A new molecular phylogeny for the Tanypodinae (Diptera: Chironomidae) places the Australian diversity in a global context

Matt N. Krosch[1,2]*, Fabio L. Silva[3], Torbjørn Ekrem[4], Andrew M. Baker[2,5], Litticia M. Bryant[2], Elisabeth Stur[4], Peter S. Cranston[6]

[1]Forensic Services Group, Queensland Police Service, Brisbane, QLD 4000, Australia.

[2]School of Biology and Environmental Science, Queensland University of Technology, Brisbane, QLD 4000, Australia.

[3]Department of Zoology, Institute of Biosciences, University of São Paulo, São Paulo, Brazil.

[4]Department of Natural History, NTNU University Museum, Norwegian University of Science and Technology, Trondheim, NO-7491, Norway.

[5]Natural Environments Program, Queensland Museum, PO Box 3300, South Brisbane, QLD 4101, Australia.

[6]Evolution and Ecology, Research School of Biological Sciences, The Australian National University, Canberra, ACT 2600, Australia.

*Corresponding author: krosch.mattn@police.qld.gov.au; ORCID 0000-0003-0354-8189; Queensland Police Service, 200 Roma Street, Brisbane, QLD 4000, Australia.

Declaration of Interest

None.

Abstract

The non-biting midge subfamily Tanypodinae (Diptera: Chironomidae) is species-rich, ecologically diverse, and near-globally distributed. Within the subfamily, aspects of generic and species-level taxonomy remain poorly understood, in particular the validity of assignment of Australian and New Zealand taxa to genera erected for northern hemisphere (Holarctic) fauna. Here, we place the austral diversity within this global context by extensive geographical and taxonomic sampling in concert with a multilocus phylogenetic approach. We incorporated sequence data for mitochondrial COI, and nuclear 28S and CAD, and conducted Bayesian and maximum likelihood phylogenetic inferences and Bayesian divergence time estimation. The resolved phylogeny supported many associations of Australian taxa with their proposed Holarctic congeners, with the exception of *Apsectrotanypus* Fittkau, and validates several taxa as endemic. Three of four New Zealand sampled taxa had their sister groups in Australia; New Zealand *Monopelopia* Fittkau was sister to a German congener. This included the first record of *Procladius* Kieffer from New Zealand. Most nodes connecting austral and Holarctic taxa clustered around the Cretaceous-Tertiary boundary (60-80 mya), whereas New Zealand-Australia nodes were generally slightly younger (53-57 mya). Together, these data contribute substantially to our understanding of the taxonomy, systematics and biogeography of the Australian Tanypodinae and more broadly to knowledge of Australia's aquatic insect biodiversity.

Keywords Pentaneurini, Macropelopiini, diversification, barcoding, non-biting midges, biogeography

1.0 Introduction

The species-rich and ecologically diverse family of non-biting midges (Diptera: Chironomidae) has aquatic immature stages that are commonly abundant and diverse components of the macroinvertebrate fauna encountered in biomonitoring surveys (Czechowski et al., 2020). The Tanypodinae is the third most species-rich subfamily and possesses a global distribution except Antarctica. The subfamily comprises 57 genera allocated to nine recognised tribes. Monophyly of the subfamily is well supported, as is its sister relationship to a clade comprising several other subfamilies (Cranston et al., 2010). Within the Tanypodinae, support for largely monophyletic tribes has been corroborated by

recent targeted morphological (Siri and Donato, 2015; Silva and Ekrem, 2016) and molecular phylogenies (Krosch et al., 2017), although their relationships were inconsistent and exhibited variable support. The tanypodines arguably remain the least well-understood subfamily at the genus and species levels, even in the adult stage in which many taxonomically informative characters typically are found. There are considerable gaps also in our understanding of the immature stages.

Comparative generic diagnoses in Chironomidae traditionally have been largely based on material from the northern hemisphere (Holarctic), and there has long been uncertainty concerning the validity of these (e.g., Fittkau, 1962; Murray and Fittkau, 1989, Cranston and Epler, 2013) to determine the systematic placement of the southern hemisphere Tanypodinae. Two Australian taxa identified previously as lying outside any Holarctic taxonomic concept are the monotypic *Australopelopia* Cranston, 2000 and *Yarrhpelopia* Cranston, 2017, the latter recently revised and expanded by Cranston et al. (2021). Several recent generic taxonomic revisions and systematic analyses have incorporated South American taxa (e.g., Silva et al., 2012; Silva et al., 2014; Silva and Ekrem, 2016; Silva and Ferrington, 2018). By contrast, the Australian Tanypodinae have received less attention to assess intraspecific diversity or systematic relationships. Indeed, most taxonomic research on the Australian fauna focused largely on the adult stage and took place before 1990, with one study integrating molecular and morphological data (for the genus *Procladius* Skuse, Carew et al., 2011). This justified Silva and Ekrem (2016, pp. 15) stating that *"The tanypodines … of the Australasian Region is comparatively poorly known"* reiterating similar earlier claims from Roback (1982). This problem extends to New Zealand, where arguably even less is known of the tanypodine fauna, although evidently it is less diverse than in Australia (Cranston, 2019).

Of the 57 tanypodine genera, Australia is considered to possess 23 (Cranston, 2019; Cranston et al., 2021), with all except five (*Australopelopia*, *Yarrhpelopia*, *Coelopynia* Freeman, and the newly described *Coronapelopia* Cranston and Krosch and *Paralarsia* Cranston and Krosch) with extra-Australian distributions. Of these, *Ablabesmyia* Johannsen, *Zavrelimyia* Fittkau (sensu Silva and Ekrem, including *Paramerina* Fittkau, *Reomyia* Roback and *Schineriella* Murray and Fittkau), *Larsia* Fittkau and *Procladius* are by far the most diverse and taxonomically complex. New Zealand possesses four genera, none of which are endemic (*Ablabesmyia*, *Alotanypus* Roback, *Monopelopia* Fittkau, *Zavrelimyia*) (Cranston, 2019). Several morphospecies similar to *Apsectrotanypus* Fittkau have been described or provisionally named as *Anatopynia* Johannsen or *Macropelopia* Thienemann from both

regions. Some insight into the systematics of the Australian fauna was provided by inclusion of selected taxa in recent global morphological (Silva and Ekrem, 2016) and molecular (Krosch et al., 2017) phylogenetic analyses. In both these works, however, the Australian fauna has featured modestly, with only representatives of the endemic genera included (Silva and Ekrem, 2016) or single typical representatives of genera (Krosch et al., 2017). In the latter study, Australian members of widely distributed *Procladius*, *Fittkauimyia* Karunakaran, *Apsectrotanypus*, and *Zavrelimyia* were included, and their relationships to Holarctic congeners were strongly supported in their generic assignments. However, this work lacked several other Australian taxa and could not explore intraspecific diversity in any detail.

Given their frequency of collection in biodiversity monitoring surveys, there is recognised need to reconcile the Australian tanypodine diversity with the Holarctic taxa to which they have been assigned on morphology. One approach to address this involves using molecular phylogenetics to understand genetic relationships between taxa. Where molecular data has been applied to chironomid systematics and taxonomy, including making associations between life stages, resulting patterns have been broadly congruent with morphological hypotheses, although often revealing cryptic taxa (e.g., Krosch et al., 2011; Anderson et al., 2013; Krosch et al., 2015). Here, we sought to place the Australian and New Zealand tanypodine fauna in a robust, dated molecular phylogeny with wide representation that includes the generic type species of Holarctic taxa and representatives of named subgenera. We expanded the geographic and taxonomic sampling, particularly of highly diverse genera such as *Zavrelimyia*, *Ablabesmyia*, *Larsia*, and *Procladius*, sought better representation of endemic genera *Coelopynia*, *Yarrhpelopia* and *Australopelopia*, and sampled widely across the continent, including Tasmania, and included Lord Howe Island and the distant Christmas Island. This approach allowed tests of hypotheses regarding assignation of austral taxa to Holarctic genera, in a necessary precondition for taxonomic revisionary studies. In addition, wider geographical sampling allowed exploration of biogeographical evolutionary patterns within Australia (e.g., divergences associated with Bass Strait, Nullarbor Plain, Lord Howe Island orogeny) and between Australia and other southern landmasses. Understanding the taxonomy and systematics of the Australian Tanypodinae and placing this diversity in a regional context will benefit applied biomonitoring surveys and improve our knowledge of Australia's aquatic insect biodiversity.

2.0 Methods

2.1 Taxon sampling & identification

Collection and specimen handling followed methods described in Krosch et al. (2017). In Australia, we sampled from far north and southeast Queensland, New South Wales (including Lord Howe Island), Australian Capital Territory, Victoria, Tasmania, Northern Territory and South Australia. We targeted immature stages, but where possible attempted to rear live specimens through to adult in individual vials to capture the discarded larval and pupal cuticles and thereby connect the morphological vouchers of all life stages. However, by emphasizing the larvae, we could benefit from preserved specimens from colleagues undertaking monitoring studies across the Australian continent from all states. In addition to Australian material, we included specimens from earlier collections by one of us (PSC) in New Zealand. Further, we sought representatives of critical type species of genera and subgenera from the northern hemisphere, as well as a selection of taxa from South America and South Africa collected by ourselves or provided by many colleagues (see Acknowledgements). Slides of Australian molecular vouchers are preserved in the Australian National Insect Collection, CSIRO, Canberra, Australia (ANIC), other vouchers are stored at the NTNU University Museum, Trondheim, Norway (NTNU-VM) or the Federal University of São Carlos, São Carlos Campus, Brazil (UFSCar).

A shortcoming of immature stages is that species-level identification, particularly for larvae, is more difficult than for the adult. As such, identifications followed the approach described in Krosch et al. (2017): larval head capsules and posterior parts were slide mounted in Euparal or Hoyer's mountant and the medial section used for DNA analysis. Pupae and exuviae were submitted to non-destructive DNA extraction (Krosch and Cranston, 2012) and the recovered cuticle mounted in Euparal with taxonomically critical adult body parts mounted and remaining parts (usually legs or medial abdomen) used for destructive DNA extraction. Identifications were made to species level where possible either on the basis of morphological data alone, or via molecular association between immature and mature specimens. Nevertheless, for some specimens this was not possible; for example, for larvae that lacked associated mature specimens or could not be identified to any known species. In such instances, only conservative identifications were made to the lowest taxonomic level possible (e.g., genus or tribe).

2.2 DNA extraction, PCR amplification and sequencing

Genomic DNA extraction followed Krosch et al. (2017) with five genomic regions amplified:

two regions of the mitochondrial protein-coding gene cytochrome *c* oxidase subunit 1 (*FolCOI* & *COI*), one region of the nuclear rRNA gene *28S*, and two regions of the nuclear protein-coding gene carbomoyl phosphate synthetase (*CAD1* and *CAD4*). Primers, reaction protocols and cycle programs used for amplification of all regions can be found in Krosch et al. (2011) and Krosch et al. (2015). Bi-directional sequencing was performed using ABI BigDye Terminator v.3.1 (ThermoFisher Scientific, Scoresby, Victoria, Australia) chemistry and was carried out in an ABI 3500 Capillary Electrophoresis Genetic Analyser at the Molecular Genetics Research Facility (QUT, Brisbane).

Northern hemisphere species were processed at the Centre for Biodiversity Genomics, University of Guelph, Canada, or at NTNU-VM following the same protocols. All new sequences generated have been lodged with GenBank (see Table A1). Sequence data was included from Cranston et al. (2010) and Krosch et al. (2017) and outgroup selection was based on the former study, using *Buchonomyia* (Buchonomyiinae), *Aphroteniella* (Aphroteniinae), *Telmatogeton* (Telmatogetoninae), *Diamesa* (Diamesinae), *Prodiamesa* (Prodiamesinae) and *Podonomopsis* (Podonominae). Genbank sequence data were also included for critical taxa, and particularly for 5' COI barcode analyses, using two podonomine sequences as outgroups (Table A1).

2.3 Data analyses

Potential heterozygous sites in nuclear sequence data, recognised by double peaks in sequence chromatograms, were coded as ambiguous bases according to IUPAC codes. *COI* and *CAD* sequences were compiled and edited by eye using BioEdit v.3.0.9 (Hall, 1999), whereas *28S* sequences were aligned initially by eye and refined using MUSCLE 3.7 (Edgar, 2004). Protein-coding sequences were aligned as nucleotides and amino acids to check for internal stop codons and frame-shift mutations. *28S* and *CAD1* were assessed with GBLOCKS ver. 0.91b (Castresana, 2000) to identify hypervariable regions: 14 and one such regions were removed from these alignments, respectively. Four introns were trimmed manually from *CAD4* alignments. Remaining alignment gaps were treated as missing data.

SequenceMatrix (Vaidya et al. 2011) was used to concatenate sequences for molecular phylogenetic reconstructions. To minimize the effects of missing data on resulting topologies, we concatenated sequences from only those specimens for which three or more loci were obtained. Molecular phylogenies were inferred for single locus datasets for these taxa (hereafter termed Datasets 1-5, Table A2, Figs. A1-5) and the concatenated dataset with each

locus partitioned individually (Dataset 6, Table A2). We also inferred a phylogeny using the entirety of 5' COI barcode (*FolCOI*) data (Dataset 7, Table A2). We opted not to partition according to codon base pair based on past experience that suggests a lack of third base pair composition bias in chironomids, and the recommendation of Angelis et al. (2018) that the use of many partitions may not be appropriate and may inadvertently introduce greater inaccuracy to topologies and divergence time estimates. Maximum likelihood (ML, 1000 bootstraps) reconstruction was performed for Datasets 1-7 using RAxML Version 8.0.24 (Stamatakis, 2006) under the GTRGAMMA model of sequence evolution. Bayesian phylogenetic inference was performed for Datasets 1-6 using MrBayes Version 3.2.2 (Huelsenbeck and Ronquist, 2001; Ronquist and Huelsenbeck, 2003), with the GTR model and gamma distribution of nucleotide frequencies applied separately to each partition. Runs were of 10 million generations sampled every 1000, with 25% of total samples removed as burn-in. All analyses were conducted on the CIPRES Science Gateway High Performance Computing platform (http://www.phylo.org; Miller et al. 2010).

Estimation of times to most recent common ancestor (tmrca) was conducted in BEAST Version 1.8.3 (Drummond and Rambaut, 2007; Drummond et al., 2012), using a dataset (Dataset 8, Table A2) that retained only single representatives of major clades from Dataset 6. Settings and calibrations followed Krosch et al. (2017), except that a normal prior was used for the rootheight calibration instead of the exponential prior of the previous study. Analyses were run twice for 100 million generations each, sampled every 1000 generations on the Cipres Science Gateway. Log files from each run were combined in LogCombiner ver. 1.8.1 (Drummond et al., 2012) after removal of the first 10% of samples from each run as burn-in. Convergence of each run and the combined data was assessed in Tracer ver. 1.5 (Rambaut et al., 2018). Tree files from each run were resampled to retain only 10% of the total trees and combined using LogCombiner after removal of the first 10% of retained trees from each run as burn-in. A chronogram was then produced using TreeAnnotator ver. 1.8.1 (Drummond et al., 2012).

3.0 Results & Discussion

In total, new sequence data was generated for at least one locus from 641 specimens, representing 109 taxa from 43 genera. New 5' COI barcodes (*FolCOI*) were recovered from almost all specimens (604), with less successful recovery of other loci resulting in an

incomplete total matrix. Removal of introns and hyper-variable regions from nuclear genes and exclusion of specimens with only one or two loci recovered produced a final concatenated multilocus dataset of 3427 characters from 338 individuals including outgroups (Dataset 6), with lengths per locus of: 642 bp (*FolCOI*), 765 bp (*COI*), 510 bp (*28S*), 742 bp (*CAD1*) and 768 bp (*CAD4*). This comprised 323, 321, 336, 145, and 76 taxa for *FolCOI*, *COI*, *28S*, *CAD1*, and *CAD4*, respectively. These data build substantially on previous analyses and extend the taxonomic and geographical coverage available for austral Tanypodinae (representing two-thirds of described Australian and New Zealand genera). This allowed deeper exploration of taxonomic relationships between austral taxa and their proposed northern hemisphere congeners and provided insights into several additional systematic matters, as well as with the tempo of diversification in the subfamily.

3.1 Systematics and taxonomic outcomes

The full *FolCOI* ML analysis included additional sequences obtained from GenBank, for a total of 718 taxa (Dataset 7). Phylogenies generated from this dataset were used reciprocally with re-examination of morphology to associate immature stages with adult conspecifics/congeners and inform species identification, and to seek potential misidentifications that required re-evaluation. It also allowed placement of taxa lacking sequence data for other loci. The full *FolCOI* tree is provided in Fig. A6. Deeper nodes of this phylogeny were largely uninformative/unresolved because of high sequence diversity; however, some key relationships deserve brief mention here. A single larval specimen of *Procladius* (NZ16.2) was collected from Ohakune, New Zealand, and was placed within a clade of southeastern Australian *Procladius* sp. that was sister to a clade of *P. villosimanus* Kieffer from Genbank data of Carew et al. (2011). We understand this to be the first record of *Procladius* from New Zealand. The near sequence identity of this specimen to Australian close relatives suggests recent introduction; however, we cannot comment further without additional specimens and data in a genus with confusing morphological uniformity (Carew et al., 2011). Several specimens of *Djalmabatista* Fittkau (larvae, pupae and an adult female) were recovered from two sites in far north Queensland and the Northern Territory, Australia; these were strongly supported as a monophyletic group. Ten specimens of *Nilotanypus* Kieffer barcoded from sites in far north Queensland grouped near a specimen from California (CATP9.3.9, from Krosch et al., 2017, and barcoded in the current study) and to representatives of European *Nilotanypus dubius* Meigen. A reared larva-pupa-female tentatively identified as ‘nr *Krenopelopia’* from northern Queensland (KCU1) was a weak sister to a clade of North American and European *Krenopelopia* Fittkau. Additional

morphological comparison is required to assess its status, but whether congeneric or not, a taxon with this morphology is novel and thus unexpected for Australia.

Maximum likelihood (Fig. 1a-c) and Bayesian phylogenies (Fig. A7) of the concatenated Dataset 6 were generally congruent, yet both were poorly resolved for many mid-level nodes, particularly within the Pentaneurini (Fig. 1a,b). This possibly arises from high sequence diversity or missing data/taxa, though we did not model the likelihood of this explicitly. Nevertheless, the phylogeny provided robust support for many relationships and allowed study of relationships of Australian taxa to regional and global (especially northern hemisphere) diversity.

At the deepest level, the nine tribes recognised within the Tanypodinae were strongly supported as monophyletic, following Silva & Ekrem (2016) and Krosch et al (2017) (Fig. 1c, node A). Two previously well-supported pairs of sister taxa were recovered again here: one with robust support from both analytical methods (Tanypodini + Procladiini, node G), the other with support only from Bayesian analysis (Pentaneurini + Natarsiini, node B). A perplexing difference between estimates of tribal relationships concerns the European Anatopyniini. This had lacked resolved support from morphology (Fig. 2A; Siri and Donato, 2015) but was modestly supported as sister to endemic Australian Coelopyniini based on the previous smaller molecular dataset (Fig. 2B). Represented by a sole species, Anatopyniini was here placed without support as sister to all tanypodines except Pentaneurini + Natarsiini under Maximum Likelihood (Fig. 1c, node C), yet with robust Bayesian support (PP = 0.98) it appeared as sister to all other tanypodines (Fig. 2C, Fig. A7). However, the phylogeny inferred by BEAST for Dataset 8 (Fig. A8) provided strong support as sister to Coelopyniini, as per Krosch et al. (2017). Interestingly, in Fittkau's (1962) scheme, *Anatopynia* was located in a deep polytomy. *Anatopynia* cannot readily be subject to greater sampling, and since the placement appears to vary with sampling outside of the tribe Anotypyniini, its correct position is not likely to be resolved without denser taxonomic sampling and genetic sequencing.

Aside from the problematic Anatopyniini, the diverse, monophyletic Pentaneurini + monogeneric Holarctic Natarsiini is robustly supported as sister to all other Tanypodinae (Fig. 1b, node B). Within this latter clade, the diverse Procladiini is well supported by all analyses as sister to the monogeneric Tanypodini (Fig. 1c, node J), in accordance with previous estimates (Fig. 2; Siri and Donato, 2015; Silva and Ekrem, 2016; Krosch et al.,

2017). These were in turn sister to a clade comprising the reciprocally monophyletic Clinotanypodini and monogeneric Fittkauimyini (Fig. 1c, node I). The Coelopyniini (with or without Anatopyniini) is supported as sister to worldwide Macropelopiini, and these then sister to the Procladiini + Tanypodini + Clinotanypodini + Fittkauimyini clade. The relationships between many of these tribes differed from those estimated from morphology previously (Fig. 2A; Siri and Donato, 2015; Silva and Ekrem, 2016).

Below the tribal level, nodal support often was greater, allowing association of several Australian taxa with their proposed northern hemisphere congeners (Fig. 1a-c). In tribe Procladiini, all Australian *Procladius* formed a strongly supported sister group to all northern hemisphere representatives. We corroborate Roback's (1982) proposal that the genotype, *Procladius paludicola* Skuse from Australia, differs from the diverse Holarctic representatives, for which he proposed subgenus *Holotanypus* Roback. A single member of a third subgenus, *Procladius* (*Psilotanypus*), *P. bellus* (Loew), was represented here only by a *FolCOI* sequence from Genbank, which was divergent from all other *Procladius.* Indeed, a subanalysis of the Tanypodini and Procladiini alone (data not shown) suggests *P*. (*P*.) *bellus* actually lies as sister to *Procladius* (s. str. + s.g. *Holotanypus*) + *Djalmabatista*. Because *P. bellus* is the type-species of *Psilotanypus*, this subgenus could be raised to genus rank or *Djalmabatista* be considered as a subgenus of *Procladius.* The two Australian specimens of *Djalmabatista* retained in the concatenated analysis (KCL9, KCL12), were sister to a congener from Arizona, USA (DJA; Fig. 1c), which, combined with the *FolCOI* results noted above, supports the generic assignment of the Australian members.

In tribe Coelopyniini, *Coelopynia* from western Australian was supported as a deeply divergent sister taxon to eastern Australian conspecifics, with western Queensland and Victorian populations reciprocally monophyletic (Fig. 1c).

Within the tribe Pentaneurini, *Larsia* (plus a new Australian sister taxon, *Paralarsia* Cranston and Krosch, 2021) was recovered as sister group to all other pentaneurines with robust support in the Bayesian analyses (Fig. 1b, node D), in keeping with Krosch et al. (2017), but contra to the morphology-based conclusions of Silva and Ekrem (2016) of a shallower *Larsia*, paired with *Hudsonomyia*, and chained with disparate genera with little or no support. The morphology-based tree had the basal nodes in Pentaneurini sequentially *Guttipelopia* Fittkau, then *Amazonimyia* Silva and Wiedenbrug sister to the other Pentaneurini with strong support (Silva and Ekrem, 2016); unfortunately the latter was unavailable for the current

study.

Amongst our well-sampled *Larsia*, all Australian specimens formed a strongly supported clade sister to a specimen from Thailand (TH42B), with this clade in turn robustly reciprocally monophyletic to all sampled New World representatives comprising North American and South American taxa (Fig. 1b). The informal taxon known previously as ‘genus B’, was supported as a robust sister to the *Larsia* cluster and a distinctive sister taxon of generic status, now described formally as *Paralarsia maiwar* Cranston & Krosch (Cranston and Krosch, 2021).

Concerning *Nilotanypus*, an Australian specimen (AUNT07) included from Cranston et al. (2010), missing *FolCOI*, grouped with all northern hemisphere members of this genus, including the Californian specimen which did provide *FolCOI* data. This latter specimen therefore associated the Australian *FolCOI* data mentioned above with the multilocus dataset, supporting this taxonomic assignment.

Australian *Zavrelimyia* Fittkau*,* treated as *Paramerina* Kieffer in all previous studies, formed a well-supported monophyletic cluster, weakly sister to European *Z. cingulata,* the type of now junior synonym *Paramerina* (Fig. 1b). The type species of *Zavrelimyia*, *Z. melanura* is separate from the Australian cluster and associates with Holarctic species from the 'core' *Zavrelimyia* in the strict sense (i.e., without *Paramerina*). *Zavrelimyia* is clearly rendered paraphyletic by inclusion of *Pentaneurella* Fittkau & Murray in the subclade of *Zavrelimyia* that included *Z. melanura*. Additionally, a strongly supported *Monopelopia* was placed near the base of the broader *Zavrelimyia* clade with weak support for the connecting node. The New Zealand representative of *Monopelopia* (NZ10.3.1) was the only taxon from Aotearoa with a sister relationship other than to Australia, instead sister to the European type-species of the genus, *Monopelopia tenuicalcar* (Kieffer), with this group then sister to a specimen from South Africa (AFTP2). However, the genus is present in Australia, but was not available for molecular study. A currently undescribed Brazilian taxon (‘Tanypodinae indet.’) was weakly supported as sister to *Zavrelimyia* + *Monopelopia* + *Pentaneurella*. These results suggest that there remain gaps in our understanding of the taxonomy of these genera, which may be resolved with greater sampling and detailed morphological study. Interestingly, subgenus *Z.* (*Paramerina*), until recently considered a distinct genus-level group (Silva & Ekrem, 2016), was consistently recovered as a monophyletic group, albeit with low support (Fig. 1b). The fact that species belonging to subgenus *Zavrelimyia* formed a well-supported group different

from the *Paramerina*-clade, suggests that *Paramerina* should be elevated to genus-level again.

Australian and New Zealand *Ablabesmyia* clustered into two clades, each with northern hemisphere representatives, corresponding to subgenera (Fig. 1a). *Ablabesmyia 'hilli*-type' from Australia and Aotearoa grouped with extralimital species allocated to *Ablabesmyia* sensu stricto, whereas the Australian *Ablabesmyia* '*notabilis*-type' formed a specimen-rich cluster with species from the northern hemisphere allocated to *A.* (*Karelia* Roback), associated with its type species *A.* (*K.*) *illinoensis* Malloch. However, our inclusion of North American *A. annulata* (Say), representing a third subgenus (*Asayia* Roback), renders subgenus *Ablabesmyia* s. str. paraphyletic, with *A. annulata* located close to the type species of the genus, *A. monilis* Linnaeus, implying that *Asayia* lacks support for subgeneric rank status.

The informal *Thienemannimyia* grouping of genera, proposed by Fittkau (1962) and recovered from morphology by Silva and Ekrem (2016) and from molecular analyses by Krosch et al. (2017) is strongly supported (Fig. 1a, node M). A novel putative genus-ranked taxon ('*Thienemannimyia* gp. gen. nov.') was recognised from specimens from the Northern Territory, Australia. Bayesian inference placed this taxon as sister to all other *Thienemannimyia* group with maximum support (Fig. A7), but ML weakly supported placement as sister to only the northern hemisphere genera *Thienemannimyia* + *Rheopelopia* Fittkau. The position of *Yarrhpelopia* relative to the *Thienemannimyia* group was equivocal, with BEAST (Fig. A3) and ML (Fig. 1a) trees variably supporting a sister grouping, as per Cranston (2017) and Krosch et al. (2017), but Bayesian analysis did not resolve this node (Fig. A7).

The genus *Conchapelopia* Fittkau is monophyletic with high support (Fig. 1a). *Meropelopia americana* (Fittkau, 1957) previously listed under *Conchapelopia* (Roback, 1981) and later elevated to genus rank by Fittkau & Roback (1983) is sister to *Arctopelopia* spp., not the remaining *Conchapelopia*, supporting a classification with *Meropelopia* as a separate genus in the *Thienemannimyia* group of genera (Fig. 1a, node M).

The position of *Ablabesmyia* as sister to the *Thienemannimyia* group, as implied by Fittkau (1962) and suggested by Silva and Ekrem (2016), is not supported here by molecular data. Likewise, proximity, albeit unsupported, to Australian taxa now described as *Yarrhpelopia*

reported by Krosch et al. (2017) is unlikely given the strong support for *Guttipelopia* as the sister group to *Ablabesmyia* in all multilocus analyses here (Fig. 1a, A7, A8).

The newly described monophyletic Australian genus *Coronapelopia* was robustly supported in Bayesian analysis (PP=1.0) as sister to Patagonian *Pentaneura cinerea* Philippi alone (Fig. A7). In ML analysis, *Coronapelopia* consistently lay close to the grouping of New World taxa *Pentaneura* (including *P. cinerea*)*, Hudsonimyia* Roback and *Parapentaneura* Stur, Fittkau and Serrano but without support (Fig. 1a). Increased molecular sampling relative to earlier studies now includes examples likely to be of *P. cinerea* (the type species), and larval specimens of *Hudsonimyia*, likely of type species *H. karelena* Roback. Our analyses now point to paraphyly for both *Hudsonimyia* and *Pentaneura* due to type species being dissociated from congeners, and with *Parapentaneura* interleaved. On morphology, Silva and Ferrington (2018) had found *Pentaneura* to be sister to *Parapentaneura*, and these to be sister to *Hudsonimyia*. However, *Hudsonimyia* was not represented by the North American type species that, when included here, modified relationships. In the absence of type specimens, uncertainty remains as to the identity of the type species, *P. cinerea*, as discussed by Silva & Ferrington (2018). However, if correctly understood, the genus name must remain with *P. cinerea*, in a concept recognised subsequently by all authors including ourselves. Although supportive molecular data in this cluster lies outside critical nodes, synonymy between *Hudsonimyia* and *Pentaneura* proposed by Sublette and Sasa (1994), despite being rejected previously including by Cranston and Epler (2013), provides a justifiable outcome. A possible classification with subgenera fails, as neither *Pentaneura* or *Hudsonimyia* are monophyletic, and the need to incorporate *Parapentaneura* cannot be overlooked. The proposal alluded to by Dantas et al. (2020) including some novel morphology has merit.

The only notable Austro-Pacific taxa placed outside their purported northern congeners were in tribe Macropelopiini. All Australian and New Zealand species assigned to '*Apsectrotanypus'* formed a monophyletic group, distant from the northern hemisphere *Apsectrotanypus trifascipennis* Zetterstedt. This, the type species of *Apsectrotanypus,* was placed without any supported sister taxon in a cluster of Macropelopiini, mostly from the Holarctic but including one South African and one Patagonian species (*Wuelkerella toncekensis* Suárez & Sublette). The three specimens of '*Apsectrotanypus*' from Aotearoa formed a sister group to all Australian members, with branch lengths and divergence age estimates suggesting species-level difference (Fig. 1c, A8), and with additional diversity evident among sampled Australian populations. Indeed, all New Zealand taxa had their

respective sister groups in Australia except *Monopelopia* (see above).

We did not include a New Zealand *Alotanypus* in our analyses (only a single *COI* sequence from Krosch et al. (2017) was available and no new molecular material was collected); however, previous study suggested that this New Zealand taxon was not placed with the North American representative of the genus. Instead, the taxon was supported as sister to *Brundiniella* (Krosch et al., 2017), a position in the current phylogeny occupied by northern hemisphere *Apsectrotanypus trifascipennis*, which may imply that New Zealand '*Alotanypus*' actually represents true *Apsectrotanypus*. Resolution will likely require greater sampling in Aotearoa and morphological comparisons to relevant type specimens.

Although we aspire to species-level identifications, this is not straightforward. Contemporaneous taxonomic revisionary studies of the Australian Tanypodinae are integrating the improved morphological sampling with the molecular studies reported here. For example, the previously monotypic pentaneurine *Yarrhpelopia* has been expanded by revelation of a new congener, and a morphologically similar new genus *Coronapelopia* with two new species (Cranston et al., 2021). Likewise for *Larsia*, with new species revealed and a generic-rank sister taxon described (Cranston & Krosch, 2021). The status and diversity of other currently monotypic taxa such as *Australopelopia*, *Coelopynia*, and *Djalmabatista*, and genera with several named Australian species such as *Ablabesmyia*, *Procladius* and *Zavrelimyia* (including *Paramerina*) are challenged by molecular data that require integration into formal taxonomy. Pending completion of such studies, the safest strategy is to refer here (e.g., Table A1, Fig. 1a-c) only to conservative identifications at higher taxonomic levels. In prior publications some molecular specimens have been allocated to named species (e.g., *Australopelopia prionoptera* Cranston, *Coelopynia pruinosa* Freeman) but our removal of the species epithets should be taken only as recognition of uncertainty about the limits of the taxon under new evidence, not that these identifications were incorrect. Further, reciprocal illumination from morphology and DNA also allowed reassessment of taxonomic identifications of taxa that were included from previous works. This largely related to larvae, often poorly mounted, from groups for which the relevant morphological characters can be highly variable or critical features in identification keys are no longer considered reliable (e.g., *Zavrelimyia*).

3.2 Tempo of radiation of the Tanypodinae

Initial divergence of the subfamily was estimated to have occurred 119 mya (105-135mya) (Fig. A8, Table 1). Tribe Pentaneurini diverged from the Natarsiini approximately 112 mya (99-127 mya), and initial divergence of the 'non-Pentaneurine' tribes began 107 mya (92-122 mya). Divergence of these tribes proceeded through the mid-late Cretaceous, with the final tribal-level split (Anatopyniini from Coelopyniini, though note the uncertainty surrounding the placement of the former tribe mentioned above) occurring around 79 mya (62-96 mya). Several genera and genus groups were of similar age (e.g., *Thienemannimyia* genus group, *Ablabesmyia*, *Zavrelimyia* + *Monopelopia* + *Pentaneurella*) (Fig. A8).

Nodes that connected New Zealand and Australian taxa ranged from 57 mya (45-70 mya, *Apsectrotanypus*) to 53 mya (40-65 mya, *Ablabesmyia*) (Fig. A8). This was similar to the estimated divergence of New Zealand and German *Monopelopia* at 59 mya (44-73 mya), though Australian *Monopelopia* was unsampled. New Zealand-Australian nodes were generally older than estimated for other chironomid groups. Such trans-Tasman nodes have been dated to 30–40 mya in the Orthocladiinae (Krosch and Cranston, 2013; Krosch et al., 2011, 2015) and the Chironominae genus *Riethia* Kieffer (Krosch et al., 2020). Divergences of NZ taxa estimated here supported previous studies in suggesting that chironomids survived the (incomplete) Oligocene 'drowning' of Zealandia with tanypodines maybe having a more ancient presence. The age of New Zealand *Procladius* – represented by a single larva from central North Island, the first record of this genus in Aotearoa – was not estimated because only *FolCOI* was available, but the position of this taxon in the *FolCOI* tree suggests it is a recent immigrant, possibly via West Wind Drift from Australia. This is a well-known phenomenon (Cook and Crisp, 2005) and may explain similar phylogenetic relationships in other chironomid groups (e.g., *Eukiefferiella* – Krosch et al., 2011).

Nodes connecting Australian taxa to relatives in the northern hemisphere clustered generally around the Cretaceous-Tertiary boundary (65 mya) for *Larsia*, *Ablabesmyia*, *Thienemannimyia*, and *Nilotanypus*, but also ranged from 80 mya (67–93 mya) in *Procladius*, to 43 mya (31–54 mya) for Christmas Island *Ablabesmyia hilli* Freeman and USA *A. annulata* Say (Fig. A8). Within Australia, *Zavrelimyia* from Lord Howe Island unexpectedly were strongly supported as sister to Western Australian representatives in all analyses, with divergence occurring approximately 52 mya (41–64 mya). In contrast, *Australopelopia* taxa from the island appear to have diverged more recently from a north Queensland sister around 17 mya (10–25 mya), with possible migration back to north Queensland around 3 mya (2–5 mya). Nodes associated with Lord Howe Island (LHI)

generally appeared much older than both estimated emergence of the island mass around 6.4–6.9 mya (McDougall et al. 1981), and divergence dates estimated for other LHI chironomids (e.g., *Cricotopus* – Krosch et al., 2015). Ancestral LHI *Australopelopia* may have diverged from relatives in northern Queensland via a more ancient island chain along the Lord Howe Rise (McDougall et al., 1981), but did not arrive on LHI itself until island emergence. The deep split of WA-LHI *Zavrelimyia* is unexpected and perhaps results from related branches from elsewhere in Australia being pruned by extinction.

Aside from the Western Australia-Lord Howe Island relationship noted above, all other included Western Australian taxa were placed as deeply divergent sister taxa to clades comprising eastern Australian specimens (*Yarrhpelopia*, *Australopelopia*, *Coelopynia*, *Larsia*) (Fig. 1a-c), with divergence time estimates ranging from 43 mya (30–56 mya) for *Coelopynia* to 72 mya (56–87 mya) for *Yarrhpelopia* (Fig. A8). This is substantially older than reported for *Riethia* (Krosch et al., 2020) but similar to the orthocladiine *Stictocladius* Edwards (Krosch and Cranston, 2013).

Tasmanian representatives were consistently most closely related conspecifics in southeastern Australia (either Victoria or New South Wales), although they were largely nested within clades rather than reciprocally monophyletic with mainland taxa (Fig. 1a-c). Relevant nodes were estimated as being around 3-17 my (1–22 my) old (Fig. A8), which accorded with trans-Bassian divergences for *Cricotopus* v.d. Wulp (Krosch et al., 2015), which appear to be associated with allopatric divergence across a proto-Bass Strait. By contrast, Northern Territory and north Queensland taxa often formed clusters separate, and often sister, to clades of southern Australian specimens (Fig. 1), suggesting strong continental-scale structuring as observed in other Australian chironomid groups (Carew et al., 2011; Krosch, 2011; Krosch et al., 2009; 2013; 2015; 2020).

4.0 Conclusions

Substantially increased testing of the subfamily Tanypodinae with wider geographic and more intensive sampling including of type species of relevant genera has enhanced understanding of diversity and relationships. At the deepest level, the prevailing tribal classification, based substantially on earlier morphological evidence, is corroborated, although some relationships remain poorly resolved or ambiguous. Addition of type species

overwhelmingly validates Australian generic placements with their respective northern congeners, as was the case with *Zavrelimyia*, *Ablabesmyia*, *Larsia*, *Procladius* (including the first record of this genus in Aotearoa), *Djalmabatista*, *Nilotanypus*, and from New Zealand, *Monopelopia*. Nonetheless, some anomalies were revealed, notably in the global tribe Macropelopiini, in which austral '*Apsectrotanypus*' are distinct from the northern hemisphere type, representing a novel taxon requiring further study.

New endemic Australian taxa of higher supraspecific rank suspected previously from morphology, especially of the immature stages, have been supported as distinct and each monophyletic (e.g., *Coelopynia*, *Australopelopia*, *Yarrhpelopia* and *Coronapelopia*). Others, reported previously under codes, have been refuted. Taxonomic revisions continue, with descriptions of new taxa a potential bottleneck in the implementation of molecular-based results. This is especially so because complete life histories are expected in chironomid systematic studies and in evaluating biomonitoring at species level. This study has revealed many life history associations by molecular associations. For example, the previously informally coded 'genus B' was supported as a distinct clade, sister to *Larsia*, representing the new genus *Paralarsia*. Similarly, the novel taxon recognised here as '*Thienemannimyia* gp. gen. nov.' was distinct from northern hemisphere *Thienemannimyia* and other members of the '*Thienemannimyia* group' and appears to be a new genus of Tanypodinae from northern Australia also requiring formal description.

In other cases, species-rich genera such as *Procladius*, *Ablabesmyia* and *Zavrelimyia* present a bewildering complexity of patterns of distribution and species delimitation for which even our extended data do not permit easy interpretation. Intensive sampling on a continental scale undertaken here cannot equate to the population-level sampling and analyses necessary for robust resolution of these groups. Unfortunately, samples from Western Australia rarely provided good molecular data for unknown reasons, thus limiting our understanding of a large part of the continent with a unique biogeography and high endemism in many groups. Any further study of the Australian Tanypodinae should aim to fill these lacunae.

5.0 Acknowledgements

We are grateful to numerous colleagues and associates who contributed specimens, both Australian and critical northern hemisphere taxa, towards this study:

- Melissa Carew, University of Melbourne, Australia
- Andrea Prior and Annette Ritchie, Queensland Department of Environment and Science, Brisbane, Australia
- Chris Madden, Freshwater Macroinvertebrates, Adelaide, South Australia
- Nicole Carey, Wetland Research & Management, Perth, Australia
- Julie Hanley and Chris Humphrey, Commonwealth Department of Agriculture, Water and the Environment, Jabiru and Darwin, Northern Territory
- Adrian Pinder, Department of Biodiversity, Conservation and Attractions, Perth, Australia
- Henk Vallenduuk, Netherlands
- Pat Hudson, Great Lakes Science Center, US Geological Survey
- Diego Suarez, National University of Comahue, Argentina
- Bohdan Bilyj, Mississauga, Canada.
- Scott R McCluen, University of Maryland

We thank all Australian state and territory governments, Te Papa Atawhai (Department of Conservation, New Zealand), and their relevant environment officers, park rangers and traditional owners who approved collecting permits and facilitated access that allowed us to conduct field sampling in protected areas. In Queensland, collecting permits were obtained via the Entomological Society of Queensland, and we thank Christine Lambkin for her tireless efforts in negotiating this arrangement. We also thank Andrew Heweston at Noah Creek, Cape Tribulation, Queensland for access to private property bordering Noah Creek; Marcus Yates at the QUT Samford Ecological Research Facility for access to Samford Creek; and several private landholders who provided access to their dams.

The data reported in this paper were partly obtained at the Central Analytical Research Facility, operated by the QUT Institute for Future Environments. Access to CARF is supported by generous funding from the Science and Engineering Faculty (QUT). We also generated data at the Centre for Biodiversity Genomics, University of Guelph, and thank Evgeny Zakharov and Suresh Naik for facilitating this. MNK thanks his management at the Queensland Police Service, and previously at QUT (Prof. Tony Clarke), for allowing him the time to work on this project despite it being additional to his normal (paid) duties.

6.0 Funding

This project was supported by funding from the Australian Biological Resources Survey National Taxonomy Research Grant Program (RT216-36).

7.0 References

Anderson, A. M., Stur, E., and Ekrem, T. 2013. Molecular and morphological methods reveal cryptic diversity and three new species of Nearctic *Micropsectra* (Diptera: Chironomidae). Freshwater Science, 32: 892-921. doi: 10.1899/12-026.1.

Angelis K., Alvarez-Carretero S., Dos Reis M., and Yang Z. 2018. An evaluation of different partitioning strategies for Bayesian estimation of species divergence times. Systematic Biology, 67: 61-77. doi: 10.1093/sysbio/syx061.

Carew, M. E., Marshall, S. E., and Hoffmann, A. A. 2011. A combination of molecular and morphological approaches resolves species in the taxonomically difficult genus *Procladius* Skuse (Diptera: Chironomidae) despite high intra-specific morphological variation. Bulletin of Entomological Research, 101: 505–519. doi: 10.1017/S000748531100006X

Castresana, J. 2000. Selection of conserved blocks from multiple alignments for their use in phylogenetic analysis. Molecular Biology and Evolution, 17: 540-552. doi: 10.1093/oxfordjournals.molbev.a026334

Cook, L. G., and Crisp, M. D. 2005. Directional asymmetry of long-distance dispersal and colonization could mislead reconstructions of biogeography. Journal of Biogeography, 32: 741-754. doi: 10.1111/j.1365-2699.2005.01261.x

Cranston, P. S. 2000. Three new species of Chironomidae (Diptera) from the Australian Wet Tropics. Memoirs of the Queensland Museum, 46: 107-127.

Cranston, P. S. 2019. Identification guide to genera of aquatic larval Chironomidae (Diptera) of Australia and New Zealand. Zootaxa, 4706: 71-102.

Cranston, P. S., Hardy, N. B., Morse, G. E., Puslednik, L., and McCluen, S. R. 2010. When molecules, and morphology concur: the Gondwanan midges (Diptera: Chironomidae). Systematic Entomology, 35: 636–648. doi: 10.1111/j.1365-3113.2010.00531.x

Cranston, P. S., and Epler, J. 2013. 5. The larvae of Tanypodinae (Diptera: Chironomidae) of the Holarctic region —Keys and diagnoses. pp. 39-136 in Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: Larvae. Editors: Trond Andersen, Peter S.Cranston & John H. Epler. Insect Systematics and Evolution Supplements, 66: 1-571.

Cranston, P. S., Krosch, M. N., and Baker, A. M. 2021. Molecular evidence for deeper diversity in Australian Tanypodinae (Chironomidae): *Yarrhpelopia* and related new taxa. Zootaxa, 4949 (1): 01-023. doi: 10.11646/zootaxa49491.1

Cranston, P. S., Krosch, M. N. 2021. Dense, continent-wide, molecular and morphological sampling supports old and new taxa in Australian pentaneurine Tanypodinae (Diptera: Chironomidae). Austral Entomology, 60: 486-504. doi: 10.1111/aen.12558

Czechowski, P., Stevens, M. I., Madden, C., and Weinstein, P. 2020. Steps towards a more efficient use of chironomids as bioindicators for freshwater bioassessment: Exploiting eDNA and other genetic tools. Ecological Indicators, 110: 105868. doi: 10.1016/j.ecolind.2019.105868

Dantas, G.P.S., Pinheiro, M.P.G. and Hamada, N. 2020. An unusual new species of *Pentaneura* Philippi (Diptera: Chironomidae) from northeastern Brazil, with an emended diagnosis to the genus. Zootaxa, 4786 (1): 081–092. doi: 10.11646/zootaxa.4786.1.6.

Drummond, A. J., and Rambaut, A. 2007. BEAST: Bayesian evolutionary analysis by sampling trees. BMC Evolutionary Biology, 7: 214. doi: 10.1186/1471-2148-7-214

Drummond, A. J., Suchard, M. A., Xie, D., and Rambaut, A. 2012. Bayesian phylogenetics with BEAUti, and the BEAST 1.7. Molecular Biology and Evolution, 29: 1969–1973. doi: 10.1093/molbev/mss075

Edgar, R. C. 2004. MUSCLE: multiple sequence alignment with high accuracy, and high throughput. Nucleic Acids Research, 32: 1792–1797. doi: 10.1093/nar/gkh340

Fittkau, E. J. 1962. Die Tanypodinae (Diptera: Chironomidae). Die Tribus Anatopyniini, Macropelopiini und Pentaneurini. Abhandlungen zur Larvalsystematik der Insekten, 6: 1–453.

Fittkau, E. J., and Roback, S. S. 1983. The larvae of Tanypodinae (Diptera: Chironomidae) of the Holarctic region. - Keys and diagnoses. pp. 34-110 in Chironomidae of the Holarctic region - Keys and diagnoses. Part 1. Larvae. Editor: Torgny Wiederholm. Entomologica scandinavica supplement, 19.

Hall, T. A. 1999. BioEdit: a user-friendly biological sequence alignment editor, and analysis program for Windows 95/98/NT. Nucleic Acids Symposium Series, 41: 95–98.

Huelsenbeck, J. P., and Ronquist, F. 2001. MrBayes: Bayesian inference of phylogeny. Bioinformatics, 17: 754–755. doi: 10.1093/bioinformatics/17.8.754.

Krosch, M. N. 2011. Phylogeography of Echinocladius martini Cranston (Diptera: Chironomidae) in closed forest streams of eastern Australia. Austral Entomology, 50: 258-268. doi: 10.1111/j.1440-6055.2011.00822.x.

Krosch, M. N., Baker, A. M., Mather, P. B., and Cranston, P. S. 2009. Deeply divergent mitochondrial lineages reveal patterns of local endemism in chironomids of the Australian Wet Tropics. Austral Ecology, 34: 317-328. doi: 10.1111/j.1442-9993.2009.01932.x.

Krosch, M. N., Baker, A. M., Mather, P. B., and Cranston, P. S. 2011. Systematics and biogeography of the Gondwanan Orthocladiinae (Diptera: Chironomidae). Molecular Phylogenetics and Evolution, 59: 458-468. doi: 10.1016/j.ympev.2011.03.003.

Krosch, M. N., and Cranston, P. S. 2012. Non-destructive DNA extraction, including of fragile pupal exuviae, extends analysable collections, and enhances vouchering. Chironomus, 25: 22–27.

Krosch, M. N., and Cranston, P. S. 2013. Not drowning, (hand)waving? Molecular phylogenetics, biogeography and evolutionary tempo of the 'Gondwanan' midge *Stictocladius* Edwards (Diptera: Chironomidae). Molecular Phylogenetics and Evolution, 68: 595-603. doi: 10.1016/j.ympev.2013.04.006.

Krosch, M. N., Cranston, P. S., Baker, A. M., and Vink, S. 2015. Molecular data extend Australian *Cricotopus* midge (Chironomidae) species diversity, and provide a phylogenetic hypothesis for biogeography and freshwater monitoring. Zoological Journal of the Linnean Society, 175: 496-509. doi: 10.1111/zoj.12284.

Krosch, M. N., Cranston, P. S., Bryant, L. M., Strutt, F., and McCluen, S. R. 2017. Towards a dated molecular phylogeny of the Tanypodinae (Chironomidae, Diptera). Invertebrate Systematics, 31: 302-316. doi: 10.1071/IS16046.

Krosch, M. N., Herold, N., Thornhill, A. H., and Cranston, P. S. 2020. How 'Gondwanan' is *Riethia*? Molecular phylogenetics elucidates the mode and tempo of diversification in Austro-Pacific Chironomidae (Diptera). Invertebrate Systematics, 34: 328-341. doi: 10.1071/IS19053.

McDougall, I., Embleton, B. J. J., and Stone, D. B. 1981. Origin and evolution of Lord Howe Island, southwest Pacific Ocean. Journal of the Geological Society of Australia, 28: 155-176.

Miller, M. A., Pfeiffer, W., and Schwartz, T. 2010. Creating the CIPRES Science Gateway for inference of large phylogenetic trees. In 'Proceedings of the Gateway Computing Environments Workshop (GCE), New Orleans, LA'. pp. 1–8.

Murray, D. A., and Fittkau, E. J. 1989. The adult males of Tanypodinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. *Chironomidae of the Holarctic Region. Keys and Diagnoses. Part 3. Adult Males*, *Entomologica Scandinavica, Supplement*, Vol. 34 (ed. by T. Wiederholm), pp. 37 – 124. Entomologica Scandinavica,

Lund, Sweden.

Rambaut A, Drummond AJ, Xie D, Baele G and Suchard MA (2018) Posterior summarization in Bayesian phylogenetics using Tracer 1.7. Systematic Biology, 67: 901-904. doi:10.1093/sysbio/syy032.

Roback, S. S. 1971. The adults of the subfamily Tanypodinae (= Pelopiinae) in North America (Diptera: Chironomidae). Monographs of the Academy of Natural Sciences of Philadelphia, 17: 1-410.

Roback, S. S. 1981. The immature chironomids of the Eastern United States V. Pentaneurini - Thienemannimyia-group. Proceedings of the Academy of Natural Sciences of Philadelphia, 133: 73-128.

Roback, S. S. 1982. The Tanypodinae (Diptera: Chironomidae) of Australia II. Proceedings of the Academy of Natural Sciences of Philadelphia, 134: 80–112.

Ronquist, F., and Huelsenbeck, J. P. 2003. MrBayes 3: Bayesian phylogenetic inference under mixed models. Bioinformatics, 19: 1572–1574. doi:10.1093/bioinformatics/btg180.

Silva, F. L., Wiedenbrug, S., Trivinho-Strixino, S., de Oliveira, C. S. N., and Pepinelli, M. 2012. Two new species of *Hudsonimyia* Roback, 1979 (Diptera: Chironomidae: Tanypodinae) from Neotropical Region unveiled by morphology and DNA barcoding. Journal of Natural History, 46: 25-26.

Silva, F. L., Fonseca-Gessner, A. A., and Ekrem, T. 2014. A taxonomic revision of genus *Labrundinia* Fittkau, 1962 (Diptera: Chironomidae: Tanypodinae). Zootaxa, 3769: 1-185.

Silva, F. L., and Ekrem, T. 2015 [2016]. Phylogenetic relationships of nonbiting midges in the subfamily Tanypodinae (Diptera: Chironomidae) inferred from morphology. *Systematic Entomology*, 41: 73-92. VoR 30 August 2015. doi:10.1111/syen.12141.

Silva, F. L., and Ferrington, L. C. 2018. Systematics of the new world genus *Pentaneura* Phillip (Diptera: Chironomidae: Tanypodinae): Historical review, new species and phylogeny. Zoologischer Anzeiger, 274: 60-89.

Siri, A., and Donato, M. 2015. Phylogenetic analysis of the tribe Macropelopiini (Chironomidae: Tanypodinae): adjusting homoplasies. Zoological Journal of the Linnean Society, 174: 74-92. doi: 10.1111/zoj.12228.

Stamatakis, A. (2006). RAxML-VI-HPC: maximum likelihood-based phylogenetic analyses with thousands of taxa, and mixed models. Bioinformatics, 22: 2688–2690. doi:10.1093/bioinformatics/btl446.

Sublette, J. E., and Sasa, M. (1994) Chironomidae collected in Onchocerciasis endemic areas of Guatemala (Insecta, Diptera). Spixiana Supplement, 20: 1 - 60.

Vaidya, G., Lohman, D. J., and Meier, R. 2011. SequenceMatrix: concatenation software for

the fast assembly of multi-gene datasets with character set and codon information. Cladistics, 27: 171-180. doi: 10.1111/j.1096-0031.2010.00329.x.

Tables

Table 1. BEAST estimated divergence dates for selected nodes (see Figure A8 for full BEAST time-scaled tree). Node letter codes correspond to Figs. 1a-c and A8, dates are in million years ago and show the mean and 95% highest posterior density in parentheses.

Clade	Node letter	Current	Krosch et al (2017)
Tanypodinae	A	119 (105-135)	118 (101-138)
Pentaneurini+Natarsiini	B	112 (99-127)	109 (92-128)
Macropelopiini+Fittkauimyiini+Tanypodini+Coelopyniini+Anatopyniini+Procladiini	C	107 (92-122)	106 (89-125)
Pentaneurini	D	106 (93-120)	101 (85-119)
Fittkauimyiini+Clinotanypodini+Procladiini+Tanypodini	E	101 (87-116)	100 (82-119)
Macropelopiini+Coelopyniini+Anatopyniini	F	99 (85-114)	99 (81-118)
Procladiini+Tanypodini	G	94 (80-108)	88 (70-107)
Macropelopiini	H	89 (75-102)	89 (72-107)
Fittkauimyiini+Clinotanypodini	I	89 (73-104)	89 (71-108)
Procladiini	J	88 (74-102)	74 (56-92)
Natarsiini	K	85 (64-108)	66 (31-98)
Anatopyniini+Coelopyniini	L	79 (62-96)	74 (50-96)
Thienemannimyia group	M	69 (58-82)	74 (60-90)
Tanypodini	N	54 (37-70)	33 (15-53)

Figure captions

Figure 1a-c. Maximum Likelihood tree for Dataset 6. Relevant bootstrap support values >50 are shown, with corresponding Bayesian posterior probabilities. Tip label codes correspond to molecular voucher codes listed in Table A1. Lineages from the southern hemisphere are colour coded: green branches = Australia (dashed green denotes a specimen from Christmas Island), red = New Zealand, yellow = South America, blue = South Africa. Lettered nodes correspond to those that appear in Table 1 and Fig. A8, unless relationships deviated (e.g., placement of *Anatopynia*).

Figure 2. Hypotheses of tribal relationships. (A) Silva and Ekrem (2016), (B) Krosch et al. (2017), (C) this study. In (A) support values are absolute frequencies/frequency differences (GC); in (B) and (C) bootstrap support (BS) values >50 are followed by the corresponding Bayesian posterior probabilities (PP); '-' denotes nodes unresolved by ML or Bayes.

Appendices

Table A1. List of taxa, codes, life-stage, locations and GenBank accessions included in this study. Life stages are given as: L, larva; L(P), pharate larva; P, pupa; Pm, male pupa; Pf, female pupa; Pe, pupal exuviae; m, adult male; f, adult female. Taxa with associated 'indet.', 'nr' or 'cf.' are uncertain at genus or species level, respectively. Genbank accessions of data generated by this study begin with prefix MW.

Table A2. Summary of each dataset used for molecular phylogenetic analyses.

Figure A1. RAxML topology for the *FolCOI* dataset (Dataset 1). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A2. RAxML topology for the *COI* dataset (Dataset 2). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A3. RAxML topology for the *28S* dataset (Dataset 3). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

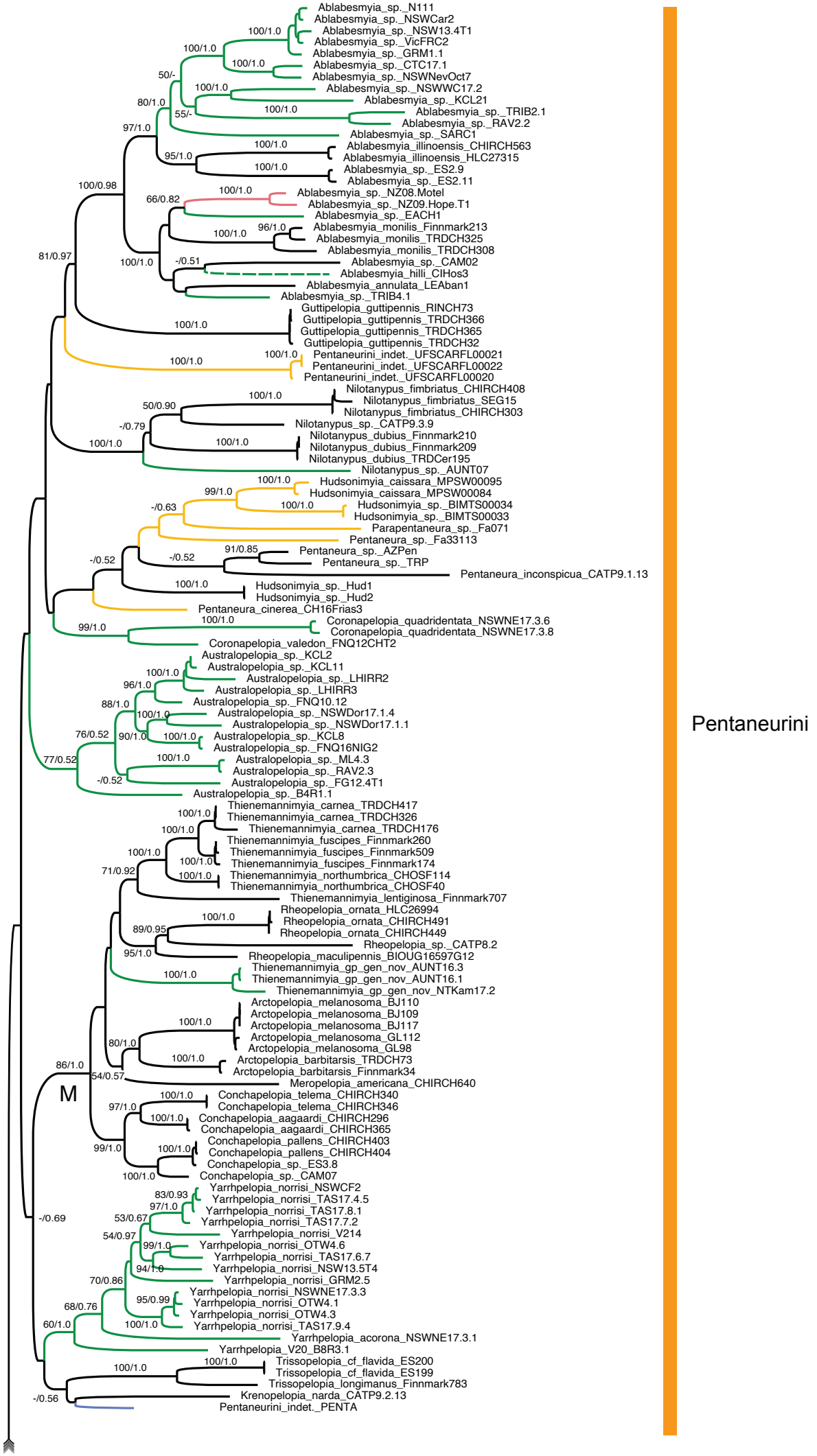
Figure A4. RAxML topology for the *CAD1* dataset (Dataset 4). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

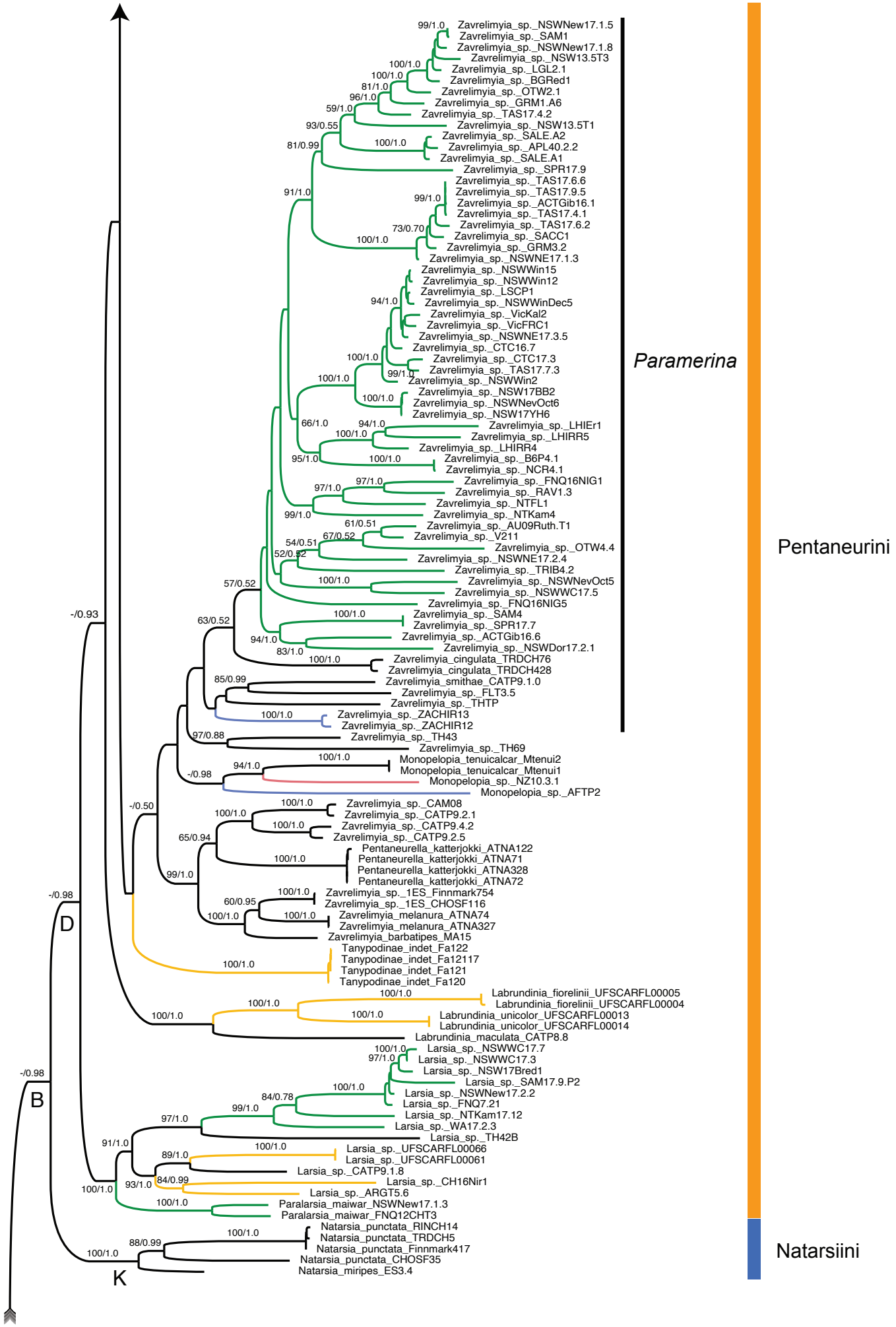
Figure A5. RAxML topology for the *CAD4* dataset (Dataset 5). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

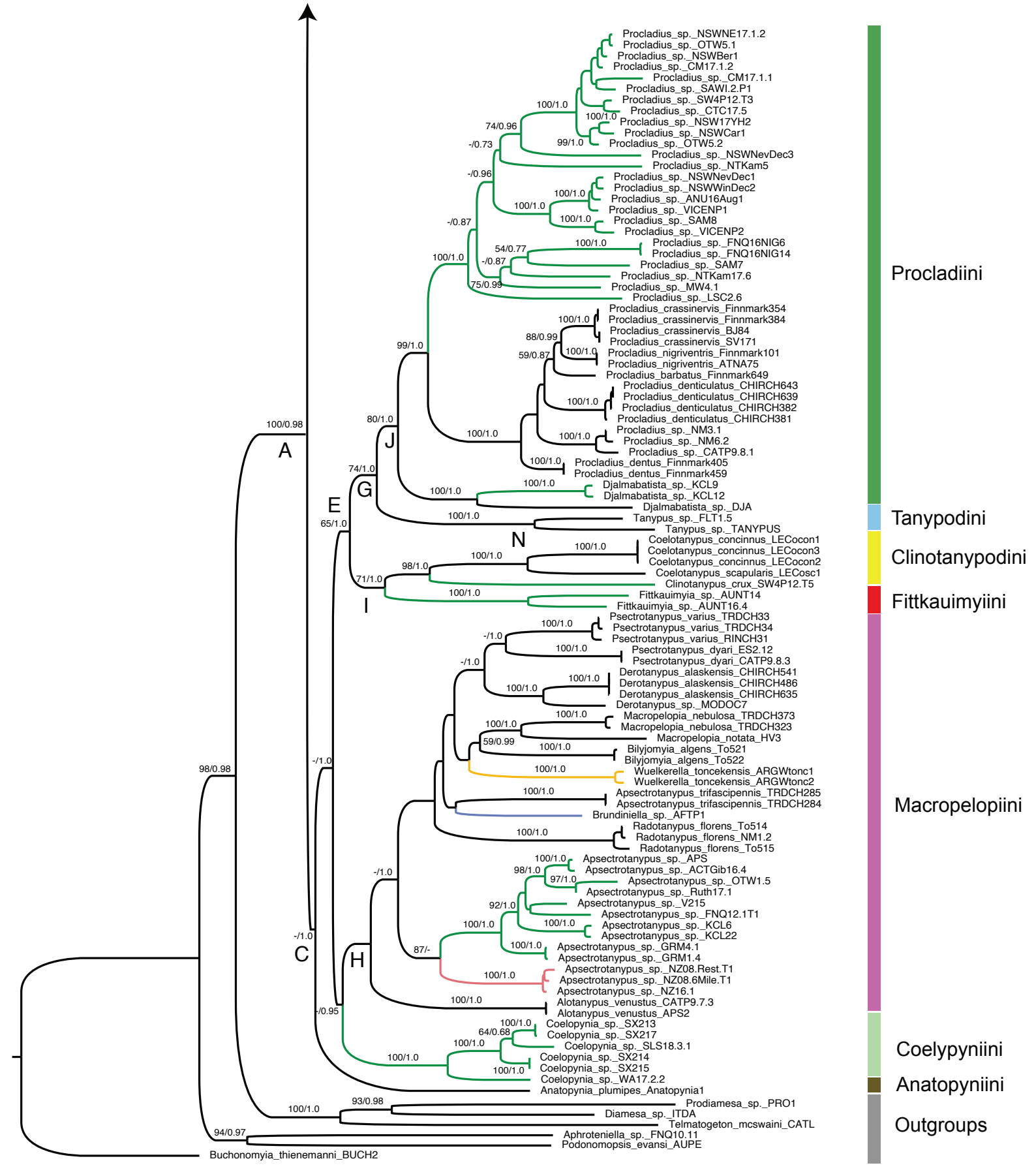
Figure A6. RAxML topology for the *FolCOI* dataset (Dataset 7). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

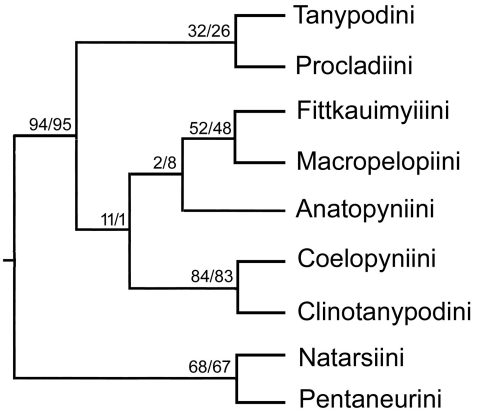
Figure A7. MrBayes topology for Dataset 6. Relevant nodal support values correspond to Bayesian posterior probability. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A8. BEAST chronogram based on Dataset 8. Timescale is in millions of years before present. Branches coloured as per Fig. 1a-c. Lettered nodes correspond to dated nodes reported in Table 1.

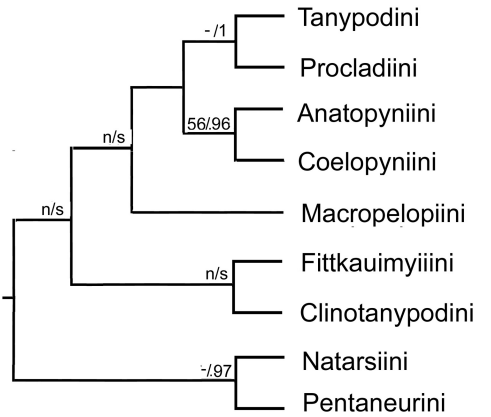

Ablabesmyia_sp._N111
Ablabesmyia_sp._NSWCar2
Ablabesmyia_sp._NSW13.4T1
Ablabesmyia_sp._VicFRC2
Ablabesmyia_sp._GRM1.1
Ablabesmyia_sp._CTC17.1
Ablabesmyia_sp._NSWNevOct7
Ablabesmyia_sp._NSWWC17.2
Ablabesmyia_sp._KCL21
Ablabesmyia_sp._TRIB2.1
Ablabesmyia_sp._RAV2.2
Ablabesmyia_sp._SARC1
Ablabesmyia_illinoensis_CHIRCH563
Ablabesmyia_illinoensis_HLC27315
Ablabesmyia_sp._ES2.9
Ablabesmyia_sp._ES2.11
Ablabesmyia_sp._NZ08.Motel
Ablabesmyia_sp._NZ09.Hope.T1
Ablabesmyia_sp._EACH1
Ablabesmyia_monilis_Finnmark213
Ablabesmyia_monilis_TRDCH325
Ablabesmyia_monilis_TRDCH308
Ablabesmyia_sp._CAM02
Ablabesmyia_hilli_CIHos3
Ablabesmyia_annulata_LEAban1
Ablabesmyia_sp._TRIB4.1
Guttipelopia_guttipennis_RINCH73
Guttipelopia_guttipennis_TRDCH366
Guttipelopia_guttipennis_TRDCH365
Guttipelopia_guttipennis_TRDCH32
Pentaneurini_indet._UFSCARFL00021
Pentaneurini_indet._UFSCARFL00022
Pentaneurini_indet._UFSCARFL00020
Nilotanypus_fimbriatus_CHIRCH408
Nilotanypus_fimbriatus_SEG15
Nilotanypus_fimbriatus_CHIRCH303
Nilotanypus_sp._CATP9.3.9
Nilotanypus_dubius_Finnmark210
Nilotanypus_dubius_Finnmark209
Nilotanypus_dubius_TRDCer195
Nilotanypus_sp._AUNT07
Hudsonimyia_caissara_MPSW00095
Hudsonimyia_caissara_MPSW00084
Hudsonimyia_sp._BIMTS00034
Hudsonimyia_sp._BIMTS00033
Parapentaneura_sp._Fa071
Pentaneura_sp._Fa33113
Pentaneura_sp._AZPen
Pentaneura_sp._TRP
Pentaneura_inconspicua_CATP9.1.13
Hudsonimyia_sp._Hud1
Hudsonimyia_sp._Hud2
Pentaneura_cinerea_CH16Frias3
Coronapelopia_quadridentata_NSWNE17.3.6
Coronapelopia_quadridentata_NSWNE17.3.8
Coronapelopia_valedon_FNQ12CHT2
Australopelopia_sp._KCL2
Australopelopia_sp._KCL11
Australopelopia_sp._LHIRR2
Australopelopia_sp._LHIRR3
Australopelopia_sp._FNQ10.12
Australopelopia_sp._NSWDor17.1.4
Australopelopia_sp._NSWDor17.1.1
Australopelopia_sp._KCL8
Australopelopia_sp._FNQ16NIG2
Australopelopia_sp._ML4.3
Australopelopia_sp._RAV2.3
Australopelopia_sp._FG12.4T1
Australopelopia_sp._B4R1.1
Thienemannimyia_carnea_TRDCH417
Thienemannimyia_carnea_TRDCH326
Thienemannimyia_carnea_TRDCH176
Thienemannimyia_fuscipes_Finnmark260
Thienemannimyia_fuscipes_Finnmark509
Thienemannimyia_fuscipes_Finnmark174
Thienemannimyia_northumbrica_CHOSF114
Thienemannimyia_northumbrica_CHOSF40
Thienemannimyia_lentiginosa_Finnmark707
Rheopelopia_ornata_HLC26994
Rheopelopia_ornata_CHIRCH491
Rheopelopia_ornata_CHIRCH449
Rheopelopia_sp._CATP8.2
Rheopelopia_maculipennis_BIOUG16597G12
Thienemannimyia_gp_gen_nov_AUNT16.3
Thienemannimyia_gp_gen_nov_AUNT16.1
Thienemannimyia_gp_gen_nov_NTKam17.2
Arctopelopia_melanosoma_BJ110
Arctopelopia_melanosoma_BJ109
Arctopelopia_melanosoma_BJ117
Arctopelopia_melanosoma_GL112
Arctopelopia_melanosoma_GL98
Arctopelopia_barbitarsis_TRDCH73
Arctopelopia_barbitarsis_Finnmark34
Meropelopia_americana_CHIRCH640
Conchapelopia_telema_CHIRCH340
Conchapelopia_telema_CHIRCH346
Conchapelopia_aagaardi_CHIRCH296
Conchapelopia_aagaardi_CHIRCH365
Conchapelopia_pallens_CHIRCH403
Conchapelopia_pallens_CHIRCH404
Conchapelopia_sp._ES3.8
Conchapelopia_sp._CAM07
Yarrhpelopia_norrisi_NSWCF2
Yarrhpelopia_norrisi_TAS17.4.5
Yarrhpelopia_norrisi_TAS17.8.1
Yarrhpelopia_norrisi_TAS17.7.2
Yarrhpelopia_norrisi_V214
Yarrhpelopia_norrisi_OTW4.6
Yarrhpelopia_norrisi_TAS17.6.7
Yarrhpelopia_norrisi_NSW13.5T4
Yarrhpelopia_norrisi_GRM2.5
Yarrhpelopia_norrisi_NSWNE17.3.3
Yarrhpelopia_norrisi_OTW4.1
Yarrhpelopia_norrisi_OTW4.3
Yarrhpelopia_norrisi_TAS17.9.4
Yarrhpelopia_acorona_NSWNE17.3.1
Yarrhpelopia_V20_B8R3.1
Trissopelopia_cf_flavida_ES200
Trissopelopia_cf_flavida_ES199
Trissopelopia_longimanus_Finnmark783
Krenopelopia_narda_CATP9.2.13
Pentaneurini_indet._PENTA
M
Pentaneurini


Zavrelimyia_sp._NSWNew17.1.5
Zavrelimyia_sp._SAM1
Zavrelimyia_sp._NSWNew17.1.8
Zavrelimyia_sp._NSW13.5T3
Zavrelimyia_sp._LGL2.1
Zavrelimyia_sp._BGRed1
Zavrelimyia_sp._OTW2.1
Zavrelimyia_sp._GRM1.A6
Zavrelimyia_sp._TAS17.4.2
Zavrelimyia_sp._NSW13.5T1
Zavrelimyia_sp._SALE.A2
Zavrelimyia_sp._APL40.2.2
Zavrelimyia_sp._SALE.A1
Zavrelimyia_sp._SPR17.9
Zavrelimyia_sp._TAS17.6.6
Zavrelimyia_sp._TAS17.9.5
Zavrelimyia_sp._ACTGib16.1
Zavrelimyia_sp._TAS17.4.1
Zavrelimyia_sp._TAS17.6.2
Zavrelimyia_sp._SACC1
Zavrelimyia_sp._GRM3.2
Zavrelimyia_sp._NSWNE17.1.3
Zavrelimyia_sp._NSWWin15
Zavrelimyia_sp._NSWWin12
Zavrelimyia_sp._LSCP1
Zavrelimyia_sp._NSWWinDec5
Zavrelimyia_sp._VicKal2
Zavrelimyia_sp._VicFRC1
Zavrelimyia_sp._NSWNE17.3.5
Zavrelimyia_sp._CTC16.7
Zavrelimyia_sp._CTC17.3
Zavrelimyia_sp._TAS17.7.3
Zavrelimyia_sp._NSWWin2
Zavrelimyia_sp._NSW17BB2
Zavrelimyia_sp._NSWNevOct6
Zavrelimyia_sp._NSW17YH6
Zavrelimyia_sp._LHIEr1
Zavrelimyia_sp._LHIRR5
Zavrelimyia_sp._LHIRR4
Zavrelimyia_sp._B6P4.1
Zavrelimyia_sp._NCR4.1
Zavrelimyia_sp._FNQ16NIG1
Zavrelimyia_sp._RAV1.3
Zavrelimyia_sp._NTFL1
Zavrelimyia_sp._NTKam4
Zavrelimyia_sp._AU09Ruth.T1
Zavrelimyia_sp._V211
Zavrelimyia_sp._OTW4.4
Zavrelimyia_sp._NSWNE17.2.4
Zavrelimyia_sp._TRIB4.2
Zavrelimyia_sp._NSWNevOct5
Zavrelimyia_sp._NSWWC17.5
Zavrelimyia_sp._FNQ16NIG5
Zavrelimyia_sp._SAM4
Zavrelimyia_sp._SPR17.7
Zavrelimyia_sp._ACTGib16.6
Zavrelimyia_sp._NSWDor17.2.1
Zavrelimyia_cingulata_TRDCH76
Zavrelimyia_cingulata_TRDCH428
Zavrelimyia_smithae_CATP9.1.0
Zavrelimyia_sp._FLT3.5
Zavrelimyia_sp._THTP
Zavrelimyia_sp._ZACHIR13
Zavrelimyia_sp._ZACHIR12
Zavrelimyia_sp._TH43
Zavrelimyia_sp._TH69
Monopelopia_tenuicalcar_Mtenui2
Monopelopia_tenuicalcar_Mtenui1
Monopelopia_sp._NZ10.3.1
Monopelopia_sp._AFTP2
Zavrelimyia_sp._CAM08
Zavrelimyia_sp._CATP9.2.1
Zavrelimyia_sp._CATP9.4.2
Zavrelimyia_sp._CATP9.2.5
Pentaneurella_katterjokki_ATNA122
Pentaneurella_katterjokki_ATNA71
Pentaneurella_katterjokki_ATNA328
Pentaneurella_katterjokki_ATNA72
Zavrelimyia_sp._1ES_Finnmark754
Zavrelimyia_sp._1ES_CHOSF116
Zavrelimyia_melanura_ATNA74
Zavrelimyia_melanura_ATNA327
Zavrelimyia_barbatipes_MA15
Tanypodinae_indet_Fa122
Tanypodinae_indet_Fa12117
Tanypodinae_indet_Fa121
Tanypodinae_indet_Fa120
Labrundinia_fiorelinii_UFSCARFL00005
Labrundinia_fiorelinii_UFSCARFL00004
Labrundinia_unicolor_UFSCARFL00013
Labrundinia_unicolor_UFSCARFL00014
Labrundinia_maculata_CATP8.8
Larsia_sp._NSWWC17.7
Larsia_sp._NSWWC17.3
Larsia_sp._NSW17Bred1
Larsia_sp._SAM17.9.P2
Larsia_sp._NSWNew17.2.2
Larsia_sp._FNQ7.21
Larsia_sp._NTKam17.12
Larsia_sp._WA17.2.3
Larsia_sp._TH42B
Larsia_sp._UFSCARFL00066
Larsia_sp._UFSCARFL00061
Larsia_sp._CATP9.1.8
Larsia_sp._CH16Nir1
Larsia_sp._ARGT5.6
Paralarsia_maiwar_NSWNew17.1.3
Paralarsia_maiwar_FNQ12CHT3
Natarsia_punctata_RINCH14
Natarsia_punctata_TRDCH5
Natarsia_punctata_Finnmark417
Natarsia_punctata_CHOSF35
Natarsia_miripes_ES3.4
Paramerina
Pentaneurini
Natarsiini
D
B
K

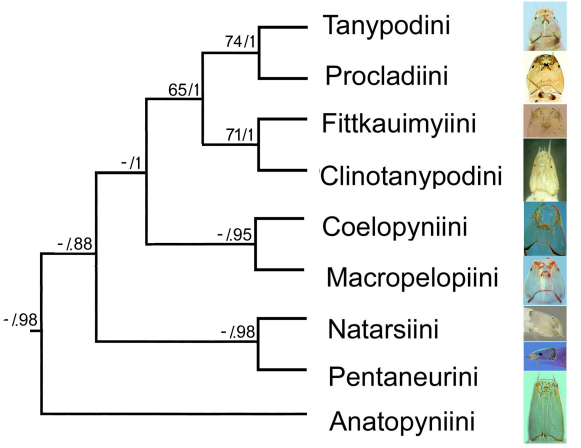

Procladius_sp._NSWNE17.1.2
Procladius_sp._OTW5.1
Procladius_sp._NSWBer1
Procladius_sp._CM17.1.2
Procladius_sp._CM17.1.1
Procladius_sp._SAWI.2.P1
Procladius_sp._SW4P12.T3
Procladius_sp._CTC17.5
Procladius_sp._NSW17YH2
Procladius_sp._NSWCar1
Procladius_sp._OTW5.2
Procladius_sp._NSWNevDec3
Procladius_sp._NTKam5
Procladius_sp._NSWNevDec1
Procladius_sp._NSWWinDec2
Procladius_sp._ANU16Aug1
Procladius_sp._VICENP1
Procladius_sp._SAM8
Procladius_sp._VICENP2
Procladius_sp._FNQ16NIG6
Procladius_sp._FNQ16NIG14
Procladius_sp._SAM7
Procladius_sp._NTKam17.6
Procladius_sp._MW4.1
Procladius_sp._LSC2.6
Procladius_crassinervis_Finnmark354
Procladius_crassinervis_Finnmark384
Procladius_crassinervis_BJ84
Procladius_crassinervis_SV171
Procladius_nigriventris_Finnmark101
Procladius_nigriventris_ATNA75
Procladius_barbatus_Finnmark649
Procladius_denticulatus_CHIRCH643
Procladius_denticulatus_CHIRCH639
Procladius_denticulatus_CHIRCH382
Procladius_denticulatus_CHIRCH381
Procladius_sp._NM3.1
Procladius_sp._NM6.2
Procladius_sp._CATP9.8.1
Procladius_dentus_Finnmark405
Procladius_dentus_Finnmark459
Djalmabatista_sp._KCL9
Djalmabatista_sp._KCL12
Djalmabatista_sp._DJA
Tanypus_sp._FLT1.5
Tanypus_sp._TANYPUS
Coelotanypus_concinnus_LECocon1
Coelotanypus_concinnus_LECocon3
Coelotanypus_concinnus_LECocon2
Coelotanypus_scapularis_LECosc1
Clinotanypus_crux_SW4P12.T5
Fittkauimyia_sp._AUNT14
Fittkauimyia_sp._AUNT16.4
Psectrotanypus_varius_TRDCH33
Psectrotanypus_varius_TRDCH34
Psectrotanypus_varius_RINCH31
Psectrotanypus_dyari_ES2.12
Psectrotanypus_dyari_CATP9.8.3
Derotanypus_alaskensis_CHIRCH541
Derotanypus_alaskensis_CHIRCH486
Derotanypus_alaskensis_CHIRCH635
Derotanypus_sp._MODOC7
Macropelopia_nebulosa_TRDCH373
Macropelopia_nebulosa_TRDCH323
Macropelopia_notata_HV3
Bilyjomyia_algens_To521
Bilyjomyia_algens_To522
Wuelkerella_toncekensis_ARGWtonc1
Wuelkerella_toncekensis_ARGWtonc2
Apsectrotanypus_trifascipennis_TRDCH285
Apsectrotanypus_trifascipennis_TRDCH284
Brundiniella_sp._AFTP1
Radotanypus_florens_To514
Radotanypus_florens_NM1.2
Radotanypus_florens_To515
Apsectrotanypus_sp._APS
Apsectrotanypus_sp._ACTGib16.4
Apsectrotanypus_sp._OTW1.5
Apsectrotanypus_sp._Ruth17.1
Apsectrotanypus_sp._V215
Apsectrotanypus_sp._FNQ12.1T1
Apsectrotanypus_sp._KCL6
Apsectrotanypus_sp._KCL22
Apsectrotanypus_sp._GRM4.1
Apsectrotanypus_sp._GRM1.4
Apsectrotanypus_sp._NZ08.Rest.T1
Apsectrotanypus_sp._NZ08.6Mile.T1
Apsectrotanypus_sp._NZ16.1
Alotanypus_venustus_CATP9.7.3
Alotanypus_venustus_APS2
Coelopynia_sp._SX213
Coelopynia_sp._SX217
Coelopynia_sp._SLS18.3.1
Coelopynia_sp._SX214
Coelopynia_sp._SX215
Coelopynia_sp._WA17.2.2
Anatopynia_plumipes_Anatopynia1
Prodiamesa_sp._PRO1
Diamesa_sp._ITDA
Telmatogeton_mcswaini_CATL
Aphroteniella_sp._FNQ10.11
Podonomopsis_evansi_AUPE
Buchonomyia_thienemanni_BUCH2
A
C
E
G
J
N
I
H
Procladiini
Tanypodini
Clinotanypodini
Fittkauimyiini
Macropelopiini
Coelypyniini
Anatopyniini
Outgroups
0.07


Tanypodini
Procladiini
Fittkauimyiiini
Macropelopiini
Anatopyniini
Coelopyniini
Clinotanypodini
Natarsiini
Pentaneurini
32/26
94/95
52/48
2/8
11/1
84/83
68/67

(A)


Tanypodini
Procladiini
Anatopyniini
Coelopyniini
Macropelopiini
Fittkauimyiiini
Clinotanypodini
Natarsiini
Pentaneurini
-/1
56/96
n/s
n/s
n/s
-/.97

(B)


Tanypodini
Procladiini
Fittkauimyiini
Clinotanypodini
Coelopyniini
Macropelopiini
Natarsiini
Pentaneurini
Anatopyniini
74/1
65/1
71/1
-/1
-/.95
-/.88
-/.98
-/.98

(C)

Supplementary Table 1. List of taxa, codes, life-stage, locations and GenBank accessions included in this study.

Life stages are given as: L, larva; L(P), pharate larva; P, pupa; Pm, male pupa; Pf, female pupa; Pe, pupal exuviae; m, adult male; f, adult female.

Taxa with associated 'indet.', 'nr' or 'cf.' are uncertain at genus or species level, respectively. Genbank accessions of data generated by this study begin with prefix MW.

Species	Molecular voucher	Life stage	Country	Location	Collector	Genbank Accession				
						5P COI	3P COI	28S	CADI	CADIV
Ablabesmyia annulata	LEAban1	m	USA	Michigan, Sterling State Park, Lake Erie	Hudson	MW283396	MW273934		MW286136	
Ablabesmyia aspera	LEAbas1	m	USA	Michigan, Sterling State Park, Lake Erie	Hudson	MW283397	MW273935			
Ablabesmyia hilli type	CIHos1	L	Australia	Christmas Is., Hosney's Creek	Cranston	MW283398		MW281079		
Ablabesmyia hilli type	CIHos2	L	Australia	Christmas Is., Hosney's Creek	Cranston	MW283399		MW281080		
Ablabesmyia hilli type	CIHos3	L	Australia	Christmas Is., Hosney's Creek	Cranston	MW283400	MW273936	MW281081		MW320399
Ablabesmyia hilli type	CIHos4	L	Australia	Christmas Is., Hosney's Creek	Cranston	MW283401		MW281082		
Ablabesmyia illinoensis	CHIR_CH563	m	Canada	Manitoba, Churchill, Ramsay Creek	Renaud	MW378341	MW378497	MW378411		
Ablabesmyia illinoensis	HLC-27315	m	Canada	Manitoba, Churchill, Twin Lakes		KR440381	MW378504	MW378419		
Ablabesmyia illinoensis	10PROBE-14871	f	Canada	Manitoba, Churchill, Ramsay Creek	Wang	JF878014				
Ablabesmyia monilis	Finnmark213	m	Norway	Finnmark, Lebesby, Lake at outflow	Ekrem, Stur	JF870860	MW378481	MW378395		
Ablabesmyia monilis	TRD-CH308	m	Norway	Sør-Trøndelag, Trondheim, near Flaten	Stur et al.	MK403762	MW378549	MW378466		
Ablabesmyia monilis	TRD-CH325	m	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur et al.	MK403742	MW378494	MW378408		
Ablabesmyia nilotica	ZACHIR123	m	Uganda	Lake Victoria, Kampala	Ekrem, Stur		MW378492	MW378406		
Ablabesmyia nilotica	ZACHIR130	m	Uganda	Lake Victoria, Kampala	Ekrem, Stur	MW378345		MW378416		
Ablabesmyia notabilis	Pr104	L	Australia	Victoria, Macedon	Carew et al	HQ247988				
Ablabesmyia sp.	BARR2	L	Australia	Queensland, Crater Lakes NP, Lake Barrine	Krosch, Bryant, Cranston	MW283402	MW273938			
Ablabesmyia sp.	BARR3	m	Australia	Queensland, Crater Lakes NP, Lake Barrine	Krosch, Bryant, Cranston	MW283403				
Ablabesmyia sp.	BRIV01.2	L	Australia	Queensland, Mascot, Weir River	Prior	MW283404				
Ablabesmyia sp.	CAM02	L	USA	California, Maillard Redwoods SF, Mill Creek	Cranston	MW283405	HQ440867	HQ440706	HQ440227	HQ440414
Ablabesmyia sp.	CTC17.1	L(P)	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283406	MW273939	MW281085		
Ablabesmyia sp.	CTC17.6	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283407				
Ablabesmyia sp.	EACH1	P	Australia	Queensland, Crater Lakes NP, Lake Eacham	Krosch, Bryant, Cranston	MW283408	MW273940	MW281083	MW286137	MW320400
Ablabesmyia sp.	ES2.11	P	USA	California, Plumas Co., Grizzly Ck.	McCluen, Bastien, Cranston	MW283409	KX684109	KX684040	KX684171	
Ablabesmyia sp.	ES2.9	P	USA	California, Plumas Co., Grizzly Ck.	McCluen, Bastien, Cranston	MW283410	KX684110	KX684041	KX684172	
Ablabesmyia sp.	GRM1.1	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283411	MW273937	MW281087	MW286138	
Ablabesmyia sp.	GRM2.2	L	Australia	Victoria, Grampian NP, Scrubby Creek	Krosch, Bryant	MW283412				
Ablabesmyia sp.	GUL17.1.1	L	Australia	Northern Territory, Kakadu NP, Gulungul Creek	Hanley	MW283413				
Ablabesmyia sp.	KCL21	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283414	MW273941	MW281095		
Ablabesmyia sp.	N111	L	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW283415	HQ440866	HQ440705	HQ440226	HQ440413
Ablabesmyia sp.	Nev3	Le/Pe/m	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283416				
Ablabesmyia sp.	NRM20.1.1	L	Australia	Victoria, Macedon, Nursery Road	Carew	MW283417		MW281086		
Ablabesmyia sp.	NRM20.3.1	L	Australia	Victoria, Macedon, Nursery Road	Carew	MW283418				
Ablabesmyia sp.	NSW13.4T1	L	Australia	New South Wales, Newnes, Lower Capertee Creek	Cranston	MW283419	MW273942	MW281090		
Ablabesmyia sp.	NSW16WC.3	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283420				
Ablabesmyia sp.	NSW17YH8	L	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283857				
Ablabesmyia sp.	NSWBal1	L	Australia	New South Wales, Balranald	Cranston	MW283421				
Ablabesmyia sp.	NSWCar2	L	Australia	New South Wales, Carwoola, Molonglo River	Cranston	MW283422	MW273943	MW281088		
Ablabesmyia sp.	NSWNE17.1.5	P	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283423				
Ablabesmyia sp.	NSWNevOct7	Pe/f	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283424	MW273944	MW281092		
Ablabesmyia sp.	NSWWC17.10	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283425				
Ablabesmyia sp.	NSWWC17.2	P	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283426	MW273945	MW281096		
Ablabesmyia sp.	NTKam17.3	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283427				
Ablabesmyia sp.	NZ08.Motel	L	New Zealand	Ohakune, Rangatau, Mangawheru River	Cranston	MW283428	KX684111	KX684043	KX684179	

Ablabesmyia sp.	NZ09.Hope.T1	L	New Zealand	Tasman-Nelson, Hope River	Cranston	MW283429	KX684112	KX684042	KX684188	
Ablabesmyia sp.	NZ16.4	L	New Zealand	Ohakune, Mangateitei Creek	Cranston	MW283430				
Ablabesmyia sp.	OTW1.4	L	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW283431				
Ablabesmyia sp.	RAV2.2	P	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283432	MW273946	MW281093		
Ablabesmyia sp.	SAM17.9.1	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283433				
Ablabesmyia sp.	SAM17.9.7	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283435				
Ablabesmyia sp.	SARC.A1	Pe/f	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283436				
Ablabesmyia sp.	SARC1	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283437		MW281097		
Ablabesmyia sp.	SARC6	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283438				
Ablabesmyia sp.	SPR17.1	L	Australia	Queensland, Bunya, South Pine River	Krosch, Bryant	MW283439				
Ablabesmyia sp.	TAS17.2.1	P	Australia	Tasmania, Little Pipers River	Cranston	MW283440				
Ablabesmyia sp.	TAS17.4.3	L	Australia	Tasmania, Charlie's Marsh	Cranston	MW283441		MW281091		
Ablabesmyia sp.	TRIB2.1	L	Australia	Queensland, Daintree NP, Noah Creek	Krosch, Bryant, Cranston	MW283442	MW273947	MW281094		
Ablabesmyia sp.	TRIB2.2	L	Australia	Queensland, Daintree NP, Noah Creek	Krosch, Bryant, Cranston	MW283443				
Ablabesmyia sp.	TRIB4.1	L	Australia	Queensland, Daintree NP, Noah Creek	Krosch, Bryant, Cranston	MW283444	MW273948	MW281084		
Ablabesmyia sp.	VicFRC2	L	Australia	Victoria, Flat Rock Creek	Cranston	MW283445	MW273949	MW281089		
Ablabesmyia sp.	WA17.11.6	L	Australia	Western Australia, Pilbara, Chadolinna Pool	Pinder	MW283446				
Alotanypus venustus	CATP9.7.3	L	USA	California, Santa Barbara Co., Cold Springs Creek	McLuen	MW150361	KX684088	KX684044	KX684175	
Alotanypus venustus	APS2	L	USA	California, McClaughlin Reserve	Cranston		HQ440871	HQ440710	HQ440236	HQ440419
Anatopynia plumipes	Anatopynia1	L	Netherlands	Waterschap Rivierenland	Vallenduuk	MW283447	KX684076	KX684045	KX684173	
Apsectrotanypus sp.	ACTGib16.4	L	Australia	Australian Capital Territory, Brindabellas, Gibraltar Creek	Cranston	MW283448	MW273950	MW281099		
Apsectrotanypus sp.	APS	L	Australia	Australian Capital Territory, Brindabellas	Cranston		HQ440870	HQ440709	HQ440235	HQ440418
Apsectrotanypus sp.	AUNT16.11	L	Australia	Northern Territory, Kakadu NP, Magela Creek	Humphrey	MW283449				
Apsectrotanypus sp.	DBN1	L	Australia	Victoria, Wick's Reserve, Dobson's Creek	Carew	MW283450				
Apsectrotanypus sp.	FNQ12.1T1	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283451	MW273951	MW281102		
Apsectrotanypus sp.	GRM1.4	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283452	MW273952	MW281106		
Apsectrotanypus sp.	GRM1.6	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283453				
Apsectrotanypus sp.	GRM3.1	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283454				
Apsectrotanypus sp.	GRM4.1	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283455	MW273953	MW281107	MW286139	MW320401
Apsectrotanypus sp.	KCL20	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283456				
Apsectrotanypus sp.	KCL22	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283457	MW273954	MW281100		
Apsectrotanypus sp.	KCL6	P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283458	MW273955	MW281105		
Apsectrotanypus sp.	KCU3	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283459				
Apsectrotanypus sp.	NSW17YH3	L	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283853				
Apsectrotanypus sp.	NSWGI17.3.1	P(A)	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283460				
Apsectrotanypus sp.	NSWGI17.3.2	f	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283461				
Apsectrotanypus sp.	NSWGI17.3.3	L(P)	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283462				
Apsectrotanypus sp.	NZ08.6Mile.T1	L	New Zealand	Tasman-Nelson, Murchison, 6-mile Creek	Cranston	MW283463	KX684090	KX684046	KX684181	
Apsectrotanypus sp.	NZ08.Rest.T1	L	New Zealand	Ohakune, Rangatau, Mangawheru River	Cranston	MW283464	KX684091	KX684047	KX684187	
Apsectrotanypus sp.	NZ16.1	P	New Zealand	Ohakune, Mangateitei Creek	Cranston	MW283465	MW273956	MW281098		
Apsectrotanypus sp.	NZ16.5	L	New Zealand	Ohakune, Mangateitei Creek	Cranston	MW283466				
Apsectrotanypus sp.	OTW1.5	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283467	MW273957	MW281104		
Apsectrotanypus sp.	Ruth17.1	L	Australia	New South Wales, Rutherford Creek	Cranston	MW283468	MW273958	MW281101		
Apsectrotanypus sp.	TAS17.1.1	L	Australia	Tasmania, Lilydale Falls Reserve, Second River	Cranston	MW283469				
Apsectrotanypus sp.	TAS17.2.2	L(P)	Australia	Tasmania, Little Pipers River	Cranston	MW283470				
Apsectrotanypus sp.	TAS17.2.5	L(P)	Australia	Tasmania, Little Pipers River	Cranston	MW283471				
Apsectrotanypus sp.	TAS17.7.5	L	Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW283472		MW281103		

Apsectrotanypus sp.	TAS17.7.6	L	Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW283473				
Apsectrotanypus sp.	V215	L (3i)	Australia	Victoria, Tallangi SF, Mullindindi	Cranston		HQ440981	HQ440818	HQ440352	HQ440511
Apsectrotanypus trifascipennis	TRD-CH284	m	Norway	Sør-Trøndelag, Klaebu, near Bjoerkly	Stur et al.	MW378342	MW536177	MW496867		MW497067
Apsectrotanypus trifascipennis	TRD-CH285	f	Norway	Sør-Trøndelag, Klaebu, near Bjoerkly	Stur et al.	MW378328	MW536176	MW496863		MW497063
Arctopelopia barbitarsis	Finnmark34	m	Norway	Finnmark, Kautokeino, near Malaise 3	Ekrem, Stur	HQ941611	MW378530	MW378447	MW430079	MW443127
Arctopelopia barbitarsis	TRD-CH73	f	Norway	Sør-Trøndelag, Trondheim, Gjeddevatnet	Skei	MW378377	MW378543	MW378460		
Arctopelopia melanosoma	BJ109	f	Norway	Svalbard, Bear Island	Ekrem	HM405940	MW378525	MW378442	MW430075	
Arctopelopia melanosoma	BJ110	L	Norway	Svalbard, Bear Island	Ekrem	HM405941	MW378508	MW378423	MW430066	
Arctopelopia melanosoma	BJ117	f	Norway	Svalbard, Bear Island	Ekrem	HM405948	MW378499	MW378413	MW430062	
Arctopelopia melanosoma	GL112	m	Greenland	Sermersooq, Kitaa, Kapisillit	Kjaerstad	MW378357	MW378519	MW378435		
Arctopelopia melanosoma	GL98	P(m)	Greenland	Sermersooq, Kitaa, Kapisillit	Kjaerstad	MW378336	MW378489	MW378403		
Australopelopia sp.	B3b.R4.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283835				
Australopelopia sp.	B3R1.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283474				
Australopelopia sp.	B3R2.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283475		MW281120		
Australopelopia sp.	B4R1.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283476	MW273959	MW281119		
Australopelopia sp.	B4R1.2	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283477				
Australopelopia sp.	FG12.4T1	L	Australia	Queensland, Cooloola NP, Franki's Gulch	Krosch, Bryant, Cranston	MW283478	MW273960			
Australopelopia sp.	FG12.4T2	L	Australia	Queensland, Cooloola NP, Franki's Gulch	Krosch, Bryant, Cranston	MW283479				
Australopelopia sp.	FNQ10.12	L	Australia	Quensland, Mt. Lewis, Windmill Creek	Cranston		HQ440874	HQ440711	HQ440241	
Australopelopia sp.	FNQ16NIG13	L(P)	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283480				
Australopelopia sp.	FNQ16NIG2	P	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283481	MW273961	MW281113		
Australopelopia sp.	KCL11	m	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283482	MW273962	MW281117		
Australopelopia sp.	KCL2	Le/Pe	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283483	MW273963	MW281116	MW286141	
Australopelopia sp.	KCL8	L(P)	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283484	MW273964	MW281112		
Australopelopia sp.	KCU2	L(P)	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283485				
Australopelopia sp.	KCU4	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283486				
Australopelopia sp.	KCU5	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283487				
Australopelopia sp.	LHIRR2	P	Australia	Lord Howe Island, Rocky Run	Cranston	MW283488	MW273965	MW281108		
Australopelopia sp.	LHIRR3	L	Australia	Lord Howe Island, Rocky Run	Cranston	MW283489	MW273966	MW281109		
Australopelopia sp.	ML4.1	Le/P	Australia	Queensland, Mount Lewis NP, Churchill Creek	Krosch, Bryant, Cranston	MW283490				
Australopelopia sp.	ML4.3	L	Australia	Queensland, Mount Lewis NP, Churchill Creek	Krosch, Bryant, Cranston	MW283491	MW273967	MW281111		
Australopelopia sp.	ML4.5	L	Australia	Queensland, Mount Lewis NP, Churchill Creek	Krosch, Bryant, Cranston	MW283492				
Australopelopia sp.	NSWDor17.1.1	L	Australia	New South Wales, Dorrigo NP, Sassafrass Creek	Cranston	MW283493	MW273968	MW281114	MW286140	MW320402
Australopelopia sp.	NSWDor17.1.2	L	Australia	New South Wales, Dorrigo NP, Sassafrass Creek	Cranston	MW283494				
Australopelopia sp.	NSWDor17.1.4	L	Australia	New South Wales, Dorrigo NP, Sassafrass Creek	Cranston	MW283495	MW273969	MW281115		
Australopelopia sp.	NSWDor17.2.3	L	Australia	New South Wales, Dorrigo NP, Coopernook Creek	Cranston	MW283496				
Australopelopia sp.	RAV2.3	L	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283497	MW273970	MW281118	MW286142	
Australopelopia sp.	RAV2.4	L	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283498				
Australopelopia sp.	RAV3.2	P	Australia	Queensland, Ravenshoe, The Millstream	Krosch, Bryant, Cranston	MW283499				
Australopelopia sp.	RAV3.5	L	Australia	Queensland, Ravenshoe, The Millstream	Krosch, Bryant, Cranston	MW283500				
Bilyjomyia algens	To521	L	United States	United States, Washington, Lewis Co.	Bilyj	MW378338		MW496864	MW496880	MW497064
Bilyjomyia algens	To522	L	United States	United States, Washington, Cowlitz Co.	Bilyj	MW378362		MW496870	MW496890	MW497070
Brundiniella sp.	AFTP1	L	South Africa	Western Cape, Gifberg	Cranston	MW283501	HQ440980	HQ440817	HQ440351	HQ440510
Clinotanypus crux	SW4P12.T5	L	Australia	NSW, Nepean River @ Maldon Weir	Sydney Water	MW283502	KX684078	MW281121	KX684193	
Coelopynia sp.	CBM62.3	L	Australia	Queensland, Loudon's Bridge, Condamine River	Prior	MW283507		MW281123		
Coelopynia sp.	LB02.1	L	Australia	Queensland, Whyenbah Station, Culgoa River	Prior	MW283508				
Coelopynia sp.	Moon06.4	L	Australia	Queensland, Balagna, Moonie River	Prior	MW283509				

Coelopynia sp.	SLS18.3.1	L	Australia	Victoria, Sunbury, Spavin Lake	Carew	MW283510	MW273971	MW281122	MW286143	MW320403
Coelopynia sp.	SX213	L	Australia	Victoria, Greater Melbourne	Carew	MW283503	KX684082	KX684048	KX684182	
Coelopynia sp.	SX214	L	Australia	Victoria, Greater Melbourne	Carew	MW283504	KX684083	KX684049	KX684183	
Coelopynia sp.	SX215	L	Australia	Victoria, Greater Melbourne	Carew	MW283505	KX684084	KX684050	KX684184	
Coelopynia sp.	SX217	L	Australia	Victoria, Greater Melbourne	Carew	MW283506	KX684086	KX684052	KX684185	
Coelopynia sp.	WA17.10.4	L	Australia	Western Australia, Pilbara, near Mulga Downs	Pinder	MW283511				
Coelopynia sp.	WA17.2.2	L	Australia	Western Australia, Pilbara, Koodjepindarranna Floodplain	Pinder	MW283512	MW273972	MW281124		
Coelotanypus concinnus	LECocon1	m	USA	Ohio, Maumee Bay, Bayview Park, Lake Erie	Hudson	MW283513	KY226610	KY226614		
Coelotanypus concinnus	LECocon2	m	USA	Ohio, Maumee Bay, Bayview Park, Lake Erie	Hudson	MW283514	KY226611	KY226615	KY226618	
Coelotanypus concinnus	LECocon3	m	USA	Ohio, Maumee Bay, Bayview Park, Lake Erie	Hudson	MW283515	KY226612	KY226616	KY226619	
Coelotanypus scapularis	LECosc1	m	USA	Ohio, Maumee Bay, Bayview Park, Lake Erie	Hudson	MW283516	KY226613	KY226617	KY226620	
Conchapelopia aagaardi	CHIR_CH296	m	Canada	Manitoba, Churchill, Goose Creek Marina	Stur	MW378361	MW378527	MW378444	MW430077	MW443126
Conchapelopia aagaardi	CHIR_CH365	m	Canada	Manitoba, Churchill, Ramsay Creek	Ekrem, Stur	MW378337	MW378493	MW378407	MW430060	MW443121
Conchapelopia pallens	CHIR_CH403	m	Canada	Manitoba, Churchill, Goose Creek Marina	Ekrem, Stur	MW378378	MW378545	MW378462		
Conchapelopia pallens	CHIR_CH404	m	Canada	Manitoba, Churchill, Goose Creek Marina	Ekrem, Stur	MW378334	MW378484	MW378398	MW430057	MW443116
Conchapelopia pallidula	PK-194-5	P	Norway	Sør-Trøndelag, Trondheim, Nidelva	Kranzfelder	KT248898				
Conchapelopia sp.	CAM07	L	USA	California, Maillard Redwoods SF, Mill Creek	Cranston	MW283517	HQ440887	HQ440723	HQ440260	HQ440432
Conchapelopia sp.	ES3.8	L	USA	California, Plumas Co., seep, Grizzly Creek	McCluen, Bastien, Cranston	MW283519	KX684103	KX684062	KX684169	
Conchapelopia telema	CHIR_CH340	m	Canada	Manitoba, Churchill, Goose Creek Marina	Ekrem, Stur	MW378347	MW378506	MW378421	MW430064	MW443123
Conchapelopia telema	CHIR_CH346	m	Canada	Manitoba, Churchill, Churchill River Pump House	Ekrem, Stur	MW378374	MW378541	MW378458	MW430083	MW443132
Coronapelopia quadridentata	NSWNE17.3.11	Pf	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150325				
Coronapelopia quadridentata	NSWNE17.3.6	L	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150326	MW150492	MW151648		
Coronapelopia quadridentata	NSWNE17.3.7	L	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150327				
Coronapelopia quadridentata	NSWNE17.3.8	L	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150328	MW150493	MW151647		
Coronapelopia valedon	FNQ12CHT2	P	Australia	Queensland, Mount Lewis NP, Churchill Creek	Cranston	MW150323	MW150491	MW151646		
Derotanypus alaskensis	CHIR_CH486	m	Canada	Manitoba, Churchill, Town of Churchill	McGowan	MW378384	MW378553	MW378470		
Derotanypus alaskensis	CHIR_CH541	m	Canada	Manitoba, Churchill, Launch Road near A-frame	McGowan	MW378372	MW378539	MW378456		
Derotanypus alaskensis	CHIR_CH635	f	Canada	Manitoba, Churchill, Ramsay Creek	Renaud	MW378343	MW378500	MW378414		MW443123
Derotanypus sp.	HLC-26905	f	Canada	Wapusk National Park, Nestor	Lankshear, McGowan, Lundie	KR444601				
Derotanypus sp.	MODOC7	L	USA	California, Modoc Wildlife reserve drain	Cranston	MW283818	HQ440985	HQ440822	HQ440357	HQ440516
Djalmabatista sp.	KCL12	f	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283520	MW273973	MW281125	MW286144	
Djalmabatista sp.	KCL4	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283521				
Djalmabatista sp.	KCL7	P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283522				
Djalmabatista sp.	KCL9	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283523	MW273974	MW281126	MW286145	
Djalmabatista sp.	NTKam17.P1	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283860	MW273975			
Djalmabatista sp.	NTKam17.P2	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283861				
Djalmabatista sp.	NTKam17.P3	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283862				
Djalmabatista sp.	NTKam17.1	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283782				
Djalmabatista sp.	NTKam17.5	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283783				
Djalmabatista sp.	DJA	Pm	USA	Arizona, Fossil Ck.	Cranston, Morse, Krosch		HQ440899	HQ440735	HQ440273	HQ440443
Fittkauimyia disparipes	Pr156	L	Australia	Victoria, Yarra River	Carew et al	HQ247987				
Fittkauimyia sp.	AUNT14	L	Australia	Northern Territory, Kakadu NP, Magela Creek	Cranston	MW283524	HQ440911	HQ440747	HQ440283	HQ440452
Fittkauimyia sp.	AUNT16.4	L	Australia	Northern Territory, Kakadu NP, Magela Creek	Cranston	MW283525	MW273976	MW281127		
Guttipelopia guttipennis	TRD-CH32	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Vange	MW496861		MW496874	MW496894	MW497074
Guttipelopia guttipennis	RIN_CH73	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Ekrem, Stur	MW496854		MW496866	MW496883	MW497066
Guttipelopia guttipennis	TRD-CH365	f	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Stur et al.	MW496860		MW496872	MW496892	MW497072
Guttipelopia guttipennis	TRD-CH366	f	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Stur et al.	MW496856		MW496868	MW496884	MW497068

Hudsonimyia caissara	MPSW-00084	m	Brazil	São Paulo, Ubatuba	Wiedenbrug	MW378376	MW378542	MW378459	MW430084	
Hudsonimyia caissara	MPSW-00095	m	Brazil	São Paulo, Ubatuba	Wiedenbrug	MW378354	MW378516	MW378432		
Hudsonimyia sp.	Hud1	L	USA	Maryland, Frederick Co., Cunningham Falls NP, seep beside falls	McCluen	MW283527	MW273978	MW281131	MW286146	
Hudsonimyia sp.	Hud2	L	USA	Maryland, Frederick Co., Cunningham Falls NP, seep beside falls	McCluen	MW283528	MW273979	MW281130		
Hudsonimyia sp.	BIM_TS_00033	f	Brazil	Minas Gerais, Monte Verde	Siqueira, Pepinelli	MW378364	MW378529	MW378446	MW430078	
Hudsonimyia sp.	BIM_TS_00034	f	Brazil	Minas Gerais, Monte Verde	Siqueira, Pepinelli	MW378387	MW378556	MW378473	MW430088	
Krenopelopia narda	CATP9.2.13	L	USA	California, Lake Co., Butts Cyn	McLuen, Cranston	MW283529	KX684120	KX684056		
Krenopelopia sp.	SOE157	m	Norway	Sør-Trøndelag, Røros kommune, Sølendet	Frengen	HQ150101				
Krenopelopia sp.	SOE17	m	Norway	Sør-Trøndelag, Røros kommune, Sølendet	Aagaard et al.	HQ150105				
Krenopelopia sp.	SOE82	m	Norway	Sør-Trøndelag, Røros kommune, Sølendet	Hanssen	HQ150107				
Labrundinia fiorelinii	UFSCAR FL-00004	l	Brazil	São Paulo, Gália	Silva	HM379513	MW378491	MW378405		MW443120
Labrundinia fiorelinii	UFSCAR FL-00005	l	Brazil	São Paulo, Gália	Silva	HM379514	MW378559	MW378476	MW430091	MW443136
Labrundinia maculata	CATP8.8	L	USA	California, Plumas Co., Sagehen Ck	Cranston	MW283530	KX684126	KX684057	KX684174	
Labrundinia unicolor	UFSCAR FL-00013	m	Brazil	São Paulo, São Carlos	Silva	HM379520	MW378532	MW378449		
Labrundinia unicolor	UFSCAR FL-00014	m	Brazil	São Paulo, São Carlos	Silva	HM379521	MW378524	MW378441	MW430074	
Larsia atrocincta	TRD-CH215	m	Norway	Sør-Trøndelag, Trondheim, near Flaten	Stur	MW378330				
Larsia sp.	ARGT5.6	L	Argentina	Lanin NP, Laguna las Corinas	Cranston	MW283531	KX684128	KX684059	KX684164	
Larsia sp.	BRIV11.1	L	Australia	Queensland, Yarramildi, Weir River	Prior	MW283532				
Larsia sp.	CATP9.1.8	L(P)	USA	California, Lake Co., Butts Canyon	McLuen, Cranston	MW283533	KX684129	KX684058		
Larsia sp.	CBM62.5	L	Australia	Queensland, Loudon's Bridge, Condamine River	Prior	MW283534		MW281140		
Larsia sp.	CH16Nir1	P	Argentina	Rio Negro, Bariloche, Ñireco stream	Cranston	MW283736	MW274045	MW281210		
Larsia sp.	CH16Nir2	P	Argentina	Rio Negro, Bariloche, Ñireco stream	Cranston	MW283737		MW281211		
Larsia sp.	CM17.3.1	L	Australia	South Australia, Macumba River, Alguchina Waterhole	Madden	MW283839				
Larsia sp.	CM17.3.2	L	Australia	South Australia, Macumba River, Alguchina Waterhole	Madden	MW283840				
Larsia sp.	CM17.3.3	L	Australia	South Australia, Macumba River, Alguchina Waterhole	Madden	MW283841				
Larsia sp.	FNQ12CHT1	P	Australia	Queensland, Mount Lewis NP, Churchill Creek	Cranston	MW283535				
Larsia sp.	FNQ7.21	L(P)	Australia	Queensland, Davies Ck.,	Cranston	MW283536	HQ440926	HQ440765	HQ440300	HQ440466
Larsia sp.	GRM4.A3	Le/Pe/f	Australia	Victoria, Grampian NP, Wannon River	Krosch, Bryant	MW283537				
Larsia sp.	NSW13.6T1	L	Australia	New South Wales, Newnes, Capertee Creek	Cranston	MW283538		MW281139		
Larsia sp.	NSW13.6T2	L	Australia	New South Wales, Newnes, Capertee Creek	Cranston	MW283539				
Larsia sp.	NSW17BB1	Le/P	Australia	New South Wales, Numeralla, Big Badja	Cranston	MW283540				
Larsia sp.	NSW17Bred1	Le/Pe/f	Australia	New South Wales, Bredbo, Bredbo River	Cranston	MW283541	MW273980	MW281134	MW286147	
Larsia sp.	NSW17Gudg1	Le/Pe/f	Australia	Australian Capital Territory, Gudgenby River	Cranston	MW283849				
Larsia sp.	NSWGl17.2.1	P	Australia	New South Wales, Tibuc Road, Manning River	Cranston	MW283542				
Larsia sp.	NSWGl17.2.3	L(P)	Australia	New South Wales, Tibuc Road, Manning River	Cranston	MW283543				
Larsia sp.	NSWNE17.1.4	P	Australia	New South Wales, Waterfall Highway, Jock's Water	Cranston	MW283544		MW281138		
Larsia sp.	NSWNew17.1.7	P	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283545				
Larsia sp.	NSWNew17.2.2	P	Australia	New South Wales, Newnes, Wongan River	Cranston	MW283546	MW273981	MW281137		
Larsia sp.	NSWWC17.3	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283547	MW273982	MW281135		
Larsia sp.	NSWWC17.6	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283548				
Larsia sp.	NSWWC17.7	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283549	MW273983	MW281136	MW286148	
Larsia sp.	NTKam17.12	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283550	MW273984	MW281133		
Larsia sp.	NTKam6.1	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283551		MW281077		
Larsia sp.	RAV1.1	P	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283552		MW281141		
Larsia sp.	RAV3.4	L	Australia	Queensland, Ravenshoe, The Millstream	Krosch, Bryant, Cranston	MW283553				
Larsia sp.	SAM1.1	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283554				
Larsia sp.	SAM17.9.6	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283555				

Larsia sp.	SAM2.10	Pe/f	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283868				
Larsia sp.	SAM2.6	Le/Pe/m	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283870				
Larsia sp.	SAM17.9.P2	P	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283866	MW273985	MW281249		
Larsia sp.	SPR17.12	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283556				
Larsia sp.	SPR17.2	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283557				
Larsia sp.	TAS17.5.1	L(P)	Australia	Tasmania, Ansons Bay, Sampson's Creek	Cranston	MW283558				
Larsia sp.	WA17.2.3	L	Australia	Western Australia, Pilbara, Koodjepindarranna Floodplain	Pinder	MW283559	MW273986	MW281142		
Larsia sp.	UFSCAR FL-00061	m	Brazil	São Paulo, Luiz Antônio	Silva	HM379562	MW378511	MW378426		
Larsia sp.	UFSCAR FL-00066	f	Brazil	São Paulo, Luiz Antônio	Silva	JX887543	MW378536	MW378453		MW542991
Larsia sp.	TH42B	L	Thailand	Chiang Mai, Doi Inthanon NP	Cranston		HQ440925	HQ440764	HQ440299	HQ440465
Macropelopia nebulosa	TRD-CH323	m	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur	MW378389	MW536182	MW496876	MW496896	MW497076
Macropelopia nebulosa	TRD-CH373	m	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur et al.	MW378392	MW536183	MW496877	MW496898	MW497077
Macropelopia nebulosa	MACR.NEB7.1	Pe	United Kingdom		Ruse	KY225353				
Macropelopia notata	HV3	L	Netherlands	Almere, Oostvaardersplassen	Vallenduuk	MW283560	MW273987	MW281143		
Macropelopia notata	SOE63	m	Norway	Sør-Trøndelag, Røros kommune, Sølendet	Hanssen	HQ105164				
Macropelopia patagonica	MN737750	m	Argentina	San Carlos de Bariloche	da Silva	MN737750				
Meropelopia americana	CHIR_CH640	m	Canada	Manitoba, Churchill, Ramsay Creek	Renaud	MW378383	MW378551	MW378468		
Monopelopia tenuicalcar	Mtenui1	L	Germany	Brandenburg, Rietz-Neuendorf, Landkreis Oder-Spree	Michiels	MW283562	MW273988	MW281144		
Monopelopia tenuicalcar	Mtenui2	L	Germany	Brandenburg, Rietz-Neuendorf, Landkreis Oder-Spree	Michiels	MW283563	MW273989	MW281145	MW286149	
Monopelopia tenuicalcar	NO 95	m	Norway	Sør-Trøndelag, Trondheim, Gjeddvatnet	Skei	MW378331				
Monopelopia tenuicalcar	10JSROW-0704	f	Canada	Ontario, Leeds and Grenville	Sones	JN301723				
Monopelopia sp.	AFTP2	L	South Africa	Western Cape, Gifberg	Cranston	MW283877	HQ440971	HQ440808	HQ440340	HQ440501
Monopelopia sp.	NZ10.3.1	L	New Zealand	Tasman-Nelson, Buller, Orikaka	Blakely & Cranston	MW283561	KX684137	KX684060	KX684194	
Natarsia miripes	ES3.4	L	USA	California, Plumas Co., seep, Grizzly Creek	McCluen, Bastien, Cranston	MW283564	KX684102	KX684061	KX684168	
Natarsia punctata	CH-OSF35	m	Norway	Oslo, Ljanselva, Urskogen	Soli, Steinert	MW378379	MW378547	MW378464		
Natarsia punctata	Finnmark417	m	Norway	Finnmark, Sor-Varanger, Pandurvatnet	Ekrem, Stur	JN286005	MW378521	MW378437		
Natarsia punctata	RIN_CH14	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Ekrem, Stur	MW378388	MW378557	MW378474	MW430089	MW443135
Natarsia punctata	TRD-CH5	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Vange	MW378370	MW378537	MW378454	MW430081	MW443129
Natarsia punctata	BIOUG03149-H06	m	Canada	Alberta, Banff National Park	Whittington	KM992148				
Natarsia punctata	BIOUG17482-E01		Canada	Northwest Territories, Nahanni National Park Reserve	Parks Canada	KR589114				
Natarsia punctata	BIOUG05857-A04	f	Canada	Saskatchewan, Prince Albert National Park	BIOBus 2012	KM898242				
Nilotanypus cf. dubius	BIOUG07413-G10	A	Germany	Bavaria, Niederbayern, Nationalpark Bayerischer Wald	Sellmayer	GMGRF747-13.COI-5P				
Nilotanypus dubius	Finnmark209	f	Norway	Finnmark, Lebesby, Eastorjavri	Ekrem	JF870856	MW378485	MW378399		
Nilotanypus dubius	Finnmark210	m	Norway	Finnmark, Lebesby, Eastorjavri	Ekrem	JF870857	MW378488	MW378402		
Nilotanypus dubius	TRD-Cer195	f	Norway	Sør-Trøndelag Trondheim, Nildeva	Stur	MW378386	MW378555	MW378472		
Nilotanypus dubius	TRD-Cer208	f	Norway	Sør-Trøndelag, Trondheim, Melhus	Stur et al.	MW378369				
Nilotanypus fimbriatus	CHIR_CH408	m	Canada	Manitoba, Churchill, Goose Creek Marina	Ekrem, Stur	MW378346	MW378502	MW378417		
Nilotanypus fimbriatus	CHIR_CH303	m	Canada	Manitoba, Churchill, Goose Creek Marina	Stur	MW378367	MW378534	MW378451		
Nilotanypus fimbriatus	SEG15	m	United States	Wyoming, Teton County, Snake River	Gresens	JF870734	MW378503	MW378418	MW430063	
Nilotanypus fimbriatus	BIOUG01725-B12	L	Canada	Ontari, Algonquin Provincial Park	Martin, Zaheer	KR635238				
Nilotanypus sp.	AUNT.07	L	Australia	Northern Territory, Magela Ck.	Humphrey		HQ440944	HQ440781	HQ440315	HQ440480
Nilotanypus sp.	CATP9.3.9	L	USA	California, Plumas Co., Sagehen Creek	McLuen	MW283565	MW273990	MW281146		
Nilotanypus sp.	FNQ16NIG15	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283566		MW281147		
Nilotanypus sp.	KCU6	P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283567		MW281148		
Nilotanypus sp.	ML4.6	P	Australia	Queensland, Mount Lewis NP, Churchill Creek	Krosch, Bryant, Cranston	MW283568				
Nilotanypus sp.	RAV1.4	L	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283569				
Nilotanypus sp.	RAV1.5	L	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283570				

Nilotanypus sp.	RAV2.6	P	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283571				
Nilotanypus sp.	RAV2.7	P	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283572				
Nilotanypus sp.	RAV2.8	P	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283573				
Nilotanypus sp.	RAV3.1	P	Australia	Queensland, Ravenshoe, The Millstream	Krosch, Bryant, Cranston	MW283574				
Nilotanypus sp.	RAV3.3	P	Australia	Queensland, Ravenshoe, The Millstream	Krosch, Bryant, Cranston	MW283575		MW281149		
nr *Krenopelopia*	KCU1	Le/Pe/f	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283576		MW281132		
Paralarsia maiwar	FNQ12.1T4	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW150321		MW281110		
Paralarsia maiwar	FNQ12CHT3	P(m)	Australia	Queensland, Mount Lewis NP, Churchill Creek	Cranston	MW150322	MW150489	MW151645		
Paralarsia maiwar	CTC16.8	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW150319				
Paralarsia maiwar	CTC16.9	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW150320				
Paralarsia maiwar	NSWNew17.1.3	P	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW150323	MW150490	MW151644		
Parapentaneura sp.	Fa071	m	Brazil	São Paulo, Pirassununga	Silva	MW496857		MW536172	MW496886	
Pentaneura cinerea	CH16Frias3	P	Argentina	Rio Negro, Lago Frias	Cranston	MW197142	MW197143	MW198061		
Pentaneura inconspicua	CATP9.1.13	Le/Pe/f	USA	California, Lake Co., Butts Canyon	McCluen, Cranston	MW283734	KX684145	KX684068	KX684180	
Pentaneura sp.	AZPen	L	USA	Arizona, Fossil Creek	Cranston, Morse, Krosch		HQ440970	HQ440807	HQ440339	
Pentaneura sp.	TRP	L	USA	California, Arroyo Seco	Morse	MW283738	HQ441014	HQ440852	HQ440390	
Pentaneura sp.	Fa33113	L	Brazil	São Paulo, São Carlos	Silva	MW496855		MW536171	JX887588	MW536499
Pentaneurella katterjokki	ATNA122	L	Norway	Oppland, Dovre, Rondane nasjonalpark	Stur	MK402321	MK402324	MK402315	MK402316	
Pentaneurella katterjokki	ATNA328	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Ekrem	HM421431	MK402323	MK402314		
Pentaneurella katterjokki	ATNA71	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Hoffstad	MW378339	MW378495	MW378409		
Pentaneurella katterjokki	ATNA72	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Hoffstad	MW378391	MW378560	MW378477		
Pentaneurini indet.	PENTA	L	South Africa	Western Cape, Jonkershoek	Cranston	MW283828	HQ440973	HQ440810	HQ440342	HQ440503
Pentaneurini indet.	UFSCAR FL-00020	m	Brazil	São Paulo, São Carlos	Silva	HM379527	MW378479	MW538941		
Pentaneurini indet.	UFSCAR FL-00021	m	Brazil	São Paulo, São Carlos	Silva	HM379528	MW378538	MW378455		
Pentaneurini indet.	UFSCAR FL-00022	m	Brazil	São Paulo, São Carlos	Silva	HM379529	MW378526	MW378443	MW430076	
Procladius barbatus	Finnmark649	m	Norway	Finnmark, Lebesby, below Baktejavri	Ekrem, Stur	MW378373	MW378540	MW378457		MW443131
Procladius bellus	1THC6121385THCOI		United States	Ohio, Toledo, Maumee Bay		KP954646				
Procladius culiciformis	NHRS.BYWS000001839	m	Sweden	Uppland, Furusundsfjaerden, Baltic Sea Coast	Essenberg	KC250834				
Procladius denticulatus	CHIR_CH381	f	Canada	Manitoba, Churchill, Farnworth Lake	Stur	MW378353	MW378515	MW378431		
Procladius denticulatus	CHIR_CH382		Canada	Manitoba, Churchill, Farnworth Lake	Stur	MW378385	MW378554	MW378471		MW443134
Procladius denticulatus	CHIR_CH639	m	Canada	Manitoba, Churchill, Ramsay Creek	Stur	MW378335	MW378487	MW378401		MW443118
Procladius denticulatus	CHIR_CH643	f	Canada	Manitoba, Churchill, Ramsay Creek	Renaud	MW378358	MW378522	MW378438		
Procladius dentus	Finnmark405	m	Norway	Finnmark, Porsanger, Rockpools	Ekrem, Stur	JN286004	MW378552	MW378469		
Procladius dentus	Finnmark459	m	Norway	Finnmark, Porsanger, Rohkosjavri	Ekrem, Stur	JN286005	MW378513	MW378428	MW430068	
Procladius frigidus	BJ84	P(m)	Norway	Svalbard, Bear Island	Ekrem	HM405916	MW378505	MW378420		
Procladius frigidus	Finnmark354	m	Norway	Finnmark, Porsanger, near Gaggavann	Ekrem, Stur	JN286000	MW378520	MW378436	MW430072	MW443125
Procladius frigidus	Finnmark384	m	Norway	Finnmark, Porsanger, near Gaggavann	Ekrem, Stur	JN286001	MW378544	MW378461	MW430085	MW443133
Procladius frigidus	SV171	f	Norway	Svalbard, Nordenskioldland, Kapp Linne	Ekrem, Haarsaker	MT047707	MW378486	MW378400	MW430058	MW443117
Procladius nigriventris	ATNA75	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Hoffstad	MW378382	MW378550	MW378467		
Procladius nigriventris	Finnmark101	m	Norway	Finnmark, Vardo, Nedre Domen	Ekrem, Stur	HQ551512	MW378490	MW378404	MW430059	MW443119
Procladius paludicola	Pr237	L	Australia	Victoria, Laverton	Carew et al	HQ248007				
Procladius paludicola	Pr186	L	Australia	Victoria, Berwick Springs	Carew et al	HQ248008				
Procladius paludicola	Pr106	L	Australia	Victoria, Macedon	Carew et al	HQ248009				
Procladius paludicola	Pr12	L	Australia	Victoria, Mill Park	Carew et al	HQ248010				
Procladius paludicola	Pr234	L	Australia	Victoria, Laverton	Carew et al	HQ248011				
Procladius paludicola	Pr239	L	Australia	Victoria, Laverton	Carew et al	HQ248012				
Procladius paludicola	Pr290	L	Australia	Victoria, Lynbrook	Carew et al	HQ248013				

Procladius paludicola	Pr16	L	Australia	Victoria, Mill Park	Carew et al	HQ248014				
Procladius paludicola	Pr48	L	Australia	Victoria, Belgrave	Carew et al	HQ248015				
Procladius paludicola	Pr124	L	Australia	Victoria, Brisbane Ranges	Carew et al	HQ248016				
Procladius paludicola	SAPr6	L	Australia	South Australia, Adelaide	Madden	HQ248017				
Procladius paludicola	Pr163	L	Australia	Victoria, Yarra River	Carew et al	HQ248018				
Procladius paludicola	Pr348	L	Australia	New South Wales, Homebush	Carew et al	HQ248019				
Procladius paludicola	SAPr7	L	Australia	South Australia, Adelaide	Madden	HQ248020				
Procladius paludicola	Pr335	L	Australia	New South Wales, Homebush	Carew et al	HQ248021				
Procladius paludicola	WAPr6	L	Australia	Western Australia, Kingsley	Carew et al	HQ248022				
Procladius paludicola	WAPr7	L	Australia	Western Australia, Kingsley	Carew et al	HQ248023				
Procladius sp.	ANU16Aug1	Le/Pe/f	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283739	MW274046	MW281230		
Procladius sp.	ANU16Aug2	Le/Pe/f	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283740				
Procladius sp.	ANU16Aug3	Le/Pe/m	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283741				
Procladius sp.	ANU16Aug4	Le/Pe/f	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283742				
Procladius sp.	ANU16Aug5	L	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283743				
Procladius sp.	ANU16.7	L	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283829				
Procladius sp.	ANU16.8	L	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283830				
Procladius sp.	ANU16.9	L	Australia	Australian Capital Territory, Dickson wetlands	Cranston	MW283831				
Procladius sp.	CATP9.8.1	Le/Pe/f	USA	California, Santa Barbara Co., Oso Flaco L.	McCluen	MW283744	KX684155	KX684054	KX684176	
Procladius sp.	CBM36.7	L	Australia	Queensland, Scott's Weir, Condamine River	Prior	MW283745		MW281233		
Procladius sp.	CBM45.1	L	Australia	Queensland, Pinedale Road, Logan Creek	Prior	MW283746				
Procladius sp.	CM17.1.1	L	Australia	South Australia, Neale's River, Stewart's Waterhole	Madden	MW283836	MW274048	MW281245		
Procladius sp.	CM17.1.2	L	Australia	South Australia, Neale's River, Stewart's Waterhole	Madden	MW283837	MW274049	MW281244		
Procladius sp.	CM17.2.2	L	Australia	South Australia, Lindsay Creek, Eringa Waterhole	Madden	MW283838				
Procladius sp.	CM17.3.4	L	Australia	South Australia, Macumba River, Alguchina Waterhole	Madden	MW283842				
Procladius sp.	CM17.3.5	L	Australia	South Australia, Macumba River, Alguchina Waterhole	Madden	MW283843				
Procladius sp.	CM17.4.1	L	Australia	South Australia, Arid Recovery Reserve, unnamed dam	Madden	MW283844				
Procladius sp.	CTC16.1	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283747		MW281217		
Procladius sp.	CTC16.10	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283748				
Procladius sp.	CTC17.5	Le/P	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283749	MW274050	MW281234		
Procladius sp.	FNQ12.1T2	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283750				
Procladius sp.	FNQ16NIG10	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283821				
Procladius sp.	FNQ16NIG12	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283822		MW281239		
Procladius sp.	FNQ16NIG14	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283823	MW274051	MW281240		
Procladius sp.	FNQ16NIG6	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283824	MW274052	MW281241		
Procladius sp.	FNQ16NIG9	P	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW283751				
Procladius sp.	GRM2.1	L	Australia	Victoria, Grampian NP, Scrubby Creek	Krosch, Bryant	MW283752				
Procladius sp.	KCL1	Le/Pe/f	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283753				
Procladius sp.	KING2	f	Australia	Queensland, Julatten, Bushy Creek	Krosch, Bryant, Cranston	MW283754				
Procladius sp.	LSC2.6	L	Australia	Victoria, Mount Evelyn, Little Stringybark Creek South	Carew	MW283755	MW274053	MW281231		
Procladius sp.	MW4.1	Le/Pe/m	Australia	Queensland, Mount Windsor, Spencer Creek	Krosch, Bryant, Cranston	MW283756	MW274055	MW281216		
Procladius sp.	Nev2	Le/Pe/m	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283757				
Procladius sp.	NM3.1	L(P)	USA	New Mexico, Apache Co., Lake Concho	Cranston	MW283758	KX684158	KX684055	KX684177	
Procladius sp.	NM6.2	L	USA	New Mexico, Apache Co., Luna Lake ouflow	Cranston	MW283759	KX684159		KX684167	
Procladius sp.	NSW13.4T2	P	Australia	New South Wales, Newnes, Lower Capertee Creek	Cranston	MW283760				
Procladius sp.	NSW17Bred2	L(P)	Australia	New South Wales, Bredbo, Bredbo River	Cranston	MW283761				
Procladius sp.	NSW17Bred3	Le/Pm	Australia	New South Wales, Bredbo, Bredbo River	Cranston	MW283762				

Procladius sp.	NSW17YH1	Pf	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283851				
Procladius sp.	NSW17YH2	Pf	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283852	MW274056	MW281253		
Procladius sp.	NSWBer1	L	Australia	New South Wales, Berri billabong	Cranston	MW283763	MW274057	MW281218		
Procladius sp.	NSWBer2	L	Australia	New South Wales, Berri billabong	Cranston	MW283764				
Procladius sp.	NSWCar1	Pe/m	Australia	New South Wales, Carwoola, Molonglo River	Cranston	MW283765	MW274058	MW281220		
Procladius sp.	NSWDor17.2.4	L	Australia	New South Wales, Dorrigo NP, Coopernook Creek	Cranston	MW283766		MW281226		
Procladius sp.	NSWFox3	L	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283767				
Procladius sp.	NSWFox8	Le/Pe/m	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283768				
Procladius sp.	NSWGl17.3.4	Pm	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283769				
Procladius sp.	NSWNE17.1.2	P/m	Australia	New South Wales, Waterfall Highway, Jock's Water	Cranston	MW283770	MW274059	MW281236		
Procladius sp.	NSWNE17.2.10	L(3i)	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283771				
Procladius sp.	NSWNE17.2.13	L	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283772				
Procladius sp.	NSWNE17.2.5	P	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283773				
Procladius sp.	NSWNE17.2.6	L	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283774				
Procladius sp.	NSWNevDec1	Le/Pe/f	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283775	MW274060	MW281228	MW286155	
Procladius sp.	NSWNevDec2	Pe/m	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283776	MW274061	MW281227		
Procladius sp.	NSWNevDec3	Le/Pe/m	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283777	MW274062	MW281229		
Procladius sp.	NSWNew17.1.1	Pe/m	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283778				
Procladius sp.	NSWWC17.8	P	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283779				
Procladius sp.	NSWWinDec2	Pe/m	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283780				
Procladius sp.	NSWWinDec4	Le/Pe/f	Australia	New South Wales, Windellama, private dam #3	Cranston	MW283781				
Procladius sp.	NTKam17.6	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283784	MW274063	MW281225		
Procladius sp.	NTKam5	Pm	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283865	MW274064	MW281248		
Procladius sp.	NTKamXP1	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283785				
Procladius sp.	NTKamXP2	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283786		MW281224		
Procladius sp.	NZ16.2	L	New Zealand	Ohakune, Mangateitei Creek	Cranston	MW283787				
Procladius sp.	OTW1.9	L	Australia	Victoria, Otway NP, Wild Dog Creek	Krosch, Bryant	MW283788				
Procladius sp.	OTW4.A1	Le/Pe/f	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW283789	MW274065			
Procladius sp.	OTW5.1	L	Australia	Victoria, Otway NP, Lake Craven	Krosch, Bryant	MW283790	MW274066	MW281235		
Procladius sp.	OTW5.2	L	Australia	Victoria, Otway NP, Lake Craven	Krosch, Bryant	MW283791	MW274067	MW281221		
Procladius sp.	PP2	L(P)	Australia	Victoria, Providence Ponds, Perry River	Cranston	MW283792				
Procladius sp.	PP3	L	Australia	Victoria, Providence Ponds, Perry River	Cranston	MW283793				
Procladius sp.	RAV1.7	L	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283794				
Procladius sp.	RAV2.5	L	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283795				
Procladius sp.	RAV2.9	L	Australia	Queensland, Koombooloomba NP, Nitchaga Creek	Krosch, Bryant, Cranston	MW283796				
Procladius sp.	REX2	Le/Pe/m	Australia	Queensland, Mossman NP, Little Rex Creek	Krosch, Bryant, Cranston	MW283797		MW281212		
Procladius sp.	SAM1.2	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283798				
Procladius sp.	SAM1.4	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283799				
Procladius sp.	SAM7	m	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283800	MW274068	MW281237		
Procladius sp.	SAM8	m	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283801	MW274069	MW281215		
Procladius sp.	SAMR.A2	Le/Pe/m	Australia	South Australia, Caloote's Landing, Murray River	Krosch, Bryant, Madden	MW283802				
Procladius sp.	SARC3	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283803				
Procladius sp.	SARC5	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283804		MW281222		
Procladius sp.	SARC7	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283805				
Procladius sp.	SARC9	L	Australia	South Australia, Reedy Creek CP, Reedy Creek	Krosch, Bryant, Madden	MW283806				
Procladius sp.	SAWI.1.1	L	Australia	South Australia, Witchelina NR, dam near homestead	Madden	MW283807				
Procladius sp.	SAWI.2.1	L	Australia	South Australia, Witchelina NR, dam near homestead	Madden	MW283808				

Procladius sp.	SAWI.2.P1	P(m)	Australia	South Australia, Witchelina NR, dam near homestead	Madden	MW283809	MW274070	MW281223		
Procladius sp.	SLS18.3.3	L	Australia	Victoria, Sunbury, Spavin Lake	Carew	MW283810				
Procladius sp.	SW4P12.T3	L(P)	Australia	NSW, Nepean R @ Maldon Weir	Sydney Water	MW283811	KX684162	KX684069	KX684191	
Procladius sp.	TAS17.5.2	L	Australia	Tasmania, Ansons Bay, Sampson's Creek	Cranston	MW283812				
Procladius sp.	VICENP1	Pf	Australia	Victoria, Enfield, Weir pool	Madden	MW283813	MW274071	MW281213		
Procladius sp.	VICENP2	P	Australia	Victoria, Enfield, Weir pool	Madden	MW283814	MW274072	MW281214		
Procladius sp.	WA17.8.2	L	Australia	Western Australia, Pilbara, Fortescue River	Pinder	MW283815		MW281232		
Procladius sp.	Pr100	L	Australia	Victoria, Gisborne	Carew et al	HQ247990				
Procladius sp.	Pr103	L	Australia	Victoria, Gisborne	Carew et al	HQ247991				
Procladius sp.	Pr98	L	Australia	Victoria, Gisborne	Carew et al	HQ247992				
Procladius sp.	Pr274	L	Australia	Victoria, Rowville	Carew et al	HQ247993				
Procladius sp.	Pr9	L	Australia	Victoria, Mill Park	Carew et al	HQ247994				
Procladius sp.	Pr276	L	Australia	Victoria, Rowville	Carew et al	HQ247995				
Procladius sp.	Pr11	L	Australia	Victoria, Mill Park	Carew et al	HQ247996				
Procladius sp.	Pr272	L	Australia	Victoria, Rowville	Carew et al	HQ247997				
Procladius sp.	Pr8	L	Australia	Victoria, Mill Park	Carew et al	HQ247998				
Procladius sp.	Pr41	L	Australia	Victoria, Rowville	Carew et al	HQ247999				
Procladius sp.	Pr14	L	Australia	Victoria, Mill Park	Carew et al	HQ248000				
Procladius sp.	Pr128	L	Australia	Victoria, Brisbane Ranges	Carew et al	HQ248001				
Procladius sp.	Pr117	L	Australia	Victoria, Brisbane Ranges	Carew et al	HQ248002				
Procladius sp.	Pr133	L	Australia	Victoria, Brisbane Ranges	Carew et al	HQ248003				
Procladius sp.	Pr115	L	Australia	Victoria, Brisbane Ranges	Carew et al	HQ248004				
Procladius sp.	DCPu2	P	Australia	Victoria, Donnelly's Weir	Carew et al	HQ248005				
Procladius sp.	LYLPu1	P	Australia	Victoria, Little Yarra	Carew et al	HQ248006				
Procladius villosimanus	SAPr3	L	Australia	South Australia, Bolivar	Madden	HQ248024				
Procladius villosimanus	A04Pr1	L	Australia	Victoria, Cairnlea	Carew et al	HQ248025				
Procladius villosimanus	A04Pr11	L	Australia	Victoria, Moonee Ponds	Carew et al	HQ248026				
Procladius villosimanus	WAPr1	L	Australia	Western Australia, Iluka	Carew et al	HQ248027				
Procladius villosimanus	N04Pr2	L	Australia	New South Wales, Homebush	Carew et al	HQ248028				
Procladius villosimanus	SAPr2	L	Australia	South Australia, Bolivar	Madden	HQ248029				
Procladius villosimanus	WAPr4	L	Australia	Western Australia, Iluka	Carew et al	HQ248030				
Procladius villosimanus	A04Pr12	L	Australia	Victoria, Wonga Park	Carew et al	HQ248031				
Procladius villosimanus	A04Pr3	L	Australia	Victoria, Greensborough	Carew et al	HQ248032				
Procladius villosimanus	A04Pr5	L	Australia	Victoria, Epsom Estate	Carew et al	HQ248033				
Procladius villosimanus	A04Pr6	L	Australia	Victoria, Dandenong North	Carew et al	HQ248034				
Procladius villosimanus	A04Pr7	L	Australia	Victoria, Fountain Gate	Carew et al	HQ248035				
Procladius villosimanus	A04Pr8	L	Australia	Victoria, Wheelers Hill	Carew et al	HQ248036				
Procladius villosimanus	A04Pr9	L	Australia	Victoria, Doncaster	Carew et al	HQ248037				
Procladius villosimanus	Pr148	L	Australia	Victoria, Lara	Carew et al	HQ248038				
Procladius villosimanus	Pr167	L	Australia	Victoria, Endeavour Hills	Carew et al	HQ248039				
Procladius villosimanus	Pr212	L	Australia	Victoria, Altona	Carew et al	HQ248040				
Procladius villosimanus	Pr360	L	Australia	New South Wales, Homebush	Carew et al	HQ248041				
Psectrotanypus dyari	CATP9.8.3	L	USA	California, Santa Barbara Co., Oso Flaco L.	McCluen	MW283816	KX684098	KX684070		
Psectrotanypus dyari	ES2.12	L	USA	California, Plumas Co., Grizzly Creek	McCluen, Bastien, Cranston	MW283817	KX684099	KX684071	KX684170	
Psectrotanypus varius	RIN_CH31	L	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Ekrem, Stur	MW378371		MW538942	MW430082	MW443130
Psectrotanypus varius	TRD-CH33	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Vange	MW378349	MW378509	MW378424	MW430067	MW443124
Psectrotanypus varius	TRD-CH34	m	Norway	Sør-Trøndelag, Trondheim, Ringve Botanical Garden	Vange	MW378365	MW378531	MW378448		MW443128

Radotanypus florens	NM1.2	L	USA	New Mexico, Taos, Rio Pueblo	Cranston	MW283819	KX684101	KX684072	KX684178	
Radotanypus florens	To514	L	United States	Minnesota, Winona Co., Rose Valley Creek	Chirhart	MW378381		MW496875	MW496895	MW497075
Radotanypus florens	To515	L	United States	Minnesota, Pacific Co., Naselle River	Chirhart	MW378340		MW496865	MW496881	MW497065
Rheopelopia maculipennis	BIOUG16597-G12	A	Norway	Sør-Trøndelag, Trondheim	Ekrem, Stur	MW378355		MW538940	MW430069	
Rheopelopia maculipennis	TRD-CH179	f	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur	MW378333				
Rheopelopia ornata	CHIR_CH449	m	Canada	Manitoba, Churchill, Town of Churchill	McGowan	MW378360	MW378523	MW378440		
Rheopelopia ornata	CHIR_CH491	m	Canada	Manitoba, Churchill, Town of Churchill	McGowan	MW378344	MW378501	MW378415		
Rheopelopia ornata	HLC-26994	m	Canada	Manitoba, Churchill, Town of Churchill		KR435681	MW378510	MW378425		
Rheopelopia ornata	08BBDIP-2724	f	Canada	Manitoba, Riding Mountain NP, Whirlpool River	BIObus 2008	HQ552178				
Rheopelopia sp.	CATP8.2	L	USA	California, Plumas Co., Sagehen Ck	Cranston	MW283518	KX684117	KX684053		
Tanypodinae indet.	Fa12117	L	Brazil	São Paulo, São Carlos	Silva	MW496859		MW536174	MW496889	MW536501
Tanypodinae indet.	Fa120	L	Brazil	São Paulo, São Carlos	Silva	MW496862		MW536175	MW496897	MW536502
Tanypodinae indet.	Fa121	L	Brazil	São Paulo, São Carlos	Silva	MW496853		MW536170	MW496879	MW536498
Tanypodinae indet.	Fa122	L	Brazil	São Paulo, São Carlos	Silva	MW496858		MW536173	MW496888	MW536500
Tanypus neopunctipennis	BIOUG02271-B04	A	USA	Texas, Brazos Bend State Park	BIObus 2011	BBDIT1857-12.COI-5P				
Tanypus punctipennis	gg214		South Korea		Ree	JN887098				
Tanypus sp.	FLT1.5	Le/Pe/m	USA	Florida, Everglades N.P., Daniel Beard Center	McCluen & Cranston	MW283820	KX684163	MW281238	KX684190	
Tanypus sp.	TANYPUS	L	USA	California, Lake Co., nr Guenoc	Cranston	MW283825	FJ570724	FJ570642	HQ440381	HQ440536
Thienemannimyia carnea	TRD-CH176	m	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur	MW378359	MW536179	MW378439	MW496887	MW497069
Thienemannimyia carnea	TRD-CH417	f	Norway	Sør-Trøndelag, Trondheim, Jonsvatn	Stur	MW378356	MW536178	MW496869	MW496885	
Thienemannimyia carnea	TRD-CH326	m	Norway	Sør-Trøndelag, Trondheim, Nildeva	Stur	MW378348	MW378507	MW378422	MW430065	
Thienemannimyia fuscipes	Finnmark174	m	Norway	Finnmark, Kautokeino, Kautokeinoelva	Ekrem	JF870822	MW378546	MW378463	MW430086	
Thienemannimyia fuscipes	Finnmark260	m	Norway	Finnmark, Alta, Sennalandet	Ekrem	JN285994	MW378518	MW378434	MW430071	
Thienemannimyia fuscipes	Finnmark509	m	Norway	Finnmark, Kautokeino, Lahpoluoppal	Ekrem, Stur	JN286013	MW378535	MW378452	MW430080	
Thienemannimyia gp. gen. nov.	AUNT16.1	Pm	Australia	Northern Territory, Kakadu NP, Magela Creek	Krosch, Cranston	MW283832	MW274074	MW281250		
Thienemannimyia gp. gen. nov.	AUNT16.2	L	Australia	Northern Territory, Kakadu NP, Magela Creek	Krosch, Cranston	MW283833				
Thienemannimyia gp. gen. nov.	AUNT16.3	Pf	Australia	Northern Territory, Kakadu NP, Magela Creek	Krosch, Cranston	MW283834	MW274075	MW281251		
Thienemannimyia gp. gen. nov.	NTKam1	P	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283859				
Thienemannimyia gp. gen. nov.	NTKam17.2	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Hanley	MW283826	MW274073	MW281242		
Thienemannimyia gp. gen. nov.	NTKam2	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283863				
Thienemannimyia gp. gen. nov.	NTKam3	L	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283864		MW281247		
Thienemannimyia lentiginosa	Finnmark707	m	Norway	Finnmark, Sor-Varanger, South of 96-hoyden	Ekrem, Stur	JN286019	MW378517	MW378433	MW430070	
Thienemannimyia northumbrica	CH-OSF114	m	Norway	Oslo, Ljanselva, Liadalen	Soli, Steinert	JN285989	MW378482	MW378396	MW430055	
Thienemannimyia northumbrica	CH-OSF40	m	Norway	Oslo, Ljanselva, Liadalen	Soli, Steinert	MW378350	MW378512	MW378427		
Trissopelopia cf. flavida	ES199	m	Germany	Bavaria, Nationalpark Berchtesgaden,Herrenroint	Eder	MW378363	MW378528	MW378445		
Trissopelopia cf. flavida	ES200	m	Germany	Bavaria, Nationalpark Berchtesgaden,Herrenroint	Eder	MW378366	MW378533	MW378450		
Trissopelopia cf. flavida	Finnmark888	P(m)	Norway	Finnmark, Alta, Gargiaelva	Ekrem	MW378352		MW378430		
Trissopelopia cf. flavida	SOE268	f	Norway	Sør-Trøndelag, Røros kommune, Sølendet	Frengen	HQ105380				
Trissopelopia longimanus	Finnmark783	L	Norway	Finnmark, Porsanger, Baukop	Halvorsen	MW378332	MW378483	MW378397	MW430056	MW443115
Wuelkeriella toncekensis	ARGWtonc1	Pe/f	Argentina	Rio Negro, Cerro Catedral, Laguna Schmoll	Suarez	MW283873	MW274076	MW281255		
Wuelkeriella toncekensis	ARGWtonc2	Pe/m	Argentina	Rio Negro, Cerro Catedral, Laguna Schmoll	Suarez	MW283874	MW274077	MW281256		
Yarrhpelopia acorona	NSWNE17.3.1	Pm	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150360		MW151663		
Yarrhpelopia norrisi	FNQ16NIG3	P	Australia	Queensland, Herberton Range NP, Wondecla Creek	Krosch, Bryant, Cranston	MW150329				
Yarrhpelopia norrisi	GRM2.5	L	Australia	Victoria, Grampian NP, Scrubby Creek	Krosch, Bryant	MW150330	MW150494	MW151655		
Yarrhpelopia norrisi	NSW13.5T4	m	Australia	New South Wales, Newnes, Coco Creek	Cranston	MW150331	MW150495	MW151658		
Yarrhpelopia norrisi	NSWCF1	L	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150332		MW151660		
Yarrhpelopia norrisi	NSWCF2	L	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150333	MW150496	MW151661		

Yarrhpelopia norrisi	NSWCF4	Pe/f	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150334				
Yarrhpelopia norrisi	NSWCF5	Pe/m	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150335				
Yarrhpelopia norrisi	NSWCF7	Le/Pe/m	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150336				
Yarrhpelopia norrisi	NSWCF8	Le/Pe/m	Australia	New South Wales, Captain's Flat, Molonglo River	Cranston	MW150337				
Yarrhpelopia norrisi	NSWDor17.1.3	L	Australia	New South Wales, Dorrigo NP, Sassafrass Creek	Cranston	MW150338				
Yarrhpelopia norrisi	NSWGl17.2.2	L(P)	Australia	New South Wales, Tibuc Road, Manning River	Cranston	MW150339				
Yarrhpelopia norrisi	NSWNE17.2.8	L	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW150340				
Yarrhpelopia norrisi	NSWNE17.3.3	L(P)	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150341	MW150497	MW151654	MW173965	
Yarrhpelopia norrisi	NSWNE17.3.4	L(P)	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150342				
Yarrhpelopia norrisi	NSWNE17.3.9	L	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW150343				
Yarrhpelopia norrisi	NSWWC17.1	Pe/f	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW150344				
Yarrhpelopia norrisi	OTW4.1	L	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW150345	MW150498	MW151650		
Yarrhpelopia norrisi	OTW4.3	L	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW150346	MW150499	MW151659		
Yarrhpelopia norrisi	OTW4.6	L	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW150347	MW150500	MW151657		
Yarrhpelopia norrisi	TAS17.2.6	L	Australia	Tasmania, Little Pipers River	Cranston	MW150348				
Yarrhpelopia norrisi	TAS17.4.5	L	Australia	Tasmania, Charlie's Marsh	Cranston	MW150349	MW150501	MW151662		
Yarrhpelopia norrisi	TAS17.6.5	L	Australia	Tasmania, Goulds Country, Ransom River	Cranston	MW150350				
Yarrhpelopia norrisi	TAS17.6.7	P	Australia	Tasmania, Goulds Country, Ransom River	Cranston	MW150351	MW150502	MW151656		
Yarrhpelopia norrisi	TAS17.7.1	P	Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW150352				
Yarrhpelopia norrisi	TAS17.7.2	L	Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW150353	MW150503	MW151651		
Yarrhpelopia norrisi	TAS17.7.4	L	Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW150354				
Yarrhpelopia norrisi	TAS17.8.1	P	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Full Moon Creek	Cranston	MW150355	MW150504	MW151652		
Yarrhpelopia norrisi	TAS17.9.1	L(P)	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Quarry pool	Cranston	MW150356				
Yarrhpelopia norrisi	TAS17.9.4	L(P)	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Quarry pool	Cranston	MW150357	MW150505	MW151653		
Yarrhpelopia norrisi	V214	L	Australia	Victoria, Toolangi SF, Mullindindi	Cranston	MW150358	HQ441020	HQ440858	HQ440398	
Yarrhpelopia V20	B8R3.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW150359	MW150506	MW151649		
Zavrelimyia barbatipes	MA15	L	Portugal	Madeira, Rabacal	Ekrem	MW378380	MW378548	MW378465	MW430087	
Zavrelimyia cingulata	TRD-CH428	L	Norway	Sør-Trøndelag, Trondheim, Melhus	Ekrem, Stur	MW378375	MW536181	MW496871	MW496891	MW497071
Zavrelimyia cingulata	TRD-CH76	m	Norway	Sør-Trøndelag, Trondheim, Gjeddvatnet	Skei	MW378368	MW536180	MW496873	MW496893	MW497073
Zavrelimyia melanura	ATNA327	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Ekrem	HM421430	MW378498	MW378412	MW496882	
Zavrelimyia melanura	ATNA74	m	Norway	Oppland, Dovre, Rondane nasjonalpark	Ekrem	MW378329	MW378480	MW378394	MW496878	
Zavrelimyia smithae	CATP9.1.0	L	USA	California, Mendocino Co.	McLuen, Cranston	MW283577	KX684138	KX684064		
Zavrelimyia sp.	ACTGib16.1	L	Australia	Australian Capital Territory, Brindabellas, Gibraltar Creek	Cranston	MW283578	MW273991	MW281208		
Zavrelimyia sp.	ACTGib16.2	L	Australia	Australian Capital Territory, Brindabellas, Gibraltar Creek	Cranston	MW283579				
Zavrelimyia sp.	ACTGib16.3	L	Australia	Australian Capital Territory, Brindabellas, Gibraltar Creek	Cranston	MW283580				
Zavrelimyia sp.	ACTGib16.6	L	Australia	Australian Capital Territory, Brindabellas, Gibraltar Creek	Cranston	MW283581	MW273992	MW281078	MW286151	
Zavrelimyia sp.	APL40.2.1	L	Australia	Victoria, Melbourne, Albert Park Lake	Carew	MW283582				
Zavrelimyia sp.	APL40.2.2	L	Australia	Victoria, Melbourne, Albert Park Lake	Carew	MW283583	MW273993	MW281162	MW286152	
Zavrelimyia sp.	AU09Ruth.T1	L	Australia	New South Wales, Rutherford Creek	Cranston	MW283584	KX684140	KX684066		
Zavrelimyia sp.	B2R3.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283585				
Zavrelimyia sp.	B2R3.2	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283586				
Zavrelimyia sp.	B6P4.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283587	MW273994	MW281197		
Zavrelimyia sp.	B7R4.1	L	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283588				
Zavrelimyia sp.	BGRed1	L	Australia	New South Wales, Barren Grounds, Redbank Gorge Creek	Cranston	MW283589	MW273995	MW281173		
Zavrelimyia sp.	BGRed2	Le/Pe/m	Australia	New South Wales, Barren Grounds, Redbank Gorge Creek	Cranston	MW283590				
Zavrelimyia sp.	CAM08	L	USA	California, Maillard Redwoods S.F., Mill CK.	Cranston	MW283878	FJ570726	FJ570644	HQ440406	HQ440554
Zavrelimyia sp.	CATP9.2.1	L	USA	California, Maillard Redwoods SF	McCluen, Cranston	MW283875	KX684152	KX684073	KX684165	

Zavrelimyia sp.	CATP9.2.5	L	USA	California, Maillard Redwoods SF	McCluen, Cranston	MW283876	KX684153	KX684074	KX684166	
Zavrelimyia sp.	CATP9.4.2	L	USA	California, Butte/Tehama Co., Big Chico Ck	Cranston	MW283880	KX684154	KX684075		
Zavrelimyia sp.	CTC16.2	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283591		MW281152		
Zavrelimyia sp.	CTC16.3	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283592				
Zavrelimyia sp.	CTC16.6	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283593				
Zavrelimyia sp.	CTC16.7	L	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283594	MW273996	MW281155	MW286153	
Zavrelimyia sp.	CTC17.2	L(P)	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283595	MW273997			
Zavrelimyia sp.	CTC17.3	L(P)	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283596	MW273998	MW281151		
Zavrelimyia sp.	CTC17.4	Le/Pe/m	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283597				
Zavrelimyia sp.	CTC17.8	L(P)	Australia	New South Wales, Cabbage Tree Creek	Cranston	MW283598				
Zavrelimyia sp.	FLT3.5	L	USA	Florida, Everglades N.P., nr Ficus Pond	McCluen, Cranston	MW283599	KX684141	KX684067	KX684189	
Zavrelimyia sp.	FNQ12.1T3	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283600				
Zavrelimyia sp.	FNQ16NIG1	P	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283601	MW273999	MW281191		
Zavrelimyia sp.	FNQ16NIG11	L(P)	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283602				
Zavrelimyia sp.	FNQ16NIG4	P	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283603				
Zavrelimyia sp.	FNQ16NIG5	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283604	MW274000	MW281189		
Zavrelimyia sp.	FNQ16NIG7	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283605				
Zavrelimyia sp.	FNQ16NIG8	L	Australia	Queensland, Herberton Range NP, Wondecla Creek	Cranston	MW283606		MW281203		
Zavrelimyia sp.	GRM1.2	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283607		MW281205		
Zavrelimyia sp.	GRM1.3	L	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283608				
Zavrelimyia sp.	GRM1.A2	Le/Pe/m	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283609		MW281171		
Zavrelimyia sp.	GRM1.A3	Le/Pe/f	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283610				
Zavrelimyia sp.	GRM1.A4	Le/Pe/m	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283611				
Zavrelimyia sp.	GRM1.A5	Le/Pe/m	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283612				
Zavrelimyia sp.	GRM1.A6	Le/Pe/m	Australia	Victoria, Grampian NP, Mackenzie River	Krosch, Bryant	MW283613	MW274001	MW281176		
Zavrelimyia sp.	GRM2.3	L	Australia	Victoria, Grampian NP, Scrubby Creek	Krosch, Bryant	MW283614		MW281198		
Zavrelimyia sp.	GRM3.2	L	Australia	Victoria, Grampian NP, Upper Glenelg River	Krosch, Bryant	MW283615	MW274002	MW281204		
Zavrelimyia sp.	GRM4.A2	Le/P	Australia	Victoria, Grampian NP, Wannon River	Krosch, Bryant	MW283616				
Zavrelimyia sp.	KCL17	P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283617				
Zavrelimyia sp.	KCL19	L	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283618		MW281193		
Zavrelimyia sp.	KCL3	Le/P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283619				
Zavrelimyia sp.	KCL5	L/P	Australia	Queensland, Crater Lakes NP, Kauri Creek	Krosch, Bryant, Cranston	MW283620				
Zavrelimyia sp.	LGL2.1	L	Australia	Victoria, Lower Glenelg NP, Eel Drain	Krosch, Bryant	MW283621	MW274003	MW281172		
Zavrelimyia sp.	LGL2.A1	Le/Pe/f	Australia	Victoria, Lower Glenelg NP, Eel Drain	Krosch, Bryant	MW283622				
Zavrelimyia sp.	LHIEr1	L	Australia	Lord Howe Island, Erskine Creek	Cranston	MW283623	MW274004	MW281180		
Zavrelimyia sp.	LHIEr2	L	Australia	Lord Howe Island, Erskine Creek	Cranston	MW283624				
Zavrelimyia sp.	LHIEr3	L	Australia	Lord Howe Island, Erskine Creek	Cranston	MW283625				
Zavrelimyia sp.	LHIRR4	L	Australia	Lord Howe Island, Rocky Run	Cranston	MW283626	MW274005	MW281181	MW286150	
Zavrelimyia sp.	LHIRR5	L	Australia	Lord Howe Island, Rocky Run	Cranston	MW283627	MW274006	MW281179		
Zavrelimyia sp.	LSC2.1	L	Australia	Victoria, Mt Evelyn, Little Stringyback Creek South	Carew	MW283628				
Zavrelimyia sp.	LSC2.4	L	Australia	Victoria, Mt Evelyn, Little Stringyback Creek South	Carew	MW283629				
Zavrelimyia sp.	LSCP1	P	Australia	Victoria, Wandin, Little Stringybark Creek	Carew	MW283845	MW274054	MW281246		
Zavrelimyia sp.	LSCP2	P	Australia	Victoria, Wandin, Little Stringybark Creek	Carew	MW283846				
Zavrelimyia sp.	LSCP3	P	Australia	Victoria, Wandin, Little Stringybark Creek	Carew	MW283847				
Zavrelimyia sp.	MW5.1	Le/P	Australia	Queensland, Mount Windsor, Spencer Creek	Krosch, Bryant, Cranston	MW283630				
Zavrelimyia sp.	NCP4.1	L(P)	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283848				
Zavrelimyia sp.	NCR4.1	L(P)	Australia	Western Australia, Jarrahdale, Wungong Catchment	Carey	MW283631	MW274007	MW281199		

Zavrelimyia sp.	Nev5	L(P)	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283827				
Zavrelimyia sp.	NSW13.5T1	L	Australia	New South Wales, Newnes, Coco Creek	Cranston	MW283632	MW274008	MW281182		
Zavrelimyia sp.	NSW13.5T3	L	Australia	New South Wales, Newnes, Coco Creek	Cranston	MW283633	MW274009	MW281184		
Zavrelimyia sp.	NSW16WC1	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283634		MW281201		
Zavrelimyia sp.	NSW16WC2	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283635				
Zavrelimyia sp.	NSW16WC4	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283636				
Zavrelimyia sp.	NSW16WC5	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283637		MW281202		
Zavrelimyia sp.	NSW17BB2	Le/Pe/m	Australia	New South Wales, Numeralla, Big Badja	Cranston	MW283638	MW274010	MW281158		
Zavrelimyia sp.	NSW17WCFeb1	Le/Pe/m	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283850				
Zavrelimyia sp.	NSW17YH5	Pf	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283854				
Zavrelimyia sp.	NSW17YH6	Pf	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283855	MW274011	MW281254		
Zavrelimyia sp.	NSW17YH7	L	Australia	New South Wales, Namadgi NP, Bogong Creek	Cranston	MW283856				
Zavrelimyia sp.	NSWDor17.2.1	L	Australia	New South Wales, Dorrigo NP, Coopernook Creek	Cranston	MW283639	MW274012	MW281159		
Zavrelimyia sp.	NSWDor17.2.2	L	Australia	New South Wales, Dorrigo NP, Coopernook Creek	Cranston	MW283640				
Zavrelimyia sp.	NSWFox1	L	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283641				
Zavrelimyia sp.	NSWFox2	L	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283642				
Zavrelimyia sp.	NSWFox5	Pm	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283643				
Zavrelimyia sp.	NSWFox6	P	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283644		MW281183		
Zavrelimyia sp.	NSWFox7	Le/Pe/m	Australia	New South Wales, Foxlow, Molonglo River	Cranston	MW283645				
Zavrelimyia sp.	NSWGl17.3.5	L(P)	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283646				
Zavrelimyia sp.	NSWGl17.3.6	P	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283647				
Zavrelimyia sp.	NSWGl17.3.7	L	Australia	New South Wales, Barrington Tops NP, Polblue Swamp	Cranston	MW283648				
Zavrelimyia sp.	NSWNE17.1.1	P	Australia	New South Wales, Waterfall Highway, Jock's Water	Cranston	MW283649				
Zavrelimyia sp.	NSWNE17.1.3	P	Australia	New South Wales, Waterfall Highway, Jock's Water	Cranston	MW283650	MW274013	MW281200		
Zavrelimyia sp.	NSWNE17.2.12	L	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283651				
Zavrelimyia sp.	NSWNE17.2.4	L	Australia	New South Wales, Cathedral Rock NP, drain of swamp	Cranston	MW283652	MW274014	MW281188		
Zavrelimyia sp.	NSWNE17.3.5	L(P)	Australia	New South Wales, Cathedral Rock NP, Sphagnum swamp	Cranston	MW283653	MW274015	MW281165		
Zavrelimyia sp.	NSWNevII.1	L(P)	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283654				
Zavrelimyia sp.	NSWNevII.2	L	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283655				
Zavrelimyia sp.	NSWNevOct4	L(P)	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283656				
Zavrelimyia sp.	NSWNevOct5	L	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283657	MW274016	MW281187		
Zavrelimyia sp.	NSWNevOct6	Le/P	Australia	New South Wales, Oallen, Neverdie	Cranston	MW283658	MW274017	MW281160		
Zavrelimyia sp.	NSWNew17.1.2	Pe/m	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283659				
Zavrelimyia sp.	NSWNew17.1.4	L	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283660				
Zavrelimyia sp.	NSWNew17.1.5	P	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283661	MW274018	MW281156		
Zavrelimyia sp.	NSWNew17.1.6	L(P)	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283662				
Zavrelimyia sp.	NSWNew17.1.8	L	Australia	New South Wales, Newnes, Little Capertee Creek	Cranston	MW283663	MW274019	MW281185		
Zavrelimyia sp.	NSWWC17.4	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283664				
Zavrelimyia sp.	NSWWC17.5	L	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283858	MW274020	MW281252		
Zavrelimyia sp.	NSWWC17.9	L/P	Australia	New South Wales, Northangera, Warrambucca Creek	Cranston	MW283665				
Zavrelimyia sp.	NSWWin1	L	Australia	New South Wales, Windellama, private dam #1	Cranston	MW283666				
Zavrelimyia sp.	NSWWin11	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283667				
Zavrelimyia sp.	NSWWin12	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283668	MW274021	MW281167		
Zavrelimyia sp.	NSWWin13	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283669				
Zavrelimyia sp.	NSWWin14	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283670				
Zavrelimyia sp.	NSWWin15	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283671	MW274022	MW281166		
Zavrelimyia sp.	NSWWin16	L	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283672				

Zavrelimyia sp.	NSWWin2	L	Australia	New South Wales, Windellama, private dam #1	Cranston	MW283673	MW274023	MW281157		
Zavrelimyia sp.	NSWWin3	L	Australia	New South Wales, Windellama, private dam #1	Cranston	MW283674				
Zavrelimyia sp.	NSWWin6	L	Australia	New South Wales, Windellama, private dam #1	Cranston	MW283675				
Zavrelimyia sp.	NSWWin8	L	Australia	New South Wales, Windellama, private dam #1	Cranston	MW283676				
Zavrelimyia sp.	NSWWinDec1	L/P	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283677				
Zavrelimyia sp.	NSWWinDec3	Le/Pe/f	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283678				
Zavrelimyia sp.	NSWWinDec5	Le/Pe/f	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283679	MW274024	MW281168		
Zavrelimyia sp.	NSWWinDec6	Le/Pe/f	Australia	New South Wales, Windellama, private dam #2	Cranston	MW283680				
Zavrelimyia sp.	NTFL1	L	Australia	Northern Territory, Litchfield NP, Florence Creek	Krosch, Cranston	MW283681	MW274025	MW281178		
Zavrelimyia sp.	NTFL2	L	Australia	Northern Territory, Litchfield NP, Florence Creek	Krosch, Cranston	MW283682				
Zavrelimyia sp.	NTKam4	Pm	Australia	Northern Territory, Kakadu NP, Kambolgie Creek	Krosch, Cranston	MW283683	MW274026	MW281177		
Zavrelimyia sp.	OTW1.1	L	Australia	Victoria, Otway NP, Wild Dog Creek	Krosch, Bryant	MW283684				
Zavrelimyia sp.	OTW2.1	L	Australia	Victoria, Otway NP, Lake Elizabeth	Krosch, Bryant	MW283685	MW274027	MW281174		
Zavrelimyia sp.	OTW3.1	L	Australia	Victoria, Otway NP, Barwon River	Krosch, Bryant	MW283686				
Zavrelimyia sp.	OTW4.4	L	Australia	Victoria, Otway NP, Johanna River	Krosch, Bryant	MW283687	MW274028	MW281175	MW286154	
Zavrelimyia sp.	RAV1.3	L	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283688	MW274029	MW281190		
Zavrelimyia sp.	RAV1.8	L	Australia	Queensland, Koombooloomba NP, Koombooloomba Creek	Krosch, Bryant, Cranston	MW283689				
Zavrelimyia sp.	SACC1	L	Australia	South Australia, Bridgewater, Cox Creek	Krosch, Bryant, Madden	MW283690	MW274030	MW281206		
Zavrelimyia sp.	SACC3	L	Australia	South Australia, Bridgewater, Cox Creek	Krosch, Bryant, Madden	MW283691				
Zavrelimyia sp.	SACC6	L	Australia	South Australia, Bridgewater, Cox Creek	Krosch, Bryant, Madden	MW283692				
Zavrelimyia sp.	SALE.A1	Le/Pf	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283693	MW274031	MW281163		
Zavrelimyia sp.	SALE.A2	Le/Pe/f	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283694	MW274032	MW281164		
Zavrelimyia sp.	SALE1	L	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283695				
Zavrelimyia sp.	SALE4	L	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283696				
Zavrelimyia sp.	SALE.P1	P	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283697		MW281161		
Zavrelimyia sp.	SALE.P2	P	Australia	South Australia, Koorine, Lake Edward	Krosch, Bryant	MW283698				
Zavrelimyia sp.	SALL2	L	Australia	South Australia, Koorine, Lake Leake	Krosch, Bryant	MW283699				
Zavrelimyia sp.	SAM1	P	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283700	MW274033	MW281170		
Zavrelimyia sp.	SAM17.9.4	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283434				
Zavrelimyia sp.	SAM17.9.P1	P	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283865				
Zavrelimyia sp.	SAM2.11	Le/Pe/f	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283869				
Zavrelimyia sp.	SAM2	P	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283701				
Zavrelimyia sp.	SAM3	P(A)	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283702				
Zavrelimyia sp.	SAM4	L	Australia	Queensland, Camp Mountain, Samford Creek	Krosch	MW283703	MW274034	MW281194		
Zavrelimyia sp.	SPR1.17	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283704				
Zavrelimyia sp.	SPR1.6	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283705				
Zavrelimyia sp.	SPR17.10	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283706				
Zavrelimyia sp.	SPR17.3	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283707				
Zavrelimyia sp.	SPR17.6	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283708				
Zavrelimyia sp.	SPR17.7	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283709	MW274035	MW281196		
Zavrelimyia sp.	SPR17.9	L	Australia	Queensland, Bunya, South Pine River	Krosch	MW283710	MW274036	MW281195		
Zavrelimyia sp.	TAS17.1.2	L	Australia	Tasmania, Lilydale Falls Reserve, Second River	Cranston	MW283711				
Zavrelimyia sp.	TAS17.2.4	L	Australia	Tasmania, Little Pipers River	Cranston	MW283712				
Zavrelimyia sp.	TAS17.3.1	P	Australia	Tasmania, Ansons Bay, Bosses Creek	Cranston	MW283713				
Zavrelimyia sp.	TAS17.3.2	P	Australia	Tasmania, Ansons Bay, Bosses Creek	Cranston	MW283714				
Zavrelimyia sp.	TAS17.3.3	L	Australia	Tasmania, Ansons Bay, Bosses Creek	Cranston	MW283715				
Zavrelimyia sp.	TAS17.3.4	L	Australia	Tasmania, Ansons Bay, Bosses Creek	Cranston	MW283716				

Zavrelimyia sp.	TAS17.3.5	L	Australia	Tasmania, Ansons Bay, Bosses Creek	Cranston	MW283871				
Zavrelimyia sp.	TAS17.4.1	L	Australia	Tasmania, Charlie's Marsh	Cranston	MW283717	MW274037	MW281186		
Zavrelimyia sp.	TAS17.4.2	L	Australia	Tasmania, Charlie's Marsh	Cranston	MW283718	MW274038	MW281154		
Zavrelimyia sp.	TAS17.4.4	Pf	Australia	Tasmania, Charlie's Marsh	Cranston	MW283719				
Zavrelimyia sp.	TAS17.6.2	Pe/f	Australia	Tasmania, Goulds Country, Ransom River	Cranston	MW283720	MW274039	MW281207		
Zavrelimyia sp.	TAS17.6.3	L	Australia	Tasmania, Goulds Country, Ransom River	Cranston	MW283872				
Zavrelimyia sp.	TAS17.6.6	P	Australia	Tasmania, Goulds Country, Ransom River	Cranston	MW283526	MW273977	MW281129		
Zavrelimyia sp.	TAS17.7.3		Australia	Tasmania, Blue Tiers FR, Goblin's Trail, Full Moon Creek	Cranston	MW283721	MW274040	MW281153		
Zavrelimyia sp.	TAS17.8.2	L	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Full Moon Creek	Cranston	MW283722				
Zavrelimyia sp.	TAS17.9.2	P(A)	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Quarry pool	Cranston	MW283723				
Zavrelimyia sp.	TAS17.9.5	L	Australia	Tasmania, Blue Tiers FR, Sun Flats Road, Quarry pool	Cranston	MW283724	MW274041	MW281209		
Zavrelimyia sp.	TH43	L	Thailand	Thung Salaeng Luang N.P., Hua Tub Da Mi	Cranston	MW283879	HQ440939	HQ440778	HQ440311	HQ440477
Zavrelimyia sp.	TH69	L	Thailand	Nakhon Ratchasima, Khao Yai NP	Cranston	MW283725	HQ440962	HQ440799	HQ440331	HQ440493
Zavrelimyia sp.	THTP	L	Thailand	Phang Nga, Sri Phang Nga NP	Cranston		HQ440972	HQ440809	HQ440341	HQ440341
Zavrelimyia sp.	TRIB4.2	L	Australia	Queensland, Daintree NP, Noah Creek	Krosch, Bryant, Cranston	MW283726	MW274042	MW281192		
Zavrelimyia sp.	V211	L	Australia	Victoria, Tallangi SF, Mullindindi	Cranston	MW283727	HQ440961	HQ440798	HQ440330	HQ440492
Zavrelimyia sp.	VicFRC1	L	Australia	Victoria, Flat Rock Creek	Cranston	MW283728	MW274043	MW281150		
Zavrelimyia sp.	VicFRC3	L	Australia	Victoria, Flat Rock Creek	Cranston	MW283729				
Zavrelimyia sp.	VicFRC4	L	Australia	Victoria, Flat Rock Creek	Cranston	MW283730				
Zavrelimyia sp.	VicKal1	L	Australia	Victoria, Kalimna Woods	Cranston	MW283731				
Zavrelimyia sp.	VicKal2	L	Australia	Victoria, Kalimna Woods	Cranston	MW283732	MW274044	MW281169		
Zavrelimyia sp.	WA17.11.9	L	Australia	Western Australia, Pilbara, Chadolinna Pool	Pinder	MW283733				
Zavrelimyia sp.	ZACHIR12	f	South Africa	Eastern Cape, Grahamstown, Glenstone farm	Ekrem, Stur	MW378351	MW378514	MW378429		
Zavrelimyia sp.	ZACHIR13	m	South Africa	Eastern Cape, Grahamstown, Glenstone farm	Ekrem, Stur	MW378393	MW378561	MW378478		
Zavrelimyia sp. 1ES	CH-OSF116	m	Norway	Oslo, Ljanselva, Liadalen	Soli, Steinert	JN285990	MW378496	MW378410	MW430061	
Zavrelimyia sp. 1ES	Finnmark754	L	Norway	Finnmark, Nesseby, Nyborg	Halvorsen	MW378390	MW378558	MW378475	MW430090	
Outgroups										
Aphroteniella sp.	FNQ10.11	L	Australia	Queensland, Mt Lewis, Windmill Ck	Cranston		FJ570648	FJ570568	HQ440232	GU356642
Buchonomyia thienemanni	BUCH2	F	Ireland	Killarney, R. Flesk			GU356693	GU356711	HQ440252	GU356654
Telmatogeton mcswaini	CATL	m	USA	California, Monterey, Asilomar coast			GU356706	GU356721	HQ440384	HQ440538
Diamesa sp.	ITDA	L	Italy	Trentino, Cornisello glacial stream			GU356695	GU356713	HQ440269	GU356656
Prodiamesa sp.	PRO1	L	USA	Idaho, Lindsay Ck.	(Ecoanalysts)		GU356703	GU356718	HQ440353	HQ440512
Podonomopsis evansi	AUPE	L	Australia	Australian Capital Territory, Brindabellas			FJ570707	FJ570625	HQ440343	GU356678

Table A2. Summary of each dataset used for molecular phylogenetic analyses.

Dataset name	Loci included	Number of taxa including outgroups	Number of base pairs	Analyses conducted
Dataset 1	FolCOI	323	642	RAxML
Dataset 2	COI	321	765	RAxML
Dataset 3	28S	336	510	RAxML
Dataset 4	CAD1	145	742	RAxML
Dataset 5	CAD4	76	768	RAxML
Dataset 6	FolCOI,COI,28S,CAD1,CAD4	338	3427	RAxML,MrBayes
Dataset 7	FolCOI	718	642	RAxML
Dataset 8	FolCOI,COI,28S,CAD1,CAD4	186	3427	BEAST

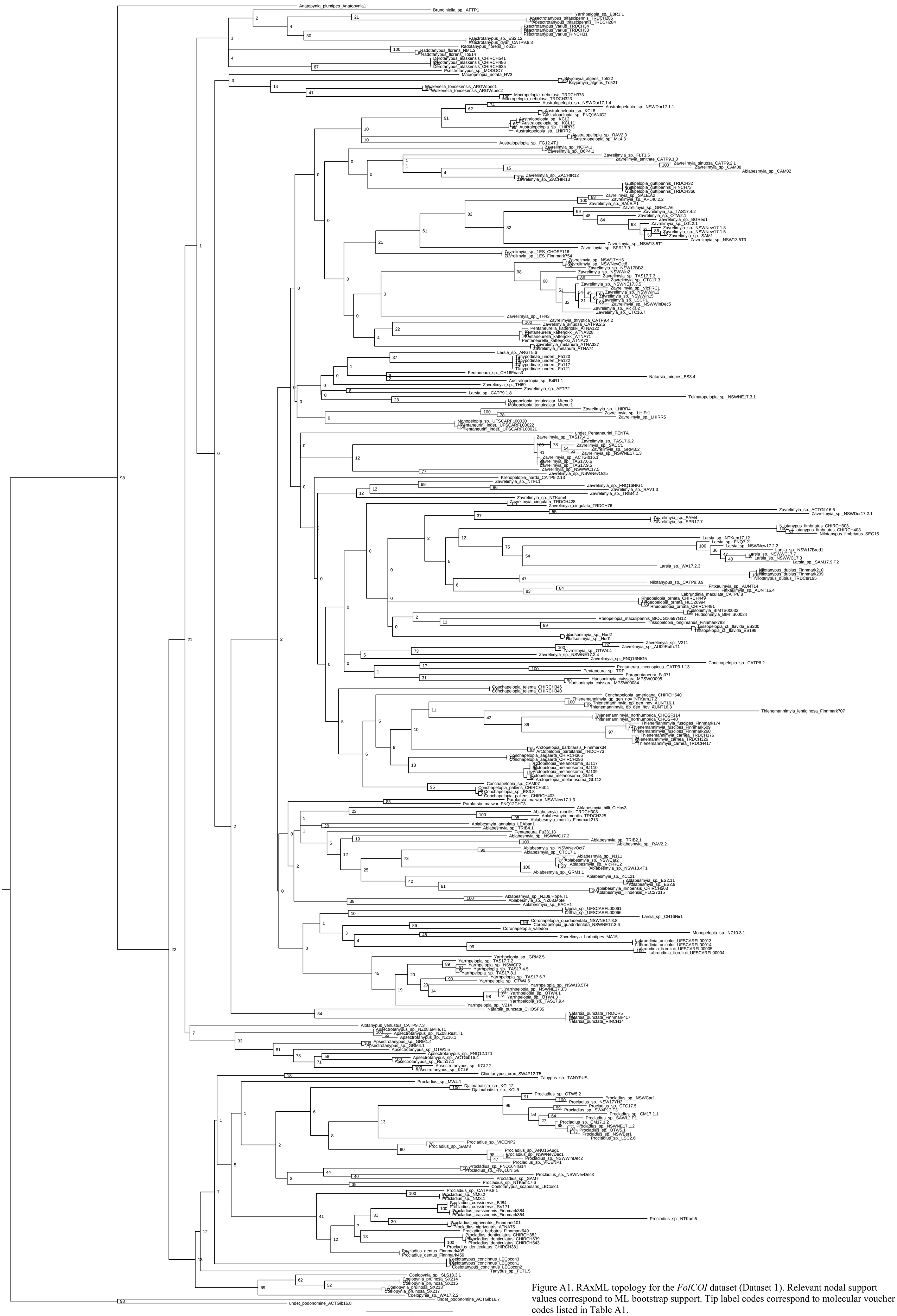
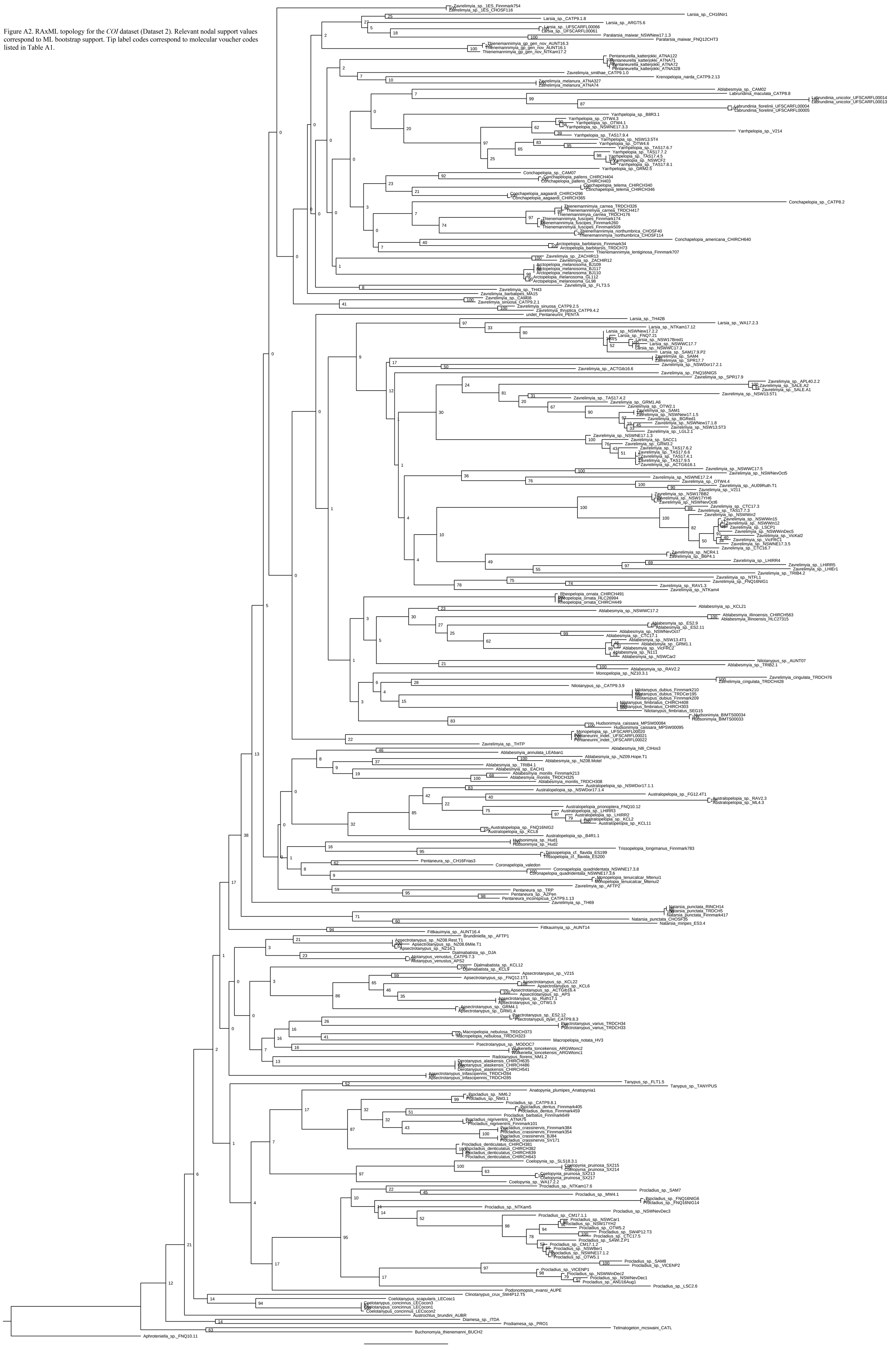


Figure A1. RAxML topology for the *FolCOI* dataset (Dataset 1). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A2. RAxML topology for the *COI* dataset (Dataset 2). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.



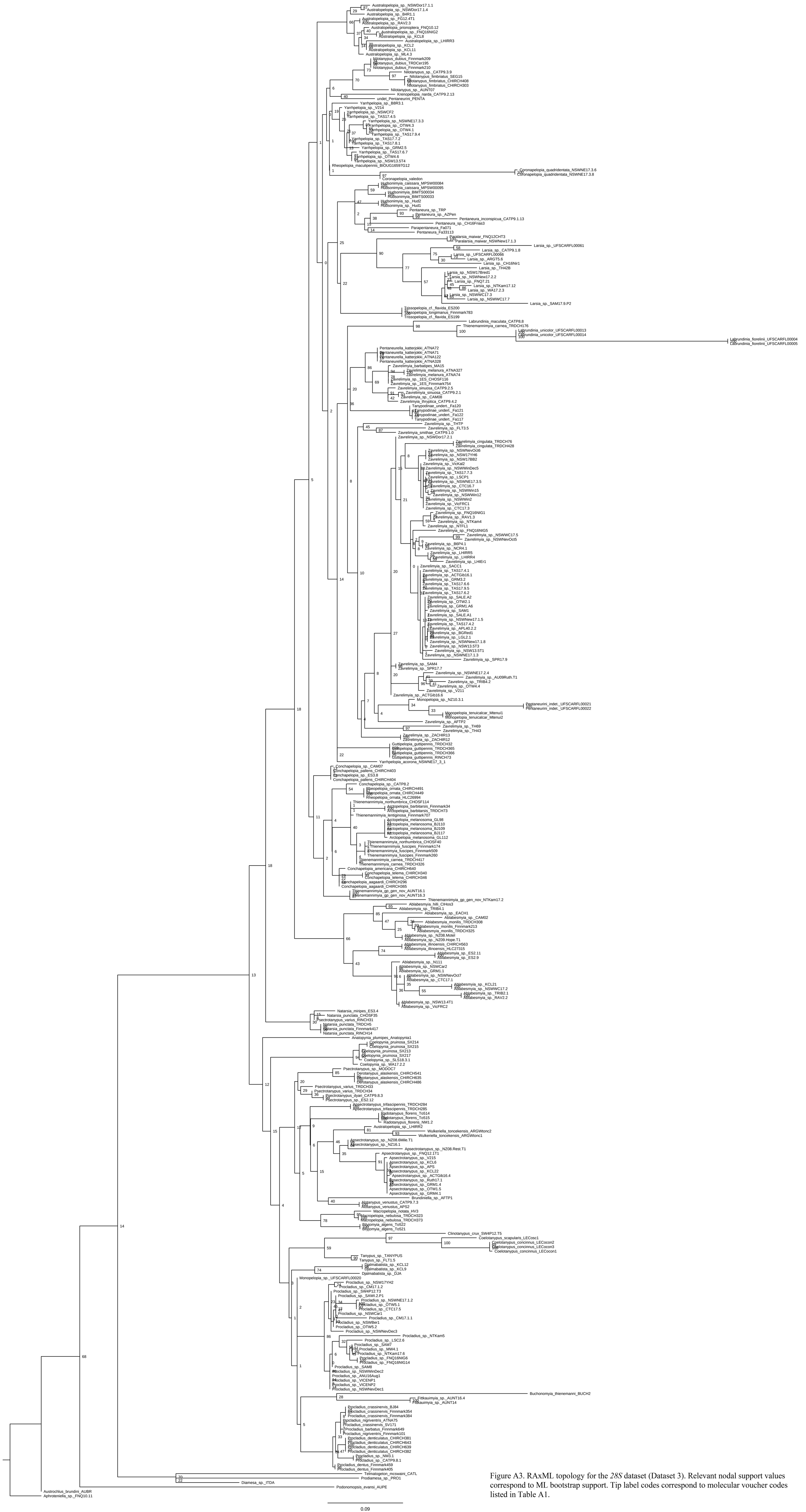


Figure A3. RAxML topology for the *28S* dataset (Dataset 3). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A4. RAxML topology for the *CAD1* dataset (Dataset 4). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

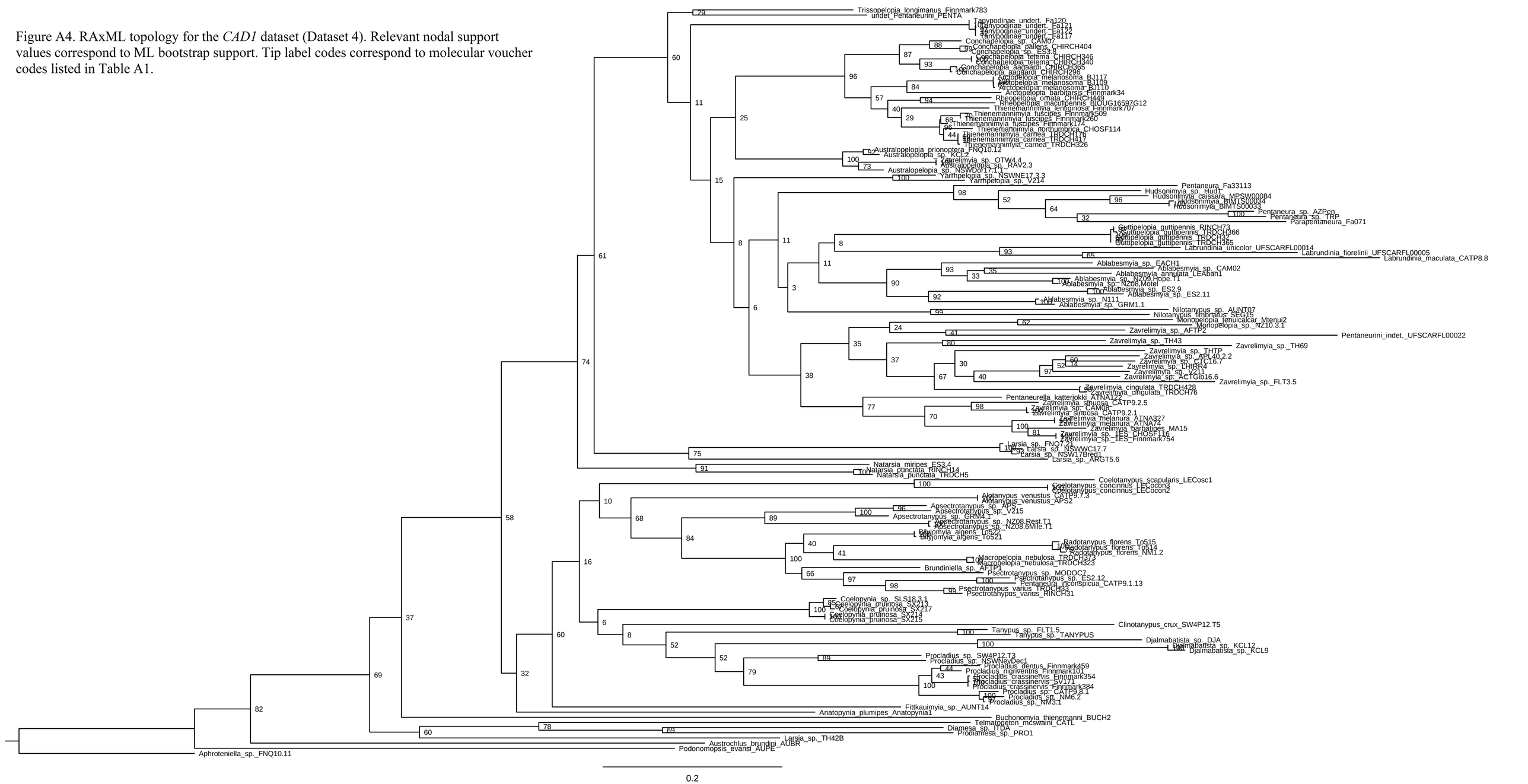
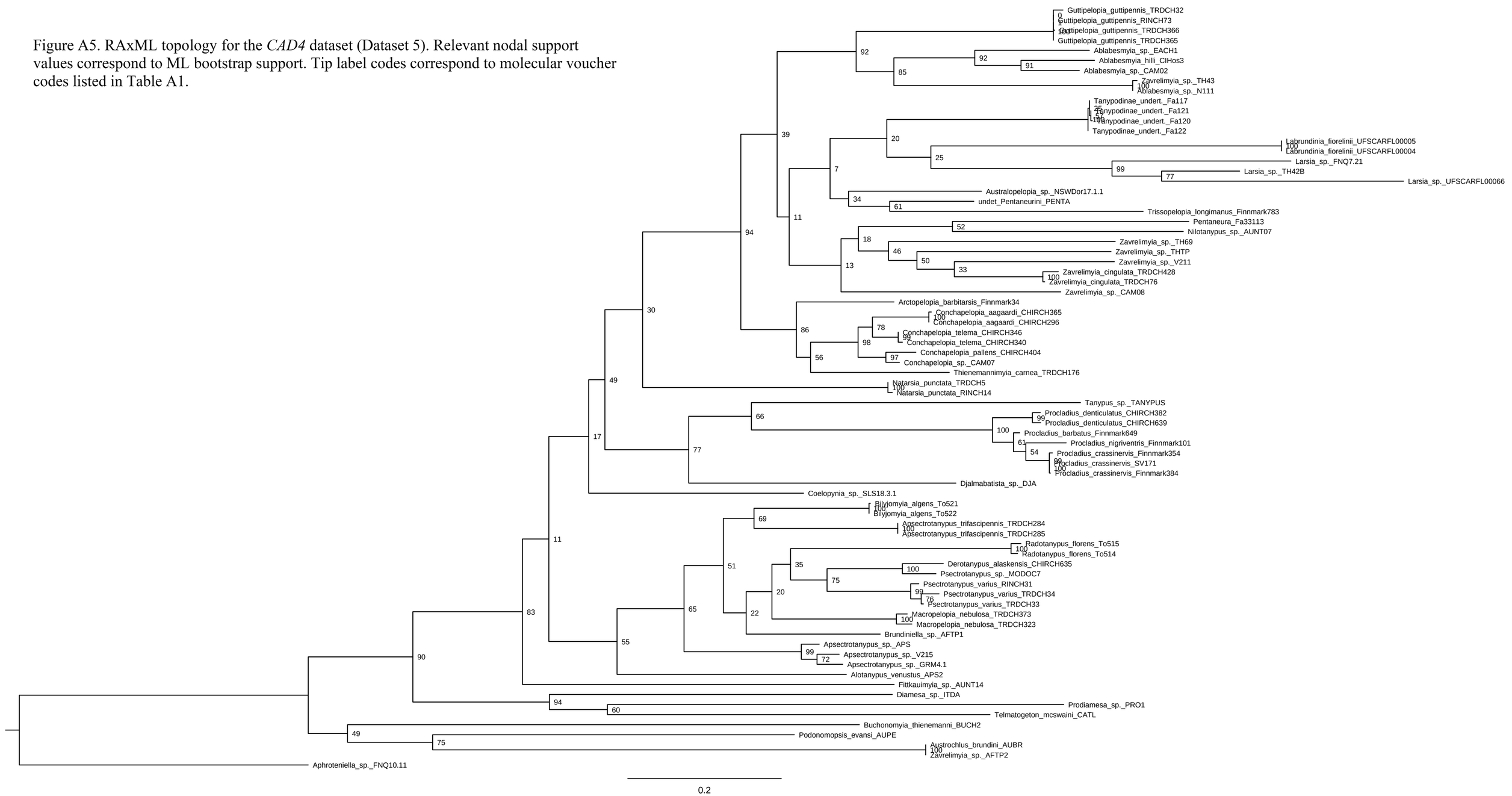
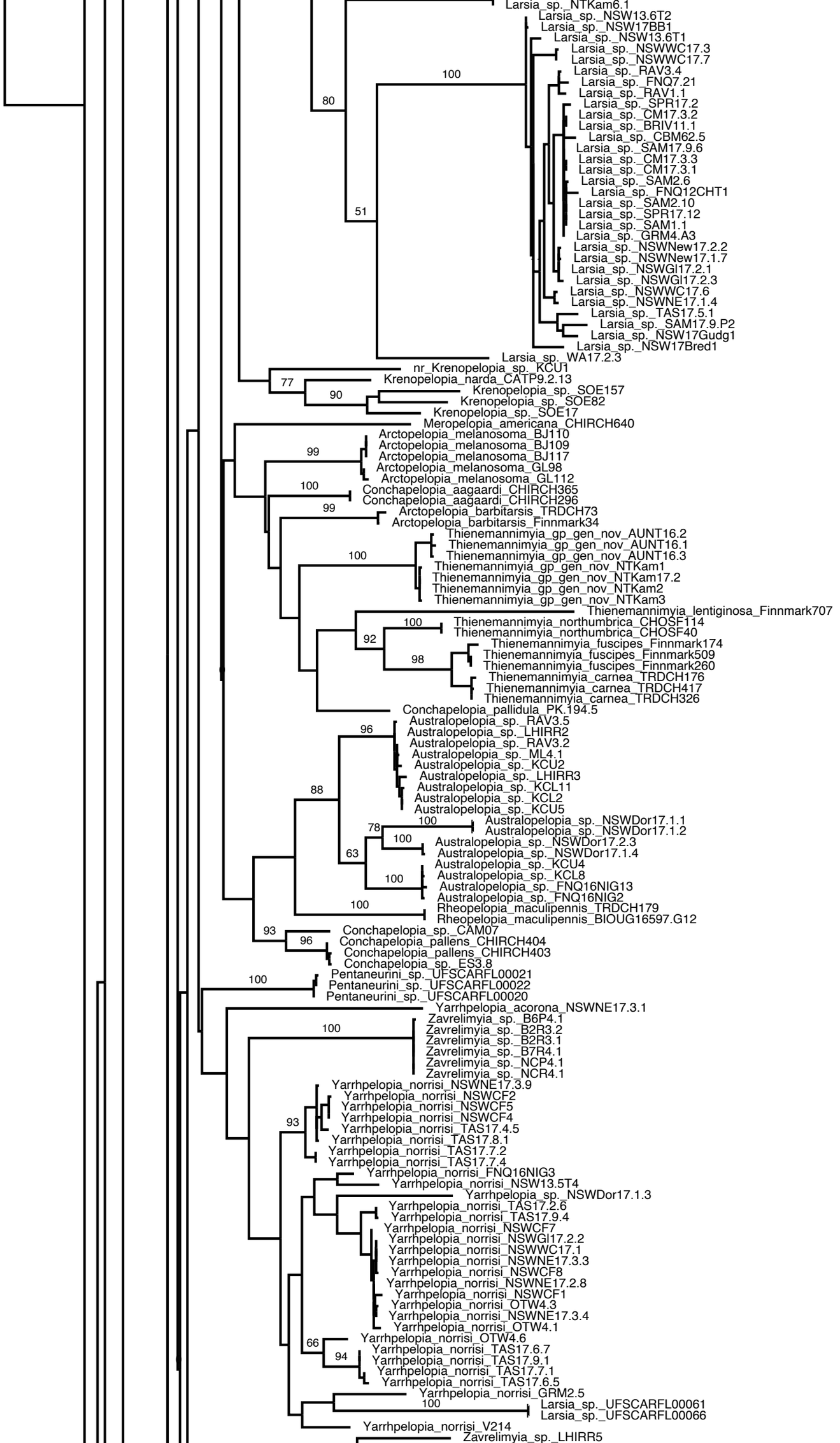


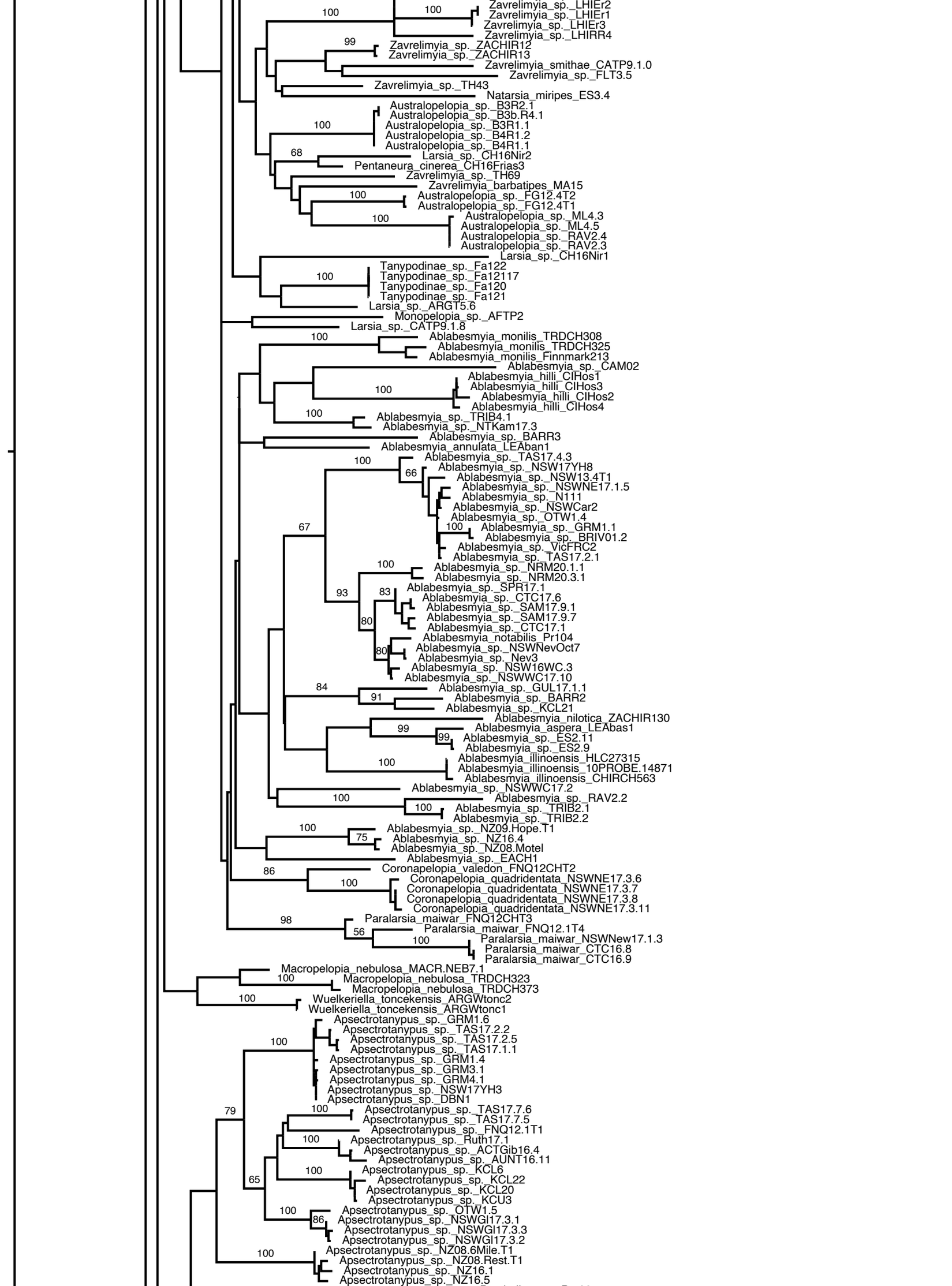
Figure A5. RAxML topology for the *CAD4* dataset (Dataset 5). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

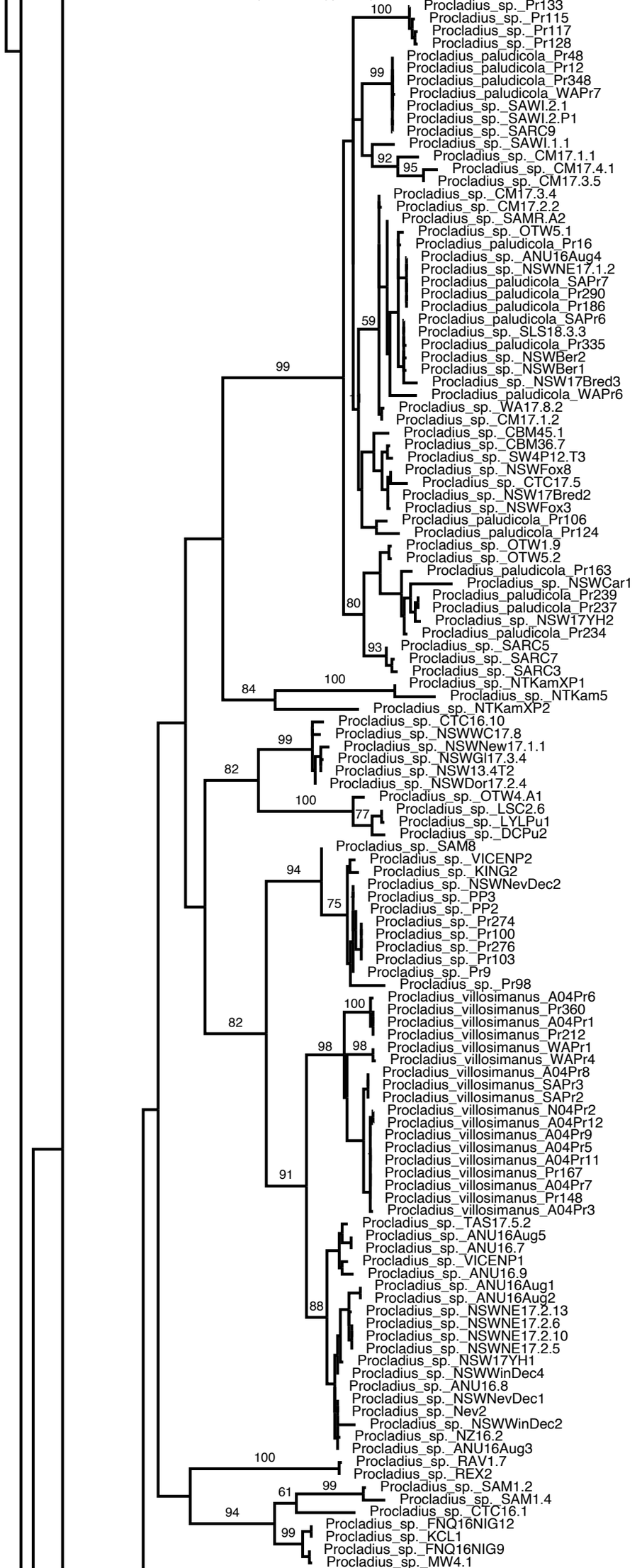



Bilyjomyia_algens_To521
Bilyjomyia_algens_To522
Macropelopia_notata_SOE63
Macropelopia_notata_HV3
Natarsia_punctata_CHOSF35
Natarsia_punctata_Finnmark417
Natarsia_punctata_TRDCH5
Natarsia_punctata_RINCH14
Natarsia_punctata_BIOUG03149.H06
Natarsia_punctata_BIOUG17482.E01
Natarsia_punctata_BIOUG05857.A04
Zavrelimyia_melanura_ATNA327
Zavrelimyia_melanura_ATNA74
Labrundinia_unicolor_UFSCARFL00014
Labrundinia_unicolor_UFSCARFL00013
Labrundinia_fiorelinii_UFSCARFL00004
Labrundinia_fiorelinii_UFSCARFL00005
Monopelopia_sp._NZ10.3.1
Monopelopia_tenuicalcar_NO95
Monopelopia_tenuicalcar_10JSROW.0704
Monopelopia_tenuicalcar_Mtenui1
Monopelopia_tenuicalcar_Mtenui2
Zavrelimyia_sp._1ES_Finnmark754
Zavrelimyia_sp._1ES_CHOSF116
Zavrelimyia_sp._SPR17.6
Zavrelimyia_sp._SPR17.9
Zavrelimyia_sp._SPR1.17
Zavrelimyia_sp._NSW13.5T1
Zavrelimyia_sp._GRM1.A6
Zavrelimyia_sp._LSC2.1
Zavrelimyia_sp._LSCP2
Zavrelimyia_sp._LSCP3
Zavrelimyia_sp._NSW13.5T3
Zavrelimyia_sp._NSWFox2
Zavrelimyia_sp._NSWFox6
Zavrelimyia_sp._GRM1.A5
Zavrelimyia_sp._NSWFox1
Zavrelimyia_sp._SAM3
Zavrelimyia_sp._NSWNew17.1.8
Zavrelimyia_sp._NSWNew17.1.6
Zavrelimyia_sp._NSWGI17.3.6
Zavrelimyia_sp._NSWNew17.1.5
Zavrelimyia_sp._GRM1.3
Zavrelimyia_sp._GRM1.A2
Zavrelimyia_sp._GRM1.A3
Zavrelimyia_sp._GRM1.A4
Zavrelimyia_sp._NSW16WC2
Zavrelimyia_sp._SAM1
Zavrelimyia_sp._NSW17WCFeb1
Zavrelimyia_sp._NSWNew17.1.2
Zavrelimyia_sp._SAM2
Zavrelimyia_sp._VicFRC3
Zavrelimyia_sp._NSW17YH7
Zavrelimyia_sp._LGL2.1
Zavrelimyia_sp._LGL2.A1
Zavrelimyia_sp._BGRed2
Zavrelimyia_sp._BGRed1
Zavrelimyia_sp._OTW2.1
Zavrelimyia_sp._OTW3.1
Zavrelimyia_sp._TAS17.4.4
Zavrelimyia_sp._TAS17.4.2
Zavrelimyia_sp._SALE.A1
Zavrelimyia_sp._SALE.A2
Zavrelimyia_sp._APL40.2.2
Zavrelimyia_sp._SALE4
Zavrelimyia_sp._APL40.2.1
Zavrelimyia_sp._SALE.P1
Zavrelimyia_sp._SALL2
Zavrelimyia_sp._SALE.P2
Zavrelimyia_sp._SALE1
Pentaneurella_katterjokki_ATNA122
Pentaneurella_katterjokki_ATNA328
Pentaneurella_katterjokki_ATNA71
Pentaneurella_katterjokki_ATNA72
Guttipelopia_guttipennis_TRDCH32
Guttipelopia_guttipennis_RINCH73
Guttipelopia_guttipennis_TRDCH366
Zavrelimyia_sp._CATP9.2.1
Zavrelimyia_sp._CAM08
Zavrelimyia_sp._CATP9.4.2
Zavrelimyia_sp._CATP9.2.5
Conchapelopia_telema_CHIRCH346
Conchapelopia_telema_CHIRCH340
Zavrelimyia_sp._NTFL2
Zavrelimyia_sp._NTFL1
Zavrelimyia_sp._RAV1.3
Zavrelimyia_sp._FNQ16NIG4
Zavrelimyia_sp._FNQ16NIG1
Larsia_atrocincta_TRDCH215
Zavrelimyia_sp._NTKam4
Zavrelimyia_sp._MW5.1
Zavrelimyia_sp._AU09Ruth.T1
Zavrelimyia_sp._V211
Zavrelimyia_sp._OTW4.4
Zavrelimyia_sp._NSWNE17.2.4
Zavrelimyia_sp._SAM2.11
Zavrelimyia_sp._SAM17.9.P1
Zavrelimyia_sp._NSW17YH6
Zavrelimyia_sp._NSW17BB2
Zavrelimyia_sp._NSWNevOct6
Zavrelimyia_sp._NSW17YH5
Zavrelimyia_sp._NSWNE17.1.1
Zavrelimyia_sp._NSW16WC4
Zavrelimyia_sp._NSWNE17.2.12
Zavrelimyia_sp._NSWNE17.3.5
Zavrelimyia_sp._NSWGI17.3.5
Zavrelimyia_sp._NSWWinDec3
Zavrelimyia_sp._NSWWinDec1
Zavrelimyia_sp._NSWWin16
Zavrelimyia_sp._NSWWin13
Zavrelimyia_sp._NSWWin11
Zavrelimyia_sp._NSWWin15
Zavrelimyia_sp._NSWNevII.1
Zavrelimyia_sp._NSWNevOct4
Zavrelimyia_sp._CTC16.6
Zavrelimyia_sp._NSWWin3
Zavrelimyia_sp._NSWWinDec5
Zavrelimyia_sp._LSCP1
Zavrelimyia_sp._NSWFox7
Zavrelimyia_sp._NSWWin12
Zavrelimyia_sp._NSWWin1
Zavrelimyia_sp._NSWWin6
Zavrelimyia_sp._NSWWin8
Zavrelimyia_sp._NSWWin14
Zavrelimyia_sp._NSWWinDec6
Zavrelimyia_sp._VicFRC1
Zavrelimyia_sp._VicFRC4
Zavrelimyia_sp._VicKal1
Zavrelimyia_sp._VicKal2


Zavrelimyia_sp._LSC2.4
Zavrelimyia_sp._CTC16.7
Zavrelimyia_sp._TAS17.9.2
Zavrelimyia_sp._TAS17.8.2
Zavrelimyia_sp._CTC16.3
Zavrelimyia_sp._CTC16.2
Zavrelimyia_sp._CTC17.8
Zavrelimyia_sp._CTC17.4
Zavrelimyia_sp._CTC17.2
Zavrelimyia_sp._CTC17.3
Zavrelimyia_sp._TAS17.7.3
Zavrelimyia_sp._NSWWin2
Zavrelimyia_cingulata_TRDCH428
Zavrelimyia_cingulata_TRDCH76
Zavrelimyia_sp._TAS17.3.4
Zavrelimyia_sp._TAS17.4.1
Zavrelimyia_sp._GRM1.2
Zavrelimyia_sp._NSWGl17.3.7
Zavrelimyia_sp._NSWNE17.1.3
Zavrelimyia_sp._TAS17.3.3
Zavrelimyia_sp._GRM4.A2
Zavrelimyia_sp._GRM2.3
Zavrelimyia_sp._OTW1.1
Zavrelimyia_sp._GRM3.2
Zavrelimyia_sp._NSWFox5
Zavrelimyia_sp._SACC3
Zavrelimyia_sp._SACC1
Zavrelimyia_sp._SACC6
Zavrelimyia_sp._TAS17.6.2
Zavrelimyia_sp._ACTGib16.3
Zavrelimyia_sp._TAS17.9.5
Zavrelimyia_sp._TAS17.3.2
Zavrelimyia_sp._TAS17.2.4
Zavrelimyia_sp._TAS17.3.1
Zavrelimyia_sp._ACTGib16.2
Zavrelimyia_sp._TAS17.3.5
Zavrelimyia_sp._TAS17.6.3
Zavrelimyia_sp._TAS17.6.6
Zavrelimyia_sp._ACTGib16.1
Zavrelimyia_sp._TAS17.1.2
Zavrelimyia_sp._NSWNevII.2
Zavrelimyia_sp._NSWNevOct5
Zavrelimyia_sp._Nev5
Zavrelimyia_sp._SAM17.9.4
Zavrelimyia_sp._NSWWC17.5
Zavrelimyia_sp._NSWWC17.9
Zavrelimyia_sp._NSWWC17.4
Zavrelimyia_sp._TRIB4.2
Zavrelimyia_sp._WA17.11.9
Zavrelimyia_sp._FNQ16NIG11
Zavrelimyia_sp._FNQ16NIG5
Zavrelimyia_sp._FNQ12.1T3
Pentaneurini_indet._PENTA
Pentaneura_inconspicua_CATP9.1.13
Pentaneura_sp._TRP
Pentaneura_sp._Fa33113
Hudsonimyia_caissara_MPSW00095
Hudsonimyia_caissara_MPSW00084
Parapentaneura_sp._Fa071
Trissopelopia_longimanus_Finnmark783
Trissopelopia_cf._flavida_ES200
Trissopelopia_cf._flavida_Finnmark888
Trissopelopia_cf._flavida_ES199
Trissopelopia_cf._flavida_SOE268
Ablabesmyia_sp._NSWBal1
Ablabesmyia_sp._GRM2.2
Ablabesmyia_sp._SARC6
Ablabesmyia_sp._WA17.11.6
Ablabesmyia_sp._SARC.A1
Ablabesmyia_sp._SARC1
Hudsonimyia_sp._BIMTS00034
Hudsonimyia_sp._BIMTS00033
Hudsonimyia_sp._Hud2
Hudsonimyia_sp._Hud1
Rheopelopia_ornata_08BBDIP.2724
Rheopelopia_ornata_CHIRCH449
Rheopelopia_ornata_CHIRCH491
Rheopelopia_ornata_HLC26994
Rheopelopia_sp._CATP8.2
Nilotanypus_fimbriatus_CHIRCH303
Nilotanypus_fimbriatus_BIOUG01725.B12
Nilotanypus_fimbriatus_SEG15
Nilotanypus_fimbriatus_CHIRCH408
Zavrelimyia_sp._ACTGib16.6
Zavrelimyia_sp._FNQ16NIG8
Zavrelimyia_sp._FNQ16NIG7
Zavrelimyia_sp._NSW16WC1
Zavrelimyia_sp._NSWNew17.1.4
Zavrelimyia_sp._NSW16WC5
Zavrelimyia_sp._NSWDor17.2.2
Zavrelimyia_sp._NSWDor17.2.1
Zavrelimyia_sp._SPR17.7
Zavrelimyia_sp._SPR17.3
Zavrelimyia_sp._SAM4
Zavrelimyia_sp._SPR1.6
Zavrelimyia_sp._SPR17.10
Zavrelimyia_sp._KCL19
Zavrelimyia_sp._KCL5
Zavrelimyia_sp._KCL17
Zavrelimyia_sp._KCL3
Zavrelimyia_sp._RAV1.8
Nilotanypus_cf._dubius_BIOUG07413.G10
Nilotanypus_dubius_TRDCer208
Nilotanypus_dubius_TRDCer195
Nilotanypus_dubius_Finnmark210
Nilotanypus_dubius_Finnmark209
Nilotanypus_sp._CATP9.3.9
Nilotanypus_sp._RAV2.8
Nilotanypus_sp._KCU6
Nilotanypus_sp._ML4.6
Nilotanypus_sp._RAV3.3
Nilotanypus_sp._RAV3.1
Nilotanypus_sp._RAV2.6
Nilotanypus_sp._RAV2.7
Nilotanypus_sp._RAV1.4
Nilotanypus_sp._FNQ16NIG15
Nilotanypus_sp._RAV1.5
Larsia_sp._NTKam17.12


Larsia_sp._NTKam6.1
Larsia_sp._NSW13.6T2
Larsia_sp._NSW17BB1
Larsia_sp._NSW13.6T1
Larsia_sp._NSWWC17.3
Larsia_sp._NSWWC17.7
Larsia_sp._RAV3.4
Larsia_sp._FNQ7.21
Larsia_sp._RAV1.1
Larsia_sp._SPR17.2
Larsia_sp._CM17.3.2
Larsia_sp._BRIV11.1
Larsia_sp._CBM62.5
Larsia_sp._SAM17.9.6
Larsia_sp._CM17.3.3
Larsia_sp._CM17.3.1
Larsia_sp._SAM2.6
Larsia_sp._FNQ12CHT1
Larsia_sp._SAM2.10
Larsia_sp._SPR17.12
Larsia_sp._SAM1.1
Larsia_sp._GRM4.A3
Larsia_sp._NSWNew17.2.2
Larsia_sp._NSWNew17.1.7
Larsia_sp._NSWGl17.2.1
Larsia_sp._NSWGl17.2.3
Larsia_sp._NSWWC17.6
Larsia_sp._NSWNE17.1.4
Larsia_sp._TAS17.5.1
Larsia_sp._SAM17.9.P2
Larsia_sp._NSW17Gudg1
Larsia_sp._NSW17Bred1
Larsia_sp._WA17.2.3
nr_Krenopelopia_sp._KCU1
Krenopelopia_narda_CATP9.2.13
Krenopelopia_sp._SOE157
Krenopelopia_sp._SOE82
Krenopelopia_sp._SOE17
Meropelopia_americana_CHIRCH640
Arctopelopia_melanosoma_BJ110
Arctopelopia_melanosoma_BJ109
Arctopelopia_melanosoma_BJ117
Arctopelopia_melanosoma_GL98
Arctopelopia_melanosoma_GL112
Conchapelopia_aagaardi_CHIRCH365
Conchapelopia_aagaardi_CHIRCH296
Arctopelopia_barbitarsis_TRDCH73
Arctopelopia_barbitarsis_Finnmark34
Thienemannimyia_gp_gen_nov_AUNT16.2
Thienemannimyia_gp_gen_nov_AUNT16.1
Thienemannimyia_gp_gen_nov_AUNT16.3
Thienemannimyia_gp_gen_nov_NTKam1
Thienemannimyia_gp_gen_nov_NTKam17.2
Thienemannimyia_gp_gen_nov_NTKam2
Thienemannimyia_gp_gen_nov_NTKam3
Thienemannimyia_lentiginosa_Finnmark707
Thienemannimyia_northumbrica_CHOSF114
Thienemannimyia_northumbrica_CHOSF40
Thienemannimyia_fuscipes_Finnmark174
Thienemannimyia_fuscipes_Finnmark509
Thienemannimyia_fuscipes_Finnmark260
Thienemannimyia_carnea_TRDCH176
Thienemannimyia_carnea_TRDCH417
Thienemannimyia_carnea_TRDCH326
Conchapelopia_pallidula_PK.194.5
Australopelopia_sp._RAV3.5
Australopelopia_sp._LHIRR2
Australopelopia_sp._RAV3.2
Australopelopia_sp._ML4.1
Australopelopia_sp._KCU2
Australopelopia_sp._LHIRR3
Australopelopia_sp._KCL11
Australopelopia_sp._KCL2
Australopelopia_sp._KCU5
Australopelopia_sp._NSWDor17.1.1
Australopelopia_sp._NSWDor17.1.2
Australopelopia_sp._NSWDor17.2.3
Australopelopia_sp._NSWDor17.1.4
Australopelopia_sp._KCU4
Australopelopia_sp._KCL8
Australopelopia_sp._FNQ16NIG13
Australopelopia_sp._FNQ16NIG2
Rheopelopia_maculipennis_TRDCH179
Rheopelopia_maculipennis_BIOUG16597.G12
Conchapelopia_sp._CAM07
Conchapelopia_pallens_CHIRCH404
Conchapelopia_pallens_CHIRCH403
Conchapelopia_sp._ES3.8
Pentaneurini_sp._UFSCARFL00021
Pentaneurini_sp._UFSCARFL00022
Pentaneurini_sp._UFSCARFL00020
Yarrhpelopia_acorona_NSWNE17.3.1
Zavrelimyia_sp._B6P4.1
Zavrelimyia_sp._B2R3.2
Zavrelimyia_sp._B2R3.1
Zavrelimyia_sp._B7R4.1
Zavrelimyia_sp._NCP4.1
Zavrelimyia_sp._NCR4.1
Yarrhpelopia_norrisi_NSWNE17.3.9
Yarrhpelopia_norrisi_NSWCF2
Yarrhpelopia_norrisi_NSWCF5
Yarrhpelopia_norrisi_NSWCF4
Yarrhpelopia_norrisi_TAS17.4.5
Yarrhpelopia_norrisi_TAS17.8.1
Yarrhpelopia_norrisi_TAS17.7.2
Yarrhpelopia_norrisi_TAS17.7.4
Yarrhpelopia_norrisi_FNQ16NIG3
Yarrhpelopia_norrisi_NSW13.5T4
Yarrhpelopia_sp._NSWDor17.1.3
Yarrhpelopia_norrisi_TAS17.2.6
Yarrhpelopia_norrisi_TAS17.9.4
Yarrhpelopia_norrisi_NSWCF7
Yarrhpelopia_norrisi_NSWGl17.2.2
Yarrhpelopia_norrisi_NSWWC17.1
Yarrhpelopia_norrisi_NSWNE17.3.3
Yarrhpelopia_norrisi_NSWCF8
Yarrhpelopia_norrisi_NSWNE17.2.8
Yarrhpelopia_norrisi_NSWCF1
Yarrhpelopia_norrisi_OTW4.3
Yarrhpelopia_norrisi_NSWNE17.3.4
Yarrhpelopia_norrisi_OTW4.1
Yarrhpelopia_norrisi_OTW4.6
Yarrhpelopia_norrisi_TAS17.6.7
Yarrhpelopia_norrisi_TAS17.9.1
Yarrhpelopia_norrisi_TAS17.7.1
Yarrhpelopia_norrisi_TAS17.6.5
Yarrhpelopia_norrisi_GRM2.5
Larsia_sp._UFSCARFL00061
Larsia_sp._UFSCARFL00066
Yarrhpelopia_norrisi_V214
Zavrelimyia_sp._LHIRR5
100
80
51
77
90
99
100
99
100
92
100
98
96
88
78
100
63
100
100
100
93
96
100
100
93
66
94
100


Zavrelimyia_sp._LHIEr2
Zavrelimyia_sp._LHIEr1
Zavrelimyia_sp._LHIEr3
Zavrelimyia_sp._LHIRR4
Zavrelimyia_sp._ZACHIR12
Zavrelimyia_sp._ZACHIR13
Zavrelimyia_smithae_CATP9.1.0
Zavrelimyia_sp._FLT3.5
Zavrelimyia_sp._TH43
Natarsia_miripes_ES3.4
Australopelopia_sp._B3R2.1
Australopelopia_sp._B3b.R4.1
Australopelopia_sp._B3R1.1
Australopelopia_sp._B4R1.2
Australopelopia_sp._B4R1.1
Larsia_sp._CH16Nir2
Pentaneura_cinerea_CH16Frias3
Zavrelimyia_sp._TH69
Zavrelimyia_barbatipes_MA15
Australopelopia_sp._FG12.4T2
Australopelopia_sp._FG12.4T1
Australopelopia_sp._ML4.3
Australopelopia_sp._ML4.5
Australopelopia_sp._RAV2.4
Australopelopia_sp._RAV2.3
Larsia_sp._CH16Nir1
Tanypodinae_sp._Fa122
Tanypodinae_sp._Fa12117
Tanypodinae_sp._Fa120
Tanypodinae_sp._Fa121
Larsia_sp._ARGT5.6
Monopelopia_sp._AFTP2
Larsia_sp._CATP9.1.8
Ablabesmyia_monilis_TRDCH308
Ablabesmyia_monilis_TRDCH325
Ablabesmyia_monilis_Finnmark213
Ablabesmyia_sp._CAM02
Ablabesmyia_hilli_CIHos1
Ablabesmyia_hilli_CIHos3
Ablabesmyia_hilli_CIHos2
Ablabesmyia_hilli_CIHos4
Ablabesmyia_sp._TRIB4.1
Ablabesmyia_sp._NTKam17.3
Ablabesmyia_sp._BARR3
Ablabesmyia_annulata_LEAban1
Ablabesmyia_sp._TAS17.4.3
Ablabesmyia_sp._NSW17YH8
Ablabesmyia_sp._NSW13.4T1
Ablabesmyia_sp._NSWNE17.1.5
Ablabesmyia_sp._N111
Ablabesmyia_sp._NSWCar2
Ablabesmyia_sp._OTW1.4
Ablabesmyia_sp._GRM1.1
Ablabesmyia_sp._BRIV01.2
Ablabesmyia_sp._VicFRC2
Ablabesmyia_sp._TAS17.2.1
Ablabesmyia_sp._NRM20.1.1
Ablabesmyia_sp._NRM20.3.1
Ablabesmyia_sp._SPR17.1
Ablabesmyia_sp._CTC17.6
Ablabesmyia_sp._SAM17.9.1
Ablabesmyia_sp._SAM17.9.7
Ablabesmyia_sp._CTC17.1
Ablabesmyia_notabilis_Pr104
Ablabesmyia_sp._NSWNevOct7
Ablabesmyia_sp._Nev3
Ablabesmyia_sp._NSW16WC.3
Ablabesmyia_sp._NSWWC17.10
Ablabesmyia_sp._GUL17.1.1
Ablabesmyia_sp._BARR2
Ablabesmyia_sp._KCL21
Ablabesmyia_nilotica_ZACHIR130
Ablabesmyia_aspera_LEAbas1
Ablabesmyia_sp._ES2.11
Ablabesmyia_sp._ES2.9
Ablabesmyia_illinoensis_HLC27315
Ablabesmyia_illinoensis_10PROBE.14871
Ablabesmyia_illinoensis_CHIRCH563
Ablabesmyia_sp._NSWWC17.2
Ablabesmyia_sp._RAV2.2
Ablabesmyia_sp._TRIB2.1
Ablabesmyia_sp._TRIB2.2
Ablabesmyia_sp._NZ09.Hope.T1
Ablabesmyia_sp._NZ16.4
Ablabesmyia_sp._NZ08.Motel
Ablabesmyia_sp._EACH1
Coronapelopia_valedon_FNQ12CHT2
Coronapelopia_quadridentata_NSWNE17.3.6
Coronapelopia_quadridentata_NSWNE17.3.7
Coronapelopia_quadridentata_NSWNE17.3.8
Coronapelopia_quadridentata_NSWNE17.3.11
Paralarsia_maiwar_FNQ12CHT3
Paralarsia_maiwar_FNQ12.1T4
Paralarsia_maiwar_NSWNew17.1.3
Paralarsia_maiwar_CTC16.8
Paralarsia_maiwar_CTC16.9
Macropelopia_nebulosa_MACR.NEB7.1
Macropelopia_nebulosa_TRDCH323
Macropelopia_nebulosa_TRDCH373
Wuelkeriella_toncekensis_ARGWtonc2
Wuelkeriella_toncekensis_ARGWtonc1
Apsectrotanypus_sp._GRM1.6
Apsectrotanypus_sp._TAS17.2.2
Apsectrotanypus_sp._TAS17.2.5
Apsectrotanypus_sp._TAS17.1.1
Apsectrotanypus_sp._GRM1.4
Apsectrotanypus_sp._GRM3.1
Apsectrotanypus_sp._GRM4.1
Apsectrotanypus_sp._NSW17YH3
Apsectrotanypus_sp._DBN1
Apsectrotanypus_sp._TAS17.7.6
Apsectrotanypus_sp._TAS17.7.5
Apsectrotanypus_sp._FNQ12.1T1
Apsectrotanypus_sp._Ruth17.1
Apsectrotanypus_sp._ACTGib16.4
Apsectrotanypus_sp._AUNT16.11
Apsectrotanypus_sp._KCL6
Apsectrotanypus_sp._KCL22
Apsectrotanypus_sp._KCL20
Apsectrotanypus_sp._KCU3
Apsectrotanypus_sp._OTW1.5
Apsectrotanypus_sp._NSWGI17.3.1
Apsectrotanypus_sp._NSWGI17.3.3
Apsectrotanypus_sp._NSWGI17.3.2
Apsectrotanypus_sp._NZ08.6Mile.T1
Apsectrotanypus_sp._NZ08.Rest.T1
Apsectrotanypus_sp._NZ16.1
Apsectrotanypus_sp._NZ16.5


Procladius_sp._Pr133
Procladius_sp._Pr115
Procladius_sp._Pr117
Procladius_sp._Pr128
Procladius_paludicola_Pr48
Procladius_paludicola_Pr12
Procladius_paludicola_Pr348
Procladius_paludicola_WAPr7
Procladius_sp._SAWI.2.1
Procladius_sp._SAWI.2.P1
Procladius_sp._SARC9
Procladius_sp._SAWI.1.1
Procladius_sp._CM17.1.1
Procladius_sp._CM17.4.1
Procladius_sp._CM17.3.5
Procladius_sp._CM17.3.4
Procladius_sp._CM17.2.2
Procladius_sp._SAMR.A2
Procladius_sp._OTW5.1
Procladius_paludicola_Pr16
Procladius_sp._ANU16Aug4
Procladius_sp._NSWNE17.1.2
Procladius_paludicola_SAPr7
Procladius_paludicola_Pr290
Procladius_paludicola_Pr186
Procladius_paludicola_SAPr6
Procladius_sp._SLS18.3.3
Procladius_paludicola_Pr335
Procladius_sp._NSWBer2
Procladius_sp._NSWBer1
Procladius_sp._NSW17Bred3
Procladius_paludicola_WAPr6
Procladius_sp._WA17.8.2
Procladius_sp._CM17.1.2
Procladius_sp._CBM45.1
Procladius_sp._CBM36.7
Procladius_sp._SW4P12.T3
Procladius_sp._NSWFox8
Procladius_sp._CTC17.5
Procladius_sp._NSW17Bred2
Procladius_sp._NSWFox3
Procladius_paludicola_Pr106
Procladius_paludicola_Pr124
Procladius_sp._OTW1.9
Procladius_sp._OTW5.2
Procladius_paludicola_Pr163
Procladius_sp._NSWCar1
Procladius_paludicola_Pr239
Procladius_paludicola_Pr237
Procladius_sp._NSW17YH2
Procladius_paludicola_Pr234
Procladius_sp._SARC5
Procladius_sp._SARC7
Procladius_sp._SARC3
Procladius_sp._NTKamXP1
Procladius_sp._NTKam5
Procladius_sp._NTKamXP2
Procladius_sp._CTC16.10
Procladius_sp._NSWWC17.8
Procladius_sp._NSWNew17.1.1
Procladius_sp._NSWGI17.3.4
Procladius_sp._NSW13.4T2
Procladius_sp._NSWDor17.2.4
Procladius_sp._OTW4.A1
Procladius_sp._LSC2.6
Procladius_sp._LYLPu1
Procladius_sp._DCPu2
Procladius_sp._SAM8
Procladius_sp._VICENP2
Procladius_sp._KING2
Procladius_sp._NSWNevDec2
Procladius_sp._PP3
Procladius_sp._PP2
Procladius_sp._Pr274
Procladius_sp._Pr100
Procladius_sp._Pr276
Procladius_sp._Pr103
Procladius_sp._Pr9
Procladius_sp._Pr98
Procladius_villosimanus_A04Pr6
Procladius_villosimanus_Pr360
Procladius_villosimanus_A04Pr1
Procladius_villosimanus_Pr212
Procladius_villosimanus_WAPr1
Procladius_villosimanus_WAPr4
Procladius_villosimanus_A04Pr8
Procladius_villosimanus_SAPr3
Procladius_villosimanus_SAPr2
Procladius_villosimanus_N04Pr2
Procladius_villosimanus_A04Pr12
Procladius_villosimanus_A04Pr9
Procladius_villosimanus_A04Pr5
Procladius_villosimanus_A04Pr11
Procladius_villosimanus_Pr167
Procladius_villosimanus_A04Pr7
Procladius_villosimanus_Pr148
Procladius_villosimanus_A04Pr3
Procladius_sp._TAS17.5.2
Procladius_sp._ANU16Aug5
Procladius_sp._ANU16.7
Procladius_sp._VICENP1
Procladius_sp._ANU16.9
Procladius_sp._ANU16Aug1
Procladius_sp._ANU16Aug2
Procladius_sp._NSWNE17.2.13
Procladius_sp._NSWNE17.2.6
Procladius_sp._NSWNE17.2.10
Procladius_sp._NSWNE17.2.5
Procladius_sp._NSW17YH1
Procladius_sp._NSWWinDec4
Procladius_sp._ANU16.8
Procladius_sp._NSWNevDec1
Procladius_sp._Nev2
Procladius_sp._NSWWinDec2
Procladius_sp._NZ16.2
Procladius_sp._ANU16Aug3
Procladius_sp._RAV1.7
Procladius_sp._REX2
Procladius_sp._SAM1.2
Procladius_sp._SAM1.4
Procladius_sp._CTC16.1
Procladius_sp._FNQ16NIG12
Procladius_sp._KCL1
Procladius_sp._FNQ16NIG9
Procladius_sp._MW4.1

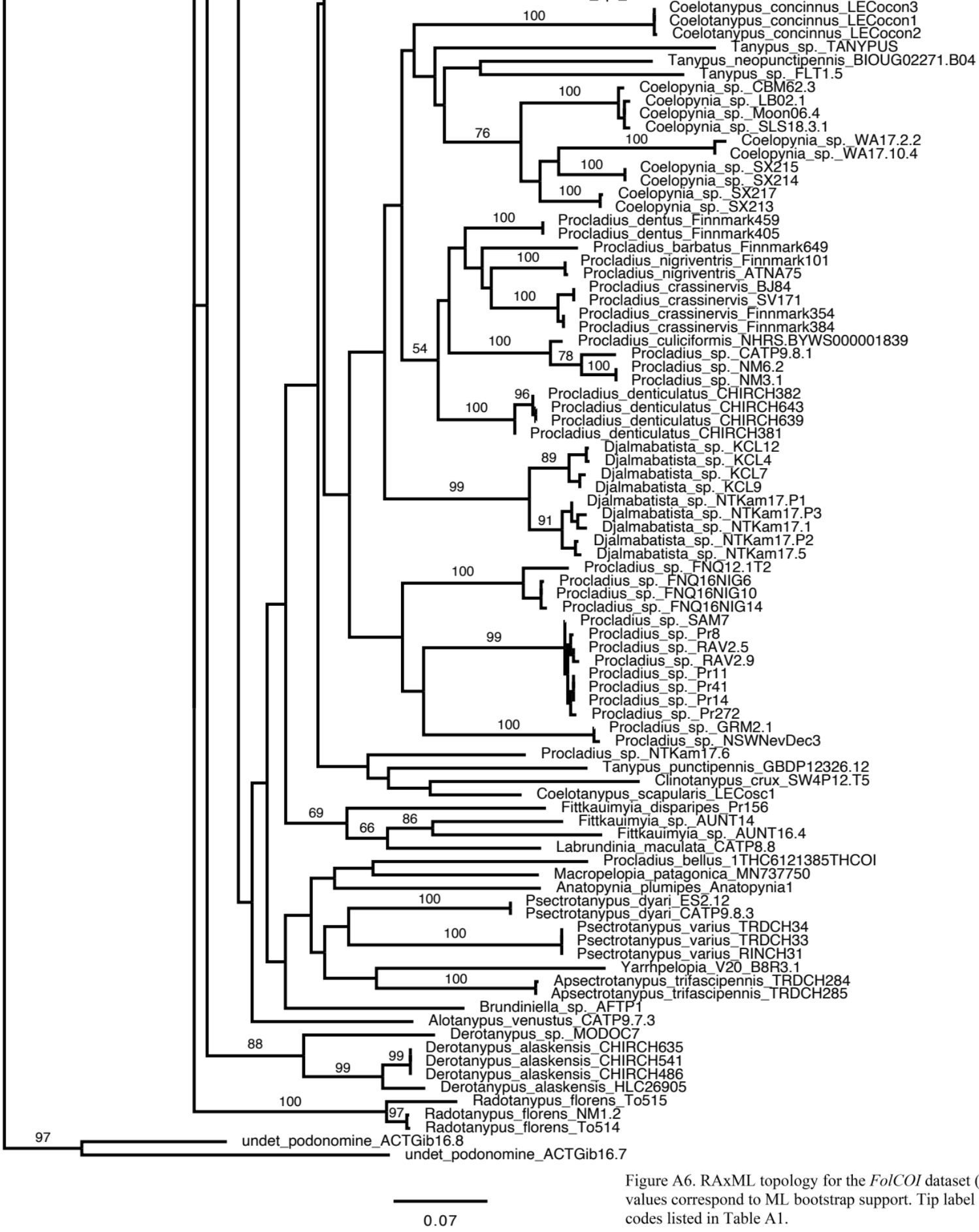
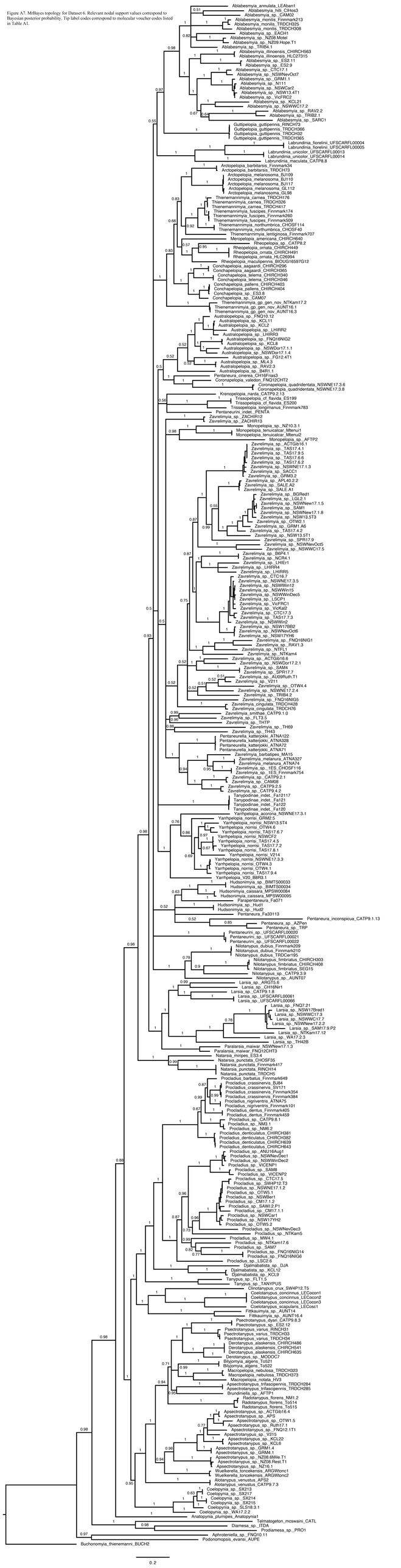


Figure A6. RAxML topology for the *FolCOI* dataset (Dataset 7). Relevant nodal support values correspond to ML bootstrap support. Tip label codes correspond to molecular voucher codes listed in Table A1.

Figure A7. MrBayes topology for Dataset 6. Relevant nodal support values correspond to Bayesian posterior probability. Tip label codes correspond to molecular voucher codes listed in Table A1.



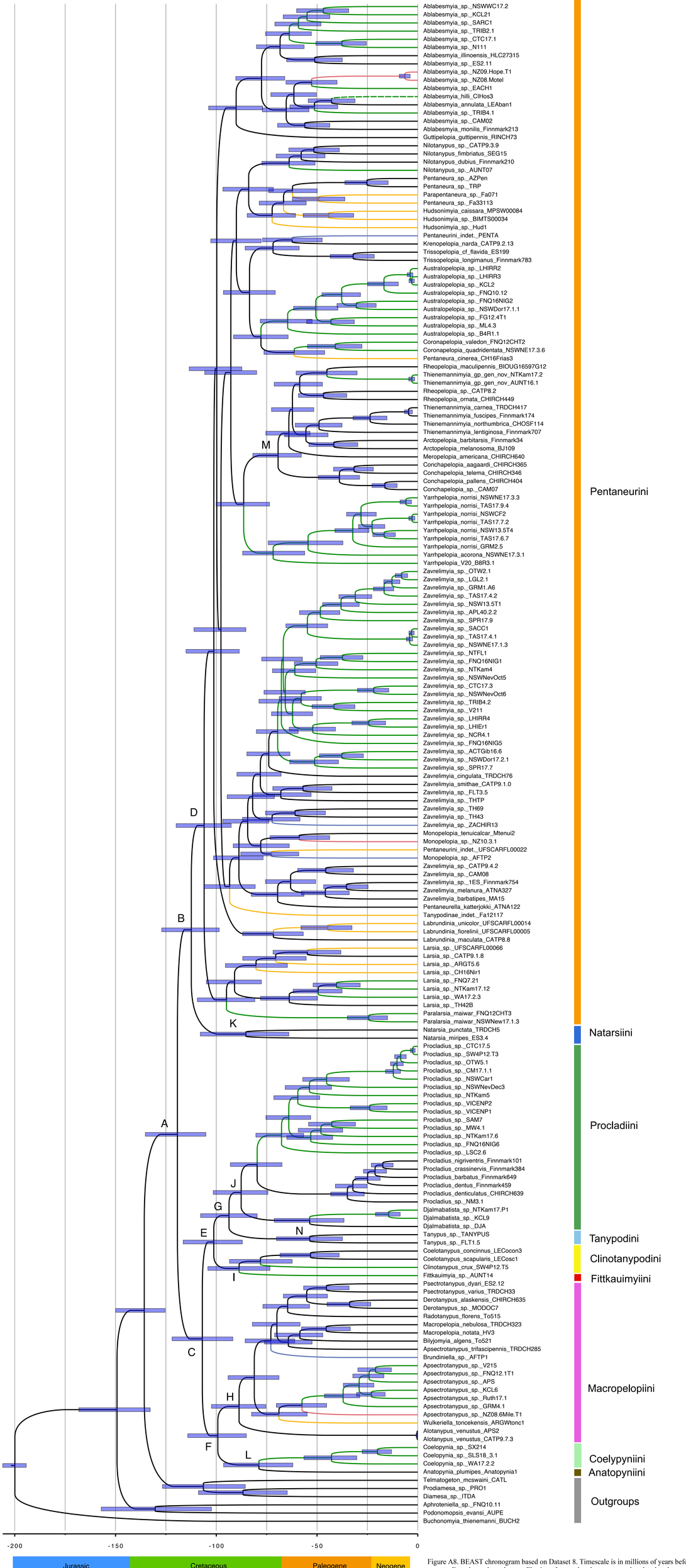


Figure A8. BEAST chronogram based on Dataset 8. Timescale is in millions of years before present. Branches coloured as per Fig. 1a-c. Lettered nodes correspond to dated nodes reported in Table 1.