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Larval descriptions of the family Porcellanidae: A worldwide annotated compilation of the literature (Crustacea, Decapoda)

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Abstract

For most of the family Porcellanidae, which comprises 283 species, larval development remains to be described. Full development has been only described for 52 species, while part of the larval cycle has been described for 45 species. The importance of knowing the complete larval development of a species goes beyond allowing the identification of larval specimens collected in the plankton. Morphological larval data also constitute a support to cladistic techniques used in the establishment of the phylogenetic status (see Hiller et al. 2006, Marco-Herrero et al. 2013). Nevertheless, the literature on the larval development of this family is old and widely dispersed and in many cases it is difficult to collect the available information on a particular taxon. Towards the aim of facilitating future research, all information available on the larval development of porcellanids has been compiled. Following the taxonomic checklist of Porcellanidae proposed by Osawa and McLaughlin (2010), a checklist has been prepared that reflects the current knowledge about larval development of the group including larval stages and the method used to obtain the larvae, together with references. Those species for which the recognised names have been changed according to Osawa and McLaughlin (2010) are indicated.

Keywords

Checklist, larval development, Anomura, zoea, megalopa

Introduction

Porcellanidae, commonly known as porcelain crabs, is a family of decapods belonging to the infraorder Anomura (Crustacea, Decapoda). The group comprises 283 species according to the classification proposed by Osawa and McLaughlin (2010). Like most decapods, their life cycle contains a planktonic larval phase presenting various morphological changes during ontogenic development; this produces different larval morphologies that vary even within the same species. This high inter- and intra-specific morphological diversity poses many difficulties both for the identification of specimens from plankton samples and for the taxonomic description of undescribed larval stages. Morphological studies are thus of crucial importance if such problems are to be overcome.

Although decapod larvae were first described almost 250 years ago (*Cancer paguru*s, described as *Cancer germanicus* by Linnaeus, 1767), the morphology of a porcellanid larva was not described until 1835, when J. Vaughan Thompson published a brief description of a larva of *Porcellana* reared from eggs of females collected in British waters. Eight years later, Dujardin (1843) presented for the first time a more comprehensive description of a porcellanid larva, describing the zoeal stage of *Pisidia longicornis* (as *Porcellana longicornis*). Numerous descriptions of the larval stages have been published during more than 170 years. The number of published descriptions of the larval morphology of porcellanids, and of other groups of decapods, has grown exponentially since the 1960's (Martin 1984, Rice 1993). Several researchers, including Gore (1968–1977) or the team constituted by Hernández, Bolaños and Graterol (see papers from 1996 to 2012), have made special contributions to knowledge of porcellanid larval morphology.

González-Gordillo et al. (2001) showed that, in addition to the limited number of descriptive studies on decapod larval morphology, a large percentage are based on organisms collected from plankton samples or reared under laboratory conditions from females that were not accurately identified. Furthermore, several published larval descriptions are brief or very general, with inadequate illustrations that are far from the well-accepted standard proposed by Clark et al. (1998).

In addition, the literature on larval descriptions is scattered or very old; since literature of this kind is often not available in digital formats for download or online request, or it has been published in local scientific journals ("grey" literature), it is complicated to access it using common bibliographic search engines. As a consequence, in studies requiring the identification of planktonic organisms (with the eventual need to present identification keys), or in morphological studies in which new larval stages are described, where it becomes necessary to compare results with those reported in previous publications of larval descriptions, the researcher has a difficult task in compiling the available information for the target taxon. Although this situation has yielded publication of several bibliographic compilations for brachyurans, like those of Gurney (1939), Soltanpour-Gargari et al. (1989), Martin (1984), Wear (1985), Wehrtman and Baez (1997) and González-Gordillo et al. (2001), there is still no published compilation on porcellanids on a worldwide basis.

Many larval publications first appeared more than 30 years ago; for example according to González-Gordillo et al. (2001), 86.6 % of the descriptions made for species of decapods from the Gibraltar Strait were published more than 25 years ago. The scientific name of a species described then could have changed, or two or more different species could have been reclassified as one species. This complicates even further the bibliographic search because a search using the current name of a target species will almost certainly omit old studies of that species under a name that has changed or been superseded.

Therefore, the objective of this study is three-fold: 1) to compile the available literature on porcellanid larval morphologies; 2) to record the possible changes in the nomenclature of species, or synonymies; and 3) to describe the state-of-the-art on the larval development of species belonging to the family Porcellanidae.

Methods

The data set of this study comprises a total of 133 entries obtained from 83 published papers (from 1835 to 2012). Search engines and scientific databases such as *Google Scholar, Scopus, Science Direct* and *Web of Science* have been used for the bibliographic compilation. The current total number of porcellanid species and the taxonomic classification used for the present checklist follow those of Osawa and McLaughlin (2010). The current validity of the species has been also checked by consulting the *World Register of Marine Species* (http://www.marinespecies.org).

In the checklist, the status of current knowledge of the larval development is specified for each species as follows: i) the author(s) and the date of publication of the larval description; ii) the specific larval stages described, using the following classification: prezoeal stage (PR), first to fifth zoeal stage (Z1-5), and megalopal stage (M); iii) the method used to obtain the larvae, according to the following designations: from plankton samples (Pl), larvae reared under laboratory conditions from an identified ovigerous females (Lab) and larvae obtained from plankton and by instar-to-instar laboratory rearing, from unknown parentage, but often a species recognizable from its postlarval or juvenile stages (P+L). Entries marked with asterisk mean that the larval description available, in our opinion, is accurate enough to establish comparisons with other species and have all stages fully described and illustrated. In the checklist, if the taxonomical name of the species described does not match the current taxonomic name according to Osawa and McLaughlin (2010), this is indicated by '*as*' followed by the name of the species cited in the description.

Results

The larval development of porcellanids usually consists of two zoeal stages and one megalopal stage, with the exception of *Petrocheles spinosus,* which has five zoeal stages.

Description of the larval development of porcellanids first appeared in 1843, when Dujardin published a description of the first zoeal stage of *Pisidia longicornis*, referred

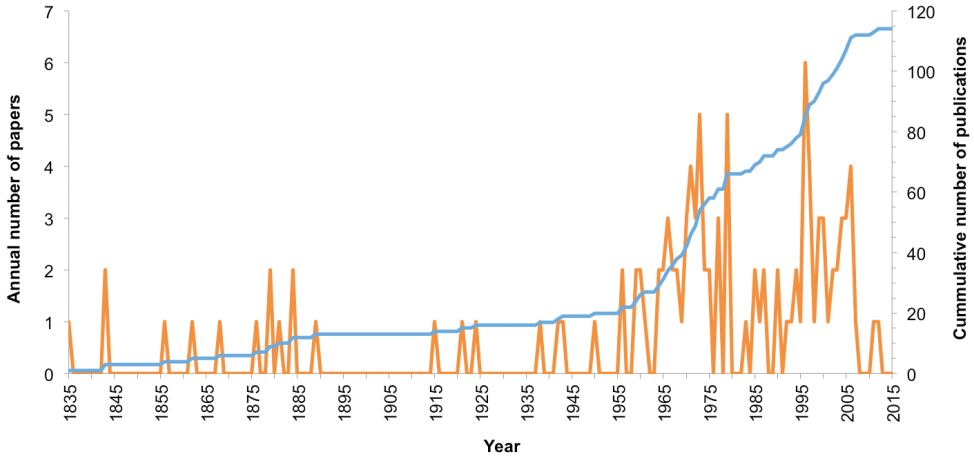

Figure 1. Number of papers describing the larval morphology of porcellanids. Number of publications per year (left-hand scale) and cumulative number of publications represented by the blue line (right-hand scale).

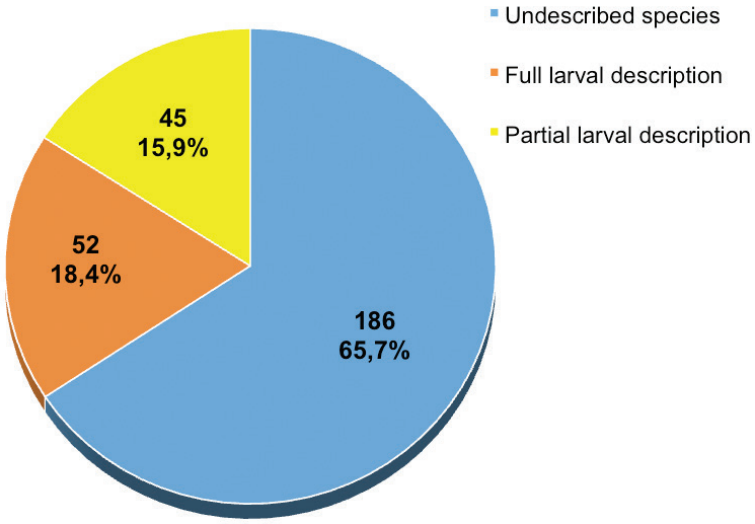

Figure 2. Number and proportion of porcellanid species (N = 283) for which undescribed species (blue sector), full larval description (orange sector) and partial larval description (yellow sector) exists.

to as *Porcellana longicornis*. The larval descriptions available were poor in number until the 1960's and 1970's, when an increasing trend in the number of publications is observed; this was possibly due to the increased number of scientists specializing in this area, to the increased facilities for cultivating larvae in laboratory conditions, and to the advances in microscope technology (Rice 1993). The historical peak for the number of publications per annum occurred in the late 1990's and at the beginning of the current century.

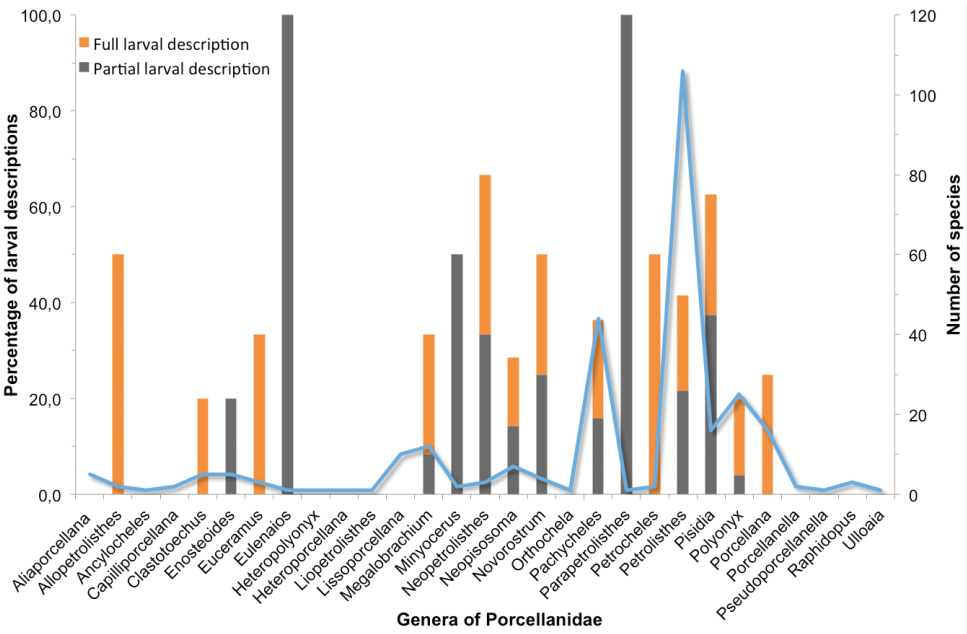

Figure 3. State of current knowledge of larval development of Porcellanidae, grouped by genus. Shown in orange is the percentage of species for which larval development has been completely described. Shown in grey is the percentage of species for which only some of the larval stages have been described (left-hand scale). The total number of species per genus is also represented with a solid blue line (right-hand scale).

Currently, the family Porcellanidae family consists of 283 species (Osawa and McLaughlin 2010). Complete larval development has been described for 52 species (18.4%), while only some larval stages have been described for another 45 species (15.9%). For the remaining 186 species (65.7%), none of the larval stages has been described.

The current knowledge of larval development by genus (percentages) and the number of species in each genus are shown in Figure 3. Although the family Porcellanidae consists of 29 genera, the larval stages have not been described for 12 genera. The genera with the most numerous species are *Petrolisthes* (106 species) and *Pachycheles* (44 species); however, the complete larval development has been described for only 21 species of *Petrolisthes* (19.8%) and only nine species of *Pachycheles* (20.4%).

Annotated bibliography of porcellanid larvae

Family Porcellanidae Haworth, 1825

Thompson (1935) as *Porcellana* sp; Z1: Lab

Webb (1921) as *Porcellana* sp; M: Pl

Gurney (1924) as Porcellanid larva; Z1, Z2: Pl

Aliaporcellana kikuchii Nakasone & Miyake, 1969: larvae undescribed

Aliaporcellana pygmaea (De Man, 1902): larvae undescribed
Aliaporcellana taiwanensis Dong, Li & Chan, 2011: larvae undescribed
Aliaporcellana suluensis (Dana, 1852): larvae undescribed
Aliaporcellana telestophila (Johnson, 1958): larvae undescribed
Allopetrolisthes angulosus (Guérin, 1835): full larval description
*Wehrtmann et al. (1996); PR, Z1, Z2, M: Lab
Allopetrolisthes punctatus (Guérin, 1835): larvae undescribed
Ancylocheles gravelei (Sankolli, 1963): larvae undescribed
Capilliporcellana murakamii (Miyake, 1942): larvae undescribed
Capilliporcellana wolffi Haig, 1981: larvae undescribed
Clastotoechus diffractus (Haig, 1957): larvae undescribed
Clastotoechus gorgonensis Werding & Haig, 1983: larvae undescribed
Clastotoechus hickmani Harvey, 1999: larvae undescribed
Clastotoechus lasios Harvey, 1999: larvae undescribed
Clastotoechus nodosus (Streets, 1872): full larval description
*Hernández et al. (2003); Z1, Z2, M: Lab
Enosteoides lobatus Osawa, 2009: larvae undescribed
Enosteoides melissa (Miyake, 1942): larvae undescribed
Enosteoides ornatus (Stimpson, 1858): partial larval description
Sankolli (1967) as *Porcellana ornata*; PR, Z1: Lab
Ko (2000); Z1: Lab
Enosteoides palauensis (Nakasone & Miyake, 1968): larvae undescribed
Enosteoides philippinesnsis Dolorosa & Werding, 2014: larvae undescribed
Euceramus panatelus Glassell, 1938: larvae undescribed
Euceramus praelongus Stimpson, 1860: full larval description
Roberts (1968); Z1, Z2, M: Lab
Maris (1983); Z1, Z2: Pl
Euceramus transversilineatus (Lockington, 1878): larvae undescribed
Eulenaios cometes (Walker, 1887): partial larval description
Ng and Nakasone (1993); Z1: Lab
Heteropolyonyx biforma Osawa, 2001: larvae undescribed
Heteroporcellana corbicola (Haig, 1960): larvae undescribed
Liopetrolisthes mitra (Dana, 1852): larvae undescribed
Lissoporcellana demani Dong & Li, 2014: larvae undescribed
Lissoporcellana flagellicola Osawa & Fujita, 2005: larvae undescribed
Lissoporcellana furcillata (Haig, 1965): larvae undescribed
Lissoporcellana miyakei Haig, 1981: larvae undescribed
Lissoporcellana monodi Osawa, 2007: larvae undescribed
Lissoporcellana nakasonei (Miyake, 1978): larvae undescribed
Lissoporcellana nitida (Haswell, 1882): larvae undescribed
Lissoporcellana pectinata Haig, 1981: larvae undescribed
Lissoporcellana quadrilobata (Miers, 1884): larvae undescribed
Lissoporcellana spinuligera (Dana, 1853): larvae undescribed

Megalobrachium erosum (Glassell, 1936): larvae undescribed
Megalobrachium festae (Nobili, 1901): larvae undescribed
Megalobrachium garthi Haig, 1957: larvae undescribed
Megalobrachium mortenseni Haig, 1962: partial larval description
Kraus (2006); Z1, Z2: Pl
Megalobrachium pacificum Gore & Abele, 1974: larvae undescribed
Megalobrachium peruvianum Haig, 1960: larvae undescribed
Megalobrachium poeyi (Guérin-Méneville, 1855): full larval description
*Gore (1971b); Z1, Z2, M: Lab
Megalobrachium roseum (Rathbun, 1900): full larval description
*Hernández et al. (2002); Z1, Z2, M: Lab
Megalobrachium sinuimanus (Lockington, 1878): larvae undescribed
Megalobrachium smithi (Glassell, 1936): larvae undescribed
Megalobrachium soriatum (Say, 1818): full larval description
*Gore (1973b); Z1, Z2, M: Lab
Megalobrachium tuberculipes (Lockington, 1878): larvae undescribed
Minyocerus angustus (Dana, 1852): partial larval description
Hernández et al. (1996); Z1: Lab
Minyocerus kirki Glassell, 1938: larvae undescribed
Neopetrolisthes alobatus (Laurie, 1926): larvae undescribed
Neopetrolisthes maculatus (H. Milne Edwards, 1837): partial larval description
Fujita and Osawa (2003); Z1, Z2: Lab
Kraus (2006); Z1: Pl
Neopetrolisthes spinatus Osawa & Fujita, 2001: partial larval description
Fujita and Osawa (2003); Z1, Z2: Lab
Neopisosoma angustifrons (Benedict, 1901): full larval description
*Gore (1977); Z1, Z2, M: Lab
Neopisosoma bicapillatum Haig, 1960: larvae undescribed
Neopisosoma curacaoense (Schmitt, 1924): larvae undescribed
Neopisosoma dohenyi Haig, 1960: larvae undescribed
Neopisosoma mexicanum (Streets, 1871): larvae undescribed
Neopisosoma neglectum Werding, 1986: full larval description
*Werding and Müller (1990); Z1, Z2, M: Lab
Neopisosoma orientale Werding, 1986: larvae undescribed
Novorostrum decorocrus Osawa, 1998: full larval description
*Fujita and Osawa (2005); Z1, Z2, M: Lab
Novorostrum indicum (De Man, 1893): partial larval description
Osawa (2000); Z1, Z2: Lab
Novorostrum phuketense Osawa, 1998: larvae undescribed
Novorostrum securiger (Melin, 1939): larvae undescribed
Orthochela pumila Glassell, 1936: larvae undescribed
Pachycheles sp.
Williamson (1970) as *Pachycheles* nrs39; Z2: Pl

Pachycheles ackleianus A. Milne-Edwards, 1880: larvae undescribed
Pachycheles attaragos Harvey & de Santo, 1997: larvae undescribed
Pachycheles barbatus A. Milne-Edwards, 1878: larvae undescribed
Pachycheles bellus (Osorio, 1887): larvae undescribed
Pachycheles biocellatus (Lockington, 1878): larvae undescribed
Pachycheles calculosus Haig, 1960: larvae undescribed
Pachycheles chacei Haig, 1956: partial larval description
Kraus (2006); Z1, Z2, M: Pl
Pachycheles chubutensis Boschi, 1963: partial larval description
González et al. (2006); Z1: Lab
Pachycheles crassus (A. Milne-Edwards, 1869): larvae undescribed
Pachycheles crinimanus Haig, 1960: larvae undescribed
Pachycheles cristobalensis Gore, 1970: larvae undescribed
Pachycheles garciaensis (Ward, 1942): partial larval description
Osawa (1997a); Z1: Lab
Pachycheles granti Haig, 1965: larvae undescribed
Pachycheles greeleyi (Rathbun, 1900): larvae undescribed
Pachycheles grossimanus (Guérin, 1835): larvae undescribed
Pachycheles hertwigi Balss, 1913: partial larval description
Ko (1999); Z1: Lab
Pachycheles holosericus Schmitt, 1921: larvae undescribed
Pachycheles johnsoni Haig, 1965: larvae undescribed
Pachycheles laevidactylus Ortmann, 1892: full larval description
*Boschi et al. (1967) as *Pachycheles haigae*; Z1, Z2, M: Lab
Pachycheles marcortezensis Glassell, 1936: larvae undescribed
Pachycheles monilifer (Dana, 1852): full larval description
*Gore (1973a); Z1, Z2, M: Lab
Pachycheles natalensis (Krauss, 1843): full larval description
Sankolli (1967); Z1: Lab
*Shenoy and Sankolli (1973a); Z1, Z2, M: Lab
*Yaqoob (1979d); Z1, Z2, M: Lab
Pachycheles panamensis Faxon, 1893: larvae undescribed
Pachycheles pectinicarpus Stimpson, 1858: larvae undescribed
Pachycheles pilosus (H. Milne Edwards, 1837): full larval description
*Piñate et al. (2005); Z1, Z2, M: Lab
Kraus (2006); Z1: Pl
Pachycheles pisoides (Heller, 1865): larvae undescribed
Pachycheles pubescens Holmes, 1900: full larval description
*McMillan (1972); Z1, Z2, M: Lab
*Gonor and Gonor (1973); PR, Z1, Z2, M: P+L
Pachycheles riisei (Stimpson, 1859): partial larval description
Kraus (2006); Z1: Pl
Pachycheles rudis Stimpson, 1859: full larval description

Knight (1966); Z1, Z2: Lab
*Gonor and Gonor (1973); PR, Z1, Z2, M: Lab
Pachycheles rugimanus A. Milne-Edwards, 1880: larvae undescribed
Pachycheles sahariensis Monod, 1933: larvae undescribed
Pachycheles sculptus (H. Milne Edwards, 1837): partial larval description
Osawa (1997a); Z1: Lab
Pachycheles serratus (Benedict, 1901): full larval description
*Rodríguez et al. (2004); Z1, Z2, M: Lab
Kraus (2006); Z1: Pl
Pachycheles setiferous Yang, 1996: larvae undescribed
Pachycheles setimanus (Lockington, 1878): larvae undescribed
Pachycheles spinidactylus Haig, 1957: larvae undescribed
Pachycheles spinipes (A. Milne-Edwards, 1873): larvae undescribed
Pachycheles stevensii Stimpson, 1858: full larval description
Kurata (1964); Z1, Z2: Pl
*Konishi (1987); Z1, Z2, M: Lab
Pachycheles subsetosus Haig, 1960: larvae undescribed
Pachycheles susanae Gore & Abele, 1974: partial larval description
Kraus (2006); Z1, Z2: Pl
Pachycheles tomentosus Hendersson, 1893: full larval description
* Tirmizi and Yaqoob (1979); Z1, Z2, M: Lab
Pachycheles trichotus Haig, 1960: larvae undescribed
Pachycheles velerae Haig, 1960: larvae undescribed
Pachycheles vicarius Nobili, 1901: larvae undescribed
Parapetrolisthes tortugensis (Glassell, 1945): partial larval description
Kraus (2006); Z1: Pl
Petrocheles australiensis (Miers, 1876): larvae undescribed
Petrocheles spinosus (Miers, 1876): full larval description
Gurney (1924); Z1: Pl
*Wear (1965); Z1-Z5: Pl; M: P+L
Wear (1966); PR: Lab
Petrolisthes aegyptiacus Werding & Hiller, 2007: larvae undescribed
Petrolisthes agassizii Faxon, 1893: larvae undescribed
Petrolisthes amoenus (Guérin Méneville, 1855): larvae undescribed
Petrolisthes armatus (Gibbes, 1850): full larval description
Lebour (1943); Z1: Lab
Lebour (1950); Z2: Pl
*Gore (1970); Z1, Z2, M: Lab
*Gore (1972a); Z1, Z2, M: Lab
Maris (1983); Z1, Z2: Pl
Petrolisthes artifrons Haig, 1960: larvae undescribed
Petrolisthes asiaticus (Leach, 1820): partial larval description
Osawa (1997b); Z1, Z2: Lab

Petrolisthes bifidus Werding & Hiller, 2004: larvae undescribed
Petrolisthes bispinosus Borradaile, 1900: larvae undescribed
Petrolisthes bolivarensis Werding & Kraus, 2003: full larval description
Kraus (2006); Z1, Z2, M: Pl
Petrolisthes borradailei Kropp, 1984: larvae undescribed
Petrolisthes boscii (Audouin, 1826): full larval description
*Yaqoob (1979a); Z1, Z2, M: Lab
Petrolisthes brachycarpus Sivertsen, 1933: larvae undescribed
Petrolisthes cabrilloi Glassell, 1945: larvae undescribed
Petrolisthes caribensis Werding, 1983: partial larval description
Kraus et al. (2004); Z1, Z2: Lab
Kraus (2006); Z1, Z2: Pl
Petrolisthes carinipes (Heller, 1861): larvae undescribed
Petrolisthes celebesensis Haig, 1981: larvae undescribed
Petrolisthes cinctipes (Randall, 1840): full larval description
*Gonor and Gonor (1973); PR, Z1, Z2, M: Lab
Petrolisthes coccineus (Owen, 1839): partial larval description
Osawa (1995); Z1, Z2: Lab
Petrolisthes cocoensis Haig, 1960: larvae undescribed
Petrolisthes columbiensis Werding, 1983: partial larval description
Kraus (2006); Z1: Pl
Petrolisthes crenulatus Lockington, 1878: larvae undescribed
Petrolisthes decacanthus Ortmann, 1897: larvae undescribed
Petrolisthes desmarestii (Guérin, 1835): larvae undescribed
Petrolisthes dissimulatus Gore, 1983: partial larval description
Kraus (2006); Z1: Pl
Petrolisthes donadio Hiller & Werding, 2007: larvae undescribed
Petrolisthes donanensis Osawa, 1997: larvae undescribed
Petrolisthes edwardsii (de Saussure, 1853): partial larval description
Kraus (2006); Z1: Pl
Petrolisthes eldredgei Haig & Kropp 1987: larvae undescribed
Petrolisthes elegans Haig, 1981: larvae undescribed
Petrolisthes elegantissimus Werding & Hiller, 2015: larvae undescribed
Petrolisthes elongatus (H. Milne Edwards, 1837): full larval description
*Wear (1964a); Z1: Lab; Z2, M: P+L
*Greenwood (1965); PR, Z1: Lab; Z2, M: P+L
Petrolisthes eriomerus Stimpson, 1871: full larval description
Forss and Coffin (1960); Z1, M: Lab
*Gonor and Gonor (1973); PR, Z1, Z2, M: Lab
Petrolisthes extremus Kropp & Haig, 1994: larvae undescribed
Petrolisthes fimbriatus Borradaile, 1898: larvae undescribed
Petrolisthes galapagensis Haig, 1960: larvae undescribed
Petrolisthes galathinus (Bosc, 1802): partial larval description

Kraus (2006); Z1: Pl
Petrolisthes gertrudae Werding, 1996: larvae undescribed
Petrolisthes glasselli Haig, 1957: larvae undescribed
Petrolisthes gracilis Stimpson, 1859: larvae undescribed
Petrolisthes granulosus (Guérin, 1835): full larval description
*Saelzer et al. (1986); PR, Z1, Z2, M: Lab
Petrolisthes haigae Chace, 1962: partial larval description
Hernández et al. (2007); Z1: Lab
Kraus (2006); Z1: Pl
Petrolisthes haplodactylus Haig, 1988: larvae undescribed
Petrolisthes hastatus Stimpson, 1858: partial larval description
Osawa (1997b); Z1, Z2: Lab
Petrolisthes haswelli Miers, 1884: larvae undescribed
Petrolisthes heterochrous Kropp, 1986: larvae undescribed
Petrolisthes hians Nobili, 1901: larvae undescribed
Petrolisthes hirtipes Lockington, 1878: larvae undescribed
Petrolisthes hirtispinosus Lockington, 1878: larvae undescribed
Petrolisthes hispaniolensis Werding & Hiller, 2005: larvae undescribed
Petrolisthes holotrichus Nobili, 1901: larvae undescribed
Petrolisthes inermis (Heller, 1862): larvae undescribed
Petrolisthes japonicus (De Haan, 1849): partial larval description
Muraoka and Konishi (1987); Z1: Lab
Osawa (1995); Z1, Z2: Lab
Petrolisthes jugosus Streets, 1872: partial larval description
Kraus (2006); Z1: Pl
Petrolisthes kranjiensis Johnson, 1970: larvae undescribed
Petrolisthes laevigatus (Guérin, 1835): full larval description
*Albornoz and Wehrtmann (1996); PR, Z1, Z2, M: Lab
Petrolisthes lamarckii (Leach, 1820): full larval description
Sankolli (1967); Z1: Lab
*Shenoy and Sankolli (1975); Z1, Z2, M: Lab
*Yaqoob (1979c); Z1, Z2, M: Lab
Petrolisthes leptocheles (Heller, 1861): larvae undescribed
Petrolisthes lewisi (Glassell, 1936): partial larval description
Kraus (2006); Z1: Pl
Petrolisthes limicola Haig, 1988: larvae undescribed
Petrolisthes lindae Gore & Abele, 1974: larvae undescribed
Petrolisthes magdalenensis Werding, 1978: full larval description
Müller and Werding (1990); Z1, Z2, M: Lab
*Hernández and Magan (2012); Z1, Z2, M: Lab
Petrolisthes manimaculis Glassell, 1945: larvae undescribed
Petrolisthes marginatus Stimpson, 1859: partial larval description
Kraus (2006); Z1: Pl

Petrolisthes masakii Miyake, 1943: larvae undescribed
Petrolisthes melini Miyake & Nakasone, 1966: partial larval description
Osawa (1995) as *Petrolisthes carinipes*; Z1, Z2: Lab
Petrolisthes mesodactylon Kropp, 1984: larvae undescribed
Petrolisthes militaris (Heller, 1862): larvae undescribed
Petrolisthes miyakei Kropp, 1984: larvae undescribed
Petrolisthes moluccensis (De Man, 1888): partial larval description
Osawa (1997b); Z1, Z2: Lab
Petrolisthes monodi Chace, 1956: partial larval description
Lebour (1959); M: Pl
Petrolisthes nanshensis Yang, 1996: larvae undescribed
Petrolisthes nigrunguiculatus Glassell, 1936: larvae undescribed
Petrolisthes nobilii Haig, 1960: partial larval description
Hernández et al. (2007); Z1: Lab
Petrolisthes novaezelandiae Filhol, 1885: full larval description
*Wear (1964b); Z1, Z2, M: P+L
*Greenwood (1965); PR, Z1: Lab; Z2, M: P+L
Petrolisthes obtusifrons Miyake, 1937: larvae undescribed
Petrolisthes ornatus Paulson, 1875: full larval description
*Yaqoob (1977b); Z1, Z2, M: Lab
Petrolisthes ortmanni Nobili, 1901: partial larval description
Kraus (2006); Z1: Pl
Petrolisthes perdecorus Haig, 1981: larvae undescribed
Petrolisthes platymerus Haig, 1960: full larval description
*Gore (1972b); Z1, Z2, M: Lab
Petrolisthes politus (Gray, 1831): full larval description
*Hernández et al. (2000); Z1, Z2, M: Lab
Petrolisthes polymitus Glassell, 1937: larvae undescribed
Petrolisthes pubescens Stimpson, 1858: partial larval description
Osawa (1995); Z1, Z2: Lab
Petrolisthes quadratus Benedict, 1901: partial larval description
Kraus (2006); Z1: Pl
Petrolisthes rathbunae Schmitt, 1921: larvae undescribed
Petrolisthes robsonae Glassell, 1945: full larval description
*García-Guerrero et al. (2005); Z1, Z2, M: Lab
Petrolisthes rosariensis Werding, 1982: partial larval description
Kraus (2006); Z1, Z2: Pl
Petrolisthes rufescens (Heller, 1861): full larval description
*Yaqoob (1974); Z1, Z2, M: Lab
Petrolisthes sanfelipensis Glassell, 1936: larvae undescribed
Petrolisthes sanmartini Werding & Hiller, 2002: larvae undescribed
Petrolisthes scabriculus (Dana, 1852): larvae undescribed
Petrolisthes schmitti Glassell, 1936: larvae undescribed

Petrolisthes squamanus Osawa, 1996: larvae undescribed
Petrolisthes teres Melin, 1939: larvae undescribed
Petrolisthes tiburonensis Glassell, 1936: larvae undescribed
Petrolisthes tomentosus (Dana, 1852): partial larval description
Osawa (1997b); Z1, Z2: Lab
Petrolisthes tonsorius Haig, 1960: full larval description
*Pellegrini and Gamba (1985); Z1, Z2, M: Lab
Kraus (2006); Z1: Pl
Petrolisthes tridentatus Stimpson, 1859: full larval description
*Gore (1971c); Z1, Z2, M: Lab
Kraus (2006); Z1: Pl
Petrolisthes trilobatus Osawa, 1996: partial larval description
Ko (2004); Z1: Lab
Petrolisthes tuberculatus (Guérin, 1835): larvae undescribed
Petrolisthes tuberculosus (H. Milne Edwards, 1837): larvae undescribed
Petrolisthes tuerkayi Naderloo & Apel, 2014: larvae undescribed
Petrolisthes unilobatus Henderson, 1888: full larval description
*Fujita et al. (2002); Z1, Z2, M: Lab
Petrolisthes uruma Osawa & Uyeno, 2013: larvae undescribed
Petrolisthes violaceus (Guérin, 1831): full larval description
Faxon (1879) as *Porcellana macrocheles*; Z2: Pl
*Wehrtmann et al. (1997); PR, Z1, Z2, M: Lab
Petrolisthes virgatus Paulson, 1875: larvae undescribed
Petrolisthes zacae Haig, 1968: full larval description
*Gore (1975); Z1, Z2, M: Lab
Pisidia sp
Barnich (1996); Z1, Z2: Pl
Rice and Williamson (1977) as *Pisidia* sp asm10; Z1, Z2, M: Pl
Pisidia bluteli (Risso, 1816): full larval description
Bourdillon-Casanova (1956) as *Porcellana bluteli*; Z1, Z2, M: Pl
Bourdillon-Casanova (1960) as *Porcellana bluteli*; M: Pl
Kaya and Özel (1992); Z1, Z2, M: Pl
Pisidia brasiliensis Haig, in Rodrigues da Costa, 1968: partial larval description
Hernández et al. (1996); Z1: Lab
Kraus (2006); Z1: Pl
Pisidia dehaanii (Krauss, 1843): full larval description
*Yaqoob (1979b); Z1, Z2, M: Lab
Pisidia delagoae (Barnard, 1955): larvae undescribed
Pisidia dispar (Stimpson, 1858): full larval description
Sheperd (1969); PR, Z1: Lab; Z2, M: P+L
Pisidia gordoni (Johnson, 1970): larvae undescribed
Pisidia inaequalis (Heller, 1861): partial larval description
Gurney (1938) as *Porcellana inaequalis*; PR, Z1, Z2: Pl

Pisidia longicornis (Linnaeus, 1767): full larval description
Dujardin (1843) as *Porcellana longicornis*; Z1: Lab
Gosse (1856) as *Galathea*; Z2: Pl
Bate (1879) as *Porcellana longicornis*; Z1: Pl
Hesse (1884) as *Porcellana platycheles*; Z1: Pl
Sars (1889) as *Porcellana longicornis*; Z1, Z2: P+L
Williamson (1915) as *Porcellana longicornis*; Z1, M: Pl
Webb (1921) as *Porcellana longicornis*; Z1, Z2: Pl
Gurney (1942) as *Porcellana* sp; Z2: Pl
*Lebour (1943) as *Porcellana longicornis*; Z1, Z2, M: P+L
Kurian (1956) as *Porcellana longicornis*; Z1, Z2, M: Pl
Lebour (1959) as *Porcellana longicornis*; M: Pl
Le Roux (1966) as *Porcellana longicornis*; Z1, Z2, M: P+L
Pisidia longimana (Risso, 1816): partial larval description
Kaya and Özel (1992); Z1, Z2: Pl
Pisidia magdalenensis (Glassell, 1936): larvae undescribed
Pisidia serratifrons (Stimpson, 1858): partial larval description
Sankolli (1967) as *Pisidia spinulifrons*; PR, Z1: Lab
Kim and Ko (2011); Z1, Z2: Lab
Pisidia streptocheles (Stimpson, 1858): larvae undescribed
Pisidia streptochiroides (Johnson, 1970): partial larval description
Sheperd (1969); PR, Z1: Lab; Z2: P+L
Pisidia striata Yang and Sun, 1990: larvae undescribed
Pisidia vanderhorsti (Schmitt, 1924): partial larval description
*Schoppe (1994) as *Clastotoechus vanderhorsti*; PR, Z1, Z2: Lab
Pisidia variabilis (Yang & Sun, 1985): larvae undescribed
Polyonyx biunguiculatus (Dana, 1852): larvae undescribed
Polyonyx boucheti Osawa, 2007: larvae undescribed
Polyonyx bouvieri Saint Joseph, 1900: larvae undescribed
Polyonyx confinis Haig, 1960: larvae undescribed
Polyonyx gibbesi Haig, 1956: partial larval description
Gore (1968); PR, Z1, Z2: Lab
Maris (1983); Z1, Z2: Pl
Polyonyx haigae McNeil, 1968: larvae undescribed
Polyonyx hendersoni Southwell, 1909: full larval description
Sankolli (1967); PR, Z1: Lab
*Shenoy and Sankolli (1973b): Z1, Z2, M: Lab
Polyonyx loimicola Sankolli, 1965: full larval description
*Shenoy and Sankolli (1973b): Z1, Z2, M: Lab
Polyonyx maccullochi Haig, 1965: larvae undescribed
Polyonyx nitidus Lockington, 1878: larvae undescribed
Polyonyx obesulus Miers, 1884: larvae undescribed
Polyonyx pedalis Nobili, 1905: larvae undescribed

Polyonyx plumatus Yang & Xu, 1994: larvae undescribed
Polyonyx quadratus Chace, 1956: larvae undescribed
Polyonyx quadriungulatus Glassell, 1935: full larval description
*Knight (1966); Z1, Z2, M: Lab
Polyonyx senegalensis Chace, 1956: larvae undescribed
Polyonyx sinensis Stimpson, 1858: larvae undescribed
Polyonyx spina Osawa, 2007: larvae undescribed
Polyonyx splendidus Sankolli, 1963: larvae undescribed
Polyonyx thai Werding, 2001: larvae undescribed
Polyonyx transversus (Haswell, 1882): full larval description
Sheperd (1969); PR, Z1: Lab; Z2, M: P+L
Polyonyx triunguiculatus Zehntner, 1894: larvae undescribed
Polyonyx tulearis Werding, 2001: larvae undescribed
Polyonyx utinomii Miyake, 1943: larvae undescribed
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Porcellana cancrisocialis Glassell, 1936: full larval description
*García-Guerrero et al. (2006); Z1, Z2, M: Lab
Porcellana caparti Chace, 1956: larvae undescribed
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Porcellana curvifrons Yang and Sun, 1990: larvae undescribed
Porcellana elegans Chace, 1956: larvae undescribed
Porcellana foresti Chace, 1956: larvae undescribed
Porcellana habei Miyake, 1961: larvae undescribed
Porcellana hancocki Glassell, 1938: larvae undescribed
Porcellana lillyae Lemaitre & Campos, 2000: larvae undescribed
Porcellana paguriconviva Glassell, 1936: larvae undescribed
Porcellana persica Haig, 1966: larvae undescribed
Porcellana platycheles (Pennant, 1777): full larval description
Couch (1843); Z1: Lab
Faxon (1879) as *Porcellana* (*Polyonyx*) *macrocheles*; Z2: Pl
Williamson (1915); Z1, M: Pl
Webb (1921); Z1: Pl
Lebour (1943); Z1, Z2, M: Lab
Le Roux (1961); PR, Z1, Z2, M: Lab
Kaya and Özel (1992); Z1, Z2, M: Pl
Barnich (1996); Z1, Z2: Pl
*González-Gordillo et al. (1996); Z1, Z2, M: Lab
Porcellana pulchra Stimpson, 1858: larvae undescribed
Porcellana sayana (Leach, 1820): full larval description
Brooks and Wilson (1881) as *Porcellana ocellata*; PR, Z1: Lab
Hernández et al. (1998); Z1, Z2, M: Lab
Porcellana sigsbeiana A. Milne-Edwards, 1880: full larval description

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Maris (1983); Z1, Z2: Pl
Porcellanella haigae Sankarankutty, 1963: larvae undescribed
Porcellanella triloba White, 1852: larvae undescribed
Pseudoporcellanella manoliensis Sankarankutty, 1961: larvae undescribed
Raphidopus ciliatus Stimpson, 1858: larvae undescribed
Raphidopus indicus Henderson, 1893: larvae undescribed
Raphidopus johnsoni Ng & Nakasone, 1994: larvae undescribed
Ulloaia perpusillia Glassell, 1938: larvae undescribed

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