–206.
- Darigo, C.** 1996. *Barbula indica* and *Fissidens crumii* new to Hawaiian Island of Maui and the status of *Barbula unguiculata* in Hawaii. *Evansia* **13**: 77.
- Devick, W.A.** 1991. Patterns of introductions of aquatic organisms to Hawaiian freshwater habitats, p. 189–213. *In: New directions in research, management, and conservation of Hawaiian freshwater stream ecosystems*. Proceedings of the 1990 Symposium on Freshwater Stream Biology and Management, State of Hawaii.
- Edmondson, C.H.** 1940. Freshwater jellyfish in Hawaii. *Science* **91**: 313–14.
- Eldredge, L.G. & S.E. Miller.** 1995. How many species are there in Hawaii? *Bishop Mus. Occas. Pap.* **41**: 3–18.
- . & **B.D. Smith.** 1994. Introductions and transfers of the triclad flatworm *Platydemus manokwari*. *Tentacle* **4**: 8.
- Evenhuis, N.L. & D.J. Preston.** 1995. New records of copepods (Copepoda) from Oahu, Hawaii. *Bishop Mus. Occas. Pap.* **42**: 52–53.
- Font, W.F. & D.C. Tate.** 1994. Helminth parasites of native Hawaiian freshwater fishes: an example of extreme ecological isolation. *J. Parasitol.* **80**(5): 682–88.
- Frahm, J.-P.** 1991. A survey of the *Campylopus* flora of Hawaii. *Bryologist* **94**(1): 60–66.
- Frey, D.G.** 1986. The non-cosmopolitanism of chydorid Cladocera: implications from biogeography and evolution, p. 237–56. *In: Gore, R.H. & K.L. Heck, eds., Crustacean biogeography*. A.A. Balkema, Rotterdam.
- Gibson, R. & J. Moore.** 1976. Freshwater nemerteans. *Zool. J. Linn. Soc.* **58**: 177–218.
- Hall, J., S. Fukuda & W.J. Hoe.** 1995. *Ricca fluitans* (Hepaticae, Ricciaceae): first observation in Hawaii. *Fragm. Flor. Geobot.* **40**(1): 233–34.
- Hara, S., Y.-L. L. Chen, J.-C. Sheu & E. Takahashi.** 1996. Choanoflagellates (Sarcocystigophora, Protozoa) from the coastal waters of Taiwan and Japan. I. Three new species. *J. Euk. Microbiol.* **43**(2): 136–43.
- Hart, D.G. & C.W. Hart, Jr.** 1974. The ostracod family Entocytheridae. *Monogr. Acad. Nat. Sci. Phila.* **18**, 239 p.
- Hartmann, G.** 1991. Ostracoden von Hawaii, insbesondere aus dem marinen Interstitial. *Helgol. Meeresunters.* **45**: 165–98.

- Hochberg, F.G.** 1990. Diseases caused by protistans and metazoans, p. 47–227. In: Kinne, O., ed., *Diseases of marine animals*. Volume III. Biologische Anstalt Helgoland, Hamburg, Germany.
- Holden, J.C.** 1967. Late Cenozoic ostracodes from the drowned terraces in the Hawaiian Islands. *Pac. Sci.* **21**(1): 1–50.
- . 1976. Late Cenozoic Ostracoda from Midway Island drill holes. *U.S. Geol. Surv. Prof. Pap.* **680-F**, 43 p.
- Holmquist, C.** 1979. *Mysis costata* Holmes, 1900, and its relations (Crustacea, Mysidacea). *Zool. Jahrb. (Syst.)* **106**: 471–99.
- Holthuis, L.B.** 1963. On red coloured shrimps (Decapoda, Caridea) from tropical land-locked saltwater pools. *Zool. Meded.* **38**(16): 261–79.
- . 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species. *Zool. Verh.* **128**: 1–48.
- Horak, D., D.E. Desjardinn & D.E. Hemmes.** 1996. Agricales of the Hawaiian Islands. 3: the genus *Galerina* and selected other brown-spored agarics. *Mycologia* **88**: 278–94.
- Howarth, F.G. & D.A. Polhemus.** 1991. A review of the Hawaiian stream insect fauna, p. 40–50. In: *New directions in research, management and conservation of Hawaiian freshwater stream ecosystems*. Proceedings of the 1990 Symposium on freshwater stream biology and fisheries management. State of Hawaii, Department of Land and Natural Resources.
- Hyman, L.H.** 1939. Land planarians from the Hawaiian Islands. *Arch. Zool. Exp. Gen.* **80**: 116–24.
- Izuka, S.K. & R.L. Kaesler.** 1986. Biostratinomy of ostracode assemblages from a small reef flat in Maunaloa Bay, Oahu, Hawaii. *J. Paleontol.* **60**(2): 347–60.
- Kanayama, R.K.** 1967. *Hawaii's aquatic animal introductions*. 47th Annual Conference Western Association of State Game and Fish Commissioners. 8 p.
- Karlin, E.F. & R.E. Andrus.** 1995. The Sphagna of Hawaii. *Bryologist* **98**(2): 235–38.
- Kawakatsu, M. & R.W. Mitchell.** 1984. *Oahuhawaiiiana kazukolinda* gen. et sp. nov. (Turbellaria, Tricladida, Maricola), a new freshwater planarian from Honolulu, Oahu Island, Hawaii, USA. *Zool. Sci.* **1**(3): 487–500.
- , **R.W. Mitchell, Y. Hirao & I. Tanaka.** 1984. Occurrence of *Dugesia dorotocephala* (Woodworth, 1897) (Turbellaria, Tricladida, Paludicola) in Honolulu, Hawaii. *Biol. Mag. (Okinawa)* **22**: 1–9.
- Kay, E.A.** 1979. Hawaiian marine shells. *Bishop Mus. Spec. Publ.* **64**(4), 653 p.
- Kensley, B.** 1996. New thalassinidean shrimp from the Pacific Ocean (Crustacea: Decapoda: Axiiidae and Calocarididae). *Bull. Mar. Sci.* **59**(3): 469–89.
- , **& D. Williams.** 1986. New shrimps (families Procarididae and Atyidae) from a submerged lava tube on Hawaii. *J. Crust. Biol.* **6**(3): 417–37.
- Kiefer, F.** 1981. Beitrag zur Kenntnis von Morphologie, Taxonomie und geographischer Verbreitung von *Mesocyclops leuckarti* auctorum. *Arch. Hydrobiol. Suppl.* **62**(1):

148–90.

- Kishinami, M.L. & C.H. Kishinami.** 1996. New records of lizards established on Oahu. *Bishop Mus. Occas. Pap.* **46**: 45–46.
- Kornicker, L.S.** 1976. Benthic Marine Cypridinacea from Hawaii (Ostracoda). *Smithson. Contrib. Zool.* **231**: 1–24.
- Korovchinsky, N.M.** 1996. How many species of Cladocera are there? *Hydrobiologia* **321**: 191–204.
- Kunz, H.** 1994. Beitrag zur Kenntnis der Gattung *Leptocaris* (Copepoda, Harpacticoida) mit Beschreibung von zwei neuen Arten und zwei neuen Unterarten. *Mitt. Hamb. Mus. Inst.* **91**: 35–52.
- Lewinsky, J.** 1993. The genus *Orthotrichum* Hedw. (Musci) in Hawaii. *Bryobrothera* **2**: 61–69.
- Lipscomb, D.** 1996. A survey of microbial diversity. *Ann. Mo. Bot. Gard.* **83**: 551–61.
- Longhurst, A.R.** 1955. A review of the Notostraca. *Bull. Br. Mus. (Nat. Hist.) Zool.* **3**(1): 1–57.
- Maciolek, J.A.** 1983. Distribution and biology of Indo-Pacific insular hypogeal shrimps. *Bull. Mar. Sci.* **33**(3): 606–18.
- Maddocks, R.F.** 1977. Zoogeography of Macrocyprididae (Ostracoda), p. 147–57. In: Löffler, H. & D. Danielopol, eds., *Aspects of ecology and zoogeography of recent and fossil Ostracoda*. W. Junk, Den Haag.
- Manning, R.B.** 1995. Stomatopod Crustacea of Vietnam: the legacy of Raoul Serène. *Crust. Res. Spec. No.* **4**, 339 p.
- Martin, W.E.** 1975. *Hydrichthys pietschi*, new species, (Coelenterata) parasitic on the fish, *Ceratias holboelli*. *Bull. South. Calif. Acad. Sci.* **74**(1): 1–5.
- Massey, J.G., T.K. Graczyk & M.R. Cranfield.** 1996. Characteristics of naturally acquired *Plasmodium relictum capistranae* infections in native Hawaiian crows (*Corvus hawaiiensis*) in Hawaii. *J. Parasitol.* **82**(1): 182–85.
- Matthews, D.C.** 1963. Freshwater jellyfish *Craspedacusta sowerbyi* Lankester in Hawaii. *Trans. Am. Microscop. Soc.* **82**: 18–22.
- . 1966. A comparative study of *Craspedacusta sowerbyi* and *Calpasoma dactyloptera* life cycles. *Pac. Sci.* **20**(2): 246–59.
- McLaughlin, P.A. & J.P. Hoover.** 1996. A new species of *Aniculus* Dana (Decapoda: Anomura: Diogenidae) from Hawaii. *Proc. Biol. Soc. Wash.* **109**(2): 299–305.
- McMillan, M. & S.R. Rushforth.** 1987. The diatom flora of Queen's Bath warm spring, Hawaii, Hawaii, U.S.A. *Nova Hedwigia* **45**: 445–69.
- Medeiros, A.C., W.H. Wagner, Jr. & R.W. Hobdy.** 1996. A new Hawaiian hanging firmoss (Lycopodiaceae: *Phlegmariurus*) from the eastern Hawaiian Islands. *Am. Fern J.* **86**(3): 89–97.
- Meyer, M.C.** 1968. Moore on the Hirudinea with emphasis on his type-specimens. *Proc. U.S. Natl. Mus.* **125**(3664): 1–32.
- Miller, S.E. & L.G. Eldredge.** 1996. Numbers of Hawaiian species: Supplement 1. *Bishop Mus. Occas. Pap.* **45**: 8–17.

- Mlot, C.** 1995. Biological surveys in Hawaii, taking inventory of a biological hot spot. *Science* **269**: 322–23.
- Moore, J.P.** 1946. Leeches (Hirudinea) from the Hawaiian Islands, and two new species from the Pacific Region in the Bishop Museum collection. *Occas. Pap. B. P. Bishop Mus.* **18**(11): 171–91.
- . 1952. New Piscicolidae (leeches) from the Pacific and their anatomy. *Occas. Pap. B. P. Bishop Mus.* **21**(2): 17–44.
- Moyer, C.L.** 1996. Microbial diversity and community structure determinations through analyses of SSR rRNA gene distributions and phylogeny. *Diss. Abstr. Int.* **57B**: 170.
- Murano, M.** 1995. New and already known species of the genus *Anisomysis* (Mysidacea) from Hawaii and the Society Islands. *J. Crust. Biol.* **15**(2): 355–64.
- Ng, P.K.L. & D.G.B. Chia.** 1994. The genus *Glyptocarcinus* Takeda, 1973, with descriptions of a new subfamily, two new genera and two new species from New Caledonia, (Crustacea: Decapoda: Brachyura: Xanthidae). *Raffles Bull. Zool.* **42**(3): 701–31.
- Nishida, G.M., ed.** 1994. Hawaiian terrestrial arthropod checklist. Second edition. *Bishop Mus. Tech. Rep.* **4**, iv + 287 p.
- Ogren, R.E. & M. Kawakatsu.** 1991. Index to the species of the family Geoplanidae (Turbellaria, Tricladida, Terricola). Part II: Caenoplaninae and Pelmatoplaninae. *Bull. Fuji Women's Coll. (II)* **29**: 25–102.
- Okuno, J.** 1996. *Rhynchocinetes rathbunae*, a new shrimp from the Hawaiian Islands (Crustacea: Decapoda: Rhynchocinetidae). *Pac. Sci.* **50**(3): 309–16.
- Ortmann, A.E.** 1906. Schizopods of the Hawaiian Islands collected by the Steamer *Albatross* in 1902. *Bull. U.S. Fish. Comm.* **23**(3): 961–73.
- Penn, G.H.** 1954. Introductions of American crawfishes into foreign lands. *Ecology* **35**(2): 296.
- Randall, J.E.** 1996. Two new soles of the genus *Aseraggodes* (Pleuronectiformes: Soleidae) from the Hawaiian Islands. *Pac. Sci.* **50**(4): 427–40.
- Randall, J.W.** 1840. Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend, from the west coast of North America and the Sandwich Islands, with descriptions of such species as are apparently new, among, which are included several species of different localities, previously existing in the collection of the Academy. *J. Acad. Nat. Sci. Phila.* **8**: 106–47.
- Rathbun, M.J.** 1906. The Brachyura and Macrura of the Hawaiian Islands. *Bull. U.S. Fish Comm.* **23**: 829–930.
- Rausch, R.L.** 1975. Cestodes of the genus *Hymenolepis* Weinland, 1858 (*sensu lato*) from bats in North America and Hawaii. *Can. J. Zool.* **53**: 1537–1551.
- Sars, G.O.** 1904. Pacificische Plankton-Crustaceen (Ergebnisse einer Reise nach dem Pacific. Schauinsland, 1986/97). *Zool. Jahrb. (Syst.)* **19**: 629–46.
- Sluys, R.** 1989. *A monograph of the marine triclads*. A.A. Balkema, Rotterdam. 463 p.
- Smirnov, N.N. & B.V. Timms.** 1983. A revision of the Australian Cladocera (Crustacea). *Rec. Aust. Mus. Suppl.* **1**, 132 p.
- Soo's, Á.** 1965. Identification key to the leech (Hirudinoidea) genera of the world, with a

- catalogue of the species. I. Family: Piscicolidae. *Acta Zool. Acad. Sci. Hung.* **11**(3-4): 417–63.
- . 1966a. Identification key to the leech (Hirudinoidea) genera of the world, with a catalogue of the species. II. Families: Semiscolecidae, Termatobdellidae, Americobdellidae, Diestecostomatidae. *Acta Zool. Acad. Sci. Hung.* **12**(1-2): 145–60.
- . 1966b. Identification key to the leech (Hirudinoidea) genera of the world, with a catalogue of the species. III. Family: Erpobdellidae. *Acta Zool. Acad. Sci. Hung.* **12**(3-4): 371–407.
- Soule, D.F., J.D. Soule & H.W. Chaney.** 1991. Some little known genera of Thalamoporellidae: *Thairopora*, *Diploporella*, and new genera *Marsupioporella* and *Thalamotreptos*. In: Bigey, F.P., ed., Bryozoaires actuels et fossiles: Bryozoa living and fossil. *Bull. Soc. Sci. Nat. Ouest Fr.* (Mém. Hors Ser.) **1**: 447–64.
- Soule, J.D., D.F. Soule & H.W. Chaney.** 1987. Phyla Entoprocta and Bryozoa (Ectoprocta), pp. 83–166. In: Devaney, D.M. & L.G. Eldredge, eds., *Reef and Shore Fauna of Hawaii*. Section 2: Platyhelminthes through Phoronida and Section 3: Sipuncula through Annelida. Bishop Museum Press, Honolulu.
- . 1991. New tropical Pacific and Indian Ocean Cleidochasmatidae (Cheilostomata, Ascophora). In: Bigey, F. P., ed., Bryozoaires actuels et fossiles: Bryozoa living and fossil. *Bull. Soc. Sci. Nat. Ouest Fr.* (Mém. Hors Ser.) **1**: 465–86.
- . 1992. The genus *Thalamoporella* worldwide (Bryozoa, Anasca): morphology, evolution and speciation. *Irene McCulloch Found. Monogr. Ser.* **1**, 94 p.
- Stingelin, T.** 1905. Untersuchungen über die Cladocerenfauna von Hinterindien, Sumatra und Java, nebst einem Beiträge zur Cladoceren-Kenntnis der Hawaii-Inseln (Reise von Dr. Walter Volz). *Zool. Jahrb. (Syst.)* **21**: 327–70.
- Svihla, A.** 1941. The occurrence of freshwater sponges in the Hawaiian Islands. *Science* **94**(2438): 278–79.
- Swezey, O.H.** 1925. Records of introduction of beneficial insects into the Hawaiian Islands. *Hawaii. Planter's Rec.* **29**: 369–76.
- . 1931. Records of introduction of beneficial insects into the Hawaiian Islands, p. 368–77. In: Williams, F.X., *Handbook of the insects and other invertebrates of Hawaiian sugar cane fields*. Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu. 400 p.
- Taiti, S. & F.G. Howarth.** 1996. Terrestrial isopods from the Hawaiian Islands (Isopoda: Oniscidea). *Bishop Mus. Occas. Pap.* **45**: 59–71.
- Tattersall, W.M.** 1951. A review of the Mysidacea of the United States National Museum. *U.S. Natl. Mus. Bull.* **201**, 292 p.
- Tkachov, V.A.** 1979. [A new cestode species, *Paraechinophallus hyperogliphe* sp. n. (Fam. Parabothriocephalidae) from the marine fish, *Hyperogliphe japonica*]. *Biol. Morya* **5**: 81–82. [In Russian.]
- Tressler, W.L.** 1937. Ostracoda. Mitteilung XVIII von der Wallacea-Expedition Woltereck, 1931–32. *Int. Rev. Ges. Hydrobiol. Hydrogr.* **34**(3-5): 188–207.
- . 1949. Fresh-water Ostracoda from Brazil. *Proc. U.S. Natl. Mus.* **100**(3258):

- 61–83.
- Turner, P.N.** 1996. Rotifers of the Hawaiian Islands. *Bishop Mus. Occas. Pap.* **46**: 18–20.
- Ueno, M.** 1936. Cladocera of Mauna Kea, Hawaii. *Occas. Pap. B.P. Bishop Mus.* **12**(11): 1–9.
- Van Zwaluwenberg, R.H.** 1948. *Lacustris hawaiiensis* Johnson. *Proc. Hawaii. Entomol. Soc.* **13**(2): 210.
- Vavra, W.** 1906. Ostracoden von Sumatra, Java, Siam, den Sandwich-Inseln und Japan. *Zool. Jahrb. (Syst.)* **23**: 413–38.
- Victor, R. & C.H. Fernando.** 1980. On *Heterocypris makua* (Tressler), 1937, a freshwater ostracod (Crustacea: Ostracoda) from the Hawaiian Islands, with notes on other species of the genus. *Can. J. Zool.* **58**: 1288–1297.
- . 1981. Freshwater Ostracoda of the genera *Chrissia* Hartmann, 1957 and *Stenocypris* Sars, 1889 from Malaysia, Indonesia and the Philippines. *Mitt. Hamb. Zool. Mus. Inst.* **78**: 151–68.
- Vitt, D.H. & W.J. Hoe.** 1980. *Andreaea* in Hawaii. *Bryologist* **83**(2): 212–14.
- Voge, M. & B.S. Davis.** 1953. Studies on the cestode genus *Anonchotaenia* (Dilepididae, Paruterininae) and related forms. *Univ. Calif. Publ. Zool.* **59**: 1–30.
- Wagner, W.H., Jr., F.S. Wagner & T. Flynn.** 1995. Taxonomic notes on the pteridophytes of Hawaii. *Contrib. Univ. Mich. Herb.* **20**: 241–60.
- Waterhouse, D.F. & K.R. Norris.** 1987. *Biological control: Pacific prospects*. Australian Centre for International Agricultural Research, Canberra. 450 p.
- Weidenbach, R.P.** 1995. *Freshwater pond life. A guide to the animals and plants of Hawaii's freshwater aquaculture ponds*. Agriculture Development Program, Department of Land and Natural Resources, State of Hawaii. 84 p.
- Wilson, C.D. & G.W. Boehlert.** 1993. Population biology of *Gnathophausia longispina* (Mysidacea: Lophogastrida) from a central North Pacific seamount. *Mar. Biol.* **115**: 537–43.
- Wilson, K.A.** 1996. Alien ferns in Hawai'i. *Pac. Sci.* **50**(2): 127–141.
- Winsor, L.** 1983. A revision of the cosmopolitan land planarian *Bipalium kewense* Moseley, 1878 (Turbellaria: Tricladida: Terricola). *Zool. J. Linn. Soc.* **79**: 61–100.
- . 1991. A provisional classification of Australian terrestrial geoplanid flatworms (Tricladida: Terricola: Geoplanidae). *Vict. Nat.* **108**(2): 42–49.
- Woodworth, W.M.** 1898. On the occurrence of *Placocephalus (Bipalium) kewense* in the Sandwich Islands. *Science* (n.s.) **8**(192): 302.
- Work, T.M. & R.A. Rameyer.** 1996. *Haemoproteus iwa* n. sp. in great frigatebirds (*Fregata minor* [Gmelin]) from Hawaii: parasite morphology and prevalence. *J. Parasitol.* **82**: 489–91.
- Yeatman, H.C.** 1984. Copepods from microhabitats in Fiji, Western Samoa and Tonga. *Micronesica* **19**(1-2) [1983]: 57–90.
- Zander, R.H. & W.J. Hoe.** 1979. Geographic disjunction and heterophyly in *Tortella fragilis* var. *tortelloides* (= *Sarconeurum tortelloides*). *Bryologist* **82**(1): 84–87.