ACTA BIOLOGICA SLOVENICA
LJUBLJANA 2018 Vol. 61, Št. 1: 93–102

Family Gammaridae (Crustacea: Amphipoda), mainly its *Echinogammarus* clade in SW Europe. Further elucidation of its phylogeny and taxonomy

Družina Gammaridae (Crustacea: Amphipoda), posebej njena veja *Echinogammarus* v JZ Evropi. Nadaljnja razjasnitev filogenetskih in taksonomskih odnosov

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Abstract: Most parts of the *Echinogammarus* clade of Gammaridae have been appropriately classified with the help of a molecular analysis, ultimately freed of the *Echinogammarus*-*Chaetogammarus* malediction. Among defining morphological characters, the gnathopod interrelations are comparatively well congruent with molecular markers. Genus *Homoeogammarus* distribution area extended from Mediterranean to Atlantic islands. *Chaetogammarus* and *Trichogammarus* are firm members of the morphologically very diversified Ponto-Caspian group genera, not closely related to the morphologically similar *Echinogammarus, Marinogammarus* or *Homoeogammarus*. Genus *Pectenogammarus* (along with *Neogammarus* and *Laurogammarus*) synonymized with *Homoeogammarus*. *Parhomoeogammarus* diagnose corrected, based on topotype samples of the type species. Freshwater species of the 'European *Eulimnogammarus*' in SW Europe defined as *Iberogammarus* gen. nov. Continental *Homoeogammarus*-like, but molecularly distinct group, defined as *Dinarogammarus* gen. nov. Some here accepted genera are molecularly well supported, some are morphologically difficult to distinguish, but each one is morphologically homogeneous; they are also geographically well defined. In both respects, the very speciose and widely spread *Homoeogammarus* is different.

Keywords: Amphipoda, Gammaridae, systematics, molecular phylogeny, biogeography, new genera

Izvleček: Večino taksonov klada *Echinogammarus* družine Gammaridae smo uspeli z molekulsko analizo primerno razvrstiti in končno rešiti prekletstva imen *Echinogammarus*-*Chaetogammarus*. Med morfološkimi znaki omogoča velikost gnatopodov I in II klasifikacijo, ki je dokaj skladna s klasifikacijo po molekulskih znakih. Izkazalo se je, da razširjenost rodu *Homoeogammarus* seže od sredozemskih otokov daleč v Atlantik. *Chaetogammarus* in *Trichogammarus* sta člana morfološko zelo razčlenjene ponto-kaspijske skupine rodov in nista blizu morfološko podobnim rodovom *Echinogammarus, Marinogammarus* ali *Homoeogammarus*. Rodovi *Pectenogammarus, Neogammarus* in *Laurogammarus* so sinonimni s *Homoeogammarus*.

Na osnovi topotipskih osebkov tipske vrste smo popravili diagnozo rodu *Parhomoeogammarus*. Sladkovodne vrste 'evropskega *Eulimnogammarus*' iz JZ Evrope smo definirali kot *Iberogammarus* gen. nov.. Kontinentalne populacije, podobne rodu *Homoeogammarus*, vendar molekulsko drugačne, smo definirali kot *Dinarogammarus* gen. nov.. Nekateri tukaj definirani rodovi so molekulsko podprti, nekatere je težko določiti morfološko, vsak zase pa je morfološko enoten; so tudi geografsko definirani. Vrstno razčlenjen in geografsko zelo razširjen rod *Homoeogammarus* je težko definirati le morfološko.

Ključne besede: Amphipoda, Gammaridae, sistematika, molekulska filogenija, biogeografija, novi rodovi.

Introduction

The previous attempt to classify the family Gammaridae on numerous samples from the entire distribution area, of the essentially entire ecological range and with most of its supposedly subordinate groups, has shown that a purely morphological characterisation can not give us a phylogenetically plausible system. The most surprising result of molecularly grounded studies is the nesting of endemic, highly aberrant (disparate) endemic 'families' from the lake Bajkal (e.g. Baikalogammaridae, Macrohectopidae, Pallaseidae; Lowry and Myers 2013, Kamaltynov 1999, Tahteev 2000), within the genus *Gammarus*; this had been pointed out by Macdonald et al. (2005) and verified by Hou and Sket (2016). Similar is the situation with Pontic families (Pontogammaridae beside Gammaridae; Grabowski 2014, Lowry and Myers 2013) which however still retained a phylogenetic status of genera, but within the family Gammaridae.

Gammaridae with shortened endopodite of uropod III make the family particularly difficult to classify. Even among the molecularly well supported genus *Gammarus* outside the strange Bajkal, there are species, which have erroneously been classified as separate genera, like *Fontogammarus* (S. Karaman 1931).

The majority of gammarids with shortened uropod III endopodite have been classified as species of *Echinogammarus* or *Chaetogammarus*, some of them changing their position between these two genera, occasionally completed by *Marinogammarus* and some others. The authors either did not make much effort with reasoning their decisions or the reasoning was not very convincing. But even the very serious attempt of Stock (1968) gave no happy result.

After the ancient Schellenberg's (1937a), among the most comprehensive revisions were made by Stock (1968) and by Karaman (1977a). Stock synonymized the taxa *Homoeogammarus, Parhomoeogammarus, Ostiogammarus* with *Echinogammarus,* while in *Chaetogammarus* he united the Pontocaspian member with some Mediterranean and Atlantic species. Karaman included *Chaetogammarus, Marinogammarus, Pectenogammarus,* the European *Eulimnogammarus* into *Echinogammarus* and rejected the majority of previously used taxonomical characters as not being genus specific. Later, Karaman (1977b) rejected also the genus *Neogammarus*. Nevertheless, Lowry and Myers (2013) revived all these genera (except *Eulimnogammarus*).

Only recently (Hou and Sket 2016) a molecularly based analysis separated most of above mentioned genera. However, some parts of the family still remained unresolved. The most confusing is the Stock's (1969) 'west European *Eulimnogammarus*', homonymous with a Bajkalian genus, but evidently being molecularly close to European genera. In this paper we are trying to solve this and some additional problems.

Material and methods

Samples

Animals were caught by a hand net and preserved in 96% ethanol, exchanged after the first fixation. At least taxonomically important parts

of the biochemically treated specimens have been preserved for a later morphological examination and/or study.

This paper is aimed to answer some phylogenetic and taxonomical questions left open in Hou and Sket (2016). We could direct our sampling mainly to areas of highest diversity at the genus level, which appeared to be the SW Europe and the shallow seas washing it. This includes the Macaronesian islands, Canaries and Madeira. The main subject of the analysis are groups of the clade *Echinogammarus*, while the clades *Gammarus* and *Sarothrogammarus* have only been used in some comparisons, evaluations.

As genera have been designated the sub-clades characterised by a high molecular or morphological singularity (e. g. *Iberogammarus*) or separated by other branches of such a character (e. g. *Chaetogammarus* within the Ponto-Caspian group of genera), if at least 80% support.

Therefore, our attention was focused on obtaining topotype samples of species, particularly type species of established or potential genera. We only attributed the species identity to samples from type localities and being morphologically adequate. The species identity can only be assured in topotype samples, since even the morphology of a population may change through the year (Pinkster 1988). For some details on sampling see Hou and Sket (2016).

Molecular methods

Total genomic DNA was extracted from specimens using the Tiangen Genomic DNA kit. Four different gene regions were amplified with primers in Hou *et al*. (2011), including nuclear fragments of 28S rRNA, 18S rRNA, elongation factor 1a (EF-1a), and a portion of mitochondrial cytochrome oxidase subunit I (COI). Sequence chromatograms were proofed and edited using Sequencher 4.2 DEMO (Gene Codes Corporation, Inc). Sequences were aligned using Clustal X (Thompson *et al*. 1997) and adjusted by eye using MacClade 4.06 (Maddison and Maddison 2000). The COI and EF-1a fragments were translated using *Drosophila* mitochondrial DNA or universal genetic code on MacClade to check for the pseudogenes.

The best-fitting partitioning schemes and nucleotide substitution models were selected using PartitionFinder 1.1.1 with the Bayesian information criterion (Lanfear *et al*. 2012). The four-partition scheme defined by gene region was selected as best-fitting scheme, 28S with SYM+I+G substitution model, COI with TIM+I+G model, 18S with GTR+I+G model and EF-1a with TrNef+I+G model. The phylogeny was reconstructed under maximum parsimony (MP) and maximum likelihood (ML). MP analyses were performed using PAUP* 4.0b10 (Swofford 2002). All phylogenetically uninformative characters were excluded from the analysis, and gaps were treated as missing data. Heuristic searches were conducted using tree bisection reconnection branch swapping, with a limit of one million rearrangements for each replicate. Bootstrap support indices were generated based on 1000 bootstrap replicates with ten random-addition sequences. ML analysis was performed using RAxML 8.2.9 (Stamatakis 2014), staring with 1000 rapid bootstrap replications followed by a thorough tree search. The GTR-GAMMA model of rate heterogeneity was used for the four-gene partition scheme. To compare the tree topology, ML analysis was implemented using GARLI 2.01 (Genetic Algorithm for Rapid Likelihood Inference; Zwickl, 2006), with four-gene partition model.

Results

The alignment of the combined data set contained 266 taxa (Table S1) with 5149 base pairs (bp), including 1507 bp for 28S, 656 bp for COI, 2385 bp for 18S, and 601 bp for EF-1a. All new sequences were deposited in GenBank (accession numbers MK159866–MK159939, MK176331, MK176332). The MP and ML analyses produced congruent phylogenetic trees, except for a few disagreements with lower support values. The main discrepancy was tip nodes within the Ponto-Caspian group of genera, with short branches.

A number of purposely collected new samples-taxa caused no substantial change in the previously (Hou and Sket 2016) constructed parts of the phylogram, but clarified some previously unclear situations (Fig. 1 and Suppl. Fig. 1).

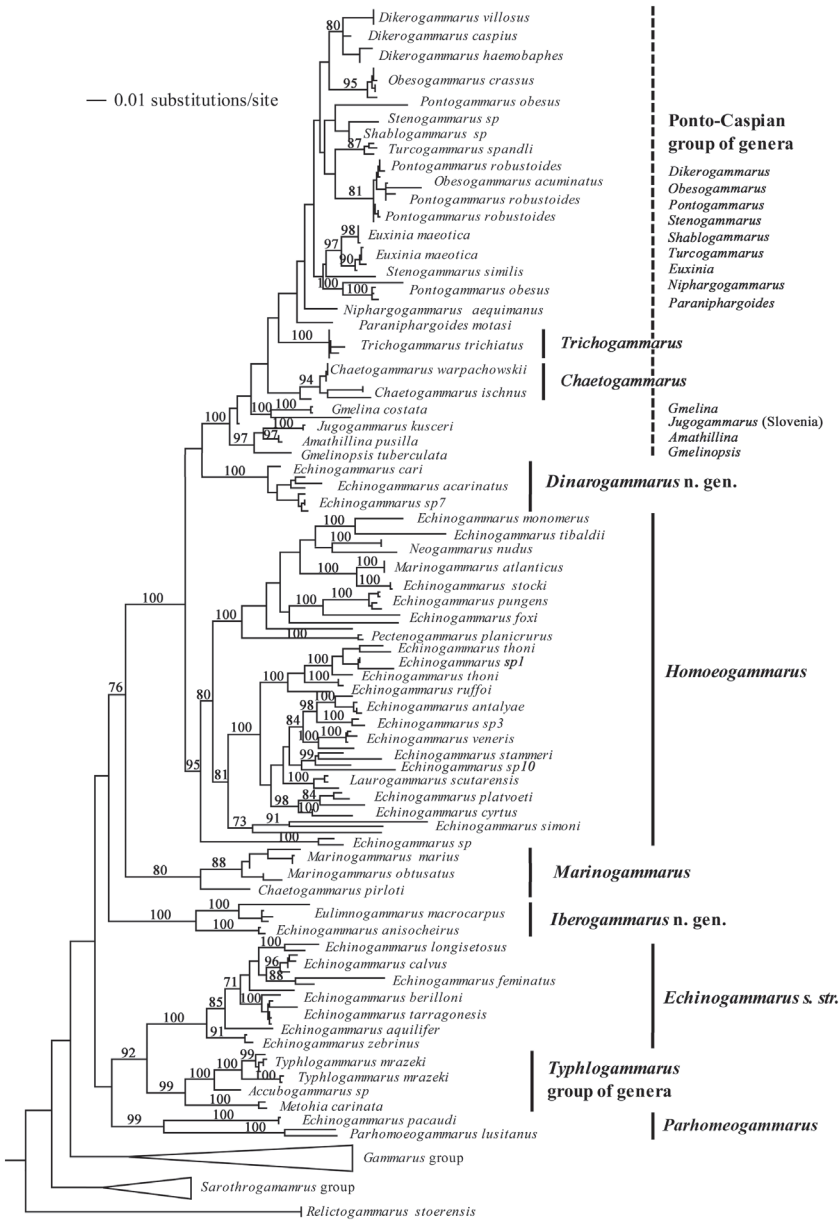

Figure 1: Maximum likelihood phylogenetic tree of *Echinogammarus* based on the combined analysis of mitochondrial (COI) and nuclear (28S, 18S and EF-1a) markers. Numbers represent statistical bootstrap supports of nodes. Taxonomical information is presented in S2.

Slika 1: Filogenetsko drevo veje *Echinogammarus* po analizi maximum likelihood (ML) na osnovi kombiniranih mitohondrijskih (COI) in jedrnih (28S, 18S and EF-1a) podatkov. Številke nad vejami so vrednosti ML bootstrap. Vrstna imena so provizorična, taksonomske rešitve so prikazane v S2.

After basally branching off of the *Relictogammarus* and the *Sarothrogammarus* clades, the gammarids divide into the *Gammarus* clade with generally plesiomorphic uropod III (with well developed endopodite) and the *Echinogammarus* clade with generally apomorphic uropod III (with more or less reduced endopodite). The plesiomorphy of the mentioned character (discussed by Hou and Sket 2016) is not in accord with the sequence of the tree branching.

The *Echinogammarus* clade is further clearly split into a number of well supported monophyla, while the sequence of branching off events is unclear, poorly supported. Well supported groups within the *Echinogammarus* large clade are:

- *Parhomoeogammarus* clade,
- *Echinogammarus* + *Typhlogammarus* group genera as well as each of both separately,
- 'W European *Eulimnogammarus*' (sensu Stock 1969) clade,
- *Marinogammarus* clade,
- *Homoeogammarus* + Dinaric + Pontocaspian genera group as well as each of the last mentioned branches separately; *Chaetogammarus* and *Trichogammarus* are morphologically similar to *Echinogammarus* or *Homoeogammarus*, but molecularly clearly nested within the morphologically very different and very diverse Pontocaspian group.

Beside the strong molecular similarity, there are rarely strong, but mostly weak morphological differences between these branches. Morphologically well distinguished are *Echinogammarus* s. str., *Typhlogammarus* group, '*Eulimnogammarus*'; less distinct are *Marinogammarus, Parhomoeogammarus*, while morphologically indistinct are geographically and molecularly well defined, mainly coastal *Homoeogammarus* and the continental Dinaric branch.

Discussion

Within the morphologically very diverse Ponto-Caspian group, there are again morphologically and molecularly distinct and well supported branchlets: *Chaetogammarus* and *Trichogammarus (sensu* Hou and Sket 2016); they are the only Ponto-Caspians morphologically similar to *Homoeogammarus*. We will be able to classify the morphologically and molecularly very diverse rest of Ponto-Caspian genera (and species) only when we obtain more complete series of samples from Caspian area. All authors agree that they have to be divided between a number of genera, but their definitions and species contents have been conceived highly diversely (Birštejn and Romanova 1968, Barnard and Barnard 1983, Karaman and Barnard 1979, Stock 1974).

It could be shown that *Gammarus anisocheirus* Ruffo which was (in the lack of the type sample of *E. lusitanus*) by Hou and Sket 2016 presented as a 'questionable *Parhomoeogammarus* member', is in fact not related to the type species *Gammarus (Parhomoeogammarus) lusitanus* Schellenberg 1943. Two populations of *P. lusitanus* form a well supported clade which includes also *Echinogammarus pacaudi* Hubault and Ruffo 1956, thus forming the genus *Parhomoeogammarus* Schellenberg 1943. On the other hand, *G. anisocheirus* could now be enthroned a type species of *Iberogammarus* **gen. nov.**, comprising species of the Stock's (1969) 'European *Eulimnogammarus*', which used to pose a particular phylogenetic and biogeographical enigma. *G. anisocheirus* has already been attributed to that group by Pinkster and Stock (1970) for its morphological similarity. In our new tree, *Iberogammarus* is a well supported monophyletic branch with *G. anisocherirus* and some populations resembling *E. grandimanus*.

(1) Genus *Homoeogammarus* Schellenberg 1937

(= *Echinogammarus* p. p.) remains the most speciose and the widely spread group of the *Echinogammarus* clade, its majority is relatively morphologically unified, with an extensive distribution area in Mediterranean and Atlantic.

Beside the previously (Hou and Sket 2016) listed species, according to further molecular analysis it includes also the following members: *Marinogammarus atlanticus* Dahl, 1958, *Neogammarus festae* Ruffo, 1937, *Pectenogammarus planicrurus* Reid, 1940. So, we can confirm the previous suppositions that the genus *Pectenogammarus* Reid, 1940 is superfluous, and so are

Neogammarus Ruffo, 1937 and *Laurogammarus* G. Karaman, 1984 (Karaman 1977, Hou and Sket 2016). But inclusion of the molecularly relevant species into *Homoeogammarus* makes it even more difficult to morphologically diagnose this genus. Opposite to the hint by Hou and Sket 2016, *Echinogammarus spinulicornis* Pinkster and Stock 1971 is not a member of *Parhomoeogammarus*, it is now a molecularly proven *Homoeogammarus* sp., inhabiting freshwater affluents of the Atlantic.

Biogeographically important is the fact that some *Homoeogammarus* spp. are present far within the Atlantic area. *H. planicrurus* reaches from French Mediterranean coast to the Great Britain. *H.* cf. *atlanticus* is present in the Atlantic Madeira, most probably (Dahl 1958; not molecularly proven) it is conspecific with *H. atlanticus* from Azores; its closest counterpart is the Adriatic *H.* cf. *stocki*, while we were not able to obtain the Canarian and topotypic samples of the Mediterranean '*Chaetogammarus*' *olivii* (H. Milne Edwards 1830) with which *H. atlanticus* might also be conspecific (Stock 1995). Our efforts to sample probably related *Gammarus nox* Stock 1995 (Madeira) and *Chaetogammarus chaetocerus* Beyer and Stock 1994 (La Gomera) were not successful. The Italian Peninsula and adjacent big islands are occupied by species of *Homoeogammarus* also inland (Ruffo and Stoch 2006), while in other parts of the Mediterranean, they are limited to narrow coastal belts (estuaries and coastal springs).

(2) The Stock's (1969) taxon 'western European (species of) *Eulimnogammarus*'

Stock (1969) classified his species *Eulimnogammarus macrocarpus* Stock 1969, along with *Gammarus anisocheirus* Ruffo 1959 and with the marine *Gammarus obtusatus* Dahl 1938 into the noted Bajkalian genus *Eulimnogammarus* Bazikalova 1945. Molecular analysis has shown that (1) the genuine Bajkalian *Eulimnogammarus* is phylogenetically a member of the genus *Gammarus* (Hou and Sket 2016) and endemic to lake Bajkal, well distinguished from *Echinogammarus* and its relatives, (2) *G. obtusatus* appears to be a member of *Marinogammarus* (Hou and Sket 2016), (3) *G. anisocheirus* is related to *E. macrocarpus*, but not closely related to *Gammarus* (or *Eulimnogammarus*). Our present tree clearly shows that *G. anisocheirus* and *E. macrocarpus* can form a separate genus, weakly related to *Marinogammarus* and *Homoeogammarus*, but not to *Gammarus*. This is the rationale of the here established *Iberogammarus* **gen. nov.**

***Iberogammarus* gen. nov.** syn. western European (species of) *Eulimnogammarus* Stock 1969 p. p. (Pinkster and Stock 1972).

Type species *Gammarus anisocheirus* Ruffo 1959; type locality is a hygropetric confluent of Neste d'Aure, at St. Lary-Soulan, Hautes-Pyrénées, France (825 m a.s.l.).

Additional species: molecularly proven *Eulimnogammarus* cf. *macrocarpus*. Not molecularly proven *Eulimnogammarus macrocarpus* Stock 1969, *Eulimnogammarus toletanus* Pinkster and Stock 1970.

Genus diagnosis. Gammariform amphipods from SW Europe (Iberian Peninsula), similar to *Homoeogammarus*, but with markedly different gnathopods; gnathopod propodite II only less than 80% length and up to 60% width of propodite I. Uropod III endopodite 20-50% exopodite length, linear, with a terminal and one or more marginal spines; exopodite with marginal groups of spines and variable setation.

Distribution. Fresh waters of Central and NE part of Iberian Peninsula, including central Pyrenees.

Remark. The most reliable marker of *Iberogammarus* is the smaller and particularly the narrower gnathopod II propodite, which also differs remarkably in shape with its very short palmar margin. Besides, the uropod III endopodite bears also a marginal spine which is normally absent in *Homoeogammarus*; the setation and the endopodite length are very variable.

(3) Correction of the *Parhomoeogammarus* definition

Before obtaining a sample of the *Parhomoeogammarus* type species, we (Hou and Sket 2016) overestimated the similarity of *G. anisocheirus* with it. In both, gnathopod I is somehow larger than gnathopod II, which is a comparatively rare character in gammarids. Additional sampling allowed a correction of that mistake. Here, we have samples of two distant populations of the type species while *G. anisocheirus* was moved to a new genus (*Iberogammarus*). Corrected data are given here.

***Parhomoeogammarus* Schellenberg 1943 (mended diagnosis)** syn. *Gammarus (Parhomoeogammarus)* Schellenberg 1943.

Type species *Gammarus (Parhomoeogammarus) lusitanus* Schellenberg 1943, type locality Lugar de Mantelães, Paredes de Coura, Portugal.

Additional molecularly proven species *Gammarus (Echinogammarus) pacaudi* Hubault and Ruffo 1956.

Genus diagnosis. Gammariform amphipods from Iberian peninsula and SW France, similar to *Homoeogammarus*, but gnathopod propodite II may be equal to or slightly shorter (only ca 80% length of) than propodite I, while they are approximately equally wide. Eyes elongated, more than twice as long as wide. Pereopod VII basis proximally convex, distally tapering, without a marked distoposterior lobe. Uropod III endopodite less than 25% exopodite long, scale-shaped to linear, with terminal and marginal spines; exopodite with marginal groups of spines and long setae.

Distribution. The genus seems to be limited to fresh waters in northern Portugal and adjacent NW Spain (all between Porto and A Coruña), SW France and NE Spain (Pinkster 1993).

Remarks. For *P. pacaudi*, the dentate posterior margin of pleonites ('l'armature caractéristique du métasome' Hubault and Ruffo 1956) was denoted the primary specific character. In fact, within the type population there are also individuals with unarmed pleonites. Both cohabiting (syntopic) morphs are molecularly indistinguishable.

Another putative candidate for this genus, *Echinogammarus spinulicornis* Pinkster and Stock 1971 (Hou and Sket 2016), appeared to be a *Homoeogammarus* (see above), although a very aberrant one.

(4) Continental Dinaric gammarids

Inland parts of the western Balkans host a group of gammarids, morphologically similar and provisionally attached to *Homoeogammarus*, making that genus paraphyletic. Some additional samples confirmed the geographical distinctness of this group and forced us to establish for it a separate genus.

***Dinarogammarus* gen. nov.**
Echinogammarus Stebbing, 1899 p.p.,
Ostiogammarus S. Karaman, 1931 p.p.
(e.g. *O. acarinatus*).

Type species *Ostiogammarus acarinatus* S. Karaman 1931a, Karaman 1970 (syn. *Gammarus pungens* forma *acarinata* Schäferna, 1922 p.p.), type locality spring Vrelo Bune, Blagaj, Mostar, Bosnia and Herzegovina. Additional species, molecularly confirmed: *Gammarus cari* S. Karaman, 1931b*, Ostiogammarus cari bosnensis* S. Karaman, 1934.

Genus diagnosis. Gammariform amphipods, morphologically indistinguishable from *Homoeogammarus.* Pereon and pleon dorsally smooth, each telson lobe less than twice as long as broad. Antennae I and II normal, antenna II shorter than antenna I; antena II with short or long, dense or sparse, straight setae. Mouth parts as in *Gammarus*. Gnathopods I and II subchelate, propodite II slightly longer than propodite I. Coxal plate IV distoposteriorly lobate. Pereopod VII basis without a distoposterior lobe. Uropods I and II usually normal, with distal and lateral spines. Uropod III exopodite with marginal groups of spines, usually accompanied by long setae that are always straight; endopodite diminished and scale-like, with terminal spine(s) only (without facial or marginal spines)

Distribution. Fresh waters (springs and rivers) in Dinaric karst from Ogulin in NW to Mostar in SE (within the rhomboid: Ogulin – Knin – Mostar - Travnik – Ogulin), away from the Adriatic coast. A local contact or shuffling with the coastal *Homoeogammarus* spp. is not impossible, but at the

moment, no case of shared locality of both genera was molecularly signalled. Some *Dinarogammarus* localities are in the Danube drainage (confluents of Sava river), the others in the confluents of the Adriatic. All *Homoeogammarus* localities in Dinaric area are in the Adriatic drainage, close to coast or even intertidal.

(5) The *Echinogammarus-Typhlogammarus* genera complex

appears now to consist of two biogeographically distinct (groups of) genera. The subgroup-genus *Echinogammarus* (s. str.) inhabits originally epigean fresh waters of SW Europe. The *Typhlogammarus* group seems to be limited to fresh subterranean waters of Dinaric karst; all species are highly troglomorph.

Acknowledgement

We are obliged to the collectors of many samples, their names are listed in Suppl. table 1. Thanks also to Pedro Oromi (La Laguna) for his help in the search for Canarian species. The study was financially supported by National Natural Sciences Foundation of China (NSFC-31372156/31422048) to ZH. Thanks to our colleagues Fabio Stoch, Rudi Verovnik and Christophe Piscart for some useful remarks. Thanks to Lučka Sket for her patience and manysided support during field work.

We must ask for excuse all colleagues who were or are not able to find some necessary data in Hou and Sket 2016. Due to some technical problems, some files disappeared from 'supporting files', prepared for that paper.

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SUPPLEMENT / PRILOGA

Family Gammaridae (Crustacea: Amphipoda), mainly its *Echinogammarus* clade in SW Europe. Further elucidation of its phylogeny and taxonomy

Družina Gammaridae (Crustacea: Amphipoda), posebej njena veja *Echinogammarus* v JZ Evropi. Nadaljnja razjasnitev filogenetskih in taksonomskih odnosov

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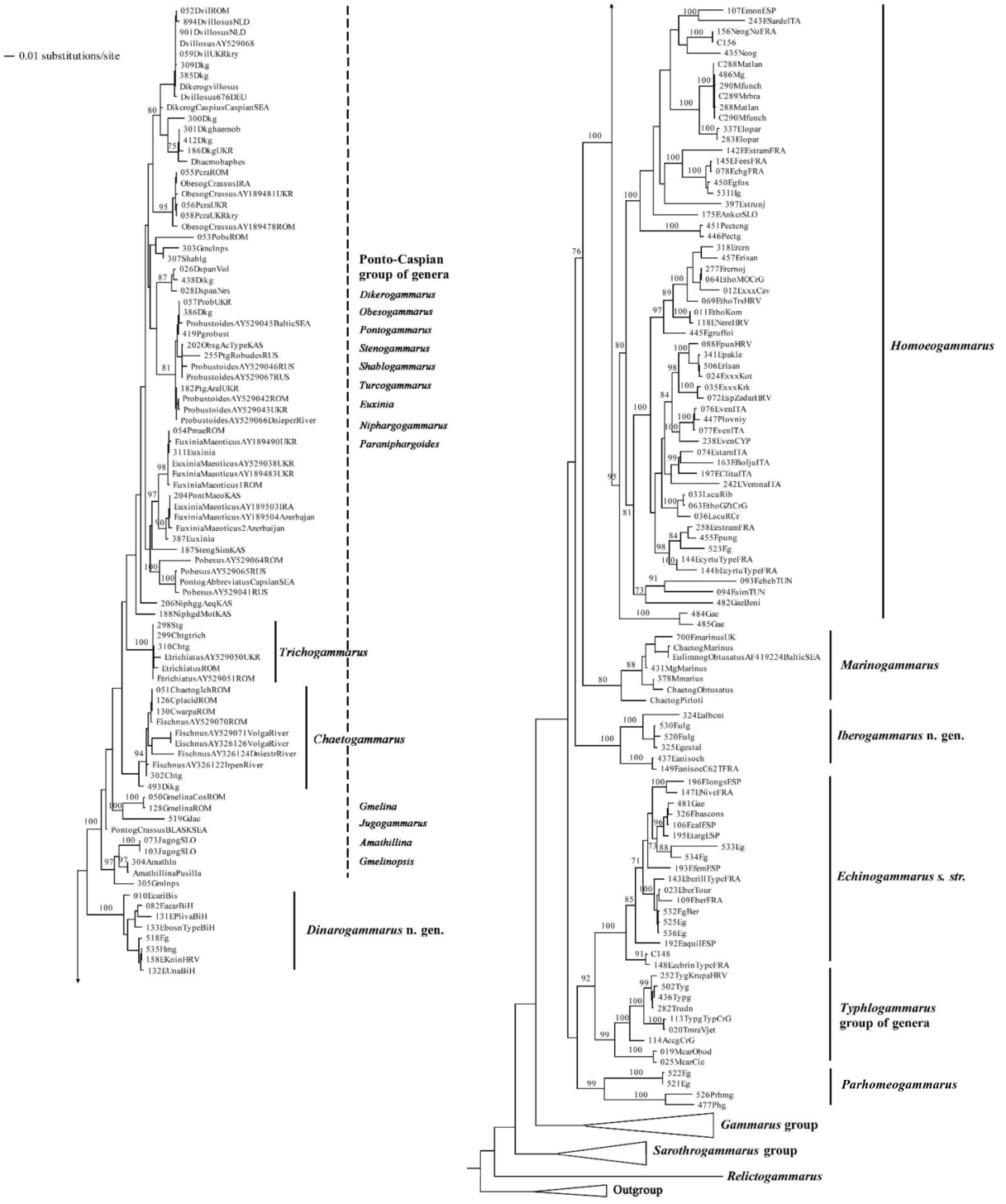

Supplement 1: Maximum likelihood phylogenetic tree of *Echinogammarus* based on the combined analysis of mitochondrial (COI) and nuclear (28S, 18S and EF-1a) markers. Numbers represent statistical bootstrap supports of nodes. Taxonomical information is presented in S2.

Priloga 1: Filogenetsko drevo veje *Echinogammarus* po analizi maximum likelihood (ML) na osnovi kombiniranih mitohondrijskih (COI) in jedrnih (28S, 18S and EF-1a) podatkov. Številke nad vejami so vrednosti ML bootstrap. Vrstna imena so provizorična, taksonomske rešitve so prikazane v S2.

Supplement 2: Taxa information and GenBank numbers. OTUs are listed in the same order as in the S1.
*Taxa names in parentheses are taken from literature unchanged. Species marked with TG are type species of genera. Species names followed with "Typ" or "typ" represent the topotype populations or populations close to "Typ". The "cf." and "ag." are abbreviations of "confer" and "aggregate or group". †F = Freshwater; S = Saline (brackish to marine water).

Priloga 2: Informacija o taksonih in številke v GenBank. OTU so v istem zaporedju, kot v drevesu S1.
*Imena taksonov v oklepajih so nespremenjena povzeta po literaturi. S 'TG' označene vrste so tipi rodov. Če imenu vrste sledi 'Typ' ali 'typ' je osebek iz topotipske populacije ali blizu nje. 'cf.' ali 'ag.' sta okrajšavi za "confer" ali "aggregate ali skupina (group)". †F = sladkovodno; S = slana (somornica ali morska) voda.

Working names; emphasized **genus name** valid for all taxa below it (not so within Ponto-Caspian or *Typhlogammarus* group). Taxon*	Designation of own samples in the tree	Collector(s) or Reference (with year).	Locality (r. = stream; c. = cave; N, S, W, E = north, south, west, east)	Habitat	Country	Voucher number	Ecological state†	28S	COI	18S	EF-1a
Ponto-Caspian group genera			**Black Sea - Caspian - surroundings**								
Dikerogammarus villosus 7 (Sowinsky, 1894)	052-D.vil-ROM	B. Sket, C. Fišer	Babadag, Jurilovca, Limanu Razim	coast of liman	Romania	SLOCHN052	S	KF478442	KF478533	KF478613	-
Dikerogammarus villosus 4	894DvillosusNLD	D.Platvoet, S. Li	River Waal (Rhine Branch) near Nijmegen	river	Netherlands	IZCASIA0894	F	KF478495	KF478581	-	-
Dikerogammarus villosus 5	901DvillosusNLD	D.Platvoet, S. Li	Gouwzee, dam to Marken, near Amsterdam	river	Netherlands	IZCASIA0901	F	KF478496	KF478582	-	-
(Dikerogammarus villosus) 1		Cristescu & Hebert 2005				-	?	AY529068	AY529048	-	-
Dikerogammarus villosus 8	059-D.vil-UKR-Kry	B.Sket, M.Zagmajster	Kyiv, r. Dnipru	river	Ukraine	SLOCHN059	F	KF478449	KF478540	-	-
Dikerogammarus villosus cf. *bispinosus* Martynov 1925	309Dkg (309-Dkg-bis-UKR)	B.Sket, C.Fišer	Dnistrovski liman,	liman	Ukraine	SLOCHN309	?	MK159866	MK159941	MK160009	
Dikerogam v. villosus	385Dkg (385-Dkg-v-Azov-RUS)	S.Utevsky, M.Kolesnykova	Morskoj Čulek, Taganrog	brook	Russia	SLOCHN385	?	MK159867	MK159942	MK160010	
(Dikerogammarus villosus) 2		Macdonald et al. 2005	Black Sea			-	S	-	-	AY926766+ AY926828	-
(Dikerogammarus villosus) 3		Hou et al. 2007	Havel Brandenburg		Germany	IZCASIA0676	F	EF582941	EF570297	EF582898	-
(Dikerogammarus caspius)		Macdonald et al. 2005	Caspian Sea			-	S	-	-	AY926765+ AY926827	-
Dikerog cf. *haemobaphes fluviatilis* Martynov, 1919	300Dkg (300-Dkg-fluv-UKR)	B.Sket, C.Fišer	r. Turunčuk, Biliaivka, Odesa	stream	Ukraine	SLOCHN300	F	MK159868	MK159943	MK160011	
Dikerogam haem cf. *haemobaphes* (Eichwald, 1841) TG	301Dkghaemob (301-Dkg-haemob-UKR)	B.Sket, C.Fišer	Dnipro, chan. Čajka, Hola prystan, Kherson	stream	Ukraine	SLOCHN301	F	MK159869	MK159987	MK160012	
Dikerogam v. villosus	412Dkg (412-Dkg-h-Odesa-UKR)	B.Sket, C.Fišer	Biliaivka, Odesa	brook	Ukraine	SLOCHN412	F	MK159870	MK159988	MK160013	
Dikerogammarus cf. *villosus 6*	186-Dkg-UKR	S.Utevsky, M.Kolesnykova	Migija, r. Južnyj Bug	river	Ukraine-S	SLOCHN186	F	KF478483	KF478569	-	-
(Dikerogammarus haemobaphes)		Cristescu & Hebert 2005				-	?	AY529069	AY529049	-	-
Obesogammarus crassus (Sars 1894)	055-P-cra-ROM	B. Sket, C. Fišer	Babadag, Jurilovca, Limanu Razim	coast of limanu	Romania	SLOCHN055	?	KF478445	KF478536	KF478615	-
(Obesogammarus crassus) 1		Cristescu & Hebert 2005	Bandar-e Anzali		Iran	-	S	AY529061	AY189482	-	-

(Obesogammarus crassus) 3		Cristescu et al. 2003	Lake Kuhal		Ukraine	-	S	-	AY189481	-	-
Obesogammarus crassus 4	056-P-cra-UKR	P. Trontelj	Harkiv, Biškin, r. Severski Donec	river	Ukraine	SLOCHN056	F	KF478446	KF478537	-	-
Obesogammarus crassus 5	058-P-cra-UKR-Kry	B.Sket, M. Zagmajster	Kyiv, r. Dnipru	river	Ukraine	SLOCHN058	F	KF478448	KF478539	-	-
(Obesogammarus crassus) 2		Cristescu et al. 2003	Lake Razim		Romania	-	S	-	AY189478	-	-
Pontogammarus obesus 4 (G.O. Sars, 1894) TG	053-P-obs-ROM	B. Sket, C. Fišer	Tulcea, Nufaru, r. Dunarea/ Danube	river bottom	Romania	SLOCHN053	F	KF478443	KF478534	-	-
cf. *Stenogammarus* sp.	303Gmelnps (303-Gmelnps-UKR)	B. Sket, C. Fišer	Dnipro, chan. Čajka, Hola prystan, Kherson	stream	Ukraine	SLOCHN303	F	MK159871	MK159944	MK160014	
cf. *Shablogammarus* sp. *2*	307Shablg (307-Shablg-UKR)	B. Sket, C. Fišer	Dnipro, chan. Čajka, Hola prystan, Kherson		Ukraine	SLOCHN307	F	MK159872	-	MK160015	
Turcogammarus spandli1 (S.Karaman 1931)	026-D.span-Vol 026	C.Fišer, R.Verovnik	Thessaloniki, Mikri Volvi	lake	Greece	SLOCHN026	F	KF478437	KF478528	KF478611	-
Turcogammarus cf. *spandli*	438Dikg (438-Dikg-Thessal-HEL)		Apollonias Stream, Thessaloniki	stream	Greece		F	MK159873	MK159945	MK160016	
Turcogammarus spandli 2	028-D.span-Nes 028	C.Fišer, R.Verovnik	Xanthi, Stathmos, r. Nestos	brook	Greece	SLOCHN028	F	KF478438	KF478529	-	-
Pontogammarus cf. *robustoides 7*	057-P-rob-UKR	P. Trontelj	Kharkiv, Biškin, r. Severski Donec	river	Ukraine	SLOCHN057	F	KF478447	KF478538	KF478616	-
Dikerogam h. haemobaphes	386Dkg (386-Dkg-h-Azov-RUS)	S.Utevsky, M.Kolesnyko	Taganrogskij zaliv, Morskoj Čulek, Taganrog		Russia	SLOCHN386	?	MK159874	MK159946	MK160017	
(Pontogammarus robustoides) 4		Cristescu & Hebert 2005	Ukraine Baltic Sea		?	-	S	-	AY529045	-	-
Pontog robustoides 4	419Pgrobust (419-Pg-robust-UKR)	S.Sidorovsky	r. Pivdennyi Bug, Mygiya, Pervomaysk Distr., Mykolayiv Reg.		Ukraine	SLOCHN419	F	MK159875	MK159947	MK160018	
Obesogammarus cf. *acuminatus* Stock et al., 1998	202-Obsg-ac-T-KAS	A.Mirzajani, B.Sket	Gilan Prov., Bandar-e Anzali, Anzali Thalab	laguna	Iran-Caspian	SLOCHN202	S	KF478487	KF478574	KF478634	-
Pontogammarus robustoides 8 (G.O. Sars, 1894) TG	255-Ptg-robudes-RUS	M.Schletterer	delta of r. Volga	river	Russia-Caspian	SLOCHN255	?	JF965822	JF965990	JF966184	-
(Pontogammarus robustoides) 5		Cristescu & Hebert 2005	Astrakhan		Russia	-	?	-	AY529046	-	-
(Pontogammarus robustoides) 6		Cristescu & Hebert 2005	Volgograd Reservoir	reservoir	Russia	-	F	AY529067	AY529047	-	-
Pontogammarus cf. *aralensis* (Uljanin, 1875)	182-Ptg.aral-UKR	S.Utevsky, M.Kolesnykova	Odesskaja Oblast, Katlabuh	lake	Ukraine	SLOCHN182	?	KF478482	KF478568	KF478631	-
(Pontogammarus robustoides) 1		Cristescu & Hebert 2005	Lake Ramiz	liman	Romania	-	S	-	AY529042	-	-
(Pontogammarus robustoides) 2		Cristescu & Hebert 2005	Lake Kahul	liman	Ukraine	-	S	-	AY529043	-	-
(Pontogammarus robustoides) 3		Cristescu & Hebert 2005	Dnieper River	river		-	F	AY529066	AY529044	-	-
Euxinia maeotica 8 (Sovinsky 1893) TG	054-P-mae-ROM	B. Sket, C. Fišer	Mangalia, Black sea	sea littoral	Romania	SLOCHN054	S	KF478444	KF478535	KF478614	-
(Euxinia maeoticus) 4		Cristescu et al. 2003	Black Sea	mar. littoral	Ukraine	-	S	-	AY189490	-	-
Euxinia maeotica	311Euxinia (311-Euxinia-UKR)	B. Sket, C. Fišer	Black Sea coast, Pokrovka, Kherson	mar. littoral	Ukraine	SLOCHN311	S	MK159876	MK159948	MK160019	

(Euxinia maeoticus) 7		Cristescu & Hebert 2005	Chernomorka		Ukraine	-	S	-	AY529038	-	-
(Euxinia maeoticus) 3		Cristescu et al. 2003	Black Sea		Ukraine	-	S	-	AY189483	-	-
(Euxinia maeoticus) 1		Cristescu & Hebert 2005	Black Sea		Romania	-	S	AY529062	AY189494	-	-
Euxinia maeotica 9	204-Pont-maeo-KAS	A.Mirzajani, B.Sket	Gilan Prov., NW Bandar-e Anzali, Caspian	sandy beach	Iran-Caspian	SLOCHN204	S	KF478488	KF478575	KF478635	-
(Euxinia maeoticus) 5		Cristescu et al. 2003	Bandar-e Anzali		Iran	-	S	-	AY189503	-	-
(Euxinia maeoticus) 6		Cristescu et al. 2003	Lankaran		Azerbaijan	-	S	-	AY189504	-	-
(Euxinia maeoticus) 2		Cristescu & Hebert 2005	Baku		Azerbaijan	-	S	AY529063	AY189500	-	-
Euxinia maeotica	387Euxinia (387-Euxinia-Azov-RUS)	S.Utevsky, M.Kolesnykova	Morskoj Čulek, Taganrog	sandy beach	Russia	SLOCHN387	?	MK159877	MK159949	MK160020	
Stenogammarus cf. *similis* (Sars 1894)	187-Steng-?sim-KAS	A.Mirzajani, B.Sket	Gilan Prov., Lisar, Caspian	lake, - 15 m	Iran-Caspian	SLOCHN187	S	KF478484	KF478570	KF478632	-
(Pontogammarus obesus) 1		Cristescu & Hebert 2005	Lake Sinoie	liman	Romania	-	S	AY529064	AY529039	-	-
(Pontogammarus obesus) 2		Cristescu & Hebert 2005	Volgograd Reservoir	reservoir	Russia	-	F	AY529065	AY529040	-	-
(Pontogammarus abbreviatus)		Macdonald et al. 2005	Caspian Sea	lake	?	-	S	-	AY926691	AY926810+ AY926871	-
(Pontogammarus obesus) 3		Cristescu & Hebert 2005			?	-	S	-	AY529041	-	-
Niphargogammarus aequimanus (Sars, 1895)	206-Niphgg-aeq-KAS	A.Mirzajani, B.Sket	Gilan Prov., Lisar, Caspian	lake, - 15 m	Iran-Caspian	SLOCHN206	?	KF478489	KF478576	KF478636	-
Paraniphargoides cf. *motasi* (Cărăuşu 1943) cfTG	188-Niphggd-?mot-KAS	A.Mirzajani, B.Sket	Gilan Prov., Jireh bagh, Caspian	lake, - 10 m	Iran-Caspian	SLOCHN188	?	KF478485	KF478571	KF478633	-
cf. *Akerogammarus-Chaetogammarus*	298Stg (298-?Stg-DniprL-UKR)	B.Sket, C.Fišer	Dniprovski liman, Herois'ke, Kherson	liman	Ukraine	SLOCHN298	S	MK159878	MK159950	MK160021	
Trichogammarus trichiatus (Martynov, 1932) TG	299Chtgtrich (299-Chtg-trich-UKR)	B.Sket, C.Fišer	Hola prystan, Kherson		Ukraine	SLOCHN299	F	MK159879	MK159951	MK160022	
Trichogammarus trichiatus	310Chtg (310-Chtg-trich-UKR)	B.Sket, C.Fišer	Dnistrovski liman, Ovidiopol', Odesa	liman	Ukraine	SLOCHN310	S	MK159880	MK159989	MK160023	
(Echinogammarus trichiatus) 1		Cristescu & Hebert 2005	Krasnaya Kosa, Dniestr Liman		Ukraine	-	S	-	AY529050	-	-
(Echinogammarus trichiatus)		Cristescu & Hebert 2005			Romania	-	S	AY529072	-	-	-
(Echinogammarus trichiatus) 2		Cristescu & Hebert 2005	Istria, Sinoie Lake		Romania	-	S	-	AY529051	-	-
Chaetogammarus cf. *ischnus* (Stebbing, 1899)	051-Ch-ich-ROM	B. Sket, C. Fišer	Babadag, Jurilovca, Limanu Razim	coast of limanu	Romania	SLOCHN051	S	KF478441	KF478532	KF478612	-
Chaetogammarus cf. *placidus* (Sars, 1896)	126-C.placid-ROM	C.Fišer, B.Sket	Babadag, Jurilovca, Lacul Razim	limanu	Romania	SLOCHN126	S	KF478466	-	-	-
Chaetogammarus cf. *warpachowskii* (Sars, 1894)	130-f?C.warpa-ROM	B. Sket, C. Fišer	Babadag, Jurilovca, Lacul Razim	limanu	Romania	SLOCHN130	S	-	KF478556	-	-
(Echinogammarus ischnus) 1		Cristescu & Hebert 2005			Romania	-	?	AY529070	AY326120	-	-

(Echinogammarus ischnus) 2		Cristescu & Hebert 2005	Volga River Delta		Russia	-	?	AY529071	AY326125	-	-
(Echinogammarus ischnus) 5		Cristescu & Hebert 2005	Volga River Delta		Russia	-	?	-	AY326126	-	-
(Echinogammarus ischnus) 4		Cristescu & Hebert 2005	Novodniestrovsk, Middle Dniestr River		Ukraine	-	F	-	AY326124	-	-
(Echinogammarus ischnus) 3		Cristescu & Hebert 2005	r. Irpen'		Ukraine	-	F	-	AY326122	-	-
Chaetogammarus cf ***tenellus*** (G.O. Sars 1914) cf TG	302Chtg (302-Chtg-Khers-UKR)	B. Sket, C. Fišer	r. Dnipro, chan. Hola pristan, Kherson		Ukraine	SLOCHN302	F	MK159881	MK159952	MK160024	
Dikerogammarus caspius (Pallas, 1771)	493Dikg (493-Dikg-casp-RUS)	M.Schletterer	delta Volgi		Russia	SLOCHN493	?	MK159940	-	√	
Gmelina costata1 Sars, 1894 TG	050-Gm.cos-ROM	B. Sket, C. Fišer	Babadag, Jurilovca, Limanu Razim	coast of limanu	Romania	SLOCHN050	S	KF478467	-	KF478624	-
Gmelina costata 2	128-Gmelin-ROM	B. Sket, C. Fišer	L Razim, Dobrogea, plitvina		Romania	SLOCHN128	S	KF478468	-	KF478625	-
Gammaridae *(*cf. *Gmelina,* ovig., tiny)	519Gdae (519-Gdae-Krupa-BiH)	T.Delić	Krušničko vrelo, Krušnica, Bos. Krupa	spring	Bosnia-Herzegovina		F				
(Pontogammarus crassus)		Macdonald et al. 2005	Black Sea			-	S	-	-	AY926811+ AY926872	-
Jugogammarus kusceri 1 (S.Karaman, 1931) (typ) TG	073-Jugog-SLO	B.Sket	Ivančna Gorica, Krka, springs of r. Krka	spring	Slovenia	SLOCHN073	F	KF478462	KF478552	KF478622	-
Jugogammarus kusceri 2 (typ)	103-Jugog-SLO	B.Sket	Ivančna Gorica, Krka, springs of r. Krka	spring	Slovenia	SLOCHN103	F	KF478463	KF478553	-	-
Amathillina pusilla G.O. Sars, 1896	304Amathln (304-Amathln-UKR)	B.Sket, C.Fišer	Dnipro, chan. Čajka, Hola prystan, Kherson		Ukraine	SLOCHN304	F	MK159882	-	MK160025	
*(Amathillina pusill*a)		Macdonald et al. 2005				-	?	-	-	AY926756+ AY926818	-
Gmelinopsis cf. ***tuberculata*** G.O. Sars, 1896 cf TG	305Gmlnps (305-Gmlnps-UKR)	B.Sket, C.Fišer	Dnipro, chan. Čajka, Hola prystan, Kherson		Ukraine	SLOCHN305	F	MK159883	MK159953	MK160026	
genus *Dinarogammarus*			**Croatia – Bosnia-Herzegovina (Dinaric karst)**								
Echinogammarus cari (S.Karaman, 1931) (Typ)	010-E.cari-Bis 010	B.Sket	Tounj, Mikašinovići, r. Bistrac	brook	Croatia	SLOCHN010	F	JF965821	-	JF966183	-
(*Echinogammarus*) *Dinarogammarus acarinatus* (S.Karaman 1931) (Typ) TG	082-E.acar-BiH	B.Sket	Mostar, Blagaj, vrelo Bune	spring	Bosnia-Herzegovina	SLOCHN082	F	KF478458	KF478548	KF478620	-
Echinogammarus sp6	131-E.Pliva-BiH	B.Sket	Jajce, Mile, outflow of Plivsko jezero	brook	Bosnia-Herzegovina	SLOCHN131	F	KF478469	KF478557	-	-
Echinogammarus acarinatus bosnensis (S.Karaman 1934) (Typ) (Synonym *E. acarinatus*)	133-E.bosn-T-BiH	B.Sket	Travnik, Šumeće	spring	Bosnia-Herzegovina	SLOCHN133	F	KF478471	KF478559	KF478626	-
Dinarogammarus sp.	518Eg (518-Eg-Krupa-BiH)	T.Delić	Krušničko vrelo, Krušnica, Bosanska Krupa	spring	Bosnia-Herzegovina	SLOCHN518	F	MK159884	MK159954	MK160027	
Homoeogammarus sp.	535Hmg (535-Hmg-Krka-HRV)	B.Sket	Krka below spring, Krško vrelo, Knin	stream	Croatia	SLOCHN535	F	MK159885	MK159955	MK160028	
Echinogammarus sp 9	158-E.Knin-HRV	B.Sket	Krško vrelo, Knin	spring-river	Croatia	SLOCHN158	F	KF478479	KF478565	-	-
Echinogammarus sp 7	132-E.Una-BiH	B.Sket	above Bihać, motel Sunce, r. Una	river	Bosnia-Herzegovina	SLOCHN132	F	KF478470	KF478558	-	-

genus *Homoeogamamrus*			**circum-Mediterranean - Atlantic**								
Echinogammarus monomerus (Stock, 1977)	107-E.mon-ESP	D.Jaume	isl. Mallorca, Soller, Font Fornalutx	spring	Spain	SLOCHN107	F	KF478464	KF478554	KF478623	-
Echinogammarus cf. *tibaldii* Pinkster and Stock, 1970	243-E.Sarde-ITA	F.Stoch	Sardegna, prov. Nuoro, Supramonte, Complesso Carsico di Su Cologone (Oliena)	spring	Italy	SLOCHN243	F	KF478492	KF478579	-	-
Neogammarus nudus Stock 1971	156-Neog.nu-FRA	B.Sket	Nice, Cagnes-sur-Mer	beach-brook	France	SLOCHN156	S	KF478477	KF478564	KF478630	-
Neogammarus nudus 1	C156 (156-C-Neog-nud-FRA)	B.Sket	Nice, Cagnes-sur-Mer	beach-brook	France	SLOCHN156C	S	KF478478	-	-	-
Neogammarus festai (Ruffo 1937)	435Neog (435-Neog-fest-FRA)	B.Sket	Calanques-Salees, Marseilles	mar. littoral	France	SLOCHN435	S	MK159886	MK159990	MK160029	
Marinogammarus atlanticus Dahl 1958	C288Matlan (C288-M-atlan-POR-M)	B.Sket	estuar NE del plaže, Machico	aestuar	Portugal-Madeira	SLOCHN288c	S	MK159887	MK159956	-	
Marinogammarus atlanticus	486Mg (486-Marg-atl-POR-Mad)	B.Sket	Lugar do Baixo, Punta do Sol	aestuar	Portugal-Madeira	SLOCHN486	S	MK159888	MK159957	MK160030	
Marinogammarus atlanticus	290Mfunch (290-M-Funch-POR-M)	B.Sket	Praia Formosa, Funchal	mar. littoral	Portugal-Madeira	SLOCHN290	S	MK159889	MK159991	MK160031	
Marinogammarus atlanticus	C289Mrbra (?:289-M-RBrava-POR-M)	B.Sket	Ribeira Brava	aestuar	Portugal-Madeira	SLOCHN289c	S	MK159890	MK159958	MK160032	
Marinogammarus atlanticus	288Matlan (288-M-atlan-POR-M)	B.Sket	Machico	aestuar	Portugal-Madeira	SLOCHN288	S	MK159891	-	MK160033	
Marinogammarus atlanticus	C290Mfunch (?: 290-M-Funch-POR-M)	B.Sket	Praia Formosa, Funchal	mar. littoral	Portugal-Madeira	SLOCHN290c	S	MK159892	MK159959	MK160034	
Echinogammarus sp.	337Elopar (337-E-Lopar-HRV)	B.Sket	Zidine, Lopar, Rab isl.	intertidal	Croatia	SLOCHN337	S	MK159893	MK159960	MK160035	
Echinogammarus cf. *stocki* G. Karaman, 1970	283Elopar (283-E-Lopar-HRV)	B.Sket	uvala Sićе, Lopar, Rab isl.	coastal spring	Croatia	SLOCHN283	S	MK159894	MK159961	MK160036	
Echinogammarus foxi 1 (Schellenberg 1928)	142-E.Estram-FRA	B.Sket	Leucate, Salses-de-Chateau, Font d'Estramar	spring	France-SE	SLOCHN142	S	KF478472	KF478560	KF478627	-
Echinogammarus sp8	145-E.Fees-FRA	B.Sket	Perpignan, Leucate, Grotte de Fees	cave	France-SE	SLOCHN145	S	KF478475	KF478562	-	-
Echinogammarus cf. *pungens 1* (Milne-Edwards, 1840)	078-Echg-FRA	B.Sket	Perpignan, Leucate, Grotte des Fees	cave	France	SLOCHN078	S	KF478457	KF478547	-	-
Echinogammarus. cf. *foxi*	450Egfox (450-Eg-cf-foxi-Nice-FRA)	G.Bračko, M.Hrovat.	Bouche-de-Loup, Villeneuve de Loubet, Nice	aestuar	France	SLOCHN450	S	MK159895	MK159992	MK160037	
Homoeogammarus cf. *monomerus-platvoeti-tabu*	531Hg (531-Hmg-Antibes-FRA)	B.Sket	mouth La Bragueе, Biot, Antibes	intersticial	France	SLOCHN531	S	MK159896	MK159993	MK160073	
Echinogammarus cf. *olivii* (Milne Edwards, 1830)	397Estrunj (397-E-Strunj-SLO)	B.Sket	hotel Salinera, Strunjan	brack. spring	Slovenia	SLOCHN397	S	MK159897	MK159962	MK160038	
Echinogammarus cf. *foxi 2*	175-E.Ankar-SLO	B.Sket	Ankaran	gravel beach	Slovenia	SLOCHN175	S	KF478481	KF478567	-	-
Pectenogammarus planicrurus	451Pecteng (451-Pecteng-plan-GB = 446)	J.Ironside	Aberystwyth, W Wales	littoral	UK	SLOCHN451	S	MK159898	MK159994	MK160039	
Pectenogammarus planicrurus	446Pectg (446-Pectg-planicr-UK)	J.Ironside	Aberystwyth, W Wales	littoral	UK	SLOCHN446	S	MK159899	MK159963	MK160040	
Echinogammarus cf *pungens*	318Ercm (318-E-RCrn-CrG)	B.Sket	Rijeka Crnojevića, Cetinje	stream	Montenegro	SLOCHN318	F	MK159900	MK159995	MK160041	
E cf. *thoni* (weak bulges)	457Erisan (457-E-Risan-CrG)	B.Sket	D. Morinj, Risan		Montenegro	SLOCHN457	F	MK159901	MK159996	MK160042	

Echinogammarus cf. *pungens*	277Ercmoj (277-E-RCrnoj-CrG)	B.Sket	Rijeka Crnojevića, Cetinje	stream	Montenegro	SLOCHN277	F	MK159902	-	MK160043	
Laurogammarus thoni 3	064-E.tho-MO-CrG	B.Sket	Virpazar, Crničko polje, Malo oko	spring	Montenegro	SLOCHN064	F	KF478451	-	-	-
Echinogammarus sp. 1	012-E.xxx-Cav 012	B.Sket	Cavtat, hotel Epidaurus	brook	Croatia	SLOCHN012	F	KF478435	KF478526	-	-
Echinogammarus thoni 4	069-Etho-Trs-HRV	C.Fišer	Dubrovnik, Trsteno	spring	Croatia	SLOCHN069	F	KF478434	KF478525	KF478610	-
Echinogammarus thoni 1 (Schäferna, 1922) (Typ; TG *Laurogammarus*)	011-E.tho-Kom 011	B.Sket	Metković, Komin, s. Modro oko	spring	Croatia	SLOCHN011	F	KF478433	KF478524	KF478609	-
Echinogammarus thoni 5	118-E.Nere-HRV	G.Bračko	Metković, r. Neretva	river	Croatia	SLOCHN118	F	KF478465	KF478555	-	-
***Echinogammarus ruffoi** 2* Typ	445Egruffoi (445-Eg-ruffoi-ITA-T)	F.Stoch	Roggia, tra Cascina Prada e Ponte Rosso,		Italy	SLOCHN445	F	MK159903	MK159997	MK160044	
Echinogammarus pungens 2	088-E.pun-HRV	G.Bračko	Metković, r. Neretva	river	Croatia	SLOCHN088	F	KF478459	KF478549	KF478621	-
Echinogammarus cf *antalyae*	341Epakle (341-E-Paklen-HRV)	B.Jalžić	Markova špilja, Seline, Starigrad, Paklenica	cave	Croatia	SLOCHN341	F	MK159904	MK159964	MK160045	
Echinogammarus sp.	506Erisan (506-E-Risan-CrG)	T.Delić	Risan	aestuary	Montenegro	SLOCHN506	?	MK159905	MK159965	MK160046	
Echinogammarus sp 2	024-E.xxx-Kot 024	B.Sket	Kotor	spring	Montenegro	SLOCHN024	F	KF478436	KF478527	-	-
Echinogammarus sp 3	035-E.xxx-Krk 035	B.Sket	island Krk, Vrbnik	spring	Croatia	SLOCHN035	F	KF478439	KF478530	-	-
Echinogammarus sp 4	072-Ech.sp-Zadar-HRV	R.Verovnik	Zadar, Pirovac	spring	Croatia	SLOCHN072	F	KF478452	KF478542	-	-
Echinogammarus cf. *veneris 1*	076-E.ven?-ITA	C.Fišer	Gargano, Carpino, spring at restaurant 'da Carlo'	spring	Italy	SLOCHN076	F	KF478455	KF478545	-	-
Echinogammarus sp	447Plovniy				?	SLOCHN447	?	MK176331	MK176332	-	
Echinogammarus cf. *veneris 2*	077-E.ven?-ITA	P.Trontelj, B.Sket	S Verona, Isola, stream at road	brook	Italy	SLOCHN077	F	KF478456	KF478546	KF478619	-
Echinogammarus cf. *veneris 3* (Heller 1865)	238-E.ex-ven-CYP	R.Verovnik	Polis, Akamas, s. Loutra tis Afroditis	spring	Cyprus	SLOCHN238	F	KF478490	KF478577	-	KF478659
Echinogammarus cf. *stammeri 1* (S. Karaman, 1931) (Typ)	074-E.stam-ITA	B.Sket	Trst/Trieste, Monfalcone/ Tržič, s. Polosco	spring	Italy	SLOCHN074	F	KF478454	KF478544	KF478618	-
Echinogammarus sp 10	163-E.Bolju-ITA	B.Sket	Trieste/Trst, Bagnolli/ Boljunec, tributary of Glinščica	brook	Italy	SLOCHN163	F	KF478480	KF478566	-	-
Echinogammarus cf. *pungens 3*	197-E-Clitu-ITA	C.Douady, F.Malard, F.Stoch	Perugia, Campello sul Clitunno, Fonti di Clitunno	spring	Italy	SLOCHN197	F	KF478486	KF478572	-	-
Echinogammarus cf. *stammeri 2*	242-E.Verona-ITA	B.Sambugar	S Verona, r. Menago - Buttapietra	resurgence	Italy	SLOCHN242	F	KF478491	KF478578	-	-
Laurogammarus scutarensis 1 (Schäferna, 1922) *(*Typ)	033-L.scu-Rib 033	B. Sket	Podgorica, springs of Ribnica	spring	Montenegro	SLOCHN033	F	KF478453	KF478543	KF478617	-
Echinogammarus cf. *thoni2*	063-E.tho-GZt-CrG	B.Sket	Glava Zete, Dobro Polje, at the mil	spring	Montenegro	SLOCHN063	F	KF478450	KF478541	-	-
Laurogammarus scutarensis2	036-L.scu-RCr 036	K.Jazbec	Rijeka Crnojevića	spring	Montenegro	SLOCHN036	F	KF478440	KF478531	-	-
Echinogammarus cf. *platvoeti* Pinkster, 1993	258-E.Estram-FRA	B.Sket	Leucate, Salses-de-Chateau, Font d'Estramar	spring	France-SE	SLOCHN258	F	KF478493	-	KF478637	-
Echinogammarus pungens Typ	455Epung (455-E-pungens-T-FRA)	B.Sket	Salses-Chateau, Leucate	spring	France.SE	SLOCHN455	S	MK159906	MK159966	MK160047	

Echinogammarus spinulicornis (Pinkster & Stock, 1971) Typ	523Eg (523-Eg-spinlcrn-FRA)	B.Sket	Touvre I spring, Angouleme, NE Bordeaux	spring	France.SE	SLOCHN523	F	MK159907	MK159967	MK160048	
Echinogammarus cyrtus1 Pinkster and Platvoet 1986 (Typ)	144-E.cyrtu-T-FRA	B.Sket	Montpellier, Sources-du-Lez	river	France-SE	SLOCHN144	F	KF478473	-	KF478628	-
Echinogammarus cyrtus 2	144b-E.cyrtu-T-FRA	B.Sket	Montpellier, Sources-du-Lez	river	France-SE	SLOCHN144b	F	KF478474	KF478561	-	-
Echinogammarus cf. *simoni* (sp 5)	093-E.Cheb-TUN	B.Sket	Tozeur, oasis Chebika	brook	Tunisia	SLOCHN093	F	KF478460	KF478550	-	-
Echinogammarus cf. *simoni* (Chevreux, 1894) cf TG	094-E.?sim-TUN	B.Sket	Tozeur, oasis Tamerza	brook	Tunisia	SLOCHN094	F	KF478461	KF478551	-	-
Echinogammarus cf. *simoni* (setae scarce)	482GaeBeni (?: 482Gae-BeniMaur-ESP)	J.Notenboom, F.Malard, C.Douady	Font des Admiraors, Benimaurel, Alicante		Spain	SLOCHN482	F	MK159908	MK159968	-	
Echinogammarus cf. *simoni* (few setae, uropod III nearly without them)	484Gae (?:484-Gae-Deifont-ESP)	J.Notenboom, F.Malard, C.Douady	Source de Deifontes, ?Granada		Spain	SLOCHN484	F	MK159909	MK159998	-	
Echinogammarus cf. *simoni* (nearly no setae, uropod III styliform)	485Gae (?:485-Gae-Sorbas-ESP)	J.Notenboom, F.Malard, C.Douady	Fuente del Peral, Sorbas, ?Almeria		Spain	SLOCHN485	F	MK159910	-	-	
genus *Marinogammarus*			**E & NW Atlantic**								
Echinogammarus marinus (Leach, 1815)		G.Yang	Thurso Bay, on the north coast of Scotland		UK	IZCASIA0700	S	KF478494	KF478580	KF478638	-
(*Chaetogammarus marinus*)		Macdonald et al. 2005	Bergin		Norway	-	S	-	AY926655	AY926760+ AY926822	-
(Chaetogammarus obtusatus) 2		Englisch et al. 2003	Baltic Sea		?	-	S	-	-	AF419224	-
Marinogammarus cf. *marinus*	431MgMarinus (431-Mg-marinus-NOR)	A. Črne	mar. littoral, Riisa, Trondheim		Norway	SLOCHN431	S	MK159911	MK159969	-	
Marinogammarus marinus (Leach, 1815**) TG**	378Mmarinus (378-M-marinus-NOR)	A. Črne	mar. littoral, Korsvika, Trondheim		Norway	SLOCHN378	S	MK159912	MK159970	MK160074	
(Chaetogammarus obtusatus) 1		Macdonald et al. 2005	Novia Scotia		Canada	-	S	-	AY926656	AY926761+ AY926823	-
(Chaetogammarus pirloti)		Englisch et al. 2003	Scotland		UK	-	S	-	-	AF419228	-
genus *Iberogammarus*			**Iberian Peninsula**								
Iberogammarus cf. *macrocarpus* 2	324Ealbent (324-E-Albent-ESP)	C.Douady, F.Malard, C.Morvan	Rio de Albentosa, Albentosa, Teruel		Spain	SLOCHN324	F	MK159913	MK159971	MK160049	
Iberogammarus macrocarpus	530Eulg (530-Eulg-mac-Tur-ESP)	B.Sket	R. Turia, Vilamarxant, Valencia	river	Spain	SLOCHN530	F	MK159914	MK159972	MK160050	
Iberogammarus cf. *macrocarpus*	520Eulg (520-Eulg-mac-Ara-ESP)	B.Sket	S of Aranjuez		Spain	SLOCHN520	F	MK159915	MK159973	MK160051	
Iberogammarus sp.	325Egestal (325-E-Gestal-ESP)	C.Douady, F.Malard, C.Morvan	Fuente el Morenillo, Gestalgar, Valencia		Spain	SLOCHN325	F	MK159916	-	MK160075	
Echinogammarus anisocheirus (Ruffo 1959) (Typ) TG	437Eanisoch (437-E.anisoc-T-FRA)	B.Sket	above St.Lary-de-Soulan	hygropetric	France-SW	SLOCHN437	**F**	MK159917	MK159999	MK160052	
Echinogammarus anisocheirus (Ruffo 1959) (Typ)	149-E.anisoc-C62T-FRA	B.Sket	above St.Lary-de-Soulan	hygropetric	France-SW	SLOCHN149	F	KF478476	KF478563	KF478629	KF478658

genus *Echinogammarus* s. str.			**SW Europe**								
Echinogammarus longisetosus 2	196-E-longs-ESP	C.Douady, F.Malard, C.Morvan	Tarragona, Creus, Santes, Rio Gaya-Santes-Creus	interstitial	Spain	SLOCHN196	F	KF478513	KF478598	-	-
Echinogammarus longisetosus 1 Pinkster, 1973	147-E.Nive-FRA	B.Sket	Uhart Cize, St-Jean-Pied-de-Port., r. Nive	brook	France-SW	SLOCHN147	F	KF478507	KF478593	-	KF478662
Echinogammarus cf. *berilloni* few setae, pleon no setae	481Gae (481-Gae-Marfil-ESP)	C.Douady, F.Malard, C.Morvan	Fuente de Marfil-Valdenoceda, Burgos		Spain	SLOCHN481	F	MK159918	MK160000	-	
Echinogammarus cf longisetosus 10	326Ebascons (326-E-Bascons-ESP)	C.Douady, F.Malard, C.Morvan	source Rio Rudron-Molino Rasgabragas,Basconcillo, Castilla y Leon		Spain	SLOCHN326	F	MK159919	MK160001	MK160053	
Echinogammarus cf. *calvus* (Margalef, 1956)	106-E.cal-ESP	G.Bračko	Burgos, Quintana del Puente, r. Arlanza	river	Spain	SLOCHN106	F	KF478502	KF478588	KF478643	KF478660
Echinogammarus cf. *tarragonensis* Pinkster, 1973	195-E-targ-ESP	C.Douady, F.Malard, C.Morvan	Navarra, Nacedero, Larraun, c. Cueva Nacedero de Larraun-Baraibar	cave	Spain	SLOCHN195	F	KF478512	KF478597	KF478650	-
Echinogammarus cf. *feminatus*	533Eg (533-Eg-Toledo-ESP)	B.Sket	r. ?Tagus, 12 km E Toledo	river	Spain	SLOCHN533	F	MK159920	MK159974	MK160054	
Echinogammarus cf. *berilloni (less setose)*	534Eg (534-Eg-Valenc-ESP)	B.Sket	Siete Aguas, Valencia	spring	Spain	SLOCHN534	F	MK159921	MK160002	MK160055	
Echinogammarus feminatus Pinkster 1973	193-E-fem-ESP	C.Douady, F.Malard, C.Morvan	Oviedo, Fuesesce, Nava, s. Rio Fuente Santa Fuesenta	interstitial	Spain	SLOCHN193	F	KF478511	KF478596	KF478649	-
Echinogammarus berilloni 3 (Catta, 1878) (Typ) TG	143-E.berill-T-FRA	B.Sket	Bidarray, Cambo-les-Bains, r. Nive	river	France	SLOCHN143	F	KF478497	KF478583	KF478639	-
Echinogammarus berilloni 1	023-E.ber-Tour 023	B.Sket	Tours, Chateau-Renault	brook	France	SLOCHN023	F	KF478501	KF478587	KF478642	-
Echinogammarus berilloni 2	109-E.ber-FRA	B.Sket	Tours, Chateau-Renault	brook	France	SLOCHN109	F	KF478503	KF478589	KF478644	-
Echinogammarus cf. *berilloni*	532EgBer (532-Eg-ber-Tou-FRA)	B.Sket	springs Touvre I, Angouleme, NE Bordeaux	limnocrene springs	France	SLOCHN532	F	MK159922	MK160003	MK160056	
Echinogammarus cf. *tarragonensis oo*	525Eg (525-Eg-tarrag-FRA)	B.Sket	springs Touvre I, Angouleme, NE Bordeaux	limnocrene springs	France	SLOCHN525	F	MK159923	MK160004	MK160057	
Echinogammarus sp. (def.)	536Eg (536-Eg-Touvre-FRA)	B.Sket	springs Touvre I, Angouleme, NE Bordeaux	limnocrene springs	France	SLOCHN536	F	MK159924	MK160005	MK160058	
Echinogammarus cf. *aquilifer* Pinkster, 1969	192-E-aquil-ESP	C.Douady, F.Malard, C.Morvan	Santander, Tijeras, Ruiloba, c. Cueva de Tijeras-Concha	cave	Spain	SLOCHN192	F	KF478510	KF478595	-	KF478663
Echinogammarus zebrinus Pinkster and Stock 1971 Typ	148-E.zebrin-TypeFRA	B.Sket	Uchacq-et-Parentis, Mont-de-Marsan, r. Estrigon	brook	France-SW	SLOCHN148	F	KF478508	KF478594	KF478648	-
Echinogammarus zebrinus 1 Typ	C148 (148-C-E-zebrinus-Type-FRA)	B.Sket	Uchacq-et-Parentis, Mont-de-Marsan, r. Estrigon	brook	France-SW	SLOCHN148C	F	KF478509	-	-	-
***Typhlogammarus* group genera**			Dinaric karst								
Typhlogammarus cf. *mrazeki*	252-Tyg-Krupa-HRV	B.Jalžić	Zrmanja, c. Krupa	cave	Croatia	SLOCHN252	F	KF478505	KF478591	KF478646	-
Typhlogammarus heteropalpus.	502Tyg (502-Tyg-Hrnjak-HRV)	T.Delić, M.Zagmajster	Hrnjakova pećina, Bunić.	cave	Croatia	SLOCHN502	F	MK159925	MK160006	MK160059	
Typhlogammarus heteropalpus G. Karaman, 1972 (Typ)	436Typg (436-Typg-heterop-HRV-T)	B.Jalžić	Rudnica VI, Kamenica, Ogulin	cave	Croatia	SLOCHN436	F	MK159926	MK160007	MK160060	

Typhlogammarus heteropalpus	282Trudn (282-T-Rudn-HRV)	V.Jalžić	Rudnica VI, Kamenica, Ogulin	cave	Croatia	SLOCHN282	F	MK159927	MK160008	MK160061	
Typhlogammarus mrazeki 2 (Typ) TG	113-Typg-Typ-CrG	P.Trontelj, S.Polak	Cetinje, c. Lipska pećina	cave	Montenegro	SLOCHN113	F	KF478504	KF478590	KF478645	-
Typhlogammarus mrazeki 1 Schäferna, 1922	020-T.mra-Vjet 020	V.Zakšek	Popovo polje, Zavala, c. Vjetrenica	cave	Bosnia-Herzegovina	SLOCHN020	F	KF478500	KF478586	-	-
Accubogammarus sp.	114-?Accg-CrG	P.Trontelj, S.Polak	Grahovo, c. Vojvode Dakovića pećina	cave	Montenegro	SLOCHN114	F	KF478506	KF478592	KF478647	KF478661
Metohia carinata1 (Absolon, 1927) TG	019-M.car-Obod 019	P.Trontelj, S.Polak	Rijeka Crnojevića, c. Obodska pećina	cave stream	Montenegro	SLOCHN019	F	KF478498	KF478584	KF478640	-
Metohia carinata 2	025-M.car-Čič 025	B.Sket	Čičevo, Velja gora, c. Šumet	cave	Bosnia-Herzegovina	SLOCHN025	F	KF478499	KF478585	KF478641	-
genus *Parhomoeogammarus*			**W Iberian Peninsula**								
Parhomoeogammarus pacaudi (Hubault & Ruffo, 1956) Typ	522Eg (522-Eg-pacaudi-FRA)	B.Sket	Bastarisse-Bazas, SE Bordeaux	forest brook	France	SLOCHN522	F	MK159928	MK159975	MK160062	
Echinogammarus pacaudi (no setae, no denticles)	521Eg (521-Eg-Bazas-FRA)	B.Sket	Bastarisse-Bazas, SE Bordeaux	forest brook	France	SLOCHN521	F	MK159929	MK159976	MK160063	
***Parhomoeogammarus lusitanus* (Typ) TG**	526Prhmg (526-Prhmg-lus-T-POR)	B.Sket	Formariz PdC, Paredes de Coura	spring	Portugal	SLOCHN526	F	MK159930	MK159977	MK160064	
Echinogammarus (Parhomoeog) lusitanus l) (no calceoli)	477Phg (477-Phg-lusit-POR)	E.Martínez Ansemil	A Coruña prov., Galicia		Spain	SLOCHN477	F	MK159931	MK159978	MK160065	
genus *Relictogammarus*			**E Atlantic**								
Marinogammarus stoerensis (Reid, 1938) TG	250-Mg-Cork-ATL	A.Myers	County Cork, Fountainstown	sea, beach	Ireland-Atlantic	SLOCHN250	S	KF478515	KF478601	KF478651	-
Chaetogammarus stoerensis (Reid, 1938)		Macdonald et al. 2005	Maine		USA	-	S	-	AY926657	AY926762+ AY926824	-
***Gammarus* group genera (including Bajkalian genera; 22 OTUs)**											
Gammarus + Zenkevitchia	14 + 3 OTUs		Holarctic								
Bajkal genera	5 OTUs		Bajkal								
***Sarothrogammarus* group genera (incl. ?*Tadzocrangonyx;* 16 OTUs)**											
	6 OTUs		Central Asia	high mount.							
	10 OTUs		Mediterranean & E Atlantic	coastal							
genus *Relictogammarus*			E Atlantic								
Marinogammarus stoerensis (Reid, 1938) TG	250-Mg-Cork-ATL	A.Myers	County Cork, Fountainstown	sea, beach	Ireland-Atlantic	SLOCHN250	S	KF478515	KF478601	KF478651	-
(*Chaetogammarus stoerensis* (Reid, 1938))		Macdonald et al. 2005	Maine		USA	-	S	-	AY926657	AY926762+ AY926824	-
Outgroup 16 species, 8 genera, 5 families.											
fam. Gammaracanthidae	5 OTUs										
fam. Crangonyctidae	2 OTUs										
fam. Niphargidae	2 OTUs										
fam. Anisogammaridae	5 OTUs										
fam. Talitridae	2 OTUs										