APPENDIX 1

Updated list of Central American Pacific shallow water echinoderms (< 200 m depth) and their COI molecular representativeness in public databases (0 = absent, 1 = present)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Class** | **Order** | **Family** | **Genus** | **GenBank** | **BOLD** |
| *Fariometra parvula* (Hartlaub, 1895) | Crinoidea | Comatulida | Antedonidae | *Fariometra* | 0 | 0 |
| *Florometra magellanica* (Bell, 1882) | 0 | 0 |
| *Florometra serratissima* (A. H. Clark, 1907) | 1 | 1 |
| *Florometra tanneri* (Hartlaub, 1895) | 0 | 0 |
| *Psathyrometra bigradata* (Hartlaub, 1895) | Zenometridae | *Psathyrometra* | 0 | 0 |
| *Thalassometra agassizii* (Hartlaub, 1895 | Notocrinidae | *Notocrinus* | 0 | 0 |
| *Calamocrinus diomedae* A. Agassiz, 1890 | Hyocrinida | Hyocrinidae | *Calamocrinus* | 0 | 0 |
| *Astropecten armatus* Gray, 1840 | Asteroidea | Paxillosida | Astropectinidae | *Astropecten* | 1 | 1 |
| *Astropecten armatus erinaceus* Gray 1840 | 1 | 0 |
| *Astropecten benthophilus* Ludwig, 1905 | 0 | 0 |
| *Astropecten exiguus* Ludwig 1905 | 0 | 0 |
| *Astropecten fragilis* Verrill, 1867 | 0 | 0 |
| *Astropecten regalis* Gray, 1840 | 1 | 1 |
| *Astropecten sulcatus* Ludwig, 1905 | 0 | 0 |
| *Astropecten verrilli* deLoriol, 1899 | 1 | 1 |
| *Dipsacaster eximius* Fisher, 1905 | *Dipsacaster* | 0 | 0 |
| *Leptychaster inermis* (Ludwig, 1905) | *Leptychaster* | 0 | 0 |
| *Psilaster pectinatus* (Fisher, 1905) | *Psilaster* | 1 | 1 |
| *Persephonaster armiger* Ludwig, 1905 | *Persephonaster* | 0 | 0 |
| *Tethyaster canaliculatus* (A. H. Clark, 1916) | *Tethyaster* | 0 | 0 |
| *Ctenodiscus crispatus* (Retzius, 1805) | Ctenodiscidae | *Ctenodiscus* | 1 | 1 |
| *Luidia armata* Ludwig, 1905 | Luidiidae | *Luidia* | 0 | 1 |
| *Luidia asthenosoma* Fisher, 1906 | 0 | 1 |
| *Luidia columbia* (Gray, 1840) | 0 | 0 |
| *Luidia ferruginea* Ludwig, 1905 | 0 | 0 |
| *Luidia foliolata* (Grube, 1866) | 1 | 1 |
| *Luidia latiradiata* (Gray, 1871) | 0 | 0 |
| *Luidia phragma* H. L. Clark, 1910 | 0 | 0 |
| *Luidia superba* A. H. Clark, 1917 | 0 | 0 |
| *Luidia tessellata* Lütken, 1859 | 0 | 0 |
| *Eremicaster crassus* (Sladen, 1883) | Porcellanasteridae | *Eremicaster* | 0 | 0 |
| *Eremicaster pacificus* (Ludwig, 1905) | 1 | 1 |
| *Porcellanaster ceruleus* Wyville Thomson, 1877 | *Porcellanaster* | 1 | 1 |
| *Pseudarchaster pectinifer* Ludwig, 1905 | Pseudarchasteridae | *Pseudarchaster* | 0 | 0 |
| *Pseudarchaster verrilli* Ludwig, 1905 | 0 | 0 |
| *Benthopecten cognatus* (Ludwig, 1905) | Benthopectinidae | *Benthopecten* | 0 | 0 |
| *Benthopecten pectinifer* (Ludwig, 1905) | 0 | 0 |
| *Benthopecten spinuliger* (Ludwig, 1905) | 0 | 0 |
| *Pectinaster agassizi* Ludwig, 1905 | *Pectinaster* | 1 | 1 |
| *Acanthaster planci* (Linnaeus, 1758) | Valvatida | Acanthasteridae | *Acanthaster* | 1 | 1 |
| *Meridiastra modesta* (Verrill, 1870) | Asterinidae | *Meridiastra* | 0 | 0 |
| *Amphiaster insignis* Verrill, 1868 | Asterodiscididae | *Amphiaster* | 0 | 0 |
| *Paulia horrida* Gray, 1840 | *Paulia* | 0 | 0 |
| *Asteropsis carinifera* (Lamarck, 1816) | Asteropseidae | *Asteropsis* | 1 | 1 |
| *Bathyceramaster elegans* (Ludwig, 1905) | Goniasteridae | *Bathyceramaster* | 0 | 0 |
| *Nymphaster diomedeae* Ludwig, 1905 | *Nymphaster* | 0 | 0 |
| *Pillsburiaster ernesti* (Ludwig, 1905) | *Pillsburiaster* | 0 | 0 |
| *Mithrodia bradleyi* Verrill, 1867 | Mithrodiidae | *Mithrodia* | 1 | 1 |
| *Leiaster coriaceus* Peters, 1852 | Ophidiasteridae | *Leiaster* | 0 | 0 |
| *Leiaster teres* (Verrill, 1871) | 0 | 0 |
| *Linckia columbiae* Gray, 1840 | *Linckia* | 1 | 1 |
| *Linckia guildingi* Gray, 1840 | 1 | 1 |
| *Narcissia gracilis* A.H. Clark, 1916 | *Narcissia* | 0 | 0 |
| *Ophidiaster ludwigi* deLoriol, 1900 | *Ophidiaster* | 0 | 0 |
| *Pharia pyramidata* (Gray, 1840) | *Pharia* | 0 | 1 |
| *Phataria unifascialis* (Gray, 1840) | *Phataria* | 1 | 1 |
| *Tamaria obstipa* Ziesenhenne, 1942 | *Tamaria* | 0 | 0 |
| *Poraniopsis inflata* (Fisher, 1906) | Poraniidae | *Poraniopsis* | 0 | 0 |
| *Nidorellia armata* (Gray, 1840) | Oreasteridae | *Nidorellia* | 0 | 1 |
| *Pentaceraster cumingi* (Gray, 1840) | *Pentaceraster* | 0 | 1 |
| *Lophaster furcilliger* Fisher, 1905 | Solasteridae | *Lophaster* | 1 | 1 |
| *Hymenaster platyacanthus* Ludwig, 1905 | Velatida | Pterasteridae | *Hymenaster* | 0 | 0 |
| *Hymenaster quadrispinosus* Fisher, 1905 | 0 | 0 |
| *Hymenaster violaceus* Ludwig, 1905 | 0 | 0 |
| *Pteraster cf. diaphanus* (Ludwig, 1905) | *Pteraster* | 0 | 0 |
| *Echinaster (Othilia) aculeata* (Gray, 1840) | Spinulosida | Echinasteridae | *Echinaster* | 0 | 0 |
| *Echinaster panamensis* Leipoldt, 1895 | 0 | 0 |
| *Coronaster marchenus* Ziesenhenne, 1942 | Forcipulatida | Asteriidae | *Coronaster* | 1 | 1 |
| *Distolasterias robusta* (Ludwig, 1905) | *Distolasterias* | 0 | 0 |
| *Meyenaster gelatinosus* (Meyen, 1834) | *Meyenaster* | 0 | 0 |
| *Pisaster ochraceus* (Brandt, 1835) | *Pisaster* | 1 | 1 |
| *Sclerasterias alexandri* (Ludwig, 1905) | *Sclerasterias* | 0 | 0 |
| *Heliaster cumingi* (Gray, 1840) | Heliasteridae | *Heliaster* | 0 | 0 |
| *Heliaster microbrachius* Xanthus, 1860 | 0 | 0 |
| *Heliaster solaris* A. H. Clark, 1920 | 0 | 0 |
| *Hydrasterias improvisus* (Ludwig, 1905) | Pedicellasteridae | *Hydrasterias* | 0 | 0 |
| *Tarsaster cocosanus* (Ludwig, 1905) | *Tarsaster* | 0 | 0 |
| *Cnemidaster wyvillii* Sladen, 1889 | Zoroasteridae | *Cnemidaster* | 0 | 0 |
| *Myxoderma longispinum* (Ludwig, 1905) | *Myxoderma* | 0 | 0 |
| *Zoroaster magnificus* Ludwig, 1905 | *Zoroaster* | 0 | 0 |
| *Astrolirus panamensis* (Ludwig, 1905) | Brisingida | Brisingidae | *Astrolirus* | 0 | 0 |
| *Freyella insignis* Ludwig, 1905 | Freyellidae | *Freyella* | 0 | 0 |
| *Freyella pacifica* Ludwig, 1905 | 0 | 0 |
| *Asteronyx loveni* Müller & Troschel, 1842 | Ophiuroidea | Euryalida | Asteronychidae | *Asteronyx* | 1 | 1 |
| *Astrodia plana* (Lütken & Mortensen, 1899) | *Astrodia* | 0 | 0 |
| *Asteroschema sublaeve* Lütken & Mortensen, 1899 | Euryalidae | *Asteroschema* | 1 | 1 |
| *Astrocaneum spinosum* (Lyman, 1875) | Gorgonocephalidae | *Astrocaneum* | 0 | 0 |
| *Astrodictyum panamense* (Verrill, 1867) | *Astrodictyum* | 0 | 0 |
| *Gorgonocephalus diomedeae* Lütken & Mortensen, 1899 | *Gorgonocephalus* | 0 | 0 |
| *Ophiomyxa panamensis* Lütken & Mortensen, 1899 | Ophiacanthida | Ophiomyxidae | *Ophiomyxa* | 0 | 0 |
| *Amphichondrius granulatus* (Lütken & Mortensen, 1899) | Amphilepidida | Amphiuridae | *Amphichondrius* | 0 | 1 |
| *Amphichondrius laevis* Ziesenhenne, 1940 | 0 | 0 |
| *Amphiura (Amphiura) assimilis* Lütken & Mortensen, 1899 | *Amphiura* | 0 | 0 |
| *Amphiodia grisea* (Ljungman, 1867) | *Amphiodia* | 0 | 0 |
| *Amphiodia occidentalis* (Lyman, 1860) | 1 | 1 |
| *Amphiodia oerstedi* (Lütken, 1856) | 0 | 0 |
| *Amphiodia platyspina* Nielsen, 1932 | 0 | 0 |
| *Amphiodia sculptilis* Ziesenhenne, 1940 | 0 | 0 |
| *Amphiodia tabogae* Nielsen, 1932 | 0 | 0 |
| *Amphiodia (Amphispina) urtica* (Lyman, 1860) | 1 | 1 |
| *Amphiodia vicina* H. L. Clark, 1940 | 0 | 0 |
| *Amphiodia violacea* (Lütken, 1856) | 0 | 0 |
| *Amphipholis elevata* Nielsen, 1932 | *Amphipholis* | 0 | 0 |
| *Amphipholis pugetana* (Lyman, 1860) | *Amphipholis* | 1 | 1 |
| *Amphipholis squamata* (Delle Chiaje, 1828) | 1 | 1 |
| *Amphiura arcystata* H. L. Clark, 1911 | *Amphiura* | 0 | 0 |
| *Amphiura (Amphiura) diomedeae* Lütken & Mortensen, 1899 | 0 | 0 |
| *Amphiura (Ophionema) hexacantha* Nielsen, 1932 | 0 | 0 |
| *Amphiura gymnogastra* Lütken & Mortensen, 1899 | 0 | 0 |
| *Amphiura gymnopora* Lütken & Mortensen, 1899 | 0 | 0 |
| *Amphiura polyacantha* Lütken & Mortensen, 1899 | 0 | 0 |
| *Amphiura seminuda* Lütken & Mortensen, 1899 | 0 | 0 |
| *Amphiura serpentina* Lütken & Mortensen 1899 | 0 | 0 |
| *Microphiopholis geminata (*Le Conte, 1851) | *Microphiopholis* | 0 | 0 |
| *Microphiopholis platydisca (Nielsen, 1932)* | 1 | 0 |
| *Microphiopholis puntarenae* (Lütken, 1856) | 1 | 0 |
| *Ophiocnida hispida* (Le Conte, 1851) | *Ophiocnida* | 0 | 0 |
| *Ophiophragmus marginatus* (Lütken, 1856) | *Ophiophragmus* | 0 | 0 |
| *Ophiophragmus ophiactoides* Ziesenhenne, 1940 | 0 | 0 |
| *Ophiophragmus paucispinus* Nielsen, 1932 | 0 | 0 |
| *Ophiophragmus tabogensis* Nielsen, 1932 | 0 | 0 |
| *Ophiostigma tenue* Lütken, 1856 | *Ophiostigma* | 0 | 0 |
| *Silax abditus* (A.M. Clark, 1970) | *Silax* | 0 | 0 |
| *Silax daleus (Lyman, 1879)* | 1 | 1 |
| *Sigsbeia laevis* Ziesenhenne, 1940 | Hemieuryalidae | *Sigsbeia* | 0 | 0 |
| *Sigsbeia lineata* Lütken & Mortensen, 1899 | 0 | 0 |
| *Ophioplocus hancocky* Ziesenhenne, 1940 | *Ophioplocus* | 0 | 0 |
| *Ophiacantha contigua* Lütken & Mortensen, 1899 | Ophiacanthida | Ophiacanthidae | *Ophiacantha* | 0 | 0 |
| *Ophiacantha cosmica* Lyman, 1878 | 1 | 1 |
| *Ophiacantha costata* Lütken & Mortensen, 1899 | 0 | 0 |
| *Ophiacantha inconspicua* Lütken & Mortensen, 1899 | 0 | 0 |
| *Ophiacantha pentacrinus* Lütken, 1869 | 0 | 0 |
| *Ophiacantha phragma* Ziesenhenne, 1940 | 0 | 0 |
| *Ophiacantha spinifera* Lütken & Mortensen, 1899 | 0 | 0 |
| *Ophiophthalmus normani* (Lyman, 1879) | *Ophiophthalmus* | 1 | 1 |
| *Ophiotoma paucispina* (Lütken & Mortensen, 1899) | Ophiotomidae | *Ophiotoma* | 0 | 0 |
| *Hemipholis cordifera* (Bosc, 1802) | Amphilepidida | Ophiactidae | *Hemipholis* | 1 | 0 |
| *Hemipholis gracilis* Verrill, 1867 | 0 | 0 |
| *Histampica duplicata* (Lyman, 1875) | *Histampica* | 0 | 0 |
| *Ophiactis kroeyeri* Lütken, 1856 | *Ophiactis* | 0 | 0 |
| *Ophiactis savignyi* (Müller & Troschel, 1842) | 1 | 1 |
| *Ophiactis simplex* (Le Conte, 1851) | 1 | 1 |
| *Ophiochiton fastigatus* Lyman, 1878 | Ophiochitonidae | *Ophiochiton* | 1 | 1 |
| *Ophiocoma aethiops* Lütken, 1859 | Ophiacanthida | Ophiocomidae | *Ophiocoma* | 1 | 1 |
| *Ophiocoma erinaceus* Müller & Troschel, 1842 | 1 | 1 |
| *Ophiocomella alexandri* (Lyman, 1860) | *Ophiocomella* | 1 | 1 |
| *Ophiocomella schmitti* A. H. Clark, 1939 | 0 | 0 |
| *Ophiocomella sexradia* (Duncan, 1887) | 1 | 1 |
| *Diopederma daniana* (Verrill, 1867) | Ophiodermatidae | *Diopederma* | 0 | 0 |
| *Ophioderma appressa* (Say, 1825) | *Ophioderma* | 1 | 1 |
| *Ophioderma hendleri,* Granja-Fernández, R.; Pineda-Enríquez, T.; Solís-Marín, F. A.; Laguarda-Figueras, A., 2020 | 1 | 1 |
| *Ophioderma panamense* Lütken, 1859 | 1 | 0 |
| *Ophioderma pentacanthum H.L. Clark, 1917* | 1 | 0 |
| *Ophioderma sodipallaresi* Caso, 1986 | 0 | 0 |
| *Ophioderma teres* (Lyman, 1860) | 1 | 1 |
| *Ophioderma variegatum* Lütken, 1856 | 0 | 0 |
| *Ophiopaepale diplax* (Nielsen, 1932) | Ophiacanthida incertae sedis | *Ophiopaepale* | 0 | 0 |
| *Ophionereis albomaculata* E.A. Smith, 1877 | Amphilepidida | Ophionereididae | *Ophionereis* | 0 | 0 |
| *Ophionereis annulata* (Le Conte, 1851) | 1 | 1 |
| *Ophionereis dubia dubia* (Müller & Troschel, 1842) | 1 | 1 |
| *Ophionereis eurybrachiplax* H. L. Clark, 1911 | 0 | 1 |
| *Ophionereis perplexa* Ziesenhenne, 1940 | 0 | 0 |
| *Ophiothela gracilis* Nielsen, 1932 | Ophiotrichidae | *Ophiothela* | 0 | 0 |
| *Ophiothela mirabilis* Verrill, 1867 | 1 | 1 |
| *Ophiothrix (Ophiothrix) rudis* Lyman, 1874 | *Ophiothrix* | 1 | 0 |
| *Ophiothrix (Ophiothrix) spiculata* Le Conte, 1851 | 1 | 0 |
| *Ophiolepis crassa* Nielsen, 1932 | Ophiolepididae | *Ophiolepis* | 0 | 0 |
| *Ophiolepis grisea* H.L. Clark, 1940 | 0 | 0 |
| *Ophiolepis pacifica* Lütken, 1856 | 0 | 0 |
| *Ophiolepis plateia* Ziesenhenne, 1940 | 1 | 0 |
| *Ophiolepis variegata* Lütken, 1856 | 1 | 1 |
| *Ophiosphalma glabrum* (Lütken & Mortensen, 1899) | Ophiurida | Ophiosphalmidae | *Ophiosphalma* | 1 | 1 |
| *Ophiosphalma jolliense* (McClendon, 1909) | Ophioleucida | *Ophiosphalma* | 1 | 1 |
| *Amphiophiura abcisa* (Lütken & Mortensen, 1899) | Ophiurida | Ophiopyrgidae | *Amphiophiura* | 0 | 0 |
| *Gymnophiura mollis* Lütken & Mortensen, 1899 | *Gymnophiura* | 0 | 0 |
| *Ophiernus adspersus adspersus* Lyman, 1883 | Ophioleucida | Ophiernidae | *Ophiernus* | 1 | 1 |
| *Ophiernus seminudus* Lütken & Mortensen, 1899 | 0 | 0 |
| *Abyssocucumis abyssorum* (Théel, 1886) | Holothuroidea | Dendrochirotida | Cucumariidae | *Abyssocucumis* | 1 | 1 |
| *Cucumaria flamma* Solís-Marín & Laguarda Figueras, 1999 | *Cucumaria* | 0 | 0 |
| *Leptopentacta nina* Deichmann, 1941 | *Leptopentacta* | 0 | 0 |
| *Leptopentacta nova* Deichmann, 1941 | *Leptopentacta*  *Neocucumis* | 0 | 0 |
| *Leptopentacta panamica* Deichmann, 1941 | 0 | 0 |
| *Neocucumis panamensis* Heding & Panning, 1954 | 0 | 0 |
| *Neocucumis veleronis* (Deichmann, 1941) | *Neocucumis*  *Pentacta* | 0 | 0 |
| *Pentacta panamensis* Verrill, 1867 | 0 | 0 |
| *Pseudocnus californicus* (Semper, 1868) | *Pseudocnus* | 1 | 1 |
| *Pseudocnus dubiosus* (Semper, 1868) | *Pseudocnus*  *Thyonella* | 0 | 0 |
| *Thyonella mexicana* (Deichmann, 1941) | 0 | 0 |
| *Trachythyone peruana* (Semper, 1868) | *Trachythyone* | 0 | 0 |
| *Allothyone mexicana* (Deichmann, 1946) | Phyllophoridae | *Allothyone* | 0 | 0 |
| *Pentamera beebei* Deichmann, 1938 | *Pentamera* | 0 | 0 |
| *Pentamera chierchiae* (Ludwig, 1886) | 0 | 1 |
| *Pentamera fonsecae Solís-Marín et al., 2022* | 0 | 0 |
| *Pentamera zacae* Deichmann, 1938 | 0 | 0 |
| *Euthyonidiella aculeata* (Ludwig, 1894) | *Euthyonidiella* | 0 | 0 |
| *Thyone bidentata* Deichmann, 1941 | *Thyone* | 0 | 0 |
| *Lissothuria hancocki* (Deichmann, 1941) | Psolidae | *Lissothuria* | 0 | 0 |
| *Lissothuria ornata* Verrill, 1867 | 0 | 0 |
| *Psolidium dorsipes* Ludwig, 1886 | *Psolidium* | 1 | 1 |
| *Psolidium ekmani* Deichmann, 1941 | 0 | 0 |
| *Psolidium eubullatum* Deichmann, 1941 | 0 | 0 |
| *Psolidium gracile* Ludwig, 1894 | 0 | 0 |
| *Psolidium panamense* Ludwig, 1894 | 0 | 0 |
| *Psolus digitatus* Ludwig, 1894 | *Psolus* | 0 | 0 |
| *Psolus diomedeae* Ludwig, 1894 | 0 | 0 |
| *Afrocucumis ovulum* (Selenka, 1867) | Sclerodactylidae | *Afrocucumis* | 0 | 0 |
| *Apentamera lepra* Deichmann, 1941 | *Apentamera* | 0 | 0 |
| *Neothyone gibber* (Selenka, 1867) | *Neothyone* | 0 | 0 |
| *Neothyone gibbosa* Deichmann, 1941 | 0 | 0 |
| *Neothyone panamensis* (Ludwig, 1887) | 0 | 0 |
| *Ypsilothuria bitentaculata* (Ludwig, 1893) | Ypsilothuriidae | *Ypsilothuria* | 1 | 1 |
| *Holothuria (Cystipus) casoae* Laguarda-Figueras & Solís-Marín, 2009 | Holothuriida | Holothuriidae | *Holothuria* | 0 | 0 |
| *Holothuria (Cystipus) inhabilis* Selenka, 1867 | 0 | 1 |
| *Holothuria (Cystipus) rigida* (Selenka, 1867) | 1 | 1 |
| *Holothuria (Halodeima) atra* (Jaeger, 1833) | 1 | 1 |
| *Holothuria (Halodeima) inornata* Semper, 1868 | 1 | 0 |
| *Holothuria (Halodeima) kefersteini* (Selenka, 1867) | 1 | 0 |
| *Holothuria (Lessonothuria) pardalis* Selenka, 1867 | 1 | 1 |
| *Holothuria (Mertensiothuria) hilla* Lesson, 1830 | 1 | 1 |
| *Holothuria (Mertensiothuria) leucospilota* (Brandt, 1835) | 1 | 1 |
| *Holothuria (Mertensiothuria) viridiaurantia* Borrero-Pérez & Vanegas-González, 2019 | 1 | 0 |
| *Holothuria (Platyperona) difficilis* Semper, 1868 | 1 | 1 |
| *Holothuria (Selenkothuria) lubrica* Selenka, 1867 | 1 | 0 |
| *Holothuria (Selenkothuria) portovallartensis* Caso, 1954 | 1 | 0 |
| *Holothuria (Selenkothuria) theeli* Deichmann, 1938 | 1 | 0 |
| *Holothuria (Semperothuria) imitans* Ludwig, 1875 | 1 | 1 |
| *Holothuria (Semperothuria) languens* Selenka, 1867 | 1 | 0 |
| *Holothuria (Stauropora) pluricuriosa* Deichmann, 1937 | 1 | 0 |
| *Holothuria (Theelothuria) paraprinceps* Deichmann, 1937 | 0 | 0 |
| *Holothuria (Thymiosycia) arenicola* Semper, 1868 | 1 | 1 |
| *Holothuria (Thymiosycia) impatiens* (Forsskål, 1775) | 1 | 1 |
| *Holothuria (Vaneyothuria) zacae* Deichmann, 1937 | 1 | 0 |
| *Labidodemas americanum* Deichmann, 1938 | *Labidodemas* | 0 | 0 |
| *Labidodemas maccullochi* (Deichmann, 1958) | 0 | 0 |
| *Mesothuria (Mesothuria) multipes* Ludwig, 1894 | Mesothuriidae | *Mesothuria* | 0 | 0 |
| *Zygothuria lactea* (Théel, 1886) | *Zygothuria* | 0 | 0 |
| *Pseudostichopus macdonaldi* (Ludwig, 1894) | Persiculida | Pseudostichopodidae | *Pseudostichopus* | 0 | 0 |
| *Pseudostichopus mollis* Théel, 1886 | 1 | 1 |
| *Pseudostichopus peripatus* (Sluiter, 1901) | 0 | 1 |
| *Isostichopus fuscus* (Ludwig, 1875) | Synallactida | Stichopodidae | *Isostichopus* | 1 | 1 |
| *Stichopus horrens* Selenka, 1867 | Synallactidae | *Stichopus* | 1 | 1 |
| *Paelopatides suspecta* Ludwig, 1894 | *Paelopatides* | 0 | 0 |
| *Synallactes aenigma* Ludwig, 1894 | *Synallactes* | 0 | 0 |
| *Synallactes alexandri* Ludwig, 1894 | 0 | 0 |
| *Deima validum pacificum* Ludwig, 1894 | Deimatidae | *Deima* | 0 | 0 |
| *Oneirophanta mutabilis affinis* Ludwig, 1893 | *Oneirophanta* | 0 | 0 |
| *Peniagone papillata* Hansen, 1975 | Elasipodida | Elpidiidae | *Peniagone* | 0 | 0 |
| *Peniagone vitrea* Théel, 1882 | 1 | 1 |
| *Pannychia moseleyi* Théel, 1882 | Laetmogonidae | *Pannychia* | 1 | 1 |
| *Pelagothuria natatrix* Ludwig, 1893 | Pelagothuriidae | *Pelagothuria* | 0 | 0 |
| *Benthodytes sanguinolenta* Théel, 1882 | Psychropotidae | *Benthodytes* | 1 | 1 |
| *Benthodytes typica* Théel, 1882 | 0 | 0 |
| *Psychropotes depressa* (Théel, 1882) | *Psychropotes* | 0 | 1 |
| *Psychropotes longicauda* Théel, 1882 | 1 | 0 |
| *Psychropotes verrucosa* (Ludwig, 1894) | 0 | 0 |
| *Paracaudina chilensis* (J. Müller, 1850) | Molpadida | Caudinidae | *Paracaudina* | 1 | 1 |
| *Molpadia granulata* (Ludwig, 1894) | Molpadiidae | *Molpadia* | 1 | 0 |
| *Molpadia intermedia* (Ludwig, 1894) | 1 | 1 |
| *Molpadia musculus* Risso, 1826 | 1 | 1 |
| *Molpadia spinosa* (Ludwig, 1893) | 0 | 0 |
| *Chiridota aponocrita* A. H. Clark, 1920 | Apodida | Chiridotidae | *Chiridota* | 0 | 0 |
| *Chiridota pacifica* Heding, 1928 | 0 | 0 |
| *Epitomapta tabogae* Heding, 1928 | Synaptidae | *Epitomapta* | 0 | 0 |
| *Euapta godeffroyi* (Semper, 1868) | *Euapta* | 1 | 1 |
| *Polyplectana oculata* Heding, 1928 | *Polyplectana* | 0 | 0 |
| *Protankyra brychia* (Verrill, 1885) | *Protankyra* | 0 | 0 |
| *Centrocidaris doederleini* (A. Agassiz, 1898) | Echinoidea | Cidaroida | Cidaridae | *Centrocidaris* | 0 | 0 |
| *Eucidaris thouarsii* (Valenciennes, 1846) | *Eucidaris* | 1 | 1 |
| *Eucidaris thouarsii galapagensis* Doederlein, 1887 | 0 | 0 |
| *Hesperocidaris asteriscus* H. L. Clark, 1948 | *Hesperocidaris* | 0 | 0 |
| *Hesperocidaris dubia* (H. L. Clark, 1907) | 0 | 0 |
| *Hesperocidaris panamensis* (A. Agassiz, 1898) | 0 | 0 |
| *Hesperocidaris perplexa* (H. L. Clark, 1907) | 0 | 0 |
| *Aporocidaris milleri* (A. Agassiz, 1898) | Ctenocidaridae | *Aporocidaris* | 1 | 1 |
| *Araeosoma eurypatum* A. Agassiz & H. L. Clark, 1909 | Echinothurioida | Echinothuriidae | *Araeosoma* | 0 | 0 |
| *Tromikosoma hispidum* (A. Agassiz, 1898) | *Tromikosoma* | 0 | 0 |
| *Tromikosoma panamense* (A. Agassiz, 1898) | 0 | 0 |
| *Plesiodiadema horridum* (A. Agassiz, 1898) | Aspidodiadematoida | Aspidodiadematidae | *Plesiodiadema* | 0 | 0 |
| *Astropyga pulvinata* (Lamarck, 1816) | Diadematoida | Diadematidae | *Astropyga* | 1 | 1 |
| *Centrostephanus coronatus* (Verrill, 1867) | *Centrostephanus* | 1 | 1 |
| *Diadema mexicanum* A. Agassiz, 1863 | *Diadema* | 1 | 1 |
| *Echinothrix calamaris* (Pallas, 1774) | *Echinothrix* | 1 | 1 |
| *Echinothrix diadema* (Linnaeus, 1758) | *Echinothrix* | 1 | 1 |
| *Caenopedina diomedeae* Mortensen, 1939 | Pedinoida | Pedinidae | *Caenopedina* | 0 | 0 |
| *Salenocidaris miliaris* (A. Agassiz, 1898) | Salenioida | Saleniidae | *Salenocidaris* | 0 | 0 |
| *Arbacia stellata* (Blainville, 1825) | Arbacioida | Arbaciidae | *Arbacia* | 1 | 1 |
| *Dialithocidaris gemmifera* A. Agassiz, 1898 | *Dialithocidaris* | 0 | 0 |
| *Lytechinus panamensis* Mortensen, 1921 | Camarodonta | Toxopneustidae | *Lytechinus* | 1 | 1 |
| *Lytechinus pictus* (Verrill, 1867) | 1 | 1 |
| *Toxopneustes roseus* (A. Agassiz, 1863) | *Toxopneustes* | 1 | 1 |
| *Tripneustes depressus* A. Agassiz, 1863 | *Tripneustes* | 1 | 1 |
| *Echinometra oblonga* (Blainville, 1825) | Echinometridae | *Echinometra* | 1 | 1 |
| *Echinometra vanbrunti* A. Agassiz, 1863 | *Echinometra* | 1 | 1 |
| *Clypeaster europacificus* H. L. Clark, 1914 | Clypeasteroida | Clypeasteridae | *Clypeaster* | 1 | 1 |
| *Clypeaster ochrus* H. L. Clark, 1914 | 0 | 0 |
| *Clypeaster rotundus* (A. Agassiz, 1863) | 0 | 0 |
| *Clypeaster speciosus* Verrill, 1870 | 0 | 0 |
| *Encope grandis* L. Agassiz, 1841 | Echinolampadacea | Mellitidae | *Encope* | 0 | 1 |
| *Encope michelini* L. Agassiz, 1841 | 1 | 1 |
| *Encope micropora* L. Agassiz, 1841 | 1 | 1 |
| *Encope wetmorei* A. H. Clark, 1946 | 0 | 1 |
| *Lanthonia grantii* (Mortensen, 1948) | *Lanthonia* | 1 | 0 |
| *Mellita kanakoffi* Durham, 1961 | *Mellita* | 1 | 1 |
| *Mellita longifissa* Michelin, 1858 | 1 | 1 |
| *Mellita notabilis* H. L. Clark, 1947 | 1 | 1 |
| *Mellitella stokesii* (L. Agassiz, 1841) | *Mellitella* | 1 | 1 |
| *Rhyncholampas pacificus* (A. Agassiz, 1863) | Cassiduloida | Cassidulidae | *Rhyncholampas* | 1 | 1 |
| *Cystechinus loveni* A. Agassiz, 1898 | Holasteroida | Urechinidae | *Cystechinus* | 0 | 0 |
| *Pilematechinus rathbuni* (A. Agassiz, 1898) | *Pilematechinus* | 0 | 0 |
| *Urechinus naresianus* A. Agassiz, 1879 | *Urechinus* | 0 | 0 |
| *Aeropsis fulva* (A. Agassiz, 1898) | Spatangoida | Aeropsidae | *Aeropsis* | 0 | 0 |
| *Brissopsis columbaris* A. Agassiz, 1898 | Brissidae | *Brissopsis* | 0 | 0 |
| *Brissopsis pacifica* (A. Agassiz, 1898) | 0 | 1 |
| *Brissus obesus* Verrill, 1867 | *Brissus* | 1 | 1 |
| *Meoma ventricosa* frangibilis Chesher, 1970 | *Meoma* | 0 | 0 |
| *Meoma ventricosa* grandis Gray, 1851 | 1 | 1 |
| *Metalia spatagus* (Linnaeus, 1758) | *Metalia* | 1 | 1 |
| *Rhabdobrissus pacificus* H. L. Clark, 1940 | *Rhabdobrissus* | 0 | 0 |
| *Holanthus tenuis* (A. Agassiz, 1898) | Hemiasteridae | *Hemiaster* | 0 | 0 |
| *Araeolampas hastata* (A. Agassiz, 1898) | Loveniidae | *Araeolampas* | 0 | 0 |
| *Lovenia cordiformis* A. Agassiz, 1872 | *Lovenia* | 1 | 1 |
| *Brisaster latifrons* (A. Agassiz, 1898) | Schizasteridae | *Brisaster* | 1 | 1 |
| *Moira atropos* clotho Michelin, 1855 | Prenasteriidae | *Moira* | 0 | 0 |
| *Agassizia scrobiculata* Valenciennes, 1846 | *Agassizia* | 1 | 1 |

APPENDIX 2

Central American Pacific shallow water echinoderm sequences from BioMar-ACG vouchers barcoded using the GenBank (BLAST) and BOLD (IDS) identification tools (X = absent, ✓ = present)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sequence Code (BMAR-)** | **Morphology-based ID** | **GB** | **Blast Best Match** | **Ident. %** | **GB ID** | **BOLD** | **BOLDSYSTEMS** | **Ident. %** | **IDS ID** |
| 881-20 | Amphiuridae | ✓ | *Amphipholis januarii* | 82.65 | NA | ✓ | No Match | NA | NA |
| 602-20 | Amphiuridae | ✓ | *Amphipholis squamata* | 96.2 | NA | ✓ | *Amphipholis* cf. s*quamata* | 97.39 | NA |
| 356-19 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.83 | 1 | ✓ | No Match | NA | 0 |
| 855-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 856-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 905-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 1151-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 1193-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 592-20 | *Arbacia stellata* | ✓ | *Holothuria arenicola* | 87.4 | 0 | ✓ | *Holothuria arenicola* | 99.69 | 0 |
| 561-20 | *Arbacia stellata* | ✓ | *Arbacia stellata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 1180-20 | *Asteropsis carinifera* | ✓ | *Stellaster equestris* | 83.87 | 0 | ✓ | *Asteropsis carinifera* | 98.93 | 1 |
| 1196-20 | *Asteropsis carinifera* | ✓ | *Oreaster clavatus* | 83.92 | 0 | ✓ | *Asteropsis carinifera* | 98.93 | 1 |
| 518-20 | *Asteropsis carinifera* | ✓ | *Asteropsis carinifera* | 87.47 | 1 | ✓ | *Asteropsis carinifera* | 99.54 | 1 |
| 641-20 | *Astropyga pulvinata* | ✓ | *Proserpinaster neozelanicus* | 81.2 | 0 | ✓ | *Nidorellia armata* | 100 | 0 |
| 495-20 | *Astropyga pulvinata* | ✓ | *Astropyga pulvinata* | 99.64 | 1 | ✓ | No Match | NA | 0 |
| 535-20 | *Astropyga pulvinata* | ✓ | *Tripneustes depressus* | 100 | 0 | ✓ | *Tripneustes kermadecensis* | 100 | 0 |
| 552-20 | *Astropyga pulvinata* | ✓ | *Astropyga pulvinata* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 595-20 | *Brissus obesus* | ✓ | *Metalia nobilis* | 99.21 | 0 | ✓ | No Match | NA | 0 |
| 635-20 | *Brissus obesus* | ✓ | *Toxopneustes roseus* | 99.74 | 0 | ✓ | *Toxopneustes pileolus* | 97.33 | 0 |
| 864-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.91 | 0 | X | No Match | NA | 0 |
| 877-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.55 | 0 | X | No Match | NA | 0 |
| 894-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.64 | 0 | X | No Match | NA | 0 |
| 941-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.76 | 0 | X | No Match | NA | 0 |
| 1128-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.91 | 0 | X | No Match | NA | 0 |
| 1158-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.91 | 0 | X | No Match | NA | 0 |
| 1203-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.67 | 0 | X | No Match | NA | 0 |
| 296-19 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.37 | 0 | X | No Match | NA | 0 |
| 530-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.92 | 0 | X | No Match | NA | 0 |
| 543-20 | *Chiridota aponocrita* | X | *Leptosynapta clarki* | 85.6 | 0 | X | No Match | NA | 0 |
| 945-20 | *Cucumaria flamma* | X | *Neocucumis proteus* | 84.5 | 0 | X | No Match | NA | 0 |
| 1202-20 | *Cucumaria flamma* | X | *Neocucumis proteus* | 84.65 | 0 | X | No Match | NA | 0 |
| 859-20 | *Diadema mexicanum* | ✓ | *Diadema mexicanum* | 99.66 | 1 | ✓ | *Diadema mexicanum* | 99.78 | 1 |
| 297-19 | *Diadema mexicanum* | ✓ | *Diadema mexicanum* | 100 | 1 | ✓ | *Diadema mexicanum* | 100 | 1 |
| 506-20 | *Diadema mexicanum* | ✓ | *Diadema mexicanum* | 99.85 | 1 | ✓ | *Diadema mexicanum* | 100 | 1 |
| 533-20 | *Diadema mexicanum* | ✓ | *Diadema mexicanum* | 99.85 | 1 | ✓ | *Diadema mexicanum* | 99.78 | 1 |
| 553-20 | *Diadema mexicanum* | ✓ | *Diadema mexicanum* | 100 | 1 | ✓ | *Diadema mexicanum* | 100 | 1 |
| 599-20 | *Diadema mexicanum* | ✓ | *Linckia laevigata* | 83.99 | 0 | ✓ | No Match | NA | 0 |
| 640-20 | *Diadema mexicanum* | ✓ | *Proserpinaster neozelanicus* | 81.25 | 0 | ✓ | *Nidorellia armata* | 100 | 0 |
| 367-19 | *Echinometra vanbrunti* | ✓ | *Echinometra vanbrunti* | 99.69 | 1 | ✓ | No Match | NA | 0 |
| 591-20 | *Echinometra vanbrunti* | ✓ | *Echinometra vanbrunti* | 99.09 | 1 | ✓ | No Match | NA | 0 |
| 350-19 | *Echinometra vanbrunti* | ✓ | *Echinometra vanbrunti* | 99.21 | 1 | ✓ | No Match | NA | 0 |
| 860-20 | *Euapta godeffroyi* | ✓ | *Holothuria impatiens* | 98.29 | 0 | ✓ | No Match | NA | 0 |
| 857-20 | *Eucidaris thouarsii* | ✓ | *Eucidaris thouarsii* | 99.84 | 1 | ✓ | *Eucidaris thouarsii* | 99.47 | 1 |
| 869-20 | *Eucidaris thouarsii* | ✓ | *Eucidaris thouarsii* | 100 | 1 | ✓ | No Match | NA | 0 |
| 1115-20 | *Eucidaris thouarsii* | ✓ | *Eucidaris thouarsii* | 99.24 | 1 | ✓ | *Eucidaris thouarsii* | 99.25 | 1 |
| 597-20 | *Eucidaris thouarsii* | ✓ | *Toxopneustes roseus* | 100 | 0 | ✓ | *Toxopneustes pileolus* | 97.64 | 0 |
| 481-20 | *Eucidaris thouarsii* | ✓ | *Eucidaris thouarsii* | 99.39 | 1 | ✓ | *Eucidaris thouarsii* | 99.25 | 1 |
| 529-20 | *Eucidaris thouarsii* | ✓ | *Eucidaris thouarsii* | 99.66 | 1 | ✓ | *Eucidaris thouarsii* | 99.5 | 1 |
| 942-20 | *Holothuria fuscocinerea* | ✓ | *Holothuria pluricuriosa* | 98.65 | 0 | ✓ | No Match | NA | 0 |
| 933-20 | *Holothuria arenicola* | ✓ | *Holothuria arenicola* | 87.56 | 1 | ✓ | *Holothuria arenicola* | 99.37 | 1 |
| 937-20 | *Holothuria arenicola* | ✓ | *Holothuria arenicola* | 87.4 | 1 | ✓ | *Holothuria arenicola* | 99.37 | 1 |
| 1147-20 | *Holothuria arenicola* | ✓ | *Holothuria arenicola* | 87.71 | 1 | ✓ | *Holothuria arenicola* | 98 | 1 |
| 1201-20 | *Holothuria arenicola* | ✓ | *Holothuria arenicola* | 87.5 | 1 | ✓ | *Holothuria arenicola* | 98.24 | 1 |
| 885-20 | *Holothuria arenicola* | ✓ | *Holothuria arenicola* | 87.71 | 1 | ✓ | *Holothuria arenicola* | 99.69 | 1 |
| 861-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 98.51 | 1 | ✓ | No Match | NA | 0 |
| 875-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 98.51 | 1 | ✓ | No Match | NA | 0 |
| 901-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.36 | 1 | ✓ | No Match | NA | 0 |
| 915-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 87.71 | 0 | ✓ | *Holothuria arenicola* | 98.16 | 0 |
| 916-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 98.72 | 1 | ✓ | No Match | NA | 0 |
| 938-20 | *Holothuria impatiens* | ✓ | *Holothuria hilla* | 91.49 | 0 | ✓ | No Match | NA | 0 |
| 1120-20 | *Holothuria impatiens* | ✓ | *Holothuria languens* | 98.88 | 0 | ✓ | No Match | NA | 0 |
| 1122-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 1141-20 | *Holothuria impatiens* | ✓ | *Holothuria imitans* | 99.36 | 0 | ✓ | *Holothuria imitans* | 98.05 | 0 |
| 1139-20 | *Holothuria impatiens* | ✓ | *Holothuria languens* | 100 | 0 | ✓ | No Match | NA | 0 |
| 1132-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 87.4 | 0 | ✓ | *Holothuria arenicola* | 99.69 | 0 |
| 1127-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 98.72 | 1 | ✓ | No Match | NA | 0 |
| 1156-20 | *Holothuria impatiens* | ✓ | *Holothuria imitans* | 99.36 | 0 | ✓ | *Holothuria imitans* | 97.84 | 0 |
| 1159-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.36 | 1 | ✓ | No Match | NA | 0 |
| 1161-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 309-19 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 327-19 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 364-19 | *Holothuria impatiens* | ✓ | *Holothuria imitans* | 99.36 | 0 | ✓ | *Holothuria imitans* | 97.84 | 0 |
| 380-19 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 567-20 | *Holothuria impatiens* | ✓ | *Holopneustes purpurescens* | 84.12 | 0 | ✓ | No Match | NA | 0 |
| 573-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 87.4 | 0 | ✓ | No Match | NA | 0 |
| 576-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 579-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 91.2 | 0 | ✓ | *Holothuria arenicola* | 98.86 | 0 |
| 608-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 90.41 | 0 | ✓ | *Holothuria arenicola* | 99.69 | 0 |
| 609-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 622-20 | *Holothuria impatiens* | ✓ | *Ophionereis reticulata* | 90.06 | 0 | ✓ | No Match | NA | 0 |
| 650-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 87.56 | 0 | ✓ | *Holothuria arenicola* | 98.16 | 0 |
| 474-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 538-20 | *Holothuria impatiens* | ✓ | *Pentamera calcigera* | 84.91 | 0 | ✓ | No Match | NA | 0 |
| 539-20 | *Holothuria impatiens* | ✓ | *Holothuria arguinensis* | 87.29 | 0 | ✓ | *Holothuria arenicola* | 99.37 | 0 |
| 544-20 | *Holothuria impatiens* | ✓ | *Holothuria imitans* | 99.57 | 0 | ✓ | *Holothuria imitans* | 98.05 | 0 |
| 548-20 | *Holothuria impatiens* | ✓ | *Holothuria arenicola* | 87.5 | 0 | ✓ | *Holothuria arenicola* | 98.56 | 0 |
| 1123-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 1119-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 1157-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 515-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 549-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.74 | 1 | ✓ | No Match | NA | 0 |
| 480-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 98.51 | 1 | ✓ | No Match | NA | 0 |
| 940-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 99.48 | 1 | ✓ | No Match | NA | 0 |
| 1160-20 | *Holothuria impatiens* | ✓ | *Holothuria impatiens* | 100 | 1 | ✓ | No Match | NA | 0 |
| 912-20 | *Holothuria kefersteinii* | ✓ | *Holothuria leucospilota* | 89.67 | 0 | ✓ | No Match | NA | 0 |
| 1133-20 | *Holothuria kefersteinii* | ✓ | *Holothuria kefersteinii* | 99.59 | 1 | ✓ | No Match | NA | 0 |
| 1130-20 | *Holothuria pardalis* | ✓ | *Holothuria arenicola* | 87.4 | 0 | ✓ | *Holothuria arenicola* | 99.69 | 0 |
| 378-19 | *Holothuria portovallartensis* | ✓ | *Holothuria portovallartensis* | 98.8 | 1 | X | No Match | NA | 0 |
| 932-20 | *Holothuria rigida* | ✓ | *Holothuria edulis* | 84.98 | 0 | ✓ | No Match | NA | 0 |
| 946-20 | *Holothuria rigida* | ✓ | *Holothuria edulis* | 85.03 | 0 | ✓ | No Match | NA | 0 |
| 1143-20 | *Holothuria rigida* | ✓ | *Holothuria edulis* | 89.39 | 0 | ✓ | No Match | NA | 0 |
| 475-20 | *Holothuria rigida* | ✓ | *Holothuria arenicola* | 84.51 | 0 | ✓ | No Match | NA | 0 |
| 540-20 | *Holothuria rigida* | ✓ | *Holothuria edulis* | 84.65 | 0 | ✓ | No Match | NA | 0 |
| 1137-20 | Holothuroidea | ✓ | *Apostichopus japonicus* | 83.28 | NA | ✓ | No Match | NA | NA |
| 1182-20 | Holothuroidea | ✓ | *Holothuria imitans* | 91.67 | NA | ✓ | No Match | NA | NA |
| 1208-20 | Holothuroidea | ✓ | *Holothuria imitans* | 99.79 | NA | ✓ | *Holothuria imitans* | 98.27 | NA |
| 581-20 | Holothuroidea | ✓ | *Holothuria imitans* | 99.79 | NA | ✓ | *Holothuria imitans* | 98.27 | NA |
| 895-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 100 | 1 | ✓ | *Isostichopus fuscus* | 100 | 1 |
| 1163-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 99.76 | 1 | ✓ | *Isostichopus fuscus* | 99.76 | 1 |
| 1199-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 100 | 1 | ✓ | *Isostichopus fuscus* | 100 | 1 |
| 658-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 100 | 1 | ✓ | *Isostichopus fuscus* | 100 | 1 |
| 659-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 99.77 | 1 | ✓ | *Isostichopus fuscus* | 99.52 | 1 |
| 496-20 | *Isostichopus fuscus* | ✓ | *Isostichopus fuscus* | 100 | 1 | ✓ | *Isostichopus fuscus* | 100 | 1 |
| 913-20 | *Labidodemas americanum* | X | *Goniocidaris tubaria* | 82.52 | 0 | X | No Match | NA | 0 |
| 1200-20 | *Labidodemas americanum* | X | *Goniocidaris tubaria* | 82.52 | 0 | X | No Match | NA | 0 |
| 889-20 | *Labidodemas maccullochi* | X | *Ophionereis reticulata* | 89.65 | 0 | X | No Match | NA | 0 |
| 484-19 | *Labidodemas maccullochi* | X | *Labidodemas pertinax* | 85.41 | 0 | X | No Match | NA | 0 |
| 636-20 | *Lovenia cordiformis* | ✓ | *Toxopneustes roseus* | 99.74 | 0 | ✓ | *Toxopneustes pileolus* | 97.33 | 0 |
| 637-20 | *Lovenia cordiformis* | ✓ | *Lovenia cordiformis* | 99.39 | 1 | ✓ | *Lovenia cordiformis* | 99.14 | 1 |
| 655-20 | *Lovenia cordiformis* | ✓ | *Lovenia cordiformis* | 99.84 | 1 | ✓ | *Lovenia cordiformis* | 99.83 | 1 |
| 560-20 | *Lovenia cordiformis* | ✓ | *Lovenia cordiformis* | 99.85 | 1 | ✓ | *Lovenia cordiformis* | 99.66 | 1 |
| 510-20 | *Meoma ventricosa* | ✓ | *Metalia nobilis* | 99.39 | 0 | ✓ | No Match | NA | 0 |
| 527-20 | *Meoma ventricosa* | ✓ | *Metalia nobilis* | 99.24 | 0 | ✓ | No Match | NA | 0 |
| 943-20 | *Mithrodia bradleyi* | ✓ | *Mithrodia bradleyi* | 99.31 | 1 | ✓ | *Mithrodia bradleyi* | 99.31 | 1 |
| 1204-20 | *Mithrodia bradleyi* | ✓ | *Mithrodia bradleyi* | 99.54 | 1 | ✓ | *Mithrodia bradleyi* | 99.54 | 1 |
| 304-19 | *Mithrodia bradleyi* | ✓ | *Mithrodia bradleyi* | 100 | 1 | ✓ | *Mithrodia bradleyi* | 100 | 1 |
| 512-20 | *Mithrodia bradleyi* | ✓ | *Mithrodia bradleyi* | 99.77 | 1 | ✓ | *Mithrodia bradleyi* | 99.77 | 1 |
| 565-20 | *Mithrodia bradleyi* | ✓ | *Mithrodia bradleyi* | 93.31 | 1 | ✓ | *Mithrodia bradleyi* | 99.31 | 1 |
| 862-20 | *Neocucumis veleronis* | X | *Holopneustes purpurescens* | 84.12 | 0 | X | No Match | NA | 0 |
| 876-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 888-20 | *Neocucumis veleronis* | X | *Apostichopus japonicus* | 83.28 | 0 | X | No Match | NA | 0 |
| 891-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 914-20 | *Neocucumis veleronis* | X | *Apostichopus japonicus* | 83.28 | 0 | X | No Match | NA | 0 |
| 1131-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 1146-20 | *Neocucumis veleronis* | X | *Holopneustes purpurescens* | 84.12 | 0 | X | No Match | NA | 0 |
| 1167-20 | *Neocucumis veleronis* | X | *Pseudocnus lubricus* | 83.41 | 0 | X | No Match | NA | 0 |
| 1184-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 358-19 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.73 | 0 | X | No Match | NA | 0 |
| 574-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 583-20 | *Neocucumis veleronis* | X | *Holopneustes purpurescens* | 84.12 | 0 | X | No Match | NA | 0 |
| 611-20 | *Neocucumis veleronis* | X | *Phyllophorella liuwutiensis* | 83.44 | 0 | X | No Match | NA | 0 |
| 872-20 | *Neothyone gibber* | X | *Rhynchocidaris triplopora* | 83.59 | 0 | X | No Match | NA | 0 |
| 873-20 | *Neothyone gibber* | X | *Rhynchocidaris triplopora* | 83.59 | 0 | X | No Match | NA | 0 |
| 892-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 83.97 | 0 | X | No Match | NA | 0 |
| 917-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.18 | 0 | X | No Match | NA | 0 |
| 936-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 83.97 | 0 | X | No Match | NA | 0 |
| 1136-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 83.97 | 0 | X | No Match | NA | 0 |
| 1150-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.12 | 0 | X | No Match | NA | 0 |
| 1183-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.12 | 0 | X | No Match | NA | 0 |
| 300-19 | *Neothyone gibber* | X | *Phyrella fragilis* | 84.24 | 0 | X | No Match | NA | 0 |
| 329-19 | *Neothyone gibber* | X | *Phyrella fragilis* | 84.24 | 0 | X | No Match | NA | 0 |
| 362-19 | *Neothyone gibber* | X | *Pentamera calcigera* | 83.84 | 0 | X | No Match | NA | 0 |
| 379-19 | *Neothyone gibber* | X | *Phyrella fragilis* | 83.54 | 0 | X | No Match | NA | 0 |
| 568-20 | *Neothyone gibber* | X | *Phyrella fragilis* | 84.21 | 0 | X | No Match | NA | 0 |
| 569-20 | *Neothyone gibber* | X | *Rhynchocidaris triplopora* | 84.19 | 0 | X | No Match | NA | 0 |
| 580-20 | *Neothyone gibber* | X | *Rhynchocidaris triplopora* | 83.59 | 0 | X | No Match | NA | 0 |
| 582-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.12 | 0 | X | No Match | NA | 0 |
| 507-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.47 | 0 | X | No Match | NA | 0 |
| 537-20 | *Neothyone gibber* | X | *Pentamera calcigera* | 84.12 | 0 | X | No Match | NA | 0 |
| 898-20 | *Nidorellia armata* | X | *Proserpinaster neozelanicus* | 81.36 | 0 | ✓ | *Nidorellia armata* | 100 | 1 |
| 1142-20 | *Nidorellia armata* | X | *Iconaster longimanus* | 81.61 | 0 | ✓ | *Nidorellia armata* | 99.54 | 1 |
| 1194-20 | *Nidorellia armata* | X | *Iconaster longimanus* | 81.6 | 0 | ✓ | *Nidorellia armata* | 100 | 1 |
| 368-19 | *Nidorellia armata* | X | *Toxopneustes roseus* | 99.84 | 0 | ✓ | *Toxopneustes pileolus* | 97.63 | 0 |
| 502-20 | *Nidorellia armata* | X | *Iconaster longimanus* | 81.61 | 0 | ✓ | *Nidorellia armata* | 99.85 | 1 |
| 532-20 | *Nidorellia armata* | X | *Proserpinaster neozelanicus* | 81.34 | 0 | ✓ | *Nidorellia armata* | 99.54 | 1 |
| 294-19 | *Ophiactis savignyi* | ✓ | *Ophiactis simplex* | 99.03 | 0 | ✓ | *Ophiactis simplex* | 99.02 | 0 |
| 882-20 | *Ophiactis savignyi* | ✓ | *Ophiactis simplex* | 98.74 | 0 | ✓ | *Ophiactis simplex* | 98.93 | 0 |
| 1169-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 347-19 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 98.82 | 1 | ✓ | *Ophiactis savignyi* | 98.82 | 1 |
| 620-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 621-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 623-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 483-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 500-20 | *Ophiactis savignyi* | ✓ | *Ophiactis savignyi* | 99.39 | 1 | ✓ | *Ophiactis savignyi* | 99.39 | 1 |
| 1118-20 | *Ophiactis simplex* | ✓ | *Ophiactis simplex* | 99.21 | 1 | ✓ | *Ophiactis simplex* | 99.36 | 1 |
| 295-19 | *Ophiactis simplex* | ✓ | *Holothuria imitans* | 99.79 | 0 | ✓ | *Holothuria imitans* | 98.27 | 0 |
| 333-19 | *Ophiactis simplex* | ✓ | *Ophiactis simplex* | 98.63 | 1 | ✓ | *Ophiactis simplex* | 98.82 | 1 |
| 366-19 | *Ophiactis simplex* | ✓ | *Ophiactis simplex* | 98.49 | 1 | ✓ | *Ophiactis simplex* | 99.1 | 1 |
| 601-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.32 | NA | ✓ | *Phataria unifascialis* | 99.84 | NA |
| 603-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 83.03 | NA | ✓ | No Match | NA | NA |
| 604-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.39 | NA | ✓ | *Phataria unifascialis* | 99.67 | NA |
| 287-19 | Ophidiasteridae | ✓ | *Linckia laevigata* | 85.96 | NA | ✓ | *Phataria unifascialis* | 99.67 | NA |
| 312-19 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.18 | NA | ✓ | *Phataria unifascialis* | 99.36 | NA |
| 907-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.93 | NA | ✓ | *Phataria unifascialis* | 99.06 | NA |
| 924-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.63 | NA | ✓ | *Phataria unifascialis* | 99.37 | NA |
| 349-19 | Ophidiasteridae | ✓ | *Linckia laevigata* | 83.92 | NA | ✓ | No Match | NA | NA |
| 645-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.78 | NA | ✓ | *Phataria unifascialis* | 99.21 | NA |
| 557-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.32 | NA | ✓ | *Phataria unifascialis* | 100 | NA |
| 880-20 | Ophidiasteridae | ✓ | *Linckia laevigata* | 86.32 | NA | ✓ | *Phataria unifascialis* | 100 | NA |
| 503-20 | *Ophiocoma aethiops* | ✓ | *Iconaster longimanus* | 81.61 | 0 | ✓ | *Nidorellia armata* | 99.85 | 0 |
| 854-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 886-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 97.7 | 1 | ✓ | No Match | NA | 0 |
| 903-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 1117-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.24 | 1 | ✓ | No Match | NA | 0 |
| 1179-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.39 | 1 | ✓ | No Match | NA | 0 |
| 291-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.62 | 1 | ✓ | No Match | NA | 0 |
| 292-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.68 | 1 | ✓ | No Match | NA | 0 |
| 307-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.8 | 1 | ✓ | No Match | NA | 0 |
| 319-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.83 | 1 | ✓ | No Match | NA | 0 |
| 372-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 97.34 | 1 | ✓ | No Match | NA | 0 |
| 351-19 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.05 | 1 | ✓ | No Match | NA | 0 |
| 586-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 97.11 | 1 | ✓ | No Match | NA | 0 |
| 593-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 618-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.37 | 1 | ✓ | No Match | NA | 0 |
| 630-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 649-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 96.96 | 1 | ✓ | No Match | NA | 0 |
| 651-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 657-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 476-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.09 | 1 | ✓ | No Match | NA | 0 |
| 494-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 505-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.7 | 1 | ✓ | No Match | NA | 0 |
| 528-20 | *Ophiocomella alexandri* | ✓ | *Ophiocomella alexandri* | 99.54 | 1 | ✓ | No Match | NA | 0 |
| 911-20 | *Ophioderma* cf. *panamense* | ✓ | *Ophioderma panamense* | 97.66 | 1 | ✓ | *Ophioderma panamense* | 97.65 | 1 |
| 921-20 | *Ophioderma* cf. *panamense* | ✓ | *Ophioderma panamense* | 98.05 | 1 | ✓ | *Ophioderma panamense* | 98.04 | 1 |
| 492-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.71 | 1 | X | No Match | NA | 0 |
| 909-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.71 | 1 | X | No Match | NA | 0 |
| 910-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.13 | 1 | X | No Match | NA | 0 |
| 944-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 96.3 | 1 | X | No Match | NA | 0 |
| 1171-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.32 | 1 | X | No Match | NA | 0 |
| 1186-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.91 | 1 | X | No Match | NA | 0 |
| 308-19 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.09 | 1 | X | No Match | NA | 0 |
| 320-19 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.71 | 1 | X | No Match | NA | 0 |
| 648-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.52 | 1 | X | No Match | NA | 0 |
| 520-20 | *Ophioderma hendleri* | ✓ | *Ophioderma hendleri* | 95.71 | 1 | X | No Match | NA | 0 |
| 908-20 | *Ophioderma panamense* | ✓ | *Ophioderma panamense* | 97.66 | 1 | ✓ | *Ophioderma panamense* | 97.65 | 1 |
| 923-20 | *Ophioderma panamense* | ✓ | *Ophioderma panamense* | 97.86 | 1 | ✓ | *Ophioderma panamense* | 97.84 | 1 |
| 305-19 | *Ophioderma panamense* | ✓ | *Ophioderma panamense* | 97.86 | 1 | ✓ | *Ophioderma panamense* | 97.86 | 1 |
| 374-19 | *Ophioderma panamense* | ✓ | *Ophioderma panamense* | 99.51 | 1 | ✓ | *Ophioderma panamense* | 99.51 | 1 |
| 546-20 | *Ophioderma panamense* | ✓ | *Ophioderma panamense* | 98.05 | 1 | ✓ | *Ophioderma panamense* | 98.04 | 1 |
| 927-20 | *Ophioderma* sp. | ✓ | *Ophioderma panamense* | 99.61 | NA | ✓ | *Ophioderma panamense* | 99.61 | NA |
| 1185-20 | *Ophioderma* sp. | ✓ | *Ophioderma hendleri* | 95.71 | NA | ✓ | No Match | NA | NA |
| 887-20 | *Ophioderma teres* | ✓ | *Ophioderma teres* | 97.87 | 1 | ✓ | *Ophioderma teres* | 97.86 | 1 |
| 922-20 | *Ophioderma teres* | ✓ | *Ophioderma rubicunda* | 93.38 | 0 | ✓ | No Match | NA | 0 |
| 288-19 | *Ophioderma teres* | ✓ | *Ophioderma teres* | 97.27 | 1 | ✓ | *Ophioderma teres* | 97.25 | 1 |
| 631-20 | *Ophioderma teres* | ✓ | *Ophioderma teres* | 97.27 | 1 | ✓ | *Ophioderma teres* | 97.25 | 1 |
| 489-20 | *Ophioderma teres* | ✓ | *Ophioderma teres* | 97.08 | 1 | ✓ | *Ophioderma teres* | 97.06 | 1 |
| 928-20 | *Ophiolepis pacifica* | X | *Ophiolepis impressa* | 94.52 | 0 | X | No Match | NA | 0 |
| 1181-20 | *Ophiolepis pacifica* | X | *Ophiolepis impressa* | 93.76 | 0 | X | No Match | NA | 0 |
| 1189-20 | *Ophiolepis pacifica* | X | *Ophiolepis impressa* | 94.52 | 0 | X | No Match | NA | 0 |
| 646-20 | *Ophiolepis pacifica* | X | *Ophiolepis impressa* | 94.52 | 0 | X | No Match | NA | 0 |
| 545-20 | *Ophiolepis pacifica* | X | *Ophiolepis impressa* | 94.52 | 0 | X | No Match | NA | 0 |
| 607-20 | *Ophiolepis* sp.? | ✓ | *Ophionereis reticulata* | 89.8 | NA | ✓ | No Match | NA | NA |
| 865-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.65 | 0 | ✓ | No Match | NA | 0 |
| 890-20 | *Ophionereis annulata* | ✓ | *Labidodemas pertinax* | 85.71 | 0 | ✓ | No Match | NA | 0 |
| 904-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.8 | 0 | ✓ | No Match | NA | 0 |
| 929-20 | *Ophionereis annulata* | ✓ | *Ophioderma panamense* | 97.66 | 0 | ✓ | *Ophioderma panamense* | 97.65 | 0 |
| 930-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.65 | 0 | ✓ | No Match | NA | 0 |
| 1173-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.8 | 0 | ✓ | No Match | NA | 0 |
| 289-19 | *Ophionereis annulata* | ✓ | *Ophionereis vittata* | 90.24 | 0 | ✓ | No Match | NA | 0 |
| 303-19 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 90.23 | 0 | ✓ | No Match | NA | 0 |
| 321-19 | *Ophionereis annulata* | ✓ | *Ophionereis vittata* | 90.29 | 0 | ✓ | No Match | NA | 0 |
| 339-19 | *Ophionereis annulata* | ✓ | *Ophionereis vittata* | 90.22 | 0 | ✓ | No Match | NA | 0 |
| 587-20 | *Ophionereis annulata* | ✓ | *Ophionereis schayeri* | 90.3 | 0 | ✓ | No Match | NA | 0 |
| 594-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.65 | 0 | ✓ | No Match | NA | 0 |
| 617-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.8 | 0 | ✓ | No Match | NA | 0 |
| 652-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.55 | 0 | ✓ | No Match | NA | 0 |
| 654-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.65 | 0 | ✓ | No Match | NA | 0 |
| 490-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.65 | 0 | ✓ | *Ophionereis annulata* | 100 | 1 |
| 504-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.84 | 0 | ✓ | No Match | NA | 0 |
| 558-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 89.8 | 0 | ✓ | No Match | NA | 0 |
| 536-20 | *Ophionereis annulata* | ✓ | *Ophionereis reticulata* | 87.99 | 0 | ✓ | No Match | NA | 0 |
| 883-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 919-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 920-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 931-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 325-19 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 344-19 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 487-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 493-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 99.85 | 1 | ✓ | *Ophiothela danae* | 99.69 | 0 |
| 498-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 499-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 525-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 566-20 | *Ophiothela mirabilis* | ✓ | *Ophiothela mirabilis* | 100 | 1 | ✓ | *Ophiothela mirabilis* | 100 | 1 |
| 524-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.93 | 1 | ✓ | *Ophiothrix spiculata* | 99.13 | 1 |
| 852-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.72 | 1 | ✓ | *Ophiothrix spiculata* | 98.61 | 1 |
| 853-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.57 | 1 | ✓ | *Ophiothrix spiculata* | 99.57 | 1 |
| 866-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.79 | 1 | ✓ | *Ophiothrix spiculata* | 99.83 | 1 |
| 867-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.57 | 1 | ✓ | *Ophiothrix spiculata* | 99.57 | 1 |
| 1124-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.72 | 1 | ✓ | *Ophiothrix spiculata* | 99.13 | 1 |
| 1152-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.29 | 1 | ✓ | *Ophiothrix spiculata* | 99.13 | 1 |
| 1187-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.49 | 1 | ✓ | *Ophiothrix spiculata* | 98.78 | 1 |
| 311-19 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.3 | 1 | ✓ | *Ophiothrix spiculata* | 99.44 | 1 |
| 323-19 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.83 | 1 | ✓ | *Ophiothrix spiculata* | 99.07 | 1 |
| 343-19 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.29 | 1 | ✓ | *Ophiothrix spiculata* | 98.89 | 1 |
| 352-19 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.72 | 1 | ✓ | *Ophiothrix spiculata* | 98.88 | 1 |
| 371-19 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.3 | 1 | ✓ | *Ophiothrix spiculata* | 99.44 | 1 |
| 588-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.14 | 1 | ✓ | *Ophiothrix spiculata* | 99.31 | 1 |
| 606-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 100 | 1 | ✓ | *Ophiothrix spiculata* | 100 | 1 |
| 619-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 97.64 | 1 | ✓ | *Ophiothrix spiculata* | 98.78 | 1 |
| 632-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.5 | 1 | ✓ | *Ophiothrix spiculata* | 98.96 | 1 |
| 644-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.36 | 1 | ✓ | *Ophiothrix spiculata* | 99.35 | 1 |
| 647-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.5 | 1 | ✓ | *Ophiothrix spiculata* | 98.48 | 1 |
| 479-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.57 | 1 | ✓ | *Ophiothrix spiculata* | 99.65 | 1 |
| 485-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.93 | 1 | ✓ | *Ophiothrix spiculata* | 99.13 | 1 |
| 486-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 99.79 | 1 | ✓ | *Ophiothrix spiculata* | 99.78 | 1 |
| 488-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.07 | 1 | ✓ | *Ophiothrix spiculata* | 99.78 | 1 |
| 519-20 | *Ophiothrix spiculata* | ✓ | *Ophiothrix spiculata* | 98.93 | 1 | ✓ | *Ophiothrix spiculata* | 98.96 | 1 |
| 1207-20 | *Pentamera chierchiae* | X | *Thyone benti* | 86.02 | 0 | X | No Match | NA | 0 |
| 570-20 | *Pentamera chierchiae* | X | *Thyone benti* | 86.02 | 0 | X | No Match | NA | 0 |
| 899-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 84.02 | 0 | ✓ | No Match | NA | 0 |
| 1197-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 83.99 | 0 | ✓ | No Match | NA | 0 |
| 600-20 | *Pharia pyramidata* | X | *Diadema mexicanum* | 100 | 0 | ✓ | *Diadema mexicanum* | 100 | 0 |
| 482-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 99.39 | 0 | ✓ | No Match | NA | 0 |
| 541-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 84.15 | 0 | ✓ | No Match | NA | 0 |
| 555-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 83.99 | 0 | ✓ | No Match | NA | 0 |
| 563-20 | *Pharia pyramidata* | X | *Linckia laevigata* | 83.69 | 0 | ✓ | No Match | NA | 0 |
| 906-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.02 | 0 | ✓ | *Phataria unifascialis* | 99.06 | 1 |
| 925-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.47 | 0 | ✓ | *Phataria unifascialis* | 99.53 | 1 |
| 870-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.32 | 0 | ✓ | *Phataria unifascialis* | 100 | 1 |
| 1114-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.32 | 0 | ✓ | *Phataria unifascialis* | 99.37 | 1 |
| 1153-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.32 | 0 | ✓ | *Phataria unifascialis* | 99.37 | 1 |
| 1188-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.63 | 0 | ✓ | *Phataria unifascialis* | 99.69 | 1 |
| 313-19 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.34 | 0 | ✓ | *Phataria unifascialis* | 99.52 | 1 |
| 340-19 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.3 | 0 | ✓ | *Phataria unifascialis* | 98.8 | 1 |
| 598-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.47 | 0 | ✓ | *Phataria unifascialis* | 99.37 | 1 |
| 625-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.45 | 0 | ✓ | *Phataria unifascialis* | 99.21 | 1 |
| 661-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.32 | 0 | ✓ | *Phataria unifascialis* | 99.06 | 1 |
| 542-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.02 | 0 | ✓ | *Phataria unifascialis* | 99.06 | 1 |
| 550-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.2 | 0 | ✓ | *Phataria unifascialis* | 99.18 | 1 |
| 564-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.25 | 0 | ✓ | *Phataria unifascialis* | 99.19 | 1 |
| 324-19 | *Phataria unifascialis* | X | *Linckia laevigata* | 86.2 | 0 | ✓ | *Phataria unifascialis* | 100 | 1 |
| 517-20 | *Phataria unifascialis* | X | *Linckia laevigata* | 85.87 | 0 | ✓ | *Phataria unifascialis* | 99.8 | 1 |
| 871-20 | *Pseudocnus californicus* | ✓ | *Pseudocolochirus violaceus* | 89.69 | 0 | ✓ | No Match | NA | 0 |
| 918-20 | *Pseudocnus californicus* | ✓ | *Pseudocolochirus violaceus* | 90.21 | 0 | ✓ | No Match | NA | 0 |
| 1140-20 | *Pseudocnus californicus* | ✓ | *Pseudocolochirus violaceus* | 89.21 | 0 | ✓ | No Match | NA | 0 |
| 522-20 | *Pseudocnus californicus* | ✓ | *Apostichopus japonicus* | 83.13 | 0 | ✓ | No Match | NA | 0 |
| 332-19 | *Stichopus horrens* | ✓ | *Stichopus horrens* | 99.31 | 1 | ✓ | *Stichopus horrens* | 99.76 | 1 |
| 660-20 | *Stichopus horrens* | ✓ | *Stichopus horrens* | 99.24 | 1 | ✓ | *Stichopus horrens* | 99.78 | 1 |
| 879-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 900-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 99.7 | 1 | ✓ | *Toxopneustes pileolus* | 97.62 | 0 |
| 1155-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 1195-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 317-19 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 99.84 | 1 | ✓ | *Toxopneustes pileolus* | 97.62 | 0 |
| 330-19 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.8 | 0 |
| 354-19 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.64 | 0 |
| 369-19 | *Toxopneustes roseus* | ✓ | *Iconaster longimanus* | 81.24 | 0 | ✓ | *Nidorellia armata* | 99.83 | 0 |
| 596-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 627-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 633-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 99.85 | 1 | ✓ | *Toxopneustes pileolus* | 97.62 | 0 |
| 477-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 509-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 531-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 554-20 | *Toxopneustes roseus* | ✓ | *Toxopneustes roseus* | 100 | 1 | ✓ | *Toxopneustes pileolus* | 97.78 | 0 |
| 1154-20 | Toxopneustidae | ✓ | *Lytechinus williamsi* | 90.27 | NA | ✓ | No Match | NA | NA |
| 365-19 | *Tripneustes depressus* | ✓ | *Tripneustes depressus* | 100 | 1 | ✓ | *Tripneustes kermadecensis* | 100 | 0 |
| 501-20 | *Tripneustes depressus* | ✓ | *Tripneustes depressus* | 100 | 1 | ✓ | *Tripneustes gratilla* | 99.85 | 0 |
| 534-20 | *Tripneustes depressus* | ✓ | *Tripneustes depressus* | 100 | 1 | ✓ | *Tripneustes kermadecensis* | 100 | 0 |
| 556-20 | *Tripneustes depressus* | ✓ | *Tripneustes depressus* | 100 | 1 | ✓ | *Tripneustes gratilla* | 99.85 | 0 |

APPENDIX 3

Taxonomic representativeness and total proposed identities for Central American Pacific shallow water echinoderm COI sequences using the GenBank (BLAST) and BOLD (IDS) identification tools

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Total vouchers** | **Morphospecies** | **Provisional ID** | **Morphology-based genus** | **COI-based genus**  **(GB/BOLD)\*** | **COI-based species (GB/BOLD)\*** | **Sequenced species (GB/BOLD)\*** | **Unsequenced species** | **No match** |
| **GenBank** | 348 | 44 | 7 | 34 | 41 | 58 | 33 | 11 | 0 |
| **BOLD** | 348 | 44 | 7 | 34 | 18 | 23 | 34 | 10 | 33 |
| **Asteroidea** | 48 | 5 | 1 | 5 | 9/6\* | 9/6\* | 2/5\* | 3/0\* | 2 |
| **Ophiuroidea** | 123 | 11 | 4 | 8 | 11/9\* | 18/11\* | 10/9\* | 1/2\* | 8 |
| **Holothuroidea** | 121 | 18 | 1 | 11 | 17/3\* | 27/4\* | 11/10\* | 7/8\* | 15 |
| **Echinoidea** | 56 | 10 | 1 | 10 | 14/7\* | 14/8\* | 10/10\* | 0 | 8 |