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The World Amphipoda Database: History and Progress

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Abstract. We provide an overview of the World Amphipoda Database (WAD), a global species database that is part of the World Register of Marine Species (WoRMS). Launched in 2013, the database contains entries for over 10,500 accepted species names. Edited currently by 31 amphipod taxonomists, following WoRMS priorities, the WAD has at least one editor per major group. All accepted species are checked by the editors, as is the authorship available for all of the names. The higher classification is documented for every species and a type species is recorded for every genus name. This constitutes five of the 13 priorities for completion, set by WoRMS. In 2015, five LifeWatch grants were allocated for WAD activities. These included a general training workshop in 2016, together with data input for the superfamily Lysianassoidea and for a number of non-marine groups. Philanthropy grants in 2019 and 2021 covered more important gaps across the whole group. Further work remains to complete the linking of unaccepted names, original descriptions, and environmental information. Once these tasks are completed, the database will be considered complete for 8 of the 13 priorities, and efforts will continue to input new taxa annually and focus on the remaining priorities, particularly the input of type localities. We give an overview of the current status of the order Amphipoda, providing counts of the number of genera and species within each family belonging to the six suborders currently recognized.

Introduction

The order Amphipoda forms part of the superorder Peracarida, uniting a diverse group of small shrimp-like taxa that brood their young in a pouch, with no independent larval dispersal stage. Amphipods range in size from a millimetre in length to the supergiant amphipod, *Alicella gigantea* Chevreux, 1899, at 340 mm body length. Amphipods can be found in all marine habitats from beaches to the deepest ocean trenches, and have also colonized freshwaters and terrestrial habitats. Amphipods are important herbivores, detritivores, micropredators, scavengers, and ectoparasites and they form an important component of aquatic ecosystems. The World Amphipoda Database (WAD)

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(Horton *et al*., 2022; https://www.marinespecies.org/amphipoda/) is a global species database, providing the most up-to-date classification and catalogue of amphipod species names from all habitats, and is based on published literature. It is part of The World Register of Marine Species, a community-driven program to provide "An authoritative classification and catalogue of marine names" (WoRMS Editorial Board 2022; https://www.marinespecies.org/; (Horton *et al*., 2017; Vandepitte *et al*., 2018), which is now accepted as a global standard for marine species names (Vandepitte *et al*., 2018). As a global species database, WAD includes not only marine species, but also brackish, freshwater, and terrestrial amphipods. WoRMS (and WAD) is managed within the Aphia platform (Vandepitte *et al*., 2015) following a successful collaborative model between taxonomists and data managers (Costello *et al*., 2018; Kroh *et al*., 2018). Each taxonomic editor is responsible for the updating and curation of a taxon (or taxa). This editing process can take place online through the editor interface or, if uploads of larger amounts of data are needed, with the help of the Data Management Team (DMT).

The aim of the World Register of Marine Species is to provide an authoritative and comprehensive list of names of marine organisms, including information on synonymy and the most up-to-date higher classification. While highest priority goes to valid names, other names that have been used are included in order to serve as a guide to interpret the taxonomic literature and results in a scientifically valuable catalogue and bibliography. Each taxon page can hold a great deal of information in addition to the currently accepted taxonomic name and authority. Associated data can include, but is not limited to, the original description of the taxon (including links to the actual publication), additional references, type locality, type specimen, environment, geographic distribution and images.

In contrast to many earlier web-based checklists, WoRMS has a permanent host institution, the Flanders Marine Institute, VLIZ, in Belgium, that is a professional data centre, collaborating with the scientific community through an editorial board of around 300 peer-selected experts from all around the world and for all taxonomic groups. WoRMS is open-access and archived monthly with a Digital Object Identifier (DOI) to ensure long-term preservation of content, and is working towards full compliance with FAIR data practices (Wilkinson *et al.,* 2016).

This collaboration between a team of expert amphipod taxonomists and the DMT support of the WoRMS database has resulted in the generation of a freely available global database of amphipod names. This is a large dataset of more than 10,600 accepted species names (as of 6 November 2023 there are 15,897 total name entries, including higher taxa and unaccepted names), which can be used for a wide range of research and non-research applications. WAD/WoRMS can be used by individuals checking on the validity of names or conducting research on the dataset, and also by institutes and other globally important scientific databases (e.g., GenBank (GenBank, 2022; Benson *et al*., 2008); Barcode of Life Data System (BOLD, 2022; Ratnasingham & Hebert, 2007); Catalogue of Life (CoL; Bánki *et al*., 2022); Global Biodiversity Information Facility (GBIF; GBIF, 2022); and Ocean Biodiversity Information System (OBIS; OBIS, 2022)), which use WoRMS as the taxonomic backbone for their own databases. Beneficiaries of the information, which is often accessed through other databases that are fed by WoRMS, include scientists, consultants, conservationists, journalists, the general public, and many others.

The WAD has facilitated several studies on the Amphipoda, including analyses of the taxonomic impediment (Coleman, 2015), species discovery (Arfianti *et al*., 2018), global biogeography (Arfianti & Costello, 2020), surveys of types in museum collections (Lo Brutto, 2017), and genetic barcode gap analysis (Jażdżewska *et al*., 2021). Amphipod taxonomists and others also make frequent use of the WAD, to provide or confirm information on the systematic and taxonomic status of entities from the species level and upwards (e.g., to provide the most up-to-date list of species in a particular genus). This is exemplified by the 328 citations of the WAD to date (via google scholar) and the number of web hits for the database (800K in 2021).

History of the World Amphipoda Database

The World Amphipoda Database, in its current format, arose from a merger in 2010 of the World Amphipoda List, compiled over many years by Jim Lowry, with the European Register of Marine Species (ERMS) amphipod list, compiled by Mark Costello, Denise Bellan-Santini and Jean-Claude Dauvin, and edited up until 2013 with significant additions from the Register of Antarctic Marine Species (RAMS) Amphipoda list (De Broyer *et al*., 2007) and from other regional editors.

Original Amphipoda editors within WoRMS were Mark Costello, Denise Bellan-Santini, Jean Claude-Dauvin, & Wim Vader, with Claude de Broyer as editor of the Register of Antarctic Marine Species (RAMS) Amphipoda. The north-Atlantic lists were initially compiled from Costello *et al*. (1989), Brattegard (1997) and Vader *et al*. (1997). The Mediterranean and south Atlantic lists were compiled from Bellan-Santini *et al*. (1998), Marques and Bellan-Santini (1990; 1991), and Lopes *et al*. (1993). Antarctic species were compiled from De Broyer *et al*. (2007). Additional species were then found in Dauvin (1999) and Dauvin & Bellan-Santini (2002) for the French metropolitan coasts, and for Arctic seas, from Palerud & Vader (1991) and Vader & Bryzagin (1998).

Jim Lowry had, for many years, compiled an unpublished list for his own use and to share with other taxonomists. This comprehensive catalogue extended over four Microsoft Word documents in alphabetical order by amphipod family, and was submitted by Jim Lowry to the Data Management Team at VLIZ for incorporation into the APHIA database in 2009. In 2010, the information was added to WoRMS, after which Jim Lowry became Chief Editor of the World Amphipoda Database.

A new editorial team and launch of the World Amphipoda Database (WAD)

In 2012, following efforts to improve the list of deep-sea Amphipoda in the World Register of Deep-Sea Species (WoRDSS; Glover *et al*., 2022), it was recognized that although Jim Lowry's catalogue had been incorporated into WoRMS in 2010, the database had not been comprehensively

Figure 1. The logo of the World Amphipoda Database, with a diversity of amphipods, featuring from left to right, *Caprella mutica* Schurin, 1935; *Epimeria oxicarinata* Coleman, 1990; *Eusirus propeperdentatus* Andres, 1979; *Cyamus boopis* Lütken, 1870; *Cyphocaris richardi* Chevreux, 1905; and *Pegohyperia princeps* K. H. Barnard, 1931.

edited or updated since that time, and an entry page with an introduction to the database was lacking. The chief taxonomic editors, Tammy Horton, Claude de Broyer, and Jim Lowry, therefore enlisted 30 amphipod taxonomists to each take on responsibility for particular taxa in the database. With almost 10,000 species to manage, it was recognized that more experts were needed to share the task of keeping the database up-to-date and to enter more information about each taxon (e.g., original descriptions, environments, type localities, life-history traits etc.). Particular expertise was required to cover the non-marine amphipod taxa. An independent account and enumeration of all freshwater amphipod taxa had been made in connection with the global Freshwater Animal Diversity Assessment project, FADA (Väinölä *et al*., 2008; Balian *et al*., 2008). The list from that project was integrated with the WoRMS database when the WAD was established. The > 2100 amphipod species and subspecies recorded from fresh or inland waters account for *ca.* 20 % of the total known amphipod diversity (Väinölä *et al*., 2008; Horton *et al*., 2022).

In July 2013 the World Amphipoda Database http://www.marinespecies.org/amphipoda was launched and it was first presented at the 15th International Colloquium on Amphipoda, in Szczawnica, Poland, in September 2013. A front page was created with a logo (Fig. 1), a comprehensive introduction to the database, and a menu allowing users to access additional information, including the back catalogue of Amphipod Newsletters, which was first produced in 1972 and is still produced annually (https://www.marinespecies.org/amphipoda/newsletter.php). By the time it was launched, the order Amphipoda contained 9329 species divided into four suborders; there were just over 200 unchecked names and 30 quarantined taxa. The first job was to deal with these, and then to add all the new taxa that had been described since Jim Lowry's catalogue had been incorporated. This was managed with the help of the Data Management Team at VLIZ and involved the addition of data from around 200 publications. Once the database was more up-to-date, focus was turned to improving other aspects (see below) and continuing to add new taxa annually.

Priorities for improvement and aims for completion

The main priority of WoRMS, and therefore WAD, is to ensure that all valid species names are entered into the database, enabling users to find information on which names are currently accepted, which are unaccepted and which are uncertain (or temporary names) (Horton *et al*., 2017). Every newly input species requires data in addition to the species name and authority, and there is a priority list for entering further information on older taxa into the database.

The WoRMS Steering Committee (SC) has provided priority aims for completing the database over the next ten years. These are:

1 *To have at least one active editor per taxonomic group*
2 *To mark (accepted) species as "checked by editor"*
3 To document the basionym (original name)
4 *To complete missing authorships*
5 To document the original description of each species
6 To complete the environment flags
7 *To document higher classification*
8 To document type localities
9 *To document type species*
10 To document all published name combinations
11 To make available at least one image per species
12 To document (the general) distribution for each species
13 To document relevant species traits

Italicized priorities have been completed already for the WAD. These extra pieces of information are critical to the usability of the dataset. The authority and date of publication must be included, and the original description is linked to the original name as a reference, but preferably also made available as a PDF. This is particularly important when adding older taxa, as some older literature is hard to find. Unaccepted names including synonyms and older name combinations are also added to the database and linked to the currently accepted name. This allows users to find the valid name even if their taxon list is old and changes have taken place (as often happens in taxonomy!). Literature references that record changes in taxonomic status are linked to the taxon page so that the user can access this information. All information entered into the World Amphipoda Database reflects what is already published.

When the database was launched in 2013, many of the priority aims were far from completion, but targeted work through small grants since then has greatly improved the quality of the information in the database.

LifeWatch Data Grants 2015

The E-Science European LifeWatch Infrastructure for Biodiversity and Ecosystem Research targets different aspects of biodiversity research, and the Taxonomic Backbone of LifeWatch aims at bringing together taxonomic

Figure 2. Attendees at the World Amphipoda Database Editor Workshop at VLIZ, Oostende, Belgium, 2015. *Back row from left to right*: Ronald Vonk, Mikhail Daneliya, Sofie Vranken*, Bart Vanhoorne*, Claude De Broyer, Jim Lowry, Michal Grabowski, Lauren Hughes, Tomasz Mamos, Wim Vader, Anne-Nina Lörz, Oliver Coleman, Mike Thurston, Wolfgang Zeidler, and Risto Väinölä. *Front row from left to right:* Rebeca Gasca, Jean-Claude Dauvin, Stefanie Dekeyzer*, Krystof Jażdżewski, Kris White, Traudl Krapp-Schickel, Ed Hendrycks, Tammy Horton, Anne Helene Tandberg, Cris Serejo, and Leen Vandepitte*. Data Management Team (*).

and species-related data and filling gaps in our knowledge, expanding the content and enhancing the quality of taxonomic databases. In 2015, five Lifewatch grants were awarded to support amphipod editors to facilitate improvements to the taxonomic quality of WoRMS and the World Amphipoda Database (WAD) through editorship of particular taxa. These included an editor training workshop for all Amphipoda editors, and four small data grants for the non-marine Gammaroidea (excluding Baikalian taxa), other non-marine amphipod families, the superfamily Lysianassoidea and the family Niphargidae.

Amphipod editor workshop

Since the original launch of the WAD, bringing together the editorial team, there had not been a meeting of the editors and it became evident that the editing team would benefit from meeting physically together and having the opportunity to organize their editorial responsibilities. A further meeting was therefore planned that would provide training on how the editing should take place in a consistent manner, illustrate the methods and requirements of editing, work on particular projects and propose new analyses for the future. The workshop took place in 2015 at the Flanders Marine Institute (VLIZ), the host institute of WoRMS (Fig. 2). By the time of the workshop, the database held 9,915 valid species names. Priority editing tasks that needed to be completed were tackled to ensure that the database was an accurate reflection of the published literature, that it was up-to-date with newly published species, and that it remained the authoritative global list of amphipod species.

Non-marine Gammaroidea (excluding Baikalian taxa)

Taxon data (including original name, authority, environment, fossil status) were edited for 319 taxa on-line in Aphia, and updates for a further 105 taxa (*Echinogammarus* Stebbing, 1899, and *Chaetogammarus* Martynov, 1924) were provided to the data management team for upload. Missing genera (*Boeckia* G. O. Sars, 1894, *Fontogammarus* S. Karaman, 1931, *Rivulogammarus* S. Karaman, 1931, *Trichogammarus* Hou & Sket, 2016) were added with their respective constituent (child) taxa. Type localities and holotype specimen information were added when this information was available in the literature. Distribution and habitat information was added with appropriate reference sources linked for each taxon. Original description references as well as additional sources (re-descriptions, identification keys) were linked and in many cases supplemented by pdf files (Mamos & Grabowski, 2015).

Selected non-marine Amphipod families

Data were revised and added for all taxa within the families Bogidiellidae, Artesiidae, Hadziidae, and Metacrangonyctidae, partly for the Crangonyctidae, and for a number of very small families. These comprised about 250 valid non-marine

species, 45 additional marine species from the same families, and about 560 names in total, including original names, synonyms, and genus-group names (*ca.* 100). The progress corresponded to about 40% of the unattended groups that need to be covered for the non-marine Amphipoda (Väinölä *et al*., 2015).

Superfamily Lysianassoidea

The Lysianassoidea is a large superfamily that, at the time of the grant, contained 22 families, 173 genera, and just over 1000 accepted species in the WAD list (1,447 total accepted and unaccepted names). Targeted work resulted in the addition of 115 taxon names to the Lysianassoidea (54 accepted names, 21 of which were described in 2014–2016; 47 unaccepted, with the remainder being temporary names etc.). The 29 taxa (unaccepted) without authority were checked and the authority added; 316 original names and 271 original descriptions were linked. An additional 353 edits were made to existing taxon names in the database (Horton & Thurston, 2015).

Family Niphargidae

The Niphargidae is a large family of freshwater Amphipods living almost exclusively in subterranean waters of the Western Palearctic. The original lists of genera and species (nine accepted genera; 274 accepted species) in the WAD were outdated and incomplete. The data grant allowed one genus (*Niphargopsis* Chevreux, 1922) to be moved to *Niphargus* Schiödte, 1949, and two new genera (*Exniphargus* G. S. Karaman, 2016, *Niphargobatoides* G. S. Karaman, 2016) were added; 111 subspecies were raised to species rank; 34 new species were added; two species were moved into synonymy. The original names for 377 taxa (species and subspecies) were documented and missing original description sources were scanned and linked (Fišer & Horton, 2015). The authorities were completed for all taxa, and years of publication were revised where necessary. Type or neotype localities for 379 taxa were documented and information on the deposition of type, lectotype or neotype material was documented for 91 taxa. The etymology for 219 taxa was documented. The environmental requirements were revised for all species. The distribution for 379 taxa was documented at the level of country and FADA biogeographical regions (Fišer & Horton, 2015). This revision was a major improvement to the taxonomic backbone and eased all subsequent work on the group.

The "Talitraits" project

In 2018, a group targeting the inclusion of talitrids' traits ("Talitraits") in WoRMS met at the Hellenic Centre for Marine Research, Crete, for a workshop sponsored by LifeWatch Belgium, https://www.marinespecies.org/amphipoda/talitraits.php. The workshop supported the broad vision to combine taxonomy and ecology, to allow the formulation of clear, testable hypotheses with respect to the category "talitrids" in a species-environment approach. Providing a taxonomic backbone for talitrids and related traits was identified as the crucial passage to do so. A dataset in WoRMS was seen as the first step towards this timely change, and the "Talitraits" project was initiated to support this aim.

"Talitraits" thematic editors met to select a set of traits, consistent with the attributes already present in WoRMS, and sufficient to define coastal talitrids. Traits were prioritized and addressed, using the published literature. Priority traits were defined, and a set of traits common to the whole group of talitrids was identified to include: qualitative body size (2–200 mm); feeding strategy (omnivorous); and development (direct development). These traits were assigned to Talitridae shared at the family level and currently linked to https://www.marinespecies.org/traits/.

Agreement was met on the curation of coastal talitrids only (excluding the ecological category of "land-hoppers", i.e. species inhabiting moist substrates, such as grasslands, forest floors, leaf litter, stream banks) and among them specifically sand-hoppers and beach-hoppers. This restricted the focus to 195 species, rather than the approximately 364 species of Talitridae known, and to the selection of the "Country name—Exclusive Economic Zone" to be used when defining each species' distribution. The list of species and related literature from Jim's catalogue were made available on WoRMS.

The traits defined were scaled by priority, on the basis of availability in the literature of information related to the trait for most of the species considered; ecological relevance of the trait; link of the trait to other WoRMS datasets and working groups (e.g., parasites). Qualitative body size was defined as the first trait to be curated, given its availability for all species, and is now completed. A set of additional traits (such as behavioural traits), were indicated for a future focus.

VLIZ-WoRMS Philanthropy grants 2019 and 2021

More recently, two VLIZ-WoRMS Philanthropy Grants were awarded within the VLIZ Philanthropy project "Support the WoRMS editors", enabling focussed work to target particular gaps within the whole WAD. Within the Amphipoda, 1004 accepted taxa remained without original names documented (as of 24 June 2019). This gap was targeted, with an aim to complete the original name information for all accepted species within the World Amphipoda Database, and to reduce considerably the total number of amphipod species without an original name linked (a further 1198 unaccepted species) at the same time. As a result of this grant, all of the 1004 accepted species without an original name linked were completed. A total of 882 taxon names were added to the World Amphipod Database and 2785 edits were made to taxa in the database during the grant period, including linking the original name, linking the original description and correcting the environment and fossil status (Horton & Valls Domedel, 2019). Of the 1325 taxa without an environment documented, 519 remained. Additionally, 115 edits were made to the sources (including creation, addition of PDF documents to existing sources, or addition of links to journals when PDF versions of the articles were not available).

The 2021 Philanthropy grant allowed further work on the remaining gaps to be completed. All of the 167 accepted species and sub-species level taxa without an original name linked were completed, and all 2108 genera (accepted and unaccepted) in the WAD now have a type species linked

(> 400 of these were edited during the grant period). 1436 accepted species-level taxa had the original description source linked (more than half of the 2621 which were missing an original description at the beginning of the grant). More than 1100 edits were made to existing entries in the database including linkage to the original name, to the original description and edits of the habitat information or the fossil range (Horton & Valls Domedel, 2019).

Current Status of the World Amphipoda Database

Despite the considerable amount of work to complete gaps for the agreed priorities, the editing of the WAD is not yet complete. Work remains to complete the linking of original names (964 unaccepted taxa remain) and linking of original descriptions (780 unaccepted taxa remain). In addition, 234 species (of which 203 are unaccepted) remain without an environment flag (marine, brackish, fresh or terrestrial). Filling of these gaps will remain high on the priority list and will be managed on an ad-hoc basis until completed. Once these gaps are filled, the work will continue to input information on the new taxa described annually, which is currently an average of 137 per year (see Table 1), and focus will turn to completing the remaining priorities, particularly the input of type localities.

Table 1. Numbers of accepted taxa described per year since 2000, data from World Amphipoda Database (as of 12 May 2022).

year	all accepted names	species/subsp. names only
2000	69	55
2001	149	126
2002	174	126
2003	144	119
2004	137	116
2005	82	75
2006	159	144
2007	105	90
2008	66	51
2009	211	192
2010	134	109
2011	116	95
2012	257	211
2013	154	139
2014	149	135
2015	178	155
2016	109	87
2017	166	144
2018	114	103
2019	142	89
2020	117	88
2021	91	79
2022	25	18
total	**3,048**	**2,546**
average 2000–2021	**137**	**115**
average 2000–2010	**130**	**109**
average 2010–2020	149	123

Following major revisions of the higher-level systematics of the Amphipoda since 2003 (Myers & Lowry, 2003; Lowry, 2006; Lowry & Myers, 2012a, 2012b, 2013, 2016, 2017), the order Amphipoda in the WAD is now (as of 12 May 2022) comprised of six suborders: Amphilochidea, Colomastigidea, Hyperiidea, Hyperiopsidea, Pseudingolfiellidea & Senticaudata; 13 infraorders, 22 parvorders, 56 superfamilies, 242 families, 1766 genera, and 10,455 species. These revisions required the addition of previously unused ranks within the Amphipoda (parvorder and infraorder). Table 2 shows the breakdown of accepted and unaccepted taxa within the available ranks of Amphipoda in the WAD. The ingolfiellids (Ingolfiellidea) were traditionally a suborder within the Amphipoda ever since their description by Hansen in 1903. They were placed outside the Amphipoda by Lowry & Myers (2017) and raised to the rank of order Ingolfiellida. They continue to be maintained as part of the World Amphipoda Database owing to their historical placement. The ingolfiellidans are now a sister group to the amphipods and comprise 51 species (of which 19 are freshwater species), and about 100 taxon names (including species names and higher taxa). The taxonomy displayed in the WAD cannot always incorporate all the newest aspects of systematic relationships due to conflicting views, but does strive to provide information on alternative classifications and names used. An example of this is provided by the recent works on the systematics and diversity of freshwater gammaroid amphipods (Hou & Sket, 2016; Sket & Hou, 2018).

We present a list of accepted infraorders, superfamilies and families within each of the six suborders, providing counts of the number of genera and species within each family in three tables (Table 3: Amphilochidea; Table 4: Hyperiidea, Hyperiopsidea, Pseudingolfiellidea & Colomastigidea; Table 5: Senticaudata) to give an overview of this information. This provides a stable reference for the current state of amphipod systematics following the extensive higher-level revisions in recent years. The majority of taxa are in the suborders Amphilochidea (688 genera, 4196 species) and Senticaudata (974 genera, 5813 species).

Table 2. Number of taxon names at each of the available taxonomic ranks in the World Amphipoda Database (as of 12 May 2022). Note that "Unaccepted" includes all types of unaccepted names.

	accepted	unaccepted
suborder	6	3
infraorder	13	3
parvorder	22	0
superfamily	56	5
family	242	26
genus	1,766	339
subgenus	55	64
species	10,410	4,787
subspecies	177	697

Table 3. Suborder Amphilochidea: Alphabetical list of infraorders, superfamilies and families, providing counts of the number of genera and species within each family; data from the World Amphipoda Database (Horton *et al*., 2022; https://www.marinespecies.org/amphipoda/; downloaded 12 May 2022).

infraorder	superfamily	family	authority	genera	species
Amphilochida	Amphilochoidea	Amphilochidae	Boeck, 1871	14	92
		Bolttsiidae	J. L. Barnard & Karaman, 1987	1	2
		Cressidae	Stebbing, 1899	2	10
		Cyproideidae	J. L. Barnard, 1974	20	46
		Didymocheliidae	Bellan-Santini & Ledoyer, 1987	3	5
		Nihotungidae	J. L. Barnard, 1972	1	3
		Pleustidae	Buchholz, 1874	36	143
		Sebidae	Walker, 1908	1	25
		Seborgiidae	Holsinger in Holsinger & Longley, 1980	1	9
		Stenothoidae	Boeck, 1871	46	276
	Eusiroidea	Bateidae	Stebbing, 1906	1	14
		Eusiridae	Stebbing, 1888	12	123
		Miramarassidae	Lowry, 2006	1	1
		Thurstonellidae	Lowry & Zeidler, 2008	1	1
	Iphimedioidea	Acanthonotozomatidae	Stebbing, 1906	1	10
		Acanthonotozomellidae	Coleman & J. L. Barnard, 1991	4	8
		Amathillopsidae	Pirlot, 1934	4	21
		Dikwidae	Coleman & Barnard, 1991	1	2
		Epimeriidae	Boeck, 1871	2	90
		Iphimediidae	Boeck, 1871	15	105
		Lafystiidae	Sars, 1893	3	6
		Laphystiopsidae	Stebbing, 1899	3	8
		Ochlesidae	Stebbing, 1910	4	21
		Odiidae	Coleman & J. L. Barnard, 1991	6	20
		Sicafodiidae	Just, 2004	1	2
		Stilipedidae	Holmes, 1908	4	24
		Vicmusiidae	Just, 1990	1	2
	Leucothoidea	Leucothoidae	Dana, 1852	5	198
	Liljeborgioidea	Liljeborgiidae	Stebbing, 1899	3	121
	Liljeborgioidea	Pseudamphilochidae	Lowry & Myers, 2017	1	1
	Maxillipioidea	Maxillipiidae	Ledoyer, 1973	2	3
	Oedicerotoidea	Exoedicerotidae	J. L. Barnard & Drummond, 1982	12	20
		Oedicerotidae	Lilljeborg, 1865	46	252
		Paracalliopiidae	J. L. Barnard & Karaman, 1982	6	20
Lysianassida	Alicelloidea	Alicellidae	Lowry & De Broyer, 2008	7	17
		Parargissidae	Lowry & Myers, 2017	1	2
		Podoprionidae	Lowry & Stoddart, 1996	1	4
		Valettidae	Stebbing, 1888	1	2
		Valettiopsidae	Lowry & De Broyer, 2008	2	12
		Vemanidae	Lowry & Myers, 2017	1	4
	Aristioidea	Acidostomatidae	Stoddart & Lowry, 2012	2	11
		Ambasiidae	Lowry & Myers, 2017	2	3
		Aristiidae	Lowry & Stoddart, 1997	5	42
		Conicostomatidae	Lowry & Stoddart, 2012	6	19
		Derjugianidae	Lowry & Myers, 2017	1	1
		Endevouridae	Lowry & Stoddart, 1997	2	19
		Izinkalidae	Lowry & Stoddart, 2010	1	2
		Kergueleniidae	Lowry & Stoddart, 2010	2	26
		Lepidepecreellidae	Stoddart & Lowry, 2010	1	12
		Pakynidae	Lowry & Myers, 2017	12	38
		Sophrosynidae	Lowry & Stoddart, 2010	1	14
		Thoriellidae	Lowry & Stoddart, 2011	5	7
		Trischizostomatidae	Lilljeborg, 1865	1	18
		Wandinidae	Lowry & Stoddart, 1990	2	4
	Dexaminoidea	Atylidae	Lilljeborg, 1865	6	40
		Dexaminidae	Leach, 1814	12	127
		Lepechinellidae	Schellenberg, 1926	5	41

Table 3. (Continued).

infraorder	superfamily	family	authority	genera	species
		Melphidippidae	Stebbing, 1899	4	18
		Pardaliscidae	Boeck, 1871	23	80
	Haustorioidea	Cheidae	Thurston, 1982	3	3
		Condukiidae	J. L. Barnard & Drummond, 1982	1	1
		Haustoriidae	Stebbing, 1906	8	46
		Ipanemidae	J. L. Barnard & Thomas, 1988	1	1
		Otagiidae	Hughes & Lörz, 2013	1	1
		Phoxocephalidae	G. O. Sars, 1891	79	371
		Phoxocephalopsidae	J. L. Barnard & Drummond, 1982	5	14
		Platyischnopidae	J. L. Barnard & Drummond, 1979	10	18
		Pontoporeiidae	Dana, 1852	3	4
		Priscillinidae	d'Udekem d'Acoz, 2006	1	2
		Sinurothoidae	Ren, 1999	1	2
		Urohaustoriidae	J. L. Barnard & Drummond, 1982	9	23
		Urothoidae	Bousfield, 1978	6	64
		Zobrachoidae	J. L. Barnard & Drummond, 1982	5	6
	Lysianassoidea	Adeliellidae	Lowry & Myers, 2017	1	3
		Amaryllididae	Lowry & Stoddart, 2002	8	37
		Cebocaridae	Lowry & Stoddart, 2011	9	15
		Cyclocaridae	Lowry & Stoddart, 2011	1	4
		Cyphocarididae	Lowry & Stoddart, 1997	2	19
		Eurytheneidae	Stoddart & Lowry, 2004	1	10
		Hirondelleidae	Lowry & Stoddart, 2010	1	20
		Lysianassidae	Dana, 1849	29	130
		Opisidae	Lowry & Stoddart, 1995	4	19
		Scopelocheiridae	Lowry & Stoddart, 1997	12	26
		Tryphosidae	Lowry & Stoddart, 1997	43	385
		Uristidae	Hurley, 1963	26	189
	Stegocephaloidea	Stegocephalidae	Dana, 1852	26	109
	Synopioidea	Ampeliscidae	Krøyer, 1842	4	318
		Argissidae	Walker, 1904	1	1
		Synopiidae	Dana, 1853	17	108
			total	688	4,196

Conclusions and future plans

The World Amphipoda Database provides an example of a successful collaboration between taxonomist experts and database managers. It would not exist if it were not for the immense work of Jim Lowry to collate the original world catalogue. At the time of writing this article Jim and his network of collaborators had contributed 62 new families, 129 new genera, and 548 new species of amphipods from the time he published his first taxonomic paper on the group in 1972 across a career spanning 55 years (Hughes *et al*., 2023).

The WAD is an ever-expanding database, with an average of 137 newly described taxon names entered into the database annually (Table 1), with edits to and additions of older names being made all the time. The database still contains residual errors and there are certain taxa that have received less focussed attention and will need targeted improvement in the future. Amphipoda systematics are in a state of flux, particularly due to new insights from molecular data and the fact that this information is not yet available for many of the relevant taxa (Copilaș-Ciocianu *et al*., 2020).

Users of the database are encouraged to point out errors to the Data Management Team using the single contact email info@marinespecies.org and queries will be passed to the relevant editor. Contributors are acknowledged annually on the WAD webpages.

Table 4. Suborders Hyperiidea, Hyperiopsidea, Pseudingolfiellidea & Colomastigidea: Alphabetical list of infraorders, superfamilies and families, providing counts of the number of genera and species within each family; data from the World Amphipoda Database (Horton *et al*., 2022; https://www.marinespecies.org/amphipoda/; downloaded 12 May 2022).

suborder/Infraorder	superfamily	family	authority	genera	species
Hyperiidea					
Physocephalata	Phronimoidea	Bougisidae	Zeidler, 2004	1	1
		Cystisomatidae	Willemöes-Suhm, 1875	1	6
		Dairellidae	Bovallius, 1887	1	1
		Hyperiidae	Dana, 1852	7	29
		Iulopididae	Zeidler, 2004	1	2
		Lestrigonidae	Zeidler, 2004	6	17
		Phronimidae	Rafinesque, 1815	2	11
		Phrosinidae	Dana, 1852	3	8
	Platysceloidea	Amphithyridae	Zeidler, 2016	3	9
		Anapronoidae	Bowman & Gruner, 1973	1	2
		Brachyscelidae	Stephensen, 1923	1	5
		Eupronoidae	Zeidler, 2016	2	9
		Lycaeidae	Claus, 1879	2	11
		Lycaeopsidae	Chevreux, 1913	1	2
		Oxycephalidae	Dana, 1852	8	18
		Parascelidae	Bovallius, 1887	4	7
		Platyscelidae	Spence Bate, 1862	4	11
		Pronoidae	Dana, 1852	1	1
		Thamneidae	Zeidler, 2016	1	1
		Tryphanidae	Boeck, 1871	1	1
	Vibilioidea	Cyllopodidae	Bovallius, 1887	1	2
		Paraphronimidae	Bovallius, 1887	1	3
		Vibiliidae	Dana, 1852	2	19
Physosomata	Lanceoloidea	Chuneolidae	Woltereck, 1909	1	3
		Lanceolidae	Bovallius, 1887	2	16
		Megalanceolidae	Zeidler, 2009	2	4
		Metalanceolidae	Zeidler, 2009	1	1
		Microphasmidae	Stephensen & Pirlot, 1931	2	2
		Mimonecteolidae	Zeidler, 2009	1	7
		Prolanceolidae	Zeidler, 2009	1	1
Physosomata	Scinoidea	Archaeoscinidae	K. H. Barnard, 1930	2	6
		Microscinidae	Zeidler, 2012	1	1
		Mimonectidae	Bovallius, 1885	3	13
		Mimoscinidae	Zeidler, 2012	1	3
		Scinidae	Stebbing, 1888	4	49
Total (Hyperiidea)				76	282
Hyperiopsidea					
Hyperiopsida	Hyperiopsoidea	Hyperiopsidae	Bovallius, 1886	2	11
		Vitjazianidae	Birstein & M. Vinogradov, 1955	1	1
	Podosiroidea	Podosiridae	Lowry & Myers, 2012	2	3
Pseudingolfiellidea					
Pseudingolfiellida	Pseudingolfielloidea	Pseudingolfiellidae	Lowry & Myers, 2012	1	4
Colomastigidea					
Colomastigida	Colomastigoidea	Colomastigidae	Chevreux, 1899	2	55
	Pagetinoidea	Pagetinidae	K. H. Barnard, 1931	1	4
Amphipoda incertae sedis					
null	null	Iciliidae	Dana, 1849	1	7
		Paramphithoidae	G. O. Sars, 1883	1	7
		Regaliidae	Lowry, 2006	1	3
		Sanchoidae	Lowry, 2006	2	4
total (all suborders and incertae sedis)				90	381

Table 5. Suborder Senticaudata: Alphabetical list of infraorders, superfamilies and families, providing counts of the number of genera and species within each family; data from the World Amphipoda Database (Horton *et al*., 2022; https://www.marinespecies.org/amphipoda/; downloaded 12 May 2022).

infraorder	superfamily	family	authority	genera	species
Bogidiellida	Bogidielloidea	Artesiidae	Holsinger, 1980	2	9
		Bogidiellidae	Hertzog, 1936	37	115
		Parabogidiellidae	Cannizzaro & Sawacki *in* Cannizzaro, Gibson & Sawacki, 2020	2	2
		Salentinellidae	Bousfield, 1977	2	14
Carangoliopsida	Carangoliopsoidea	Carangoliopsidae	Bousfield, 1977	1	1
		Kairosidae	Lowry & Myers, 2013	1	1
Corophiida	Aetiopedesoidea	Aetiopedesidae	Myers & Lowry, 2003	1	1
		Paragammaropsidae	Myers & Lowry, 2003	2	2
	Aoroidea	Aoridae	Stebbing, 1899	26	260
		Unciolidae	Myers & Lowry, 2003	17	43
	Caprelloidea	Caprellidae	Leach, 1814	96	447
		Caprogammaridae	Kudrjaschov & Vassilenko, 1966	1	2
		Cyamidae	Rafinesque, 1815	8	29
		Dulichiidae	Dana, 1849	7	30
		Podoceridae	Leach, 1814	8	89
	Cheluroidea	Cheluridae	Allman, 1847	3	4
	Chevalioidea	Chevaliidae	Myers & Lowry, 2003	2	14
	Corophioidea	Ampithoidae	Boeck, 1871	16	241
		Corophiidae	Leach, 1814	25	162
	Isaeoidea	Isaeidae	Dana, 1852	2	5
	Microprotopoidea	Australomicroprotopidae	Myers, Lowry & Billingham, 2016	1	1
		Microprotopidae	Myers & Lowry, 2003	1	5
	Neomegamphoidea	Neomegamphopidae	Myers, 1981	6	22
		Priscomilitaridae	Hirayama, 1988	2	3
	Photoidea	Ischyroceridae	Stebbing, 1899	51	287
		Kamakidae	Myers & Lowry, 2003	10	41
		Photidae	Boeck, 1871	18	235
	Protodulichioidea	Protodulichiidae	Ariyama *in* Ariyama & Hoshino, 2019	1	1
	Rakirooidea	Rakiroidae	Myers & Lowry, 2003	1	1
Gammarida	Allocrangonyctoidea	Allocrangonyctidae	Holsinger, 1989	1	2
		Crymostygidae	Kristjánsson & Svavarsson, 2004	1	1
		Dussartiellidae	Lowry & Myers, 2012	2	3
		Kergueleniolidae	Lowry & Myers, 2013	1	1
		Pseudoniphargidae	Karaman, 1993	3	74
	Crangonyctoidea	Austroniphargidae	Iannilli, Krapp & Ruffo, 2011	3	5
		Chillagoeidae	Lowry & Myers, 2012	1	1
		Crangonyctidae	Bousfield, 1973	10	234
		Giniphargidae	Lowry & Myers, 2012	1	1
		Kotumsaridae	Messouli, Holsinger & Ranga Reddy, 2007	1	1
		Neoniphargidae	Bousfield, 1977	7	22
		Niphargidae	Bousfield, 1977	9	432
		Paracrangonyctidae	Bousfield, 1983	1	2
		Paramelitidae	Bousfield, 1977	16	70
		Perthiidae	Williams & J. L. Barnard, 1988	1	2
		Pseudocrangonyctidae	Holsinger, 1989	2	38
		Sandroidae	Lowry & Myers, 2012	1	3
		Sternophysingidae	Holsinger, 1992	1	8
		Uronyctidae	Lowry & Myers, 2012	1	1
	Gammaroidea	Acanthogammaridae	Garjajeff, 1901	34	122
		Anisogammaridae	Bousfield, 1977	12	65
		Baikalogammaridae	Kamaltynov, 2002	1	1
		Bathyporeiidae	d'Udekem d'Acoz, 2011	2	24
		Behningiellidae	Kamaltynov, 2002	3	4
		Carinogammaridae	Tachteew, 2001	1	1
		Crypturopodidae	Kamaltynov, 2002	9	37
		Eulimnogammaridae	Kamaltynov, 1999	16	114

Table 5. (Continued).

infraorder	superfamily	family	authority	genera	species
		Falklandellidae	Lowry & Myers, 2012	3	3
		Gammaracanthidae	Bousfield, 1989	1	4
		Gammarellidae	Bousfield, 1977	2	6
		Gammaridae	Leach, 1814	37	441
		Iphigenellidae	Kamaltynov, 2002	1	3
		Lucioblividae	Tomikawa, 2007	1	1
		Macrohectopidae	Sowinsky, 1915	1	1
		Mesogammaridae	Bousfield, 1977	6	8
		Micruropodidae	Kamaltynov, 1999	3	41
		Ommatogammaridae	Kamaltynov, 2010	3	5
		Pachyschesidae	Kamaltynov, 1999	1	16
		Pallaseidae	Tachteew, 2001	8	21
		Paraleptamphopidae	Bousfield, 1983	3	5
		Phreatogammaridae	Bousfield, 1983	3	6
		Pontogammaridae	Bousfield, 1977	11	37
		Sensonatoridae	Lowry & Myers, 2012	1	1
		Typhlogammaridae	Bousfield, 1978	5	9
		Zaramillidae	Lowry & Myers, 2016	1	1
Hadziida	Calliopioidea	Calliopiidae	G. O. Sars, 1893	28	105
		Cheirocratidae	d'Udekem d'Acoz, 2010	7	19
		Hornelliidae	d'Udekem d'Acoz, 2010	1	13
		Megaluropidae	Thomas & J. L. Barnard, 1986	4	16
		Pontogeneiidae	Stebbing, 1906	29	168
	Hadzioidea	Crangoweckeliidae	Lowry & Myers, 2012	2	3
		Eriopisidae	Lowry & Myers, 2013	21	77
		Gammaroporeiidae	Bousfield, 1979	1	1
		Hadziidae	S. Karaman, 1943	27	93
		Maeridae	Krapp-Schickel, 2008	48	413
		Melitidae	Bousfield, 1973	31	178
		Metacrangonyctidae	Boutin & Messouli, 1988	2	20
		Nuuanuidae	Lowry & Myers, 2013	3	25
	Magnovioidea	Magnovidae	Alves, Lowry & Jonsson, 2020	1	1
Talitrida	Caspicoloidea	Caspicolidae	Birstein, 1945	1	1
	Hyaloidea	Ceinidae	J. L. Barnard, 1972	3	7
		Chiltoniidae	J. L. Barnard, 1972	10	22
		Dogielinotidae	Gurjanova, 1953	9	39
		Eophliantidae	Sheard, 1936	6	16
		Hyalellidae	Bulyčeva, 1957	1	89
		Hyalidae	Bulyčeva, 1957	12	150
		Najnidae	J. L. Barnard, 1972	2	12
		Phliantidae	Stebbing, 1899	7	32
		Plioplateidae	J. L. Barnard, 1978	1	2
		Temnophliantidae	Griffiths, 1975	2	2
	Kurioidea	Kuriidae	J. L. Barnard, 1964	2	2
		Tulearidae	Ledoyer, 1979	1	1
	Talitroidea	Arcitalitridae	Myers & Lowry, 2020	15	35
		Brevitalitridae	Myers & Lowry, 2020	8	24
		Curiotalitridae	Myers & Lowry, 2020	1	1
		Makawidae	Myers & Lowry, 2020	22	39
		Protorchestiidae	Myers & Lowry, 2020	6	24
		Talitridae	Rafinesque, 1815	77	236
		Uhlorchestiidae	Myers & Lowry, 2020	1	2
			total	974	5,813

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