



New species of Phyllodocidae (Annelida) from south-eastern Australia

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Abstract

Four new species of the marine annelid family Phyllodocidae are described from shallow waters in south-eastern Australia: *Eulalia farosh* sp. nov., *Eulalia dinraal* sp. nov. *Eumida frampt* sp. nov. and *Phyllodoce naydra* sp. nov. Each of the new species is characterised genetically and morphologically. *Eulalia australiensis* (Hartmann-Schröder, 1989) is now considered *species inquirenda*. *Eumida fuscocolata* Eibye-Jacobsen, 1991 is shown to comprise at least two morphologically distinct forms and appears to comprise at least one additional species which remains undescribed. We provide descriptions of *Eulalia australiensis* Hartmann-Schröder, 1987 new status, *Eulalia australiensis* (Hartmann-Schröder, 1989) *species inquirenda* new status, and of two forms currently confused under *Eumida fuscocolata* Eibye-Jacobsen, 1991: *Eumida* cf. *fuscocolata* “macropapillae pharynx” and *Eumida* cf. *fuscocolata* “smooth pharynx”. The Australian fauna of benthic Phyllodocidae now comprises 29 described species and a key to all Australian species of Phyllodocidae, and three unnamed forms, is included.

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Introduction

The Phyllodocidae is a family of marine annelids comprising 33 genera, 22 of which are benthic while 11 belong to the holopelagic tribe Alciopini (Read and Fauchald 2026). Members of the family typically have flattened, leaf-like dorsal cirri and an eversible, muscular pharynx; most are predators or scavengers (Jumars et al. 2015). Species of Phyllodocidae are found in all

marine environments world-wide, from the intertidal to depths of at least 10,000 m (Glover et al. 2025).

Molecular studies have shown that despite apparent morphological uniformity, many long-established phyllodocid species comprise numerous genetically distinct lineages with those that are also diagnosable on morphometric or pigmentation data subsequently described as distinct species (Nygren et al. 2011, Nygren and Pleijel 2010, Teixeira et al. 2022, Teixeira et al. 2023).

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Deciding which members of a species complex should take the names of previously described species will often be challenging since in the vast majority of cases molecular data cannot be obtained from type or other original specimens. The studies of *Eumida* and *Eulalia* species by Teixeira et al. (2022) and Teixeira et al. (2023) provide a potential solution: those studies characterised new members of species complexes genetically, but also quantified intra-specific morphological variation using a suite of morphological characters and ratios. Our approach, as set out in the Methods below, has been to take the levels of intraspecific morphological variability observed by Teixeira et al. (2022) and Teixeira et al. (2023) as the best available estimates of intraspecific variability for Phyllodocidae more generally, and to apply the same methods in a study of Australian Phyllodocidae.

In Australia, Hutchings & Yerman (2023) recognise 16 genera and 43 species. However the only Australian molecular study is a characterisation of an unnamed taxon, *Eumida* cf. *longicirrata* Hartmann-Schröder, 1975, known from four specimens at bathyal depths of south-eastern Australia by Georgieva et al. (2023). Here, we explore the diversity of Australian phyllodocids from the intertidal of south-eastern Australia using molecular methods, and then evaluate genetic lineages against previously described taxa by adopting the quantitative measures developed by Teixeira et al. (2022), Teixeira et al. (2023) as an indicative baseline for intraspecific morphological variation.

Methods

Sample sites and collecting methods

For this study, we examined 44 specimens from nine locations. These were obtained through donations made by members of the Marine Research Group of FNCV to the Museums Victoria Marine Invertebrate Department and through several collecting trips done in collaboration with members of the Marine Research Group of FNCV around Port Phillip Bay during September 2021, April 2022, and between January and April 2024. For localities see Figure 1 and material examined lists for each species. In the field, specimens were hand collected from intertidal habitats using a sieve to sift sandy substrate or extracted from algae, *Galeolaria* spp., *Pyura* spp., Oysters and other invertebrate substrate scraped into buckets and reviewed in laboratory.

Morphological methods

Live phyllodocids photographed using Sony A7R3 camera (either Sony 90mm f2.8 macros lens or Canon MPE65 f2.8 macro lens) combined with three Godox TT6000 flash units and measured using Leica® M125 stereomicroscope, Flexcam C3 and LAS X software (Leica Microsystems). The same Leica® system was used to photograph and measure preserved specimens

and mounted parapodia. Chaetae of median segments imaged using Hitachi TM4000Plus II desktop SEM. Tissue samples were taken from median segments of live specimens relaxed in MgCl₂ solution and older donated specimens preserved in 95% ethanol. Live specimens were then fixed initially in formalin and transferred into 70% ethanol for long-term storage.

All specimens were deposited in the collections of Museums Victoria, Melbourne Australia and have the registration prefix NMV in material examined lists in the Systematics section below; these data are also available at Museums Victoria collections online: <https://collections.museumsvictoria.com.au/>. Institution prefixes for other institutions from which we have examined specimens are Museum of Nature, Hamburg (then Hamburg Zoological Museum - HZM) and Natural History Museum, London - NHMUK.

We adopted the abbreviations used by Teixeira et al. (2023 Fig. 2) for morphometric quantities of *Eulalia* spp: CLL, length of chaetigerous lobes; CLH, height of chaetigerous lobes; AL, length of antennae; PL, length of palps; MAL, length of median antenna; DTL, length of dorsal tentacular cirri on segment 2; VTL, length of ventral tentacular cirri on segment 2; DCL, length of dorsal cirri; VCL, length of ventral cirri; HL, length of head; WWP, width of worm with parapodia; WW, width of worm without parapodia; HW, width of head; DCW, width of dorsal cirri; VCW, width of ventral cirri; DE, distance between the eyes. These are also the abbreviations used previously by Teixeira et al. (2022 Fig. 1) for morphometric quantities of *Eumida* spp except that in the earlier study CS1L was used for cirri on segment 1 and DCS2L for dorsal cirri on segment 2 (this abbreviation was replaced by DTL for the same quantity in the subsequent study). We recorded these quantities for all our material excepting *Phyllodoce* specimens which have no median antenna and for which MAL ratios were thus inapplicable. Teixeira et al. (2022) and Teixeira et al. (2023) found species complexes to be morphologically conservative but identified a subset of morphometric quantities which were partially able to separate lineages; we adopted the same quantities and add three not used by Teixeira et al. (2022) and Teixeira et al. (2023) to make use of values widely recorded elsewhere in the literature. These quantities are expressed as ratios with abbreviations summarised in Table 1.

Morphometric data were summarised for each lineage and were recorded in the Delta (Descriptive Language for Taxonomy) suite of programs (Dallwitz & Paine 2015, Atlas of Living Australia 2026, Wilson et al. 2023) to facilitate comparisons between taxa and generation of natural language descriptions. For specimens we collected, morphometric data were taken from photographs of live specimens, and again for the same specimen after fixation, in order to investigate preservation effects. Comparative data using the same quantities for previously described species were obtained from existing

Table 1. Morphometric data and abbreviations.

Ratio or quantity	Teixeira et al. notation (* = not used by Teixeira et al.)
ventral tentacular cirrus segment 1: paired antenna length	CSIL/AL
dorsal tentacular cirrus segment 2: paired antenna length	CCS2L/AL
prostomium width: paired antenna length	HW/AL
prostomium length: paired antenna length	HL/AL
palp: paired antenna length	PL/AL
median antenna: paired antenna length	MAL/AL
median antenna: prostomium length	MAL/HL*
segment number: body width	NS/WW
segment number: body length	NS/WL
body width-parapodia: body width	WWP/WW
prostomium width: eye separation	HW/DE
dorsal cirri length: dorsal cirri width	DCL/DCW*
ventral cirri length: ventral cirri width	VCL/VCW*
ventral cirrus: dorsal cirrus length	VCL/DCL
parapodium: ventral cirrus length	CLL/VCL

museum specimens and published descriptions and are presented below in the Supplementary Data. We were unable to measure median antenna length or parapodial structures accurately on live specimens or on photographs of live specimens so ratios of these quantities are provided on for preserved (not live) specimens. Synonymies of previously published taxa are not included; these are available at Read & Fauchald (2026).

Molecular methods

Tissue samples were taken from median segments of live specimens relaxed in MgCl₂ solution and older donated specimens preserved in 95% ethanol. DNA was extracted using Omega Bio-tek E.Z.N.A Tissue DNA kit (Omega Bio-tek, Norcross, Georgia, USA). For all available specimens, three markers were amplified and sequenced for this study: the mitochondrial cytochrome c oxidase subunit I (COI), mitochondrial 16S rRNA, and the nuclear 28S rRNA. We performed polymerase chain reactions (PCR) in 20 µl reactions using 1 µl of each forward and reverse primer, 6 µl of H₂O, 10 µl of GoTaq Hot Start Master Mix (Promega, Madison, Wisconsin, USA), and 2 µl genomic DNA. Table 2 displays primers used and PCR conditions. Forward and reversed sequencing was conducted by Macrogen Inc. (Seoul, South Korea), and sequences then edited in Geneious Prime 2023.1.2 (Biomatters, Auckland, New Zealand, available at <http://www.geneious.com/>). Genbank numbers and

accession details for specimens included in this study are provided in Table 3.

Phylogenetic analyses

To determine whether the samples collected in this study genetically grouped with known species, we compared our sequence data for COI, 16S rRNA and 28S rRNA sequences to published sequences of *Eulalia*, *Eumida*, and *Phyllodoce* using maximum likelihood analyses in IQ-TREE 2.4.0 (Minh et al. 2020). *Paranaitis wahlbergi* (Malmgren, 1865), *Eteone picta* Quatrefages, 1866 (now *Mysta picta* (Quatrefages, 1866)), and *Lacydonia eliasoni* Hartmann-Schröder, 1996 were used as outgroups. *Eumida cf. longicirrata* was excluded as only a single gene (COI) was available which was insufficient to include species in concatenated tree. Table 3 details the sampling locations, GenBank accession numbers, and data sources for all samples (this study and published studies) included in the analyses. We concatenated the sequences and selected a model of best fit using the ‘-m TESTONLY’ option in IQ-TREE 2.4.0 (Kalyaanamoorthy et al. 2017). The substitution model ‘GTR+F+I+G4’ was consistently high ranking among AIC, AICc, and BIC. Each of the analyses was run with 1000 ultrafast bootstraps (Hoang et al. 2018) and visualised in FigTree 1.4.4 (Rambaut 2018). MEGA 11 (Tamura et al. 2021) was used to assess variation within sequences and calculate pairwise genetic distance between clades.

Table 2. Primers and PCR conditions used in this study.

Primer	Fragment	Direction (5' - 3')	PCR thermal cycling conditions	Reference
PolyLCO	658	(F) GAYTATWTTCAACAAATCATAAAGATATTGG	(1) 95 C (3 min); (2) 40 cycles: 95 C (30s), 48 C (30s), 72 C (60s); (3) 72 C (7 min).	Kessing et al. (1989)
PolyHCO	658	(R) TAACTTCWGGGTGACCAARAATCA	(1) 95 C (3 min); (2) 40 cycles: 95 C (30s), 48 C (30s), 72 C (60s); (3) 72 C (7 min).	Kessing et al. (1989)
16SANN-F	368	(F) GCGGTATCCTGACCGTRCWAAGGTA	(1) 95 C (3 min); (2) 40 cycles: 95 C (30s), 48 C (30s), 72 C (60s); (3) 72 C (7 min).	Kessing et al. (1989)
16SBR-H	368	(R) CCGGTCTGAACTCAGATCACGT	(1) 95 C (3 min); (2) 40 cycles: 95 C (30s), 48 C (30s), 72 C (60s); (3) 72 C (7 min).	Kessing et al. (1989)
28sC1	791	(F) ACCCGCTGAATTTAAGCAT	(1) 95 C (3 min); (2) 40 cycles: 95 C (30s), 48 C (30s), 72 C (60s); (3) 72 C (7 min).	Kessing et al. (1989)
28s-D2	791	(R) TCCGTGTTTCAAGACGG		



Figure 1. Collection localities of phyllodocid samples. *Eulalia farosh* sp. nov. (orange circle); *Eulalia dinraal* sp. nov. (yellow diamond); *Eumida frampton* sp. nov. (blue triangle); *Phyllodoce naydra* sp. nov. (red square).

Results

Molecular analysis

We sequenced twenty-six individuals for the mitochondrial genes COI and 16S and nuclear gene 28S. In all generated phylogenies, sequences did not group with existing species available through GenBank. Within the genus *Eulalia*, seven of the concatenated sequences resolved into a well-supported lineage, hereafter

referred to as *Eulalia farosh* sp. nov., and exhibit a sister relationship with *Eulalia aurea* (Figure 2). Also within *Eulalia*, six of the concatenated sequences formed a second well-supported lineage, hereafter referred to as *Eulalia dinraal* sp. nov. (Figure 2). For COI, *E. farosh* sp. nov. clade was 17.5% divergent from the single *E. aurea* sequence and the two new *Eulalia* species showed 17.4% net pairwise divergence between each other. Within *Eumida*, four of the concatenated sequences formed a distinct clade, hereafter referred to as *Eumida*

Table 3. Genbank numbers and accession details for specimens sequenced in this study. na = not sequenced for this specimen.

Specimen	Voucher no.	Location	GenBank (CO1)	# GenBank # (16S)	GenBank # (28S)	Reference (if blank, data from this study)
<i>Eteone picta</i>	SMNH 90971	France	AY996124	AY996068	AY996107	Eklöf et al. (2007)
<i>Eulalia aurea</i>	SMNH 124056	United Kingdom	MG254496	MG254420	MG254452	San Martín et al. (2021)
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314737	Australia, Victoria: Black Rock	QB177944	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314738	Australia, Victoria: Black Rock	QB177946	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314739	Australia, Victoria: Black Rock	QB177947	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314740	Australia, Victoria: Black Rock	QB177948	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314744	Australia, Victoria: Walkerville South and Bird Rock	QB177941	QB177256	QB177223	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314887	Australia, Victoria: Walkerville South and Bird Rock	QB177943	QB177257	QB177224	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F314888	Australia, Victoria: Walkerville South and Bird Rock	QB177940	QB177258	QB177225	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315065	Australia, Victoria: North Road Boat Ramp	QB177949	QB177259	QB177226	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315069	Australia, Victoria: North Road Boat Ramp	QB177939	QB177260	QB177228	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315074	Australia, Victoria: Ricketts Point	QB177945	QB177261	QB177227	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315342	Australia, Victoria: Martha Cove	QB177950	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315346	Australia, Victoria: Martha Cove	QB177942	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315349	Australia, Victoria: Martha Cove	QB177938	na	na	
<i>Eulalia sp.nov.</i>	<i>dinraal</i> NMV F315350	Australia, Victoria: Martha Cove	QB177937	na	na	
<i>Eulalia sp.nov.</i>	<i>farosh</i> NMV F169530	Australia, Victoria: Westgate Bridge	QB177951	QB177249	QB177216	
<i>Eulalia sp.nov.</i>	<i>farosh</i> NMV F311112	Australia, Victoria: Martha Cove	QB177958	QB177250	QB177217	

<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F311113	Australia, Victoria: Martha Cove	QB177954	QB177251	QB177222	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F311114	Australia, Victoria: Martha Cove	QB177952	QB177255	QB177218	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F311115	Australia, Victoria: Martha Cove	QB177953	QB177252	QB177219	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315062	Australia, Victoria: North Road Boat Ramp	QB177956	QB177254	QB177220	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315067	Australia, Victoria: The Jawbone, Williamstown	QB177955	na	na	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315068	Australia, Victoria: North Road Boat Ramp	QB177959	QB177253	QB177221	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315073	Australia, Victoria: North Road Boat Ramp	QB177960	na	na	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315347	Australia, Victoria: Martha Cove	QB177957	na	na	
<i>Eulalia sp.nov</i>	<i>farosh</i> NMV F315348	Australia, Victoria: Martha Cove	QB177961	na	na	
<i>Eulalia hanssoni</i>	SMNH 124057	Norway	MG254497	MG254421	MG254455	San Martín et al. (2021)
<i>Eulalia mustela</i>	SMNH 90974	Sweden	AY996123	AY996065	AY996105	Eklöf et al. (2007)
<i>Eulalia tjalfiensis</i>	SMNH 124055	Norway	MG254498	MG254422	MG254457	San Martín et al. (2021)
<i>Eulalia viridis</i>	SMNH 90975	Sweden	AY996122	AY340455	AY996104	Eklöf et al. (2007)
<i>Eumida alkyone</i>	SMNH T-7972	Sweden	HM358692	MT340767	MN587903	Teixeira et al. (2019)
<i>Eumida asterope</i>	SMNH T-7973	France	HM358681	MT340765	MN587908	Teixeira et al. (2019)
<i>Eumida bahusiensis</i>	SMNH 110638	Sweden	HM358649	MG254423	MG254460	San Martín et al. (2021)
<i>Eumida elektra</i>	DBUA0002415.06	France	MZ303419	MZ303581	MZ303361	Teixeira et al. (2022)
<i>Eumida fauchaldi</i>	DBUA0002400.01	United Kingdom	MT762778	MT763383	MT763433	Teixeira et al. (2022)
<i>Eumida fenwicki</i>	DBUA0002397.05	United Kingdom	MT762741	MT763370	MT763396	Teixeira et al. (2022)
<i>Eumida sp. nov.</i>	<i>frampt</i> NMV F311125	Australia, Victoria: Stony Point	QB177962	QB177262	QB177229	
<i>Eumida sp. nov.</i>	<i>frampt</i> NMV F315341	Australia, Victoria: Martha Cove	QB177963	QB177263	QB177230	
<i>Eumida sp. nov.</i>	<i>frampt</i> NMV F315343	Australia, Victoria: Martha Cove	QB177964	QB177264	QB177231	
<i>Eumida sp. nov.</i>	<i>frampt</i> NMV F315352	Australia, Victoria: Martha Cove	QB177965	QB177265	QB177232	
<i>Eumida kelaino</i>	DBUA0002413.01	United Kingdom	MT762784	MT763385	MT763439	Teixeira et al. (2022)
<i>Eumida</i>	DBUA0002408.01	Italy	MZ303425	MZ303584	MZ303364	Teixeira et al.

<i>langenecki</i>						(2022)
<i>Eumida longicornuta</i>	SIO-BIC A2612	United States of America	MG254501	MG254424	MG254462	San Martín et al. (2021)
<i>Eumida mackiei</i>	DBUA0002331.04	United Kingdom	MN621790	MT763369	MN621745	Teixeira et al. (2019)
<i>Eumida maia</i>	DBUA0002338.01	United Kingdom	MN621794	MT340785	MN621748	Teixeira et al. (2022)
<i>Eumida merope</i>	SMNH T-8001	France	HM358716	MT340772	MN587926	Teixeira et al. (2019)
<i>Eumida notata</i>	SMNH 110608	Portugal	HM358708	MT340770	MN587927	Teixeira et al. (2019)
<i>Eumida ockelmanni</i>	SMNH 110633	Denmark	HM358644	MT340759	MN587955	Teixeira et al. (2019)
<i>Eumida pleijeli</i>	DBUA0002407.01	Italy	MZ303412	MZ303578	MZ303359	Teixeira et al. (2022)
<i>Eumida sanguinea</i>	DBUA0002412.01	United Kingdom	MZ303406	MZ303576	MZ303357	Teixeira et al. (2022)
<i>Eumida sanguinea</i>	SMNH 110601	Sweden	HM358701	MT340768	MN587941	Teixeira et al. (2019)
<i>Eumida sanguinea</i>	SMNH 110603	Sweden	HM358704	MT340769	MN587942	Teixeira et al. (2019)
<i>Eumida schanderi</i>	ZMBN_134550	Norway	MT762750	MT763374	MT763405	Teixeira et al. (2022)
<i>Eumida taygete</i>	DBUA0002417.02	France	MZ303447	MZ303596	MZ303373	Teixeira et al. (2022)
<i>Lacydonia eliasoni</i>	SMNH 90987	Norway	AY996120	AY996061	AY996102	Eklöf et al. (2007)
<i>Paranaitis wahlbergi</i>	SMNH 90981	Norway	AY996115	AY996058	AY996098	Eklöf et al. (2007)
<i>Phyllodoce citrina</i>	SMNH 124074	Norway	MG254508	MG254433	MG254472	San Martín et al. (2021)
<i>Phyllodoce groenlandica</i>	SMNH 90982	Norway	AY996114	AY996057	AY996097	Eklöf et al. (2007)
<i>Phyllodoce laminosa</i>	SMNH 124076	United Kingdom	MG254509	MG254434	MG254474	San Martín et al. (2021)
<i>Phyllodoce lineata</i>	SMNH 124078	France	KF808169	MG254435	MG254475	San Martín et al. (2021)
<i>Phyllodoce longipes</i>	SMNH 90983	Sweden	AY996113	AY996056	AY996096	Eklöf et al. (2007)
<i>Phyllodoce maculata</i>	SMNH 124081	Sweden	AY839586	MG254436	MG254477	San Martín et al. (2021)
<i>Phyllodoce mucosa</i>	SMNH 124080	United Kingdom	MG254511	MG254437	MG254478	San Martín et al. (2021)
<i>Phyllodoce naydra sp. nov.</i>	NMV F314741	Black Rock	QB177966	QB177247	QB177234	
<i>Phyllodoce naydra sp. nov.</i>	NMV F314742	Australia, Victoria: Black Rock	QB177968	na	na	
<i>Phyllodoce naydra sp. nov.</i>	NMV F314743	Australia, Victoria: Shallow Inlet	QB177969	QB177241	QB177235	
<i>Phyllodoce naydra sp. nov.</i>	NMV F314885	Australia, Victoria: Shallow Inlet	QB177973	QB177242	QB177233	
<i>Phyllodoce naydra sp. nov.</i>	NMV F314886	Australia, Victoria: Shallow Inlet	QB177967	QB177248	QB177239	
<i>Phyllodoce naydra sp. nov.</i>	NMV F315063	Australia, Victoria: The Jawbone, Williamstown	QB177971	QB177243	QB177236	

<i>Phyllodoce naydra</i> sp. nov.	NMV F315064	Australia, Victoria: The Jawbone, Williamstown	QB177974	na	na	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315066	Australia, Victoria: Ricketts Point	QB177970	na	na	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315070	Australia, Victoria: The Jawbone, Williamstown	QB177979	QB177246	QB177240	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315071	Australia, Victoria: North Road Boat Ramp	QB177976	na	na	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315072	Australia, Victoria: The Jawbone, Williamstown	QB177977	QB177244	QB177238	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315344	Australia, Victoria: Martha Cove	QB177975	QB177245	QB177237	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315345	Australia, Victoria: Martha Cove	QB177972	na	na	
<i>Phyllodoce naydra</i> sp. nov.	NMV F315351	Australia, Victoria: Martha Cove	QB177978	na	na	
<i>Phyllodoce rosea</i>	SMNH 124079	Sweden	MG254512	MG254438	MG254479	San Martín et al. (2021)

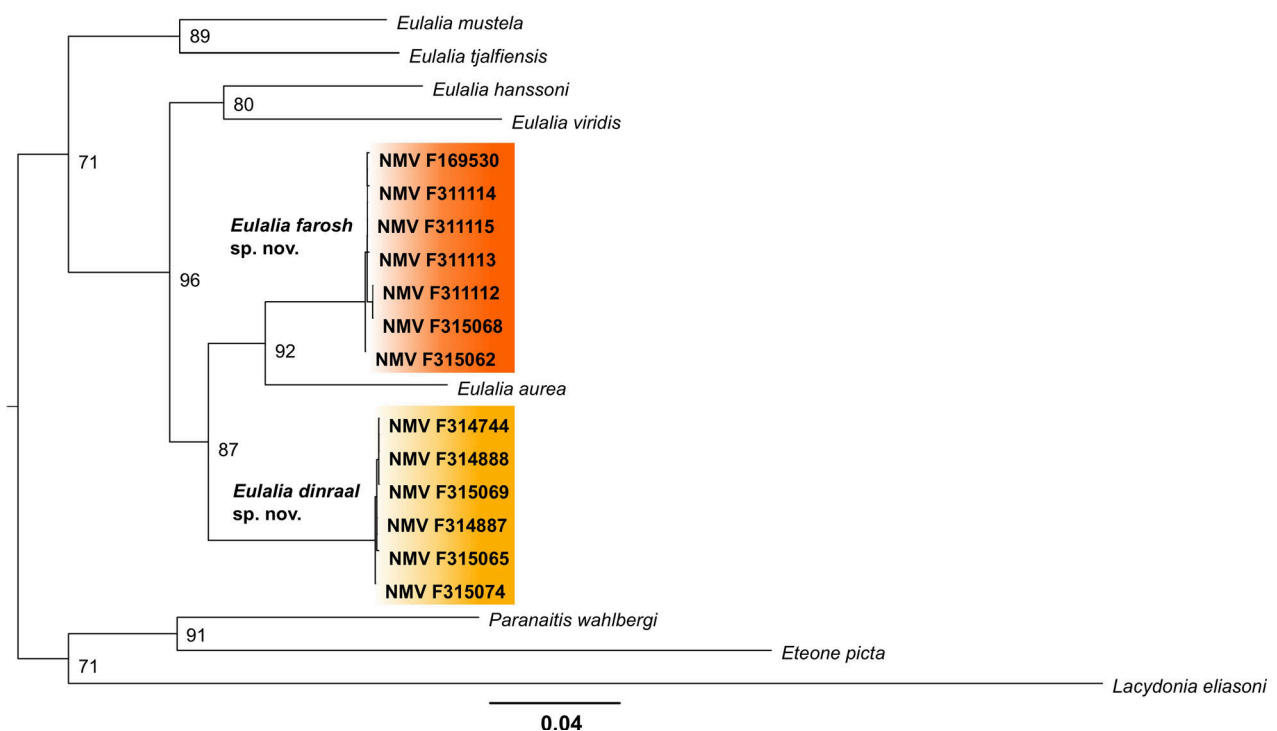


Figure 2. Maximum likelihood phylogeny of *Eulalia* species constructed using mitochondrial COI and 16S and nuclear 28S sequences. Support values > 70 are provided for major nodes.

frampt sp. nov., and exhibited shallow branching into two subgroups (Figure 3). The remaining concatenated sequences formed a distinct lineage within *Phyllodoce*, hereafter referred to as *Phyllodoce naydra* sp. nov., which contains two subclades (Figure 4). These sub-

clades showed 5.7% net pairwise divergence for COI. The most closely related species to *Phyllodoce naydra* sp. nov. was *P. longipes*. For COI, *P. longipes* had an average pairwise distance of 28.7% to the *P. naydra* sp. nov. sequences.

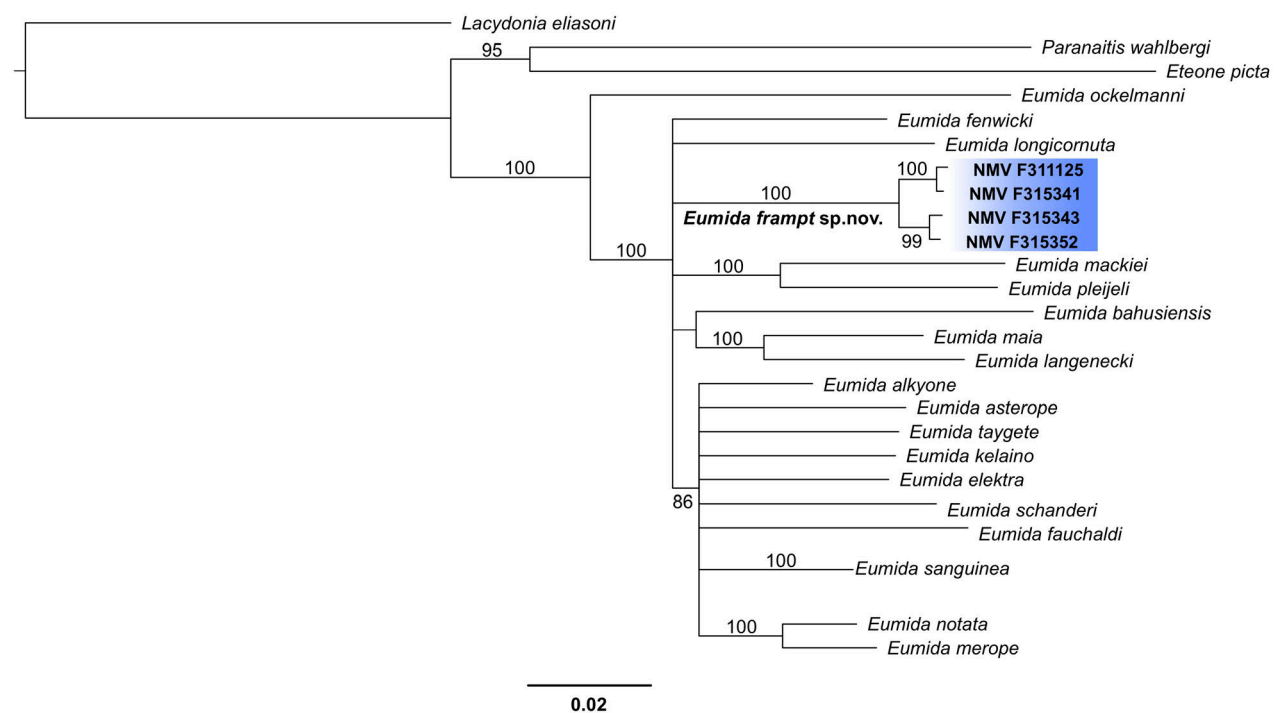


Figure 3. Maximum likelihood phylogeny of *Eumida* species constructed using mitochondrial COI and 16S and nuclear 28S sequences. Support values > 70 are provided for major nodes.

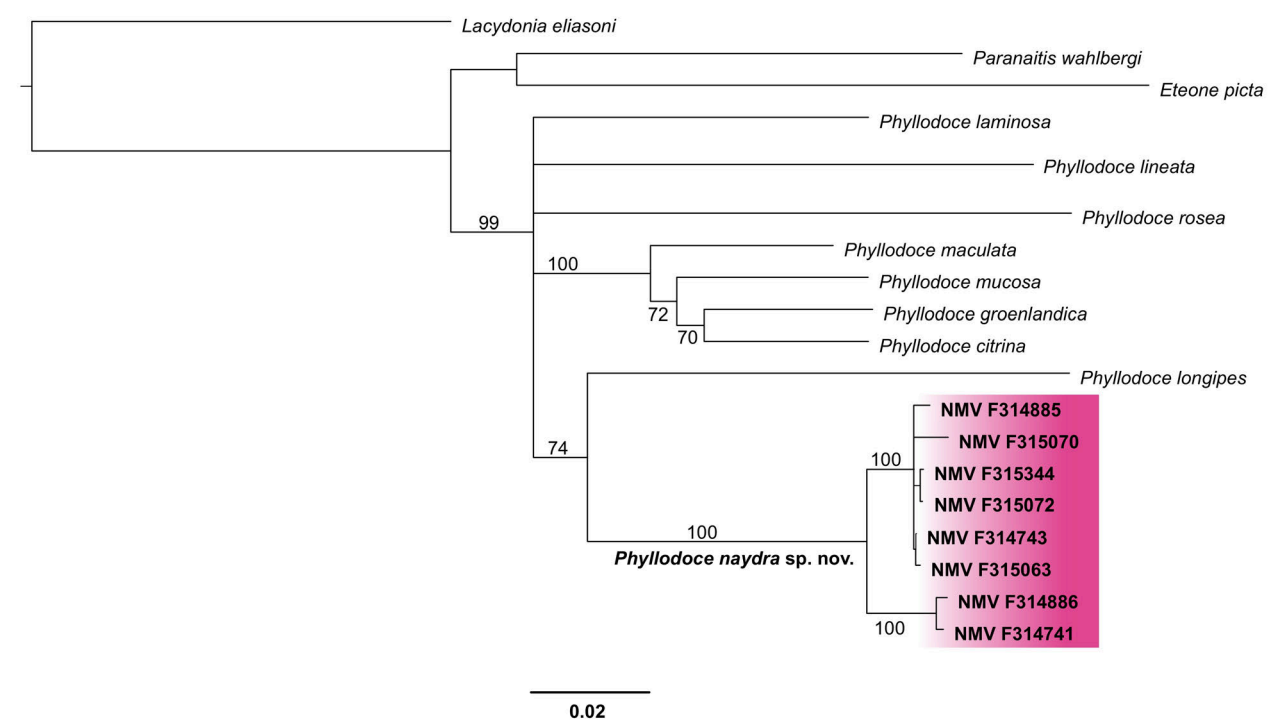


Figure 4. Maximum likelihood phylogeny of *Phyllodoce* species constructed using mitochondrial COI and 16S and nuclear 28S sequences. Support values > 70 are provided for major nodes.

Morphological analysis - preservation effect

Our photography and morphometric data collection was consistent with the methods of Teixeira et al. (2022) and Teixeira et al. (2023). However, we also obtained morphometric data from museum specimens not collected by us, and from published descriptions based

on specimens preserved with different (often unknown) protocols. Seeking to compare our morphometric data more widely with those from other species in other studies raises the question of whether preservation artefacts might be of the same order as inter-specific differences and might qualify or invalidate the taxonom-

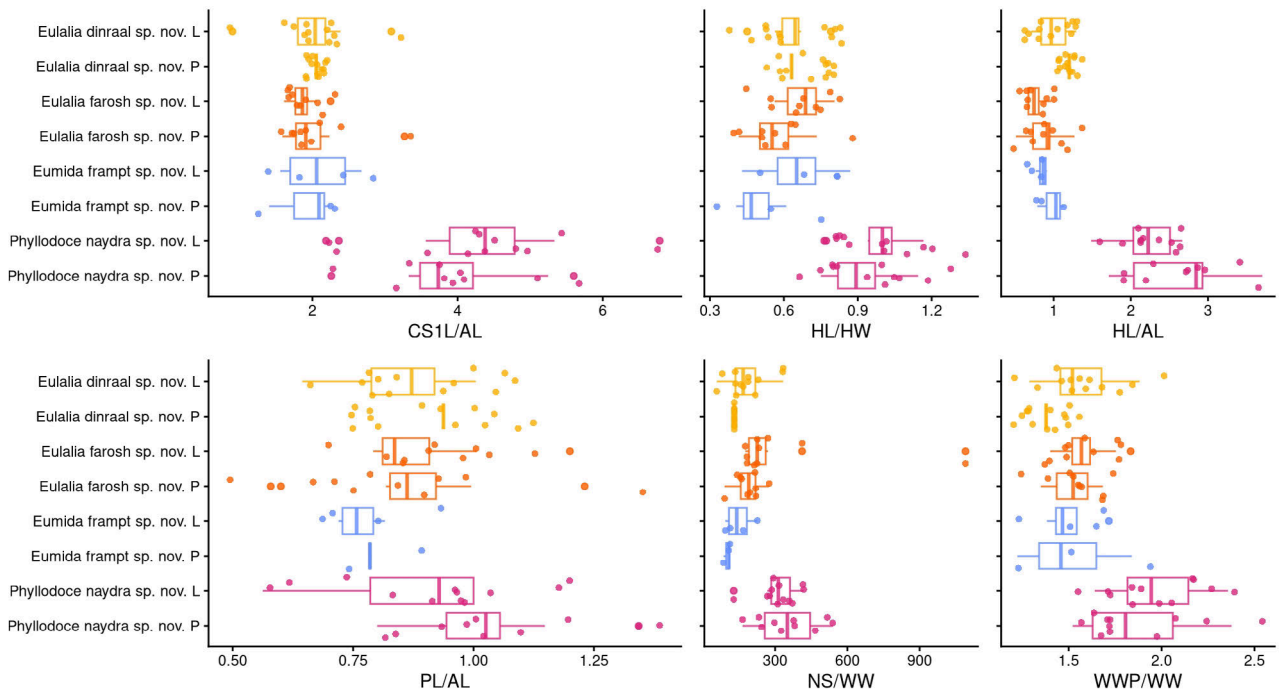


Figure 5. Comparison of morphometric ratios calculated from live (L) and preserved (P) specimens of *Eulalia dinraal* sp. nov., *Eulalia farosh* sp. nov., *Eumida frampt* sp. nov. and *Phyllodoce naydra* sp. nov. See Table 1 for explanation of ratios.

ic value of such comparisons. For *Eulalia dinraal* sp. nov., morphometric comparisons between measurements from live and preserved specimens had overlapping ranges apart from prostomium width:eye separation. For *Eulalia farosh* sp. nov., *Eumida frampt* sp. nov. and for *Phyllodoce naydra* sp. nov., all morphometric comparisons had overlapping ranges between live and preserved specimens.

These data are presented in Tables 4, 5 and 6; a subset of which are summarised in Figure 5 showing a similar range of values for both live and preserved specimens, suggesting that preservation artefacts do not skew morphometric data in a way that would imitate discriminating characters between species.

Morphological analysis - status of *Eumida fusciculata*

Our new morphometric data collected for comparative purposes in this study revealed variability within specimens of *Eumida fusciculata* Eibye-Jacobsen, 1991 distinguished by the presence or absence of a dense cover of macropapillae on the pharynx. We denote these two forms as *Eumida* cf. *fusciculata* “macropapillae pharynx” and *Eumida* cf. *fusciculata* “smooth pharynx”. These forms were recognised from NMV specimens previously seen by Eibye-Jacobsen (1991) and based on specimens of similar size-ranges (78–98 segments, 0.7–1.1 mm wide for *Eumida* cf. *fusciculata* “macropapillae pharynx”, 71–92 segments, 0.9–1.6 mm wide for *Eumida* cf. *fusciculata* “smooth pharynx”) but differences for morphometric data are comparable to those seen between species (Table 5). We were unable to collect new specimens and thus have no molecular data for these two forms but

more extensive sampling may show that at least two species are present among the material referred to as *Eumida fusciculata*. Descriptions of these two forms are provided below.

Discussion

Morphological characters traditionally used for description and discrimination of species of Phyllodocidae frequently rely on morphological characters expressed as ratios, such as length of paired antennae relative to length of palps and length: width proportions of prostomium, dorsal and ventral cirri (eg Blake, 1997; Oliveira et al., 2015, 2021; Pleijel, 1993). Teixeira et al. (2022, 2023) showed that these ratios can sometimes be helpful in distinguishing species, even those that are morphologically cryptic. The question remains, however, whether morphological ratios can be relied on when taken from the literature, as is inevitable in comparisons with previously described species. In our study we compared morphometric ratios from live and preserved specimens and for the species of *Eulalia*, *Eumida* and *Phyllodoce*. For *Eulalia* species we found the range of variability for these quantities to be similar irrespective of treatment of specimen (Figure 5) and also comparable with variability present in Teixeira et al. (2023) (Table 4 last two rows). Similar levels of variability in morphometric ratios were seen in *Eumida* and *Phyllodoce* (Tables 5 and 6). We consider it reasonable to take our live to preserved specimen comparisons as a proxy for variability in the taxonomic literature where preservation and methodology is typically unknown. We therefore conclude that morphometric ratios between phyllodocid species, at least in these three genera, are

Table 4. Morphometric variability in *Eulalia* species. See Table 1 for explanation of column heading abbreviations. * denotes two species from Teixeira et al. (2023) for comparison. na = morphometric data unavailable due to damaged or fragile specimens or data absence in original species description.

Species (no of specimens)	CS1L/AL	CCS2L/AL	HW/AL	HL/AL	PL/AL	MAL/AL	MAL/HL	NS/WW	NS/WL	WWP/WW	HW/DE	DCL/DCW
<i>E. australiensis</i> (n=1)	1.4	2.8	1.6	1.6	0.9	0.9	0.8-1.	66.7	na	na	1.8	1.8
<i>E. farosh</i> sp. nov. LIVE (n=10)	1.6-2.3	2.8-3.8	0.9-1.4	0.7-1.0	0.8-1.2	0.6-1.0	0.8-1.2	176-1091	2.7-6.7	1.4-1.8	1.5-1.9	na
<i>E. farosh</i> sp. nov. FIXED (n=10)	1.6-3.3	2.6-5.7	1.2-2.6	0.5-1.3	0.6-1.2	0.7-1.3	0.8-1.4	90-275	2.7-6.7	1.4-1.7	1.4-6.8	1.75-2.7
<i>E. dinraal</i> sp. nov. LIVE (n=13)	0.9-3.1	1.8-6.9	1.1-2.1	0.7-1.3	0.6-1.0	0.7-1.5	0.6-1.3	58-333	2.8-8.6	1.3-1.9	1.6-2.2	na
<i>E. dinraal</i> sp. nov. FIXED (n=14)	0.8-2.4	1.9-4.5	1.5-2.8	0.9-1.7	0.5-1.1	0.8-1.5	0.7-1.3	60-234	2.8-8.6	1.3-1.9	2.4-3.2	1.7-3.0
<i>E. microphylloides</i> (n=1)	1.6	3.3	1.6	1.2	na	1.6	1	na	na	na	1.6	na
<i>E. feliciae</i> (n=5)*	1.7-2.7	3.2-4.2	1.4-1.8	1.0-1.4	1.1-1.1	na	0.7-1	254-339	7.6-10.4	1.3-1.4	1.6-1.9	1.6-3.1
<i>E. xanthomucosa</i> (n=5)*	1.5-2.2	3.0-4.2	1.6-2.1	1.3-1.8	1.0-1.0	0.8-1.1	0.5-0.8	151-247	4.9-7.9	1.4-1.6	1.5-1.9	1.9-2.7

Table 5. Morphometric variability in *Eumida* species. See Table 1 for explanation of column heading abbreviations. na = morphometric data unavailable due to damaged or fragile specimens or data absence in original species description.

Species (no of specimens)	CS1L/AL	CCS2L/AL	HW/AL	HL/AL	PL/AL	MAL/AL	MAL/HL	NS/WW	NS/WL	WWP/WW	HW/DE	DCL/DCW	VCL/VCW	VCL/DCL	CLL/VCL
<i>E. hawkesburyensis</i> (n=1)	2.1	3.5	2	1.2	1	1	0.9	na	na	1.5	1.7	1	1.7	0.8-0.9	1.8
<i>E. framptoni</i> sp. nov. (n=3) FIXED	1.4-2.2	3.2-4.0	1.9-2.2	0.8-1.1	0.8	1.1-1.4	1.1-1.4	85.9-112.3	2.4-5.8	1.2-1.8	1.5-1.7	1.5-1.7	1.8-2.0	0.5-0.6	1.0-1.2
<i>E. framptoni</i> sp. nov. (n=4) LIVE	1.6-2.7	2.3-3.4	0.9-2.0	0.8-0.9	0.7-0.8	0.7-0.8	0.8-1.0	93.0-226.4	2.4-5.8	1.4-1.7	1.6-1.9	na	na	na	na
<i>E. fusciculata</i> "micropapillae" (n=2)	1.8	3.8	2.1	1.2	0.7	0.9	0.7	69-142	5.2-6.2	1.4-1.5	1.8-2	1.7-2.5	1.6-2.1	0.4-0.5	1-1.9
<i>E. fusciculata</i> "smooth" (n=3)	1.9-2.1	4.1-4.2	1.6-2.6	0.4-1.1	0.9-1.1	0.9-1.2	1.1-2.2	52.5-79.8	2.5-3.9	1.3-1.7	2	1.8-2.2	1.9-2.3	0.4-0.6	1.1-1.7
<i>E. trifasciata</i> (n=1)	2.5	4.6	2.1	1	0.9	1	0.9	na	na	1.7	1.6	1.3	1.9	0.7	1

likely to be robust against preservation artefacts and other local inconsistencies.

The cryptic diversity found within taxa formerly treated as species of *Eulalia* and *Eumida* in European waters (Teixeira et al., 2019, 2022, 20223) also prevails in Australia; similar diversity should probably be expected in other regions. Our study from a small geographic region does not allow us to say whether species in the genus Phyllodoce will show similar levels of cryptic diversity. Nor can we speculate how many additional species of *Eulalia* and *Eumida* should be expected in Australian waters, but it is evident that Australian phyllodocid fauna is currently poorly known, with many species remaining to be discovered and described.

Table 6. Morphometric variability in *Phyllodoce* species. See Table 1 for explanation of column heading abbreviations. na = morphometric data unavailable due to damaged or fragile specimens or data absence in original species description.

Species (no of specimens)	CSIL/AL	CCS2L/AL	HW/AL	HL/AL	PL/AL	NS/WW	NS/WL	WWP/WW	HW/DE	DCL/DCW	VCL/VCW	VCL/DCL	CLL/VCL
<i>P. australis</i> (n=1)	3.3	10	na	1.3-2	na	na	na	na	na	1.5	2.2	na	na
<i>P. duplex</i> (n=1)	2.4	5.5	4.3-4.4	3.3	1	na	na	1.4-1.7	1.6-1.8	1.5	1.8	0.6	1-1.2
<i>P. longipes</i> (n=1)	2	7	2.2	2	1.3	na	na	2.1	1.2	1.1	2.3	0.7-0.8	0.8
<i>P. madeirensis</i> (n=1)	5	10	5	5	1.3	na	na	1.4	1.8	1.4-1.6	2.3	0.9	0.8
<i>P. malmgreni</i> (n=2)	3.9	7	4	2-2.2	0.8-0.9	na	na	1.6	1.5	1.1-1.2	2.1	0.6-0.8	1
<i>P. novaehollandiae</i> (n=1)	na	na	na	2	na	na	na	na	na	1	2.9	0.8	1.2
<i>P. naydra</i> sp. nov. (n=13) FIXED	2.3-5.6	5.3-10.8	2.0-4.3	1.7-3.7	0.8-1.3	165.0-538.8	3.4-8.4	1.5-2.4	1.3-3.9	1.3-2.0	1.8-2.7	0.5-0.6	0.6-0.9
<i>P. naydra</i> sp. nov. (n=11) LIVE	2.2-6.8	4.6-10.5	1.6-3.6	1.5-2.7	0.6-1.0	128.2-418.9	3.4-8.4	1.6-2.4	1.4-1.7	na	na	na	na
<i>P. salicifolia</i> (n=1)	1.8	4.1	1.8	2	1	na	na	1.4	1.4	3.2	2.5	0.7	0.9

Key to Australian benthic Phyllodocidae

Of the 33 genera of Phyllodocidae currently recognised (Read & Fauchald, 2026), only 16 are currently known to occur in Australia waters (Hutchings & Yerman, 2023). The holopelagic Alciopini are even less studied in Australian waters and are omitted. This key is therefore only an interim tool. Also poorly known and omitted are *Phyllodoce gracilis* Kinberg, 1866 ("Nereiphylla gracilis Kinberg, 1866" on the Australian Faunal Directory -Hutchings & Yerman, 2023) and *Pterocirrus magalhaensis* Kinberg, 1866. Some species of *Eulalia*, *Eumida* and *Phyllodoce* nominally recorded from Australia are also omitted; see the Remarks for those taxa below for our reasons.

- | | | |
|----|---|--|
| 1 | Prostomium with a median antenna present | 2 |
| 1 | Prostomium without a median antenna or with a dorsal or posterior papilla | 13 |
| 2 | Nuchal organs conspicuous posterior outgrowths from prostomium | <i>Notophylum multicirris</i> |
| 2 | Nuchal organs inconspicuous | 3 |
| 3 | Dorsal cirri inflated, grape-like; paired antennae widest at mid-length; neuropodium prechaetal lobe undivided | <i>Clavadoce dorsolobata</i> |
| 3 | Dorsal cirri flattened, leaf-like; paired antennae widest at base; neuropodium prechaetal lobe divided into dorsal and ventral lobes | 4 |
| 4 | Segments 1 and 2 separate; segment 1 with 1 pair of cirri, segment 2 with 2 pairs of cirri | 5 (<i>Eulalia</i>) |
| 4 | Segment 1 reduced or fused to segment 2, not visible dorsally; 3 pairs of cirri arise from the first visible segment | 8 (<i>Eumida</i>) |
| 5 | Ventral cirri of median segments shorter than neuropodium | 6 |
| 5 | Ventral cirri of median segments about as long as neuropodium | 7 |
| 6 | Median antenna about as long or slightly shorter than paired antennae; dorsal lobe of neuropodium slightly longer than ventral lobe | <i>Eulalia australiensis</i> |
| 6 | Median antenna about 1.5-1.6 times as long as paired antennae; dorsal and ventral neuropodial lobes similar in length | <i>Eulalia microphylloides</i> |
| 7 | Median antenna longer than paired antennae; dorsal cirri almost triangular, greatest width basally and tapering evenly to the tip | <i>Eulalia dinraal</i> sp. nov. |
| 7 | Median antenna shorter than paired antennae; dorsal cirri classically leaf-shaped, tapering to the tip after greatest width reached at about mid-length | <i>Eulalia farosh</i> sp. nov. |
| 8 | Eyes absent; about 40 pointed oral papillae | <i>Eumida</i> cf. <i>longicirrata</i> |
| 8 | Eyes present; 16-21 rounded oral papillae | 9 |
| 9 | Dorsal cirri symmetrical, about as long as wide or slightly longer | 10 |
| 9 | Dorsal cirri asymmetrical, distinctly longer than maximum width | 11 |
| 10 | Dorsum of segments 4, 5, 6 with prominent green transverse pigmented band; median antenna as long as prostomium; surface of pharynx with micropapillae; dorsal cirri symmetrical, about as long as wide | <i>Eumida trifasciata</i> |
| 10 | Dorsum of anterior segments sometimes with lateral black spots, lacking transverse bands; median antenna | |

	0.8 length of prostomium; surface of pharynx smooth, lacking micropapillae	<i>Eumida hawkesburyensis</i>
11	Median antenna located anteriorly on prostomium, closer to paired antennae; ventral cirri shorter than neuropodium	<i>Eumida framptoni</i> sp. nov.
11	Median antenna located more posteriorly on prostomium, closer to eyes; ventral cirri about as long as neuropodium	12
12	Paired antennae longer than as palps; pharynx with micropapillae	" <i>Eumida fuscocolata</i> micropapillae-pharynx"
12	Paired antennae about as long as palps; pharynx smooth, lacking micropapillae	" <i>Eumida fuscocolata</i> smooth-pharynx"
13	Segments 1 and 2 inflated to form a collar which covers posterior part of prostomium	<i>Paranaitis inflata</i>
13	Segments 1 and 2 not inflated, posterior part of prostomium free	14
14	2 pairs of tentacular cirri arising from the first visible segment	15
14	3 pairs of tentacular cirri arising from the first two segments (which may be partially fused)	20
15	Prostomium distinctly dorso-ventrally flattened; pharynx with a longitudinal row of flattened papillae on each side	<i>Mysta platycephala</i>
15	Prostomium not dorso-ventrally flattened; pharynx lacking lateral rows of flattened papillae	16
16	Prostomium longer than maximum width	17
16	Prostomium shorter than or as long as maximum width	18
17	Eyes present; pharynx without lateral rows of papillae; ventral cirri shorter than neuropodium	<i>Eteone filiformis</i>
17	Eyes absent; pharynx with 3-4 lateral rows of rugose papillae; ventral cirri longer than neuropodium	<i>Eteone tingara</i>
18	Prostomium wider than long; pharynx bare of papillae; dorsal cirri triangular to lanceolate, with a distinct tip	<i>Eteone palari</i>
18	Prostomium about as wide as long; pharynx with micro- or macropapillae; dorsal cirri evenly rounded, without a distinct tip	19
19	Paired antennae half as long as prostomium; pharynx with micropapillae; chaetae first present on segment 3	<i>Eteone otati</i>
19	Paired antennae equal to length of prostomium; pharynx with macropapillae; chaetae first present on segment 2	<i>Eteone tulua</i>
20	Prostomium posterior margin entire, median antenna papilla or nuchal papilla absent	21
20	Prostomium heart-shaped, with posterior indentation enclosing median (antenna) papilla	24 (<i>Phyllodoce</i>)
21	Paired antennae thread-like; dorsal cirri of segment 2 bottle shaped, swollen basally and with a long narrow tip; dorsal cirri inflated	<i>Mystides triangulifera</i>
21	Paired antennae not thread-like; dorsal cirri of segment 2 taper gradually; dorsal cirri flattened	22
22	Paired antennae widest at mid-length; prostomial protuberance indistinct; dorsal cirri evenly rounded, without a distinct tip	<i>Nereiphylla castanea</i>
22	Paired antennae widest at base, tapering evenly to tip; prostomial protuberance distinct; dorsal cirri ovoid-lanceolate, with a distinct tip	23 (<i>Hesionura</i>)
23	Eyes present; ventral cirri more than 2 times as long as neuropodium	<i>Hesionura australiensis</i>
23	Eyes absent; ventral cirri about as long as neuropodium	<i>Hesionura gracilis</i>
24	Basal region of pharynx completely covered with rows of papillae	25
24	Basal region of pharynx with 12 rows of papillae, bare dorsally and ventrally	26
25	Distal region of pharynx tuberculate; dorsal cirri of mid and posterior segments rhomboidal	<i>Phyllodoce malmgreni</i>
25	Distal region of pharynx with large papillae; dorsal cirri ovoid	<i>Phyllodoce naydra</i> sp. nov.
26	Live and preserved specimens with distinct dark pigmentation on segments 4 and 5; minute papillae present on ventral tentacular cirri of segments 1 and 2	<i>Phyllodoce australis</i>
26	Segments 4 and 5 not distinctively pigmented; segments 1 and 2 lacking minute papillae on ventral tentacular cirri	27
27	Distal region of pharynx with papillae; dorsal lobe of neuropodium greatly extended, much longer than ventral lobe	<i>Phyllodoce longipes</i>
27	Distal region of pharynx smooth or tuberculate; dorsal lobe of neuropodium not greatly extended	28
28	Prostomium about as long as wide; dorsal cirri almost circular, about as long as wide	<i>Phyllodoce novaehollandiae</i>
28	Prostomium either shorter or longer than maximum width; dorsal cirri elongate, longer than maximum width	29
29	Prostomium longer than maximum width; dorsal cirri very elongate, at least 3 times as long as wide; chaetae present from segment 3	<i>Phyllodoce salicifolia</i>

- 29 Prostomium wider than long; dorsal cirri about 1.5 times as long as wide; chaetae present from segment 4 30
- 30 Distal region of pharynx about 1.5 times length of basal region; palps and paired antennae similar in length ***Phyllodoce duplex***
- 30 Distal region of pharynx about 4-5 times length of basal region; palps slightly longer than paired antennae ***Phyllodoce madeirensis***

Taxonomy

Eulalia Savigny, 1822

Type species.

Nereis viridis Linnaeus, 1767, by subsequent designation.

Description. Eyes present. Eyes superficial. Paired antennae widest basally, tapering ~evenly to tip. Prostomial protuberance well defined. Nuchal organs ciliated pits; and cirrophores of first pair of tentacular cirri separate basally. Median antenna present; closest to eyes.

Pharynx undivided with densely distributed conical to rounded micropapillae. Anterior three segments all distinct (i.e. one pair or two pairs (dorsal and ventral) of tentacular cirri present on each segment). Segment 1 visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium from the first visible segment after the prostomium. Segment 2 with dorsal tentacular cirri. Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe rounded and similar in shape to ventral lobe. Ventral tentacular cirri of segment 2 flattened. Segment 3 with dorsal cirri; ventral cirri horizontally oriented. Based on Pleijel (1991).

Remarks. The genus *Eulalia* currently includes 69 species (Read & Fauchald, 2026) of which three are known from Australia (Hutchings & Yerman, 2023): *Eulalia australiensis* Hartmann-Schröder, 1987 new status (originally as *Eulalia viridis australiensis* Hartmann-Schröder, 1987), *Eulalia australiensis* (Hartmann-Schröder, 1989) (originally as *Notalia australiensis* Hartmann-Schröder, 1989) and *Eulalia microphyloides* Hartmann-Schröder, 1979. As discussed below, *Eulalia australiensis* (Hartmann-Schröder, 1989) does not belong in *Eulalia* and is here designated *species inquirenda* and is not considered further in comparisons. Two additional Australian records of phyllodocids are apparently referable to *Eulalia* but are not further considered here as the published descriptions are insufficient to diagnose this material from numerous other *Eulalia* species: *Eulalia* cf. *brevicornis*.–Augener, 1927 (not Moore, 1893; originally as *Steggoa brevicornis*.–Augener, 1927: 120–123) and *Eulalia* cf. *microphylla*.–Augener, 1913 (not Schmarda, 1861; originally as *Eulalia microphylla*.–Augener, H. 1913: 133–134). Two species encountered in this study are new and described below: *Eulalia farosh* sp. nov. and *Eulalia dinraal* sp. nov. We thus accept four species of *Eulalia* belonging to the Aus-

tralian fauna; these can be separated using our key to Australian Phyllodocidae species herein.

Eulalia australiensis Hartmann-Schröder, 1987, new status

Eulalia viridis australiensis Hartmann-Schröder, 1987: 30, figs 1a, b.

Material examined. Australia, Victoria: Wilson's Promontory: Leonard Bay: Felsen vom Nordende der Squeaky Beach: Algen und Krusten, 1975-12-27, holotype HZM P-18884 and 1 paratype HZM P-18885.

Diagnosis. *Eulalia australiensis* Hartmann-Schröder, 1987 can be distinguished from the other Australian species of *Eulalia* by the relative length of the median antenna, which is longer than the paired antennae (it is shorter than the paired antennae in other Australian *Eulalia* species). *Eulalia australiensis* Hartmann-Schröder, 1987 also differs in that the pharyngeal papillae are much smaller, low and much more sparsely distributed (Fig. 6A) than in other Australian *Eulalia* species: *Eulalia microphyloides* Hartmann-Schröder, 1979 and the two new species of *Eulalia* described below all have a dense cover of long uniform-sized papillae throughout the length of the pharynx (Fig. 7C, 8C).

Description. The holotype has retracted pharynx and some appendages missing, paratype has prostomial appendages and most tentacular cirri intact. "Holotype (HZM: P-18884) and 1 paratype (HZM: P-18885) [translation:] Holotype with numerous segments, 34 mm long" Hartmann-Schröder (1987: 30). Additional notes RSW: holotype entire, about 150 segments, 32 mm long, 2 mm wide excluding parapodia; paratype 156 segments, 25 mm long, 1.5 mm wide excluding parapodia.

Pharynx retracted in holotype, almost fully extended in paratype (terminal papillae not visible), pharynx with uniform cover of small papillae forming low bumps on pharynx, undivided but surface epidermis split in proximal region of paratype revealing muscular pharynx (Fig. 6A).

Pigmentation pattern anterior segments with a broad brown transverse band; behind them dark green to blackish due to eggs in the body cavity. A small spot outside each of the eyes. The paratype, a male with sperm in coelomic cavity, also with a spot outside each of the eyes, with a brown transverse band on the segments and some brownish pigment on the dorsal cirrus. Prostomium wider than long; rounded triangular. Paired antennae widest basally, tapering evenly to tip. Prostom-

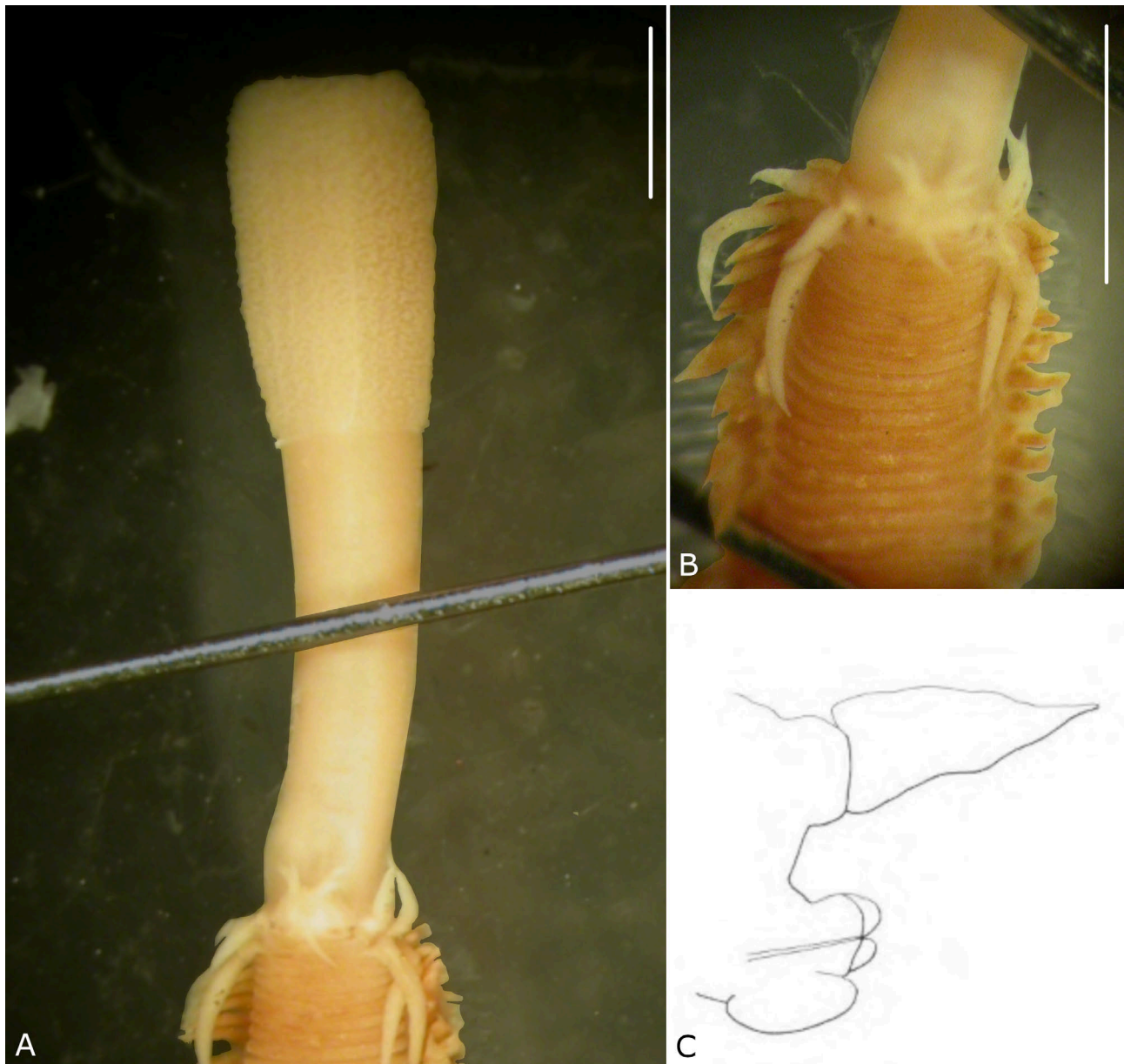


Figure 6. *Eulalia australiensis* Hartmann-Schröder, 1987. A, B: paratype HZM P-18885; C, from Hartmann-Schröder, 1987 fig. 1a. A, prostomium and pharynx, dorsal view; B, prostomium, dorsal view; C, median parapodium. Scale lines: A-B, 1.0mm.

mial protuberance well defined. Nuchal organs ciliated pits; and cirrophores of first pair of tentacular cirri separate basally. Median antenna present; closest to eyes; 0.8 times length of prostomium (equal to length of prostomium in the paratype); longer than paired antennae (Fig. 6B).

Anterior three segments all distinct (i.e. one pair or two pairs (dorsal and ventral) of tentacular cirri present on each segment). Segment 1 visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium from the first visible segment after the prostomium. Ventral tentacular cirri of segment 2 flattened. Segment 3 with dorsal cirri; ventral cirri present. Tentacular cirri lengths from paratype: TC 1 to segment 7, DTC 2 to 14, VTC 2 to 8, DTC 3 to 14. Chaetae first present on segment 3.

Dorsal cirri of median segments elongate, 2.4 times longer than wide, symmetrical, tapering to a pointed tip. Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe slightly longer and wider than ventral lobe. Ventral cirri horizontally oriented, 2 times longer than wide; 0.8 times length of neuropodium, tips rounded (Fig. 6C) (parapodial proportions from segment 55 of paratype and closely consistent with Hartmann-Schröder, 1987: fig 1a).

Neurochaetae shafts distally with several small teeth; blade relatively short (based on holotype description by Hartmann-Schröder (1987: 30) and additional variation in paratype noted by RSW).

Anal cirri subulate with blunt tips, about 3 times as long as wide (in holotype; missing in paratype).

Distribution & habitat. Known from the type locality, Leonard Bay, Wilson's Promontory, Victoria, south-eastern Australia. Also recorded from Lake Macquarie, New South Wales by Hartmann-Schröder (1989: 15; specimens not seen by us).

Remarks. *Eulalia viridis* (Linnaeus, 1767) from northern Europe was redescribed by Bonse et al. (1996) and split into two species based on morphological and genetic data. Until a more comprehensive study of specimens similar to *E. viridis* from a wider range of localities is undertaken, we prefer not to imply that Hartmann-Schröder's taxon is closely allied to *E. viridis* from northern Europe and instead elevate the Australian taxon to species rank.

***Eulalia australiensis* (Hartmann-Schröder, 1989) species inquirenda new status**

Notalia australiensis Hartmann-Schröder, 1989: 15-16, figs 8-13.

Material examined. Australia, New South Wales, Eden: Quarantine Bay: Algen und Polsterbewuchs von Felsen,

1976-02-01: holotype HZM P-19656 and 3 paratypes HZM P-19657. When examined in August 2004 by RSW HZM P-19656 was found to contain 2 specimens and HZM P-19657 2 specimens; presumably 1 of the 2 specimens in HZM P-19656 is the 3rd paratype listed by Hartmann-Schröder, 1989 for HZM P-19657.

Description. The holotype lot contains 2 specimens both 2-3 mm long, about 18-20 segments and less than 0.3 mm wide excluding parapodia; in both the pharynx is retracted. Pigmentation pattern greenish-brownish, with brown pigment grains, especially on the anterior and posterior parts, on tentacular cirri and dorsal cirri. Eyes superficial, located at posterior margin of prostomium. Prostomium about as long as maximum width; with slight protuberance between palps and paired antennae, widest point at posterior third of prostomium. Paired antennae widest basally, tapering evenly to tip, slightly longer than palps. Small prostomial protuberance between paired antennae. Median antenna located slightly anterior to eyes, 0.6 times length of prostomium.

Pharynx everted in one paratype, divided into 2 regions approximately equal in length, basal region bare, distal region with dense cover of long filiform papillae.

Anterior three segments all distinct. Tentacular cirri spindle-shaped (bottle-shaped - swolled basally, tapering abruptly to fine tips). Dorsal tentacular cirri segment 2 reach about segment 6, remaining tentacular cirri similar in length, equal to 2-3 body segments. Chaetae first present on segment 2.

Dorsal cirri of median segments elongate, longer than maximum width; large, prominent and longer than neuropodial lobe; ovoid or lanceolate, with a pointed or rounded tip. Dorsal cirri of median segments asymmetrical; widest point slightly basal to mid-length, ventral

margin more rounded than dorsal margin which is somewhat more straight.

Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe rounded and similar in shape to ventral lobe. Ventral cirri of median segments horizontally oriented; longer than wide; shorter than neuropodium; tips rounded; ovoid, without distinct tip. Neurochaetae relatively short, coarsely toothed blade; distal end of shaft with many small teeth. Pygidial cirri long, widest at base and tapering, much longer than wide. Pygidial cirri spindle-shaped.

Morphometric data – Tentacular cirrus segment 1: paired antenna length 1.4. Dorsal tentacular cirrus segment 2: paired antenna length 2.8. Prostomium width: paired antenna length 1.6. Prostomium length: paired antenna length 1.6. Palp: paired antenna length 0.9. Median antenna: paired antenna length 0.9. Segment number: body width 67. Prostomium width: eye separation 1.8. Dorsal cirri length: width 1.8. Ventral cirrus: dorsal cirrus length 0.5. Parapodium: ventral cirrus length 1.2. Ventral cirrus length: width 1.3.

Distribution & habitat. Only known from the type material, from intertidal algal community at Quarantine Bay, Eden, southeastern Australia.

Remarks. The description above is based on Hartmann-Schröder (1989: 15-16, figs 8-10) and examination of the type material.

Hartmann-Schröder placed this species in the genus *Notalia* Bergström, 1914, but without confidence (~"I will stick with the genus *Notalia* for the time being." - translation of Hartmann-Schröder 1989: 15-16). Pleijel (1991) synonymised *Notalia* with *Eulalia* and thus *Notalia australiensis* Hartmann-Schröder, 1989 followed, becoming *Eulalia australiensis* (Hartmann-Schröder 1989). However, for the following reasons we consider *Notalia australiensis* Hartmann-Schröder, 1989 does not belong in *Eulalia*: The pharynx is unknown in the holotype but has long filiform papillae in the paratype. Except as noted above, the holotype and paratypes are morphologically similar and are evidently conspecific. The spindle-shaped tentacular cirri (in holotype and paratypes) are similar to *Mystides* Théel, 1879 however the paired antennae and palps of the present species are not filiform as they are in species of *Mystides*, and the pharyngeal papillae also differ. We cannot allocate these specimens to *Eulalia* based on these characters, nor to any other genus; it is possible that the type material of *Eulalia australiensis* (Hartmann-Schröder, 1989) are immature specimens with morphology not representative of mature specimens. *Eulalia australiensis* (Hartmann-Schröder, 1989) is therefore here designated *species inquirenda*. The combination *Eulalia australiensis* (Hartmann-Schröder, 1989) would be a secondary homonym of *Eulalia australiensis* Hartmann-Schröder, 1987 but that generic placement cannot be supported

so we designate *Notalia australiensis* Hartmann-Schroder, 1989 as *Phyllodocidae incertae sedis*.

Eulalia dinraal sp. nov.

urn:lsid:zoobank.org:act:D395E87A-5BD8-4533-9F28-0857B310969C

Material examined.

Holotype. Australia, Victoria, Martha Cove (MRG 911), -38.306318° 144.993304°, intertidal, Falconer, A & Altoff, L, 28/04/2024, NMV F315346.

Paratypes. Australia, Victoria: Black Rock jetty (MRG 899), -37.969259°, 145.009968°, coll. Marine Research Group of FNCV, intertidal, 20/01/2024: 1 spm, NMV F314737; 1 spm, NMV F314738; 1 spm, NMV F314739; 1 spm, NMV F314740.

Walkerville South, Bird Rock (MRG 907), -38.860103°, 145.99995°, coll. Marine Research Group of FNCV, intertidal, 18/03/2024: 1 spm, NMV F314744; 1 spm, NMV F314887; 1 spm, NMV F314888.

Port Phillip Bay, Brighton, North Road Boat Ramp (MRG 908), -37.898332°, 144.984701°, coll. Marine Research Group of FNCV, Falconer, A & Altoff, L, intertidal, 30/03/2024: 1 spm, NMV F315065; 1 spm, NMV F315069.

Port Phillip Bay: Ricketts Point (MRG 909), -37.993764°, 145.02991°, coll. Marine Research Group of FNCV, intertidal, 01/04/2024, 1 spm, NMV F315074.

Port Phillip Bay, Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024: 1 spm, NMV F315342; 1 spm, NMV F315349; 1 spm, NMV F315350.

Diagnosis. *Eulalia dinraal* sp. nov. is similar to *Eulalia australiensis* Hartmann-Schröder, 1987 in that some specimens of both species have additional irregular pigment patches lateral to the eyes. However the two species differ in prostomial structures: *E. australiensis* has a pharynx with diffuse micropapillae widely spaced (Fig. 6A) while *E. dinraal* sp. nov. has much larger, longer papillae, densely arranged on the pharynx (Fig. 7C). We were concerned that this may be due to preservation artefacts but it is not: the holotype of *E. dinraal* sp. nov. in Fig. 7C was a narcotised live specimen which after fixation retracted the pharynx but we dissected the preserved specimen and the long densely-arranged papillae are still evident. Arguably the dense arrangement of pharyngeal papillae in *E. dinraal* sp. nov. compared with the very sparse arrangement visible in the holotype of *E. australiensis* is due to the more inflated pharynx in the *E. australiensis* specimen. However, it is difficult for us to understand how the long prominent papillae in all our specimens of *E. dinraal* sp. nov. could be consistent with the much smaller low micropapillae of *E. australiensis*. Nor are the differences due to size-related variation — both specimens are similar, a little less than 2 mm in width excluding parapodia.

Eulalia dinraal sp. nov. and *E. australiensis* also differ in the location of the eyes which are more widely separated relative to prostomium width in *E. australiensis* (the ratio prostomium width:eye separation is 1.8 in *Eulalia australiensis* compared with 2.4-3.2 in *Eulalia dinraal* sp.

nov. Also, the ventral cirri of median segments are shorter than the neuropodium in *Eulalia australiensis* but the ventral cirri extend to similar length to the neuropodium in *Eulalia dinraal* sp. nov.

In some specimens, prostomial appendages and tentacular cirri are shorter and thicker (Fig. 7H-I). This does not appear due to maturity, as these specimens can be as long or longer than specimens which exhibit the typical body form.

Description. Holotype 94 segments, 0.7 mm wide (1.1mm including parapodia), 20.8mm long (Fig. 7A). Pigmentation pattern in life bright yellow bands dorsally from anterior to posterior segments, connecting parapodia across each segment; faintly visible on segment 1, increasing gradually in saturation until segment 10 with maximum vibrance onwards; interstitial spaces between yellow lateral bands translucent or pale blue; yellow banding on ventral side, much fainter; eyes superficial, dark red (Fig. 7A-B). Bright yellow pigmentation also extends to papillae on proboscis, from middle to distal end (Fig. 7C). Preserved specimen brown-orange with dense darker brown speckling in faint lateral bands dorsally from anterior to posterior segments, also present on tentacular cirri and dorsal cirri; dorsal cirri dark brown-purple; eyes dull purple (Fig. 7D). Pharynx undivided with densely distributed micropapillae (Fig. 7C). Prostomium 1.7 times wider than long (1.6 times in life). Paired antennae widest basally, tapering evenly to tip; length equal to that of prostomium (1.3 times prostomium length in life), longer than palps. Palps widest at base, tapering evenly to tip. Prostomial protuberance well defined. Median antenna location slightly anterior to level of eyes (Fig. 7E). Median antenna 1.1 times length of prostomium, 1.2 times length of paired antennae. Anterior three segments all distinct, segment 1 visible dorsally. Segment 1 tentacular cirri reaching segment 6, (4 in life), segment 2 dorsal cirri reaching segment 13 (9 in life). Ventral tentacular cirri of segment 2 flattened, reaching segment 5 (4 in life). Segment 3 dorsal cirri reaching segment 13 (9 in life). Dorsal cirri of median segments elongate, 2.7 times longer than wide (no data for live specimen), asymmetrical, with pointed tip; neuropodium of median segments with separate dorsal and ventral prechaetal lobes, dorsal lobe rounded, wider but similar in shape to ventral lobe; ventral cirri horizontally oriented, 1.5 times longer than wide, about as long as neuropodium, tip rounded (Fig. 7F).

Chaetae described from paratype NMV F314888. Rostrum of chaetal shaft with many teeth, longer than wide, decreasing substantially in size proximally; blade slightly serrated (Fig. 7G).

Variation (from paratypes). Size range 0.5-0.9 mm wide, 7.8-35.8 mm long, 54-147 segments. Preserved specimens light brown to darker brown-dull orange, pink, or purple; dense dark brown speckling from anterior to posterior, with the same dense small spotting seen

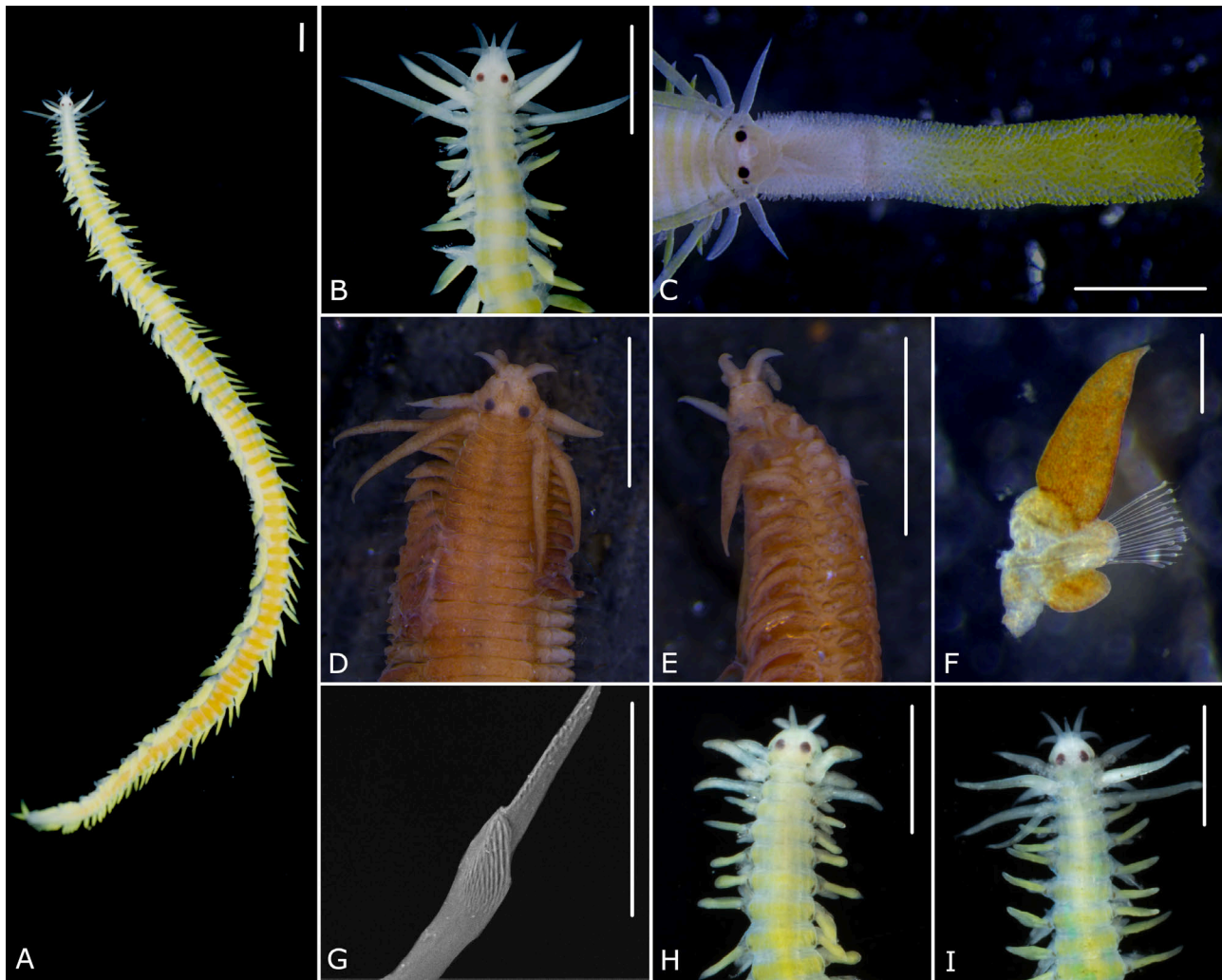


Figure 7. *Eulalia dinraal* sp. nov.; A-F, holotype (NMV F315346); G, paratype (NMV F314888); H, paratype (NMV F315065); I, paratype (NMV F315069). A, whole animal, dorsal view, live; B, close-up of prostomium, dorsal view, live; C, everted pharynx, dorsal view, live; D, close-up of prostomium, dorsal view, preserved; E, close-up of prostomium, lateral view, preserved; F, parapodium of median segment, preserved; G, articulation of chaetae; H, close-up prostomium, dorsal view, live, variant form; I, close-up of prostomium, dorsal view, live, variant form. Scale lines: A-E, H, I, 1.0mm; F, 0.25mm; G, 0.02mm.

on cirri. More visible on lighter coloured specimens. In live specimens, yellow banding may appear only faintly from segments 1 to 10 before reaching full vibrance or may be immediately vibrant from segment 1 onwards. In some cases, dark brown spots visible in small, neat groupings at both ends of the yellow band on each segment. Eggs, when present, are bright blue-green and highly visible throughout body of worm. Median antenna located variable distance between posterior and anterior of prostomium; 0.7-1.3 times length of prostomium. Segment 1 tentacular cirri reaching about segment 5-6 (4-6 in life), segment 2-4 for outliers (2-4 in life). Segment 2 dorsal cirri reaching about segment 11-13 (7-10 in life), segment 5-9 for outliers (5-6 in life). Ventral tentacular cirri of segment 2 flattened, reaching segment 4-5 (4-5 in life), segment 2-3 for outliers (3-4 in life). Segment 3 with dorsal cirri; dorsal tentacular cirri reaching segment typically 10-13 (9-10 in life), 6-9 in two outliers (6-7 in life). Pygidial cirri long, widest at base and tapering, longer than wide; as long as last 3-9 segments (measured from live specimens).

Morphometric data - Tentacular cirrus segment 1: paired antenna length 0.8-3.1 (0.8-2.4 in preserved specimens; 0.9-3.1 in live specimens). Dorsal tentacular cirrus segment 2: paired antenna length 1.8-6.9 (1.9-4.5 in preserved specimens, 1.8-6.9 in live specimens). Prostomium width: length 1.4-1.9 (1.3-2.2 on live specimens). Prostomium width: paired antenna length 1.5-2.8 (1.1-2.1 in live specimens). Prostomium length: paired antenna length 0.7-1.7 (0.9-1.7 in preserved specimens, 0.7-1.3 in live specimens). Palp: paired antenna length 0.5-1.1 (0.6-1.0 in live specimens). Median antenna: paired antenna length 0.8-1.5. Segment number: body width 58-333 (for live specimens, 60-234 in preserved specimens). Segment number: body length 2.8-8.6 (in live and preserved specimens). Body width-parapodia: body width 1.3-1.9 (in live specimens 1.3-1.7 in preserved specimens). Prostomium width: eye separation 2.4-3.2 (1.6-2.2 in live specimens). Dorsal cirrus length: dorsal cirrus width 1.7-3.0 (no data for live specimens). Ventral cirrus: dorsal cirrus length 0.3-0.5 (no data for live specimens). Parapodium: ventral cirrus

length 0.8-1.4 (no data for live specimens). Ventral cirrus length: ventral cirrus width 1.3-1.9 (no data for live specimens).

Distribution & habitat. South-eastern Australia on the eastern side of Port Phillip Bay from Brighton to Martha Cove, as well as Walkerville and Birdrock (Fig.1), intertidal within *Galeolaria*, *Pyura*, *Ulva* and mussels.

Etymology. The species name 'dinraal', used as singular noun is apposition, is derived from a fictional character from the video game *Zelda: Breath of the Wild*. This character is one of three wyrm-like dragon spirits bearing a resemblance to a phyllodocid worm.

Remarks. For discussion of genetic data, see the Diagnosis for *Eulalia farosh* sp. nov., below.

Eulalia australiensis was collected from exposed rocky habitat on the coast of Bass Strait, while our *E. dinraal* specimens are all from sheltered environments on the shores of Port Phillip Bay.

Eulalia farosh sp. nov.

urn:lsid:zoobank.org:act:B59EF2DC-4821-4CBB-A49F-F51AC5FE3274

Material examined.

Holotype. Australia, Victoria, Port Phillip Bay, Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024, NMV F315347.

Paratypes. Port Phillip Bay: Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024, 1 spm, NMV F315348.

Port Phillip Bay: Westgate Bridge, Yarra River/Hobsons Bay (MARINV 148), -37.8333°, 144.9°, coll. Wilson, R S.; Walker-Smith, G K.; MacIntosh, H; Norman, M D, intertidal, 24/02/2016, 1 spm, NMV F169530.

Port Phillip Bay: Black Rock jetty (MRG 10022), -37.969259°, 145.009968°, coll. Falconer, A & Altoff, L, intertidal, 22/09/2021, 1 spm, NMV F311112; 1 spm, NMV F311113; 1 spm, NMV F311114; 1 spm, NMV F311115.

Port Phillip Bay: Brighton, North Road Boat Ramp (MRG 908), -37.898332°, 144.984701°, coll. Marine Research Group of FNCV, Falconer, A & Altoff, L, intertidal, 30/03/2024: 1 spm, NMV F315062; 1 spm, NMV F315068; 1 spm, NMV F315073.

Port Phillip Bay: Jawbone Marine Sanctuary (MRG 910), -37.866093°, 144.881242°, coll. Marine Research Group of FNCV, intertidal, 13/04/2024, 1 spm, NMV F315067.

Diagnosis. Among Australian species of *Eulalia*, *Eulalia farosh* sp.nov. is most similar to *Eulalia dinraal* sp.nov. in that both species have the ventral cirrus about as long as the neuropodium. The two new species described here differ morphologically most obviously due to the shape of the dorsal cirri, which are widest at the base and almost triangular and symmetrical in *E. dinraal* sp.nov. whereas in *E. farosh* sp.nov. the dorsal cirri are more classically leaf-shaped widest sub-basally and asymmetrical. Analysis of genetic data for COI shows 17.4% net pairwise divergence between *E. farosh* sp. nov.

and *E. dinraal* sp. nov., and 17.5% between *E. farosh* sp. nov. and single *E. aurea* sequence.

Description. Holotype 127 segments, 0.8 mm wide (1.4 mm including parapodia), 35.0 mm long (Fig. 8A). Pigmentation pattern in life bright yellowish green bands from anterior to posterior segments, connecting parapodia across each segment; intersegmental regions between and tentacular cirri faint yellow or else unpigmented; eyes superficial, dark red (Fig. 8B); yellow banding on ventral side, fainter than dorsal; pigmentation also extends to papillae on proboscis (Fig. 8C). Preserved specimen dark brown-dull orange; dense darker brown speckling in faint lateral bands dorsally from anterior to posterior segments, also present on tentacular cirri and dorsal cirri; eyes dull purple (Fig. 8D-E). Pharynx undivided with densely distributed micropapillae (Fig. 8C). Prostomium two times as wide as long. Paired antennae widest basally, tapering evenly to tip; length 1.6 times length of prostomium (1.5 in life), longer than palps. Palps widest at base, tapering evenly to tip. Prostomial protuberance well defined (Fig. 8E). Median antenna located slightly anterior to level of eyes, 1.3 times length of prostomium, 0.8 times length of paired antennae (Fig. 8B, D). Anterior three segments all distinct, segment 1 visible dorsally. Segment 1 tentacular cirri reaching segment 7, (5 in life), segment 2 dorsal cirri reaching segment 13 (9 in life); ventral tentacular cirri of segment 2 flattened, reaching segment 7 (5 in life); segment 3 dorsal cirri reaching segment 13 (9 in life).

Dorsal cirri of median segments elongate, 1.9 times longer than wide, asymmetrical, with pointed tip; neuropodium of median segments with separate dorsal and ventral prechaetal lobes, dorsal lobe rounded and similar in shape to ventral lobe; ventral cirri horizontally oriented, 1.8 times longer than wide, about as long as neuropodium, tips rounded (Fig. 8F). Rostrum of chaetal shaft with many teeth, longer than wide, decreasing substantially in size proximally; blade slightly serrated (Fig. 8G).

Variation (from paratypes). Size range 0.4-1.2 mm wide, 13.5-70.7 mm long, 72-229 segments. In some cases, sparse to dense dark brown speckling from anterior to posterior, with the same brown pigmentation speckles on dorsal cirri, more visible on lighter coloured specimens. Segment 1 tentacular cirri reaching about segment 7-9 (7-9 on preserved specimens, 5-6 when measured live). Segment 2 dorsal cirri reaching about segment 10-11 (7-8 on live specimens). Segment 3 dorsal tentacular cirri reaching segment 10-11 (9-10 on live specimens). Pygidial cirri long, widest at base and tapering, longer than wide; as long as last 7-10 segments (measured from live specimens).

Morphometric data- Tentacular cirrus segment 1: paired antenna length 1.6-3.3 (1.6-2.3 on live specimens). Dorsal tentacular cirrus segment 2: paired antenna length 2.6-5.7 (2.8-3.8 on live specimens). Prostomium width:

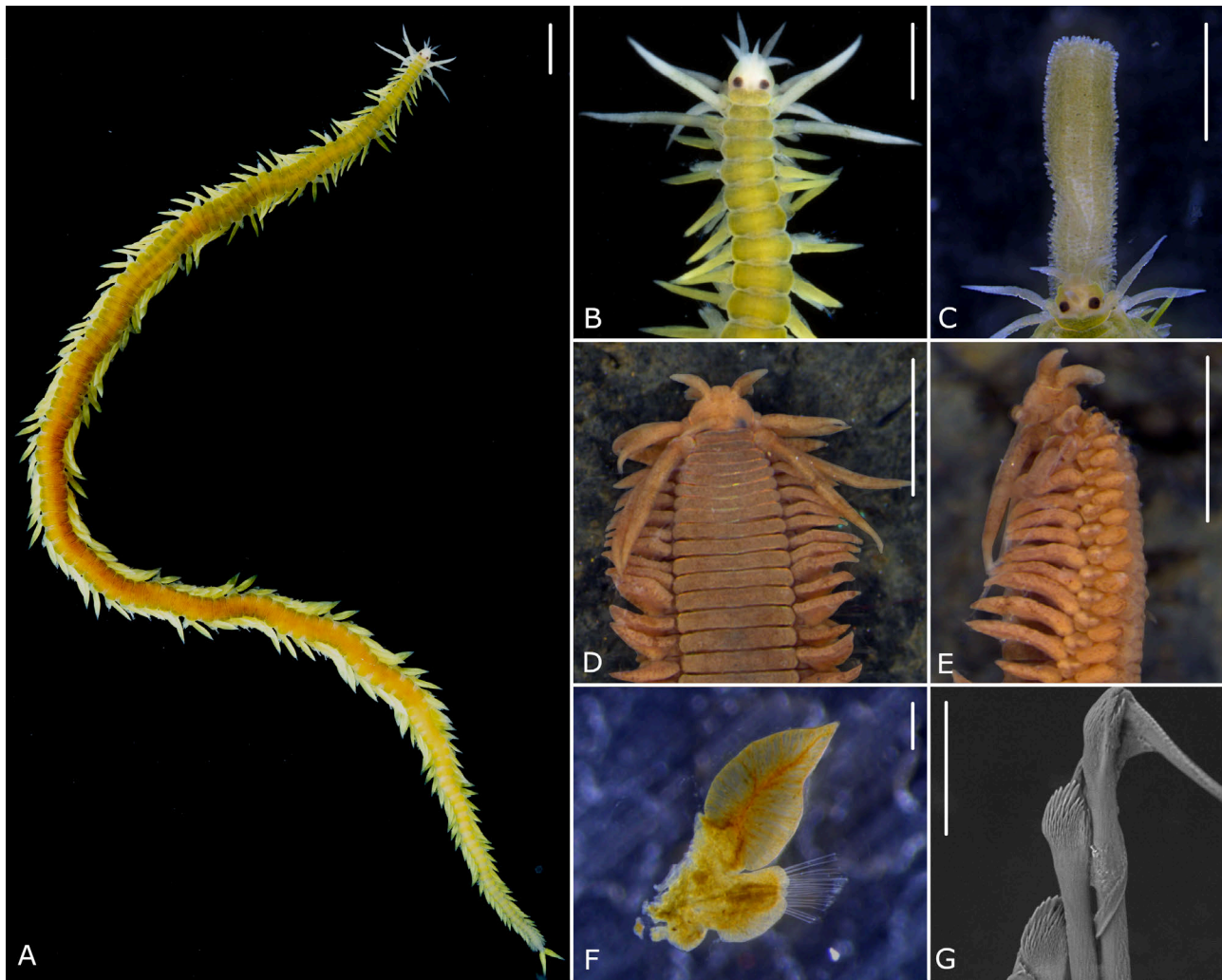


Figure 8. *Eulalia farosh* sp. nov.; A-G, holotype (NMV F315347). A, whole animal, dorsal view, live; B, close-up of prostomium, dorsal view, live; C, everted pharynx, dorsal view, live; D, close-up of prostomium, dorsal view, preserved; E, close-up of prostomium, lateral view, preserved; F, parapodium of median segment, preserved; G, articulation of chaetae. Scale lines: A-E 1.0mm; F, 0.25mm; G, 0.02mm.

length 1.5-2.4 (1.2-1.8 on live specimens). Prostomium width: paired antenna length 0.9-2.6 (1.2-2.6 on preserved specimens, 0.9-1.4 on live specimens). Prostomium length: paired antenna length 0.5-1.3 (0.7-1.0 on live specimens). Palp: paired antenna length 0.6-1.2 (0.8-1.2 on live specimens). Median antenna: paired antenna length 0.7-1.3. Segment number: body width 90-1091 (90-275 on preserved specimens; 176-1091 on live specimens). Segment number: body length 2.7-6.7 (on both live and preserved specimens). Body width-parapodia: body width 1.4-1.8 (1.4-1.7 on preserved specimens; 1.4-1.8 on live specimens). Prostomium width: eye separation 1.4-6.8 (1.5-1.9 on live specimens). Dorsal cirrus length: dorsal cirrus width 1.75-2.7 (no data for live specimens). Ventral cirrus: dorsal cirrus length 0.3-0.5 (no data for live specimens). Parapodium: ventral cirrus length 0.6-1.3 (no data for live specimens). Ventral cirrus length: ventral cirrus width 1.5-2.0.

Distribution & habitat. South-eastern Australia within Port Phillip Bay in marine intertidal zones from Williamstown to Martha Cove, as well as brackish water

near the Yarra River mouth (Fig.1), in colonies of *Galeolaria* and *Pyura*.

Etymology. The species name 'farosh', used as singular noun is apposition, is derived from a fictional character from the video game *Zelda: Breath of the Wild*; this is one of three wyrm-like dragon spirits bearing a resemblance to a phyllodocid worm.

Eumida Malmgren, 1865

Type species *Eulalia sanguinea* Örsted, 1843 by monotypy.

Description. Eyes present or absent, superficial. One pair of palps, one pair of anterior paired antennae, antennae widest basally, tapering to tip. Prostomial protuberance well defined. Median antenna present; located near eyes.

Pharynx undivided, variable: usually with sparsely distributed conical micropapillae, rarely micropapillae absent, macropapillae present in some species or in juveniles of species lacking them as adults (Eibye-Jacobsen, 1991). Papillae forming the terminal ring usually

with one to three rows of micropapillae on each terminal papilla.

Segment 1 reduced, not visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium. Segment 2 with dorsal and ventral tentacular cirri, ventral tentacular cirri of segment 2 circular in cross-section, or flattened. Segment 3 with dorsal cirri; ventral cirri present. Chaetae first present on segment 2.

Neuropodium of median segments with separate dorsal and ventral prechaetal lobes. Ventral cirri of median segments horizontally oriented.

Pygidial papilla present, or absent, pygidial cirri long and tapering to fine tips or shorter with somewhat blunt tips. (Based on Pleijel, 1991 and Eibye-Jacobsen, 1991).

Remarks. Ornamentation of the pharynx in *Eumida* species is variable, not assisted by poorly-defined use of the terms micropapillae and macropapillae in some species descriptions. We follow Eibye-Jacobsen (1991) and consider macropapillae as those 10–20 µm in diameter and micropapillae as those 40–60 µm in diameter. In practical terms, macropapillae are large enough that they could (potentially) have micropapillae on them; so far as is known this does not occur on the trunk of the pharynx in any *Eumida* species but the presence of two or more longitudinal rows of micropapillae on each terminal papilla (=oral papilla) is part of the generic definition Eibye-Jacobsen (1991). San Martín et al. (2021) showed that *Eumida* is polyphyletic and includes several morphologically distinct clades of benthic species as well as the holopelagic Alciopini, thus the variability in pharynx morphology noted in some *Eumida* species by Eibye-Jacobsen (1991) and in this study is not surprising. A further example is an OTU tentatively referred to *Eumida* by Georgieva et al. (2023): *Eumida* cf. *longicirrata* Hartmann-Schröder, 1975 which has about 40 filiform terminal papillae which taper to a point, violating the generic definition of *Eumida*. Georgieva et al. (2023) found: *Eumida* cf. *longicirrata* to be sister to *Sige*, forming a clade with *Eumida*. A revision of this group will undoubtedly result in circumscription of *Eumida* and description or revision of several other genera.

The genus *Eumida* includes 40 species (Read and Fauchald, 2026). The Australian Faunal Directory (Hutchings and Yerman, 2023) records five species of *Eumida* from Australia but two of these are not accepted here: *Eumida strigata* Ehlers, 1901 (described from Tierra del Fuego) was recorded from Western Australia by Augener (1913) but these small and poorly-described specimens were re-identified as *Eumida subulifera* (Ehlers, 1897) by Eibye-Jacobsen (1991: 118–121). Given the high level of cryptic diversity now known to occur in phyllococids generally and in *Eumida* in particular (Teixeira et al., 2022), and given the lack of detailed morphological comparative data across the range attributed to *Eumida subulifera* (type locality: Strait of Magellan, also

recorded from Palmer Peninsula, Antarctica and. Kerguelen) we do not accept the record of *E. subulifera* due to Augener, 1913 and consider these specimens belong to an unidentified species *Eumida* cf. *subulifera*. The remaining specimens attributed to *E. subulifera* from Australia are those previously published as *Eumida* (*Sige*) *dorsolobata* Hartmann-Schröder, 1987 but that species was transferred to *Clavadoce* by Wilson and Greaves (2016). Australian records attributed to *Eumida sanguinea* (Örsted, 1843) by Hartmann-Schröder (1979, 1981), Hutchings & Rainer (1979) and Hutchings & Murray (1984) were re-examined by Eibye-Jacobsen (1991) and found to belong to either *E. fuscoculata* Eibye-Jacobsen, 1991 or *E. hawkesburyensis* Eibye-Jacobsen, 1991. Thus three species of *Eumida* are now accepted to occur in Australia, all described in the generic revision by Eibye-Jacobsen (1991): *E. fuscoculata* Eibye-Jacobsen, 1991, *E. hawkesburyensis* Eibye-Jacobsen, 1991 and *E. trifasciata* Eibye-Jacobsen, 1991. Here we add a fourth described species, *Eumida frampt* sp. nov. to the Australian fauna. A further species, currently unnamed, was recorded by Georgieva et al. (2023) from bathyal depths on a whale carcass off eastern Australia: *Eumida* cf. *longicirrata* Hartmann-Schröder, 1975; this undescribed taxon and all Australian species of *Eumida* can be distinguished using the key to Australian species of Phyllococidae provided herein.

Eumida frampt sp. nov.

urn:lsid:zoobank.org:act:884B2966-0097-4707-BA07-672CBB7B0B96

Material examined.

Holotype. Australia, Victoria, Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024, NMV F315341.

Paratypes. Port Phillip Bay, Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024: 1 spm, NMV F315343; 1 spm, NMV F315352.

Western Port: Stony Point (MRG 887), -38.37468°, 145.22208°, coll. Marine Research Group of FNCV, intertidal, 23/04/2022, 1 spm, NMV F311125.

Diagnosis. *Eumida frampt* sp. nov. can be separated from the other Australian species of *Eumida* by the position of the median antenna, which is closer to the paired antennae than in the other species, the proportions of the dorsal cirri (length:width 1.5–1.8 in *E. frampt* sp. nov. compared with ~1 in *E. hawkesburyensis*, 1.7–2.5 in both forms of *E. fuscoculata* and ~1.3 in *E. trifasciata*). Segment 2 dorsal cirri are longer (extend back to segments 6–8 in *E. frampt* sp. nov. compared with 5 in *E. hawkesburyensis* and 6–7 in both forms of *E. fuscoculata*) while segment 2 dorsal cirri are shorter (reaching segments 8–9 in *E. frampt* sp. nov. compared with 8 in *E. hawkesburyensis* and 10–17 in both forms of *E. fuscoculata*).

Description. Holotype 91 segments, 0.8 mm wide (1.5 mm including parapodia), 37.5 mm long (Fig. 9A). Pigmentation pattern in life dark blue-green bands dorsally



Figure 9. *Eumida frampt* sp. nov.; A-G, holotype (NMV F315341). A, whole animal, dorsal view, live; B, close-up of prostomium, dorsal view, live; C, everted pharynx, dorsal view, live; D, close-up of prostomium, dorsal view, preserved; E, close-up of prostomium, lateral view, preserved; F, parapodium of median segment, preserved; G, articulation of chaetae. Scale lines: A-E 1.0mm; F, 0.25mm; G, 0.02mm.

from anterior to posterior segments, immediately visible from segment 1; dark blue-green also visible on prostomium between eyes, encircling median antenna; inter-segmental regions on dorsal side pale to deep yellow, emerging from behind prostomium as a longitudinal streak restricted to the middle of the body before expanding to encompass the space from parapodia to parapodia around median segments; dorsal cirri and tentacular cirri pale blue; eyes superficial, dark red (Fig. 9A-B). Preserved specimen pale brown to off white, with dense darker brown speckling in faint lateral bands dorsally from anterior to posterior segments, also present on prostomium, tentacular cirri, dorsal and ventral cirri; eyes dull purple (Fig. 9D).

Pharynx undivided with sparsely distributed micropapillae. Terminal ring of pharynx with a ring of papillae; comprising 18 papillae (Fig. 9C). Prostomium wider than long, 2.6 times longer than width (2.3 times in life). Paired antennae consistent width from basal end, tapering sharply at tip; 1.3 times length of prostomium (1.2 in life), longer than palps. Palps consistent width from

basal end, tapering sharply at tip. Prostomial protuberance well defined. Median antenna location closest to eyes (closest to paired antennae in life) (Fig. 9B, D-E). Median antenna 1.4 times length of prostomium, 1.1 times length of paired antennae. Anterior three segments include at least two fused or reduced segments. Segment 1 not visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium from the first visible segment after the prostomium. Segment 1 tentacular cirri reaching segment 6, (5 in life), segment 2 dorsal cirri reaching segment 9 (8 in life). Ventral tentacular cirri of segment 2 flattened, reaching segment 6 (5 in life). Segment 3 dorsal cirri reaching segment 10 (9 in life).

Dorsal cirri of median segments elongate, 1.7 times longer than maximum width; large, prominent and longer than neuropodial lobe; ovate, but slightly elongated with a rounded tip; asymmetrical, neuropodium of median segments with separate dorsal and ventral prechaetal lobes, with dorsal lobe expanded, longer and wider than ventral lobe; ventral cirri of median seg-

ments horizontally oriented; 2 times longer than wide; shorter than neuropodium; tip rounded (Fig. 9F). Rostrum of chaetal shaft with large number of pointed teeth, longer than wide, decreasing slightly in size proximally; blade slightly serrated (Fig. 9G).

Variation (from paratypes). Size range 0.6-1.0 mm wide, 14.5-37.5 mm long, 64-91 segments. Preserved specimen pale brown to tan in colour. Subtle darker brown lateral banding may be visible on each segment. Banding may also appear more as sparse to dense darker brown speckling, which extend to dorsal cirri. Speckling may also be present on prostomium. In live specimens, blue-green bands may also be faint, with intersegmental regions forming narrow unpigmented bands.

Median antenna located closest to paired antennae, closest to eyes, or about equal distance between posterior and anterior of prostomium; 0.8-1.4 times length of prostomium. Segment 1 tentacular cirri reaching about segment 6-8. Segment 2 dorsal tentacular cirri reaching about segment 8-9. Ventral tentacular cirri of segment 2 reaching segment 5-6. Segment 3 dorsal tentacular cirri reaching segment 8-9.

Neuropodium of median segments with dorsal lobe slightly longer than ventral lobe, or expanded, longer and wider than ventral lobe. Neurochaetae 20-31 per parapodium. Pygidial cirri long, widest at base and tapering, much longer than wide; length/width ratio 8-12; as long as last 8-14 segments (measured from live specimens).

Morphometric data- Tentacular cirrus segment 1: paired antenna length 0.6-2.7 (1.4-2.2 when preserved, 0.6-2.7 when live). Dorsal tentacular cirrus segment 2: paired antenna length 0.8-4.0 (3.2-4.0 when preserved, 0.8-3.3 when live). Prostomium width: paired antenna length 0.9-2.2 (1.9-2.2 when preserved, 0.9-1.4 when live). Prostomium length: paired antenna length 0.8-1.3 (0.8-1.3 when preserved, 0.8-0.9 when live). Palp: paired antenna length 0.7-0.9 (0.8 when preserved, 0.7-0.9 when live). Median antenna: paired antenna length 1.1-1.4. Segment number: body width 85.9-226.4 (85.9-112.3 when preserved, 93.0-226.4 when live). Segment number: body length 2.4-5.8 (both in live and preserved specimens). Body width-parapodia: body width 1.2-1.8 (1.2-1.8 when preserved, 1.4-1.7 when live). Prostomium width: eye separation 1.5-1.7 (1.5-1.7 when preserved, 1.6-1.8 when live). Dorsal cirrus length: dorsal cirrus width 1.5-1.8 (1.5-1.7 when live). Ventral cirrus: dorsal cirrus length 0.5-0.6 (no data when live). Parapodium: ventral cirrus length 1.0-1.2 (no data when live). Ventral cirrus length: ventral cirrus width 1.8-2.0.

Distribution & habitat. South-eastern Australia from Port Phillip Bay, Martha Cove and Westernport, Stony Point (Fig.1), intertidal among oysters, *Caulerpa* spp. and *Galeolaria*.

Etymology. The species name 'frampt', used as singular noun is apposition, is derived from a fictional worm-like character bearing a resemblance to a phyllodocid worm from the video game series Dark Souls.

Remarks. As discussed above (see Remarks for the genus *Eumida*) we accept three other species of *Eumida* in the Australian fauna, with *Eumida fuscocolata* encompassing sufficient morphological variability to suspect the presence of additional species.

Eumida cf. *fuscocolata* sp. "macropapillae pharynx"

Eumida fuscocolata Elbye-Jacobsen, 1991: 101-104, fig. 4A-F (in part).

Material examined.

Victoria: Mutton Bird Island, near Port Campbell (WV 3), -38.6485°, 143.0628333°, coll. O'Hara, T D, 3.5 m, 18/05/1998, 1 spm, NMV F90775; Point Hicks: 200 m offshore of Point Hicks, near "The Whaleback" [rock], 200 m east of point (VNPMS 76), -37.8013333°, 149.289°, coll. O'Hara, TD & Heislars, SP, 7 m, 26/03/1996, 1 spm, NMV F90778.

Description. Size range 0.7-1.1 mm wide, 14.9-15.7mm long, 78-98 segments. Pigmentation pattern preserved specimen pinkish, yellowish or light brown to tan in colour, with subtle darker brown lateral banding on each segment. Banding may also appear more as sparse darker brown speckling, which extend to dorsal cirri. Speckling may also be present on prostomium. Eyes present. Eyes superficial; dull purple; based on preserved specimen only. Prostomium wider than long; proportions may be skewed due to pharynx eversion. Paired antennae widest basally, tapering evenly to tip; length longer than palps; based on very limited data. Palp form widest at base, tapering to tip. Prostomial protuberance well defined. Nuchal organs dorsal outgrowths on prostomium. Median antenna present; closest to eyes; 0.7 times length of prostomium; shorter than paired antennae (Fig. 10A).

Pharynx undivided. Trunk with micropapillae; papillae with rounded tips; densely distributed (trunk of pharynx barely visible); increasing in size distally. Pharynx terminally with a ring of papillae; comprising 18 papillae (Fig. 10A-B).

Anterior three segments include at least two fused or reduced segments (i.e. at least one segment apparently with three pairs of tentacular cirri). Segment 1 not visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium from the first visible segment after the prostomium; tentacular cirri reaching about segment 6. Segment 2 dorsal cirri reaching about segment 10-12. Ventral tentacular cirri of segment 2 flattened; reaching segment 5-7. Segment 3 with dorsal cirri; dorsal tentacular cirri reaching segment 10-15; ventral cirri present.

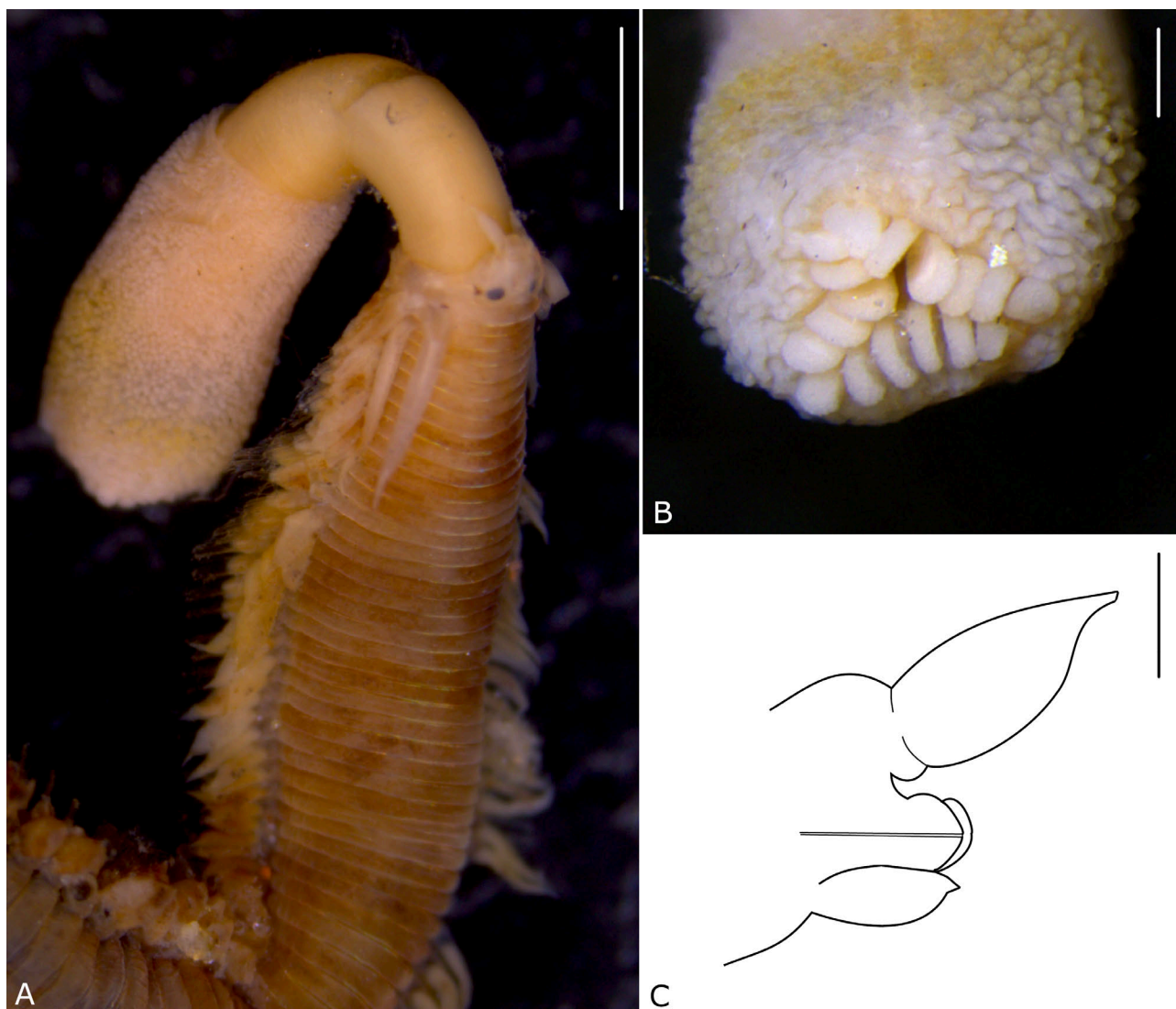


Figure 10. *Eumida fuscocolata* sp. "micropapillae-pharynx"; A-C, (NMV F90778). A, body and pharynx, dorsal view, preserved; B, distal end of pharynx, preserved; C, parapodium of median segment. Scales lines: A, 1.0mm; B-C, 0.25mm.

Dorsal cirri of median segments elongate, longer than maximum width; large, prominent and longer than neuropodial lobe; ovoid or lanceolate, with a pointed or rounded tip. Dorsal cirri of median segments asymmetrical.

Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe rounded and similar in shape to ventral lobe. Ventral cirri of median segments horizontally oriented; longer than wide; about as long as neuropodium; tips rounded (Fig. 10C). Neurochaetae 13-15 per parapodium.

Morphometric data– Tentacular cirrus segment 1: paired antenna length 1.8. Dorsal tentacular cirrus segment 2: paired antenna length 3.8. Prostomium width: paired antenna length 2.1. Prostomium length: paired antenna length 1.2. Palp: paired antenna length 0.7. Median antenna: paired antenna length 0.9. Segment number: body width 69-142. Segment number: body length 5.2-6.2. Body width-parapodia: body width 1.4-1.5. Prostomium width: eye separation 1.8-2.0. Dorsal cirrus

length: dorsal cirrus width 1.7-2.5. Ventral cirrus: dorsal cirrus length 0.4-0.5. Parapodium: ventral cirrus length 1-1.9. Ventral cirrus length: ventral cirrus width 1.6-2.1.

Distribution & habitat. South-eastern Australia, Bass Strait, 3.5-7 m.

Remarks. *Eumida fuscocolata* Eibye-Jacobsen, 1991, is originally described as having "Proboscis smooth, with 6 more or less well defined broad rows of micropapillae along longitudinal muscle bands. 15-17 (rarely up to 21) oral papillae, each with 2-3 longitudinal rows of micropapillae" (Eibye-Jacobsen, 1991: 103). However, the holotype NMV F53954 has pharynx retracted and undissected; it is unclear which specimens were examined for the pharynx description. Many of the original specimens of Eibye-Jacobsen, 1991 have pharynx retracted and dissection would be destructive of specimens while still probably not revealing the structures accurately. Our re-examination of some of that material indicates that two forms appear to be present, the present form and one with smooth pharynx (see account

of *Eumida* cf. *fuscocolata* sp. "smooth pharynx", below) based on whether the pharynx is smooth or has macropapillae.

The pharynx of holotype of *Eumida fuscocolata* (NMV F53954) has not been examined either by Eibye-Jacobsen (1991) or by us; the specimen is small and it is much more likely that an attempt at dissection would destroy, rather than reveal, the structure of the pharynx. Other characters are not definitive, and we cannot say which of the two forms the name *Eumida fuscocolata* Eibye-Jacobsen, 1991 might belong to. The description of the pharynx by Eibye-Jacobsen (1991) is apparently based on paratype NMV FF90778, collected from an adjacent station several hundred metres distant on the following day; this is the specimen in Figures 10A, B.

Eumida fuscocolata was originally reported to occur widely in southern and eastern Australia and in the south-west of Western Australia from a variety of habitats and from intertidal to depths of 13 m. There are ample precedents among polychaetes for us to suspect the presence of additional unrecognised species within *Eumida fuscocolata* as originally conceived, most obviously the discovery by Nygren & Pleijel (2011) and Teixeira et al. (2022) of numerous cryptic lineages in European waters within what is now known as the *Eumida sanguinea* species complex. It is unsurprising that the same might be the case in *E. fuscocolata* in Australia, however confirmation that the variability in pharynx does represent distinct species would require new collections of specimens suitable for molecular study, live photography and morphometric analysis from a representative geographic and ecological range. Such a study is beyond our resources, however it does seem useful to show that "*E. fuscocolata*" in Australia seemingly includes additional species and, to document at least two of those forms with preliminary descriptions. Aside from the conspicuously different pharynx morphology described here, our preliminary observations indicate that *E. cf. fuscocolata* sp. "macropapillae pharynx" may also differ from *E. cf. fuscocolata* sp. "smooth pharynx" in the shape of the dorsal cirri, in having relatively shorter median antenna and fewer neurochaetae. However, we are unwilling to present preliminary morphometric data based on only a few specimens.

The implications of presence of pharyngeal macropapillae in some species of *Eumida* are discussed above in the Remarks of the generic account of *Eumida*.

***Eumida* cf. *fuscocolata* sp. "smooth pharynx"**

Eumida fuscocolata Eibye-Jacobsen, 1991: 101-104, fig. 4A-F (in part).

Material examined.

Australia, Tasmania, Just south of Bicheno, -41.8667°, 148.3°, coll. Smith, B J, intertidal, 21/11/1968, 1 spm, NMV F53880.

Victoria, Reef Island, coll. Gunn, SW, intertidal, 27/04/1974, 1 spm, NMV F53883; Port Phillip Bay, Point Wilson, -37.95°, 147.7°, coll. Melbourne Metropolitan Board of Works, intertidal, 1 spm, NMV F53960.

Description. Size range: 0.9-1.6 mm wide, 18-33 mm long, 71-92 segments. Pigmentation of preserved specimens pinkish, pale yellow or light brown to tan in colour. Either unpigmented or subtle transverse bands of dense dark speckling extending to dorsal cirri on each segment may be visible, also on prostomium. Eyes present. Eyes superficial; dull purple; based on preserved specimen only. Prostomium wider than long; prostomium proportions may be skewed due to pharynx eversion. Paired antennae widest basally, tapering evenly to tip; length about as long as palps; based on very limited data. Palp form widest at base, tapering to tip. Prostomial protuberance well defined. Nuchal organs dorsal outgrowths on prostomium. Median antenna present; closest to eyes; 0.5-0.9 times length of prostomium; about as long as paired antennae, or longer than paired antennae (Fig. 11A-B). Pharynx undivided. Trunk bare of papillae. Pharynx terminally with a ring of papillae; comprising 17 papillae (Fig. 11A).

Anterior three segments include at least two fused or reduced segments (i.e. at least one segment apparently with three pairs of tentacular cirri). Segment 1 not visible dorsally; with one pair of tentacular cirri arising immediately posterior to prostomium from the first visible segment after the prostomium; tentacular cirri reaching about segment 7. Segment 2 dorsal cirri reaching about segment 11-17. Ventral tentacular cirri of segment 2 flattened; reaching segment 6-7. Segment 3 dorsal tentacular cirri reaching segment 11-17; ventral cirri present.

Dorsal cirri of median segments elongate, longer than maximum width; large, prominent and longer than neuropodial lobe; ovoid or lanceolate, with a pointed or rounded tip. Dorsal cirri of median segments asymmetrical. Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe rounded and similar in shape to ventral lobe. Ventral cirri of median segments horizontally oriented; longer than wide; about as long as neuropodium; tips rounded, or pointed (Fig. 11C). Neurochaetae 15-26 per parapodium.

Morphometric data- Tentacular cirrus segment 1: paired antenna length 1.9-2.1. Dorsal tentacular cirrus segment 2: paired antenna length 4.1-4.2. Prostomium width: paired antenna length 1.6-2.6. Prostomium length: paired antenna length 0.4-1.1. Palp: paired antenna length 0.9-1.1. Median antenna: paired antenna length 0.9-1.2. Segment number: body width 52.5-79.8. Segment number: body length 2.5-3.9. Body width-parapodia: body width 1.3-1.7. Prostomium width: eye separation 2.0. Dorsal cirrus length: dorsal cirrus width 1.75-2.15. Ventral cirrus: dorsal cirrus

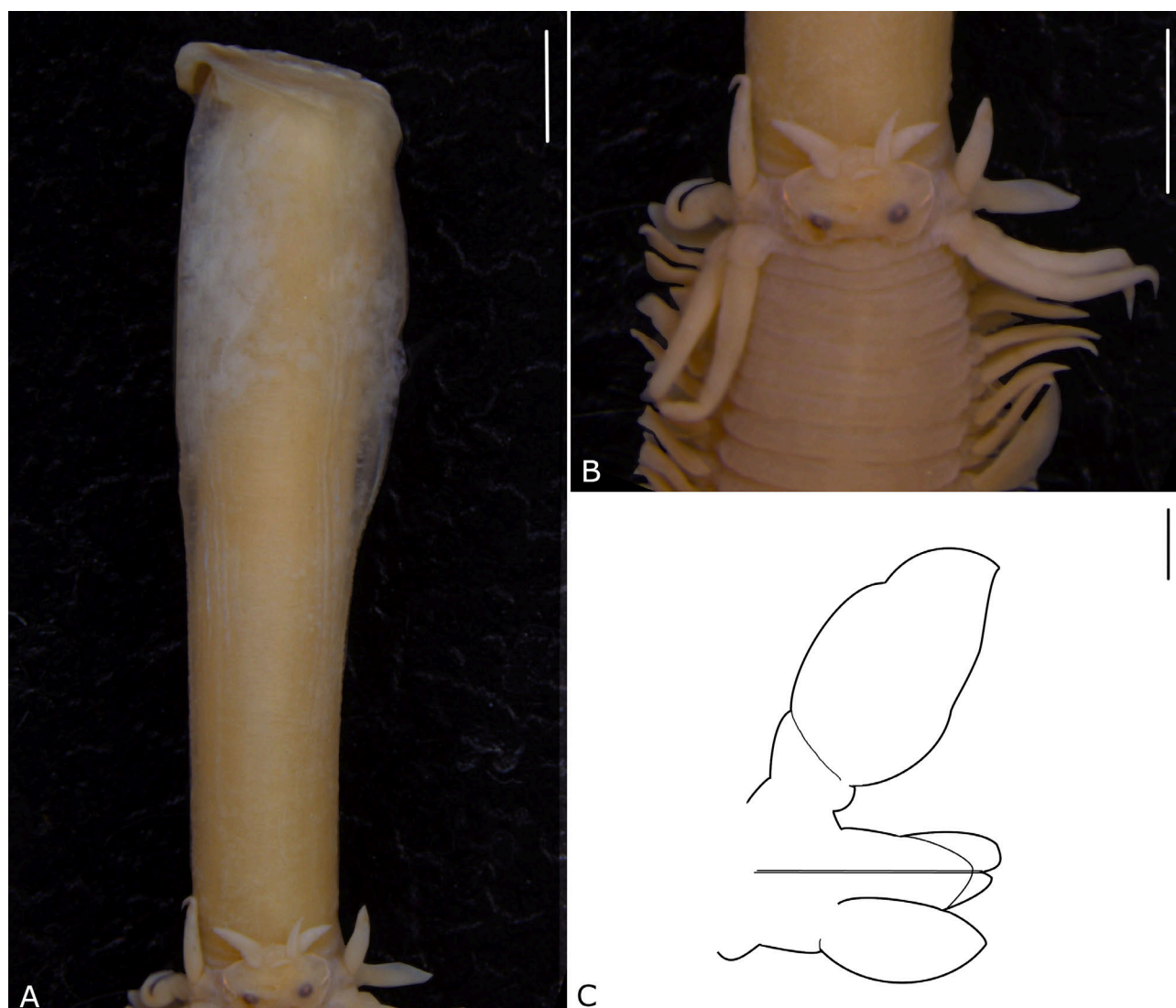


Figure 11. *Eumida fuscocolata* sp. "smooth-pharynx"; A-C, (NMV F53880). A, prostomium and pharynx, dorsal view, preserved; B, close-up of prostomium, dorsal view, preserved; C, parapodium of median segment. Scales lines: A-B, 1.0mm; C, 0.25mm.

length 0.4-0.6. Parapodium: ventral cirrus length 1.1-1.7. Ventral cirrus length: width 1.9-2.2.

Distribution & habitat. South-eastern Australia: Tasmania and Victoria, both from intertidal habitats on sheltered coasts.

Remarks. *Eumida* cf. *fuscocolata* sp."smooth pharynx" may represent an additional species within what was previously considered to be a single species widely distributed in Australia: *Eumida fuscocolata* Eibye-Jacobsen, 1991. See the Remarks above for *Eumida* cf. *fuscocolata* sp."macropapillae pharynx" for further details.

Phyllodoce Lamarck, 1818

Type species *Phyllodoce laminosa* Lamarck, 1818 (from Savigny Mss) by monotypy.

Description. Prostomium with one pair of antennae and one pair of palps, nuchal papilla in posterior incision of prostomium. Eyes usually present. Nuchal organs retractile. Proboscis divided into proximal and

distal regions, proximal region with rounded to conical papillae, in rows or irregularly distributed, distal part with six rows of tubercles or (rarely) with papillae. All anterior segments separate, first segments frequently covered by posterior part of prostomium. Chaetae first present on segments 2-4. Segmental bands of cilia present. Parapodia uni- or (rarely) biramous. Dorsal cirri symmetrical or asymmetrical, lanceolate, cordiform, rectangular or rounded, with well-developed cirrophores or without dorsal extensions. Dorsal cirri with a ciliated furrow on dorsal, posterior side. Prechaetal lobes bilobate, symmetrical, or asymmetrical. Postchaetal lobes usually rounded. Rostrum of chaetal shaft with a large number of teeth, proximally decreasing in size. Ventral cirri foliaceous, rounded, reniform or lanceolate. Pygidial cirri pointed, cylindrical or slightly flattened; median pygidial papilla usually absent. After Oliveira et al. (2021).

Remarks. Ten species of *Phyllodoce* are recorded from Australia by Hutchings & Yerman (2023). Of these, three are not accepted here and are discussed in turn:

Phyllodoce diversiantennata Hartmann-Schröder, 1986 based on the original description of the 30 segment 4.9 mm long 0.2 mm wide holotype, differs only in the proportions of the prostomium (about as long as wide rather than wider than long in *P. duplex*), slightly shorter dorsal tentacular cirri of segment 3 (reaching segment 7-8 rather than 10-11 in *P. duplex*) and the dorsal cirri which are almost symmetrical and 1.5 times as long as wide with rounded tips (rather than asymmetrical and 1.8 times as long as wide with pointed tips in *P. duplex*). However these differences are easily explained by the small size of Hartmann-Schröder's material and her figure being of a detached posterior segment dorsal cirrus. Both *P. diversiantennata* and *P. duplex* have a distinct dark spot on each dorsal cirrus not seen in any other Australian *Phyllodoce* species (R. Wilson pers. obs. of *P. duplex* Holotype NHMUK 1885.12.1.130A; "Dorsalcirren mit je einem Fleck" (from description of *P. diversiantennata* by Hartmann-Schröder, 1986: 34), If not considered a synonym, *P. diversiantennata* is not well enough described to assign further specimens to that name and would have to be considered *taxon inquirendum*. Therefore *Phyllodoce diversiantennata* (Hartmann-Schröder, 1986) is here considered a new synonym of *P. duplex* McIntosh, 1885.

Phyllodoce parvula Gravier, 1907 (type locality Peru) was recorded from south-western Western Australia by Augener, 1913: 126, we consider Augener's record to be indeterminable since it was based on two very small specimens which were not described or figured.

Phyllodoce tenuissima Grube, 1878 (type locality Philippine Islands) was recorded from south-eastern Australia by Augener (1927: 118-120) but incompletely described; it is here considered an indeterminable *Phyllodoce*.

We thus accept seven species of *Phyllodoce* as recorded from Australia: *P. australis* Day, 1975; *P. duplex* McIntosh, 1885; *P. longipes* Kinberg, 1866; *P. madeirensis* Langerhans, 1880; *P. malmgreni* Gravier, 1900; *P. novaehollandiae* Kinberg, 1866 and *P. salicifolia* Augener, 1913. To these we add a new species, *Phyllodoce naydra* sp. nov. described below. All Australian species of *Phyllodoce* can be distinguished using the key herein.

***Phyllodoce naydra* sp. nov.**

urn:lsid:zoobank.org:act:834E8E0F-FA7C-49C4-A451-6BF1ED36EF66

Material examined.

Holotype. Australia, Victoria, Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, among *Caulerpa* spp, 28/04/2024, NMV F315351.

Paratypes. Australia, Victoria: Port Phillip Bay: Black Rock jetty (MRG 899), -37.969259°, 145.009968°, coll. Marine Research Group of FNCV, intertidal, 20/01/2024: 1 spm, NMV F314742; 1 spm, NMV F314741.

Port Phillip Bay: Ricketts Point (MRG 909), -37.993764°, 145.02991°, coll. Marine Research Group of FNCV, intertidal, 01/04/2024, 1 spm, NMV F315066.

Port Phillip Bay: Brighton, North Road Boat Ramp (MRG 908), -37.898332°, 144.984701°, coll. Marine Research Group of FNCV; Falconer, A & Altoff, L, intertidal, 30/03/2024, 1 spm, NMV F315071.

Port Phillip Bay: Martha Cove (MRG 911), -38.306318°, 144.993304°, coll. Falconer, A & Altoff, L, intertidal, 28/04/2024, 1 spm, NMV F315344; 1 spm, NMV F315345.

Port Phillip Bay: Jawbone Marine Sanctuary (MRG 910), -37.866093°, 144.881242°, coll. Marine Research Group of FNCV, intertidal, 13/04/2024, 1 spm, NMV F315072; 1 spm, NMV F315070; 1 spm, NMV F315063; 1 spm, NMV F315064.

Shallow Inlet: (MRG 905), -38.84087°, 146.15578°, coll. Marine Research Group of FNCV, intertidal, 16/03/2024: 1 spm, NMV F314743; 1 spm, NMV F314885; 1 spm, NMV F314886.

Diagnosis. Including *Phyllodoce naydra* sp. nov., eight species of *Phyllodoce* are known from Australia, however only *P. naydra* sp. nov. and *P. malmgreni* have the basal region of the pharynx completely covered with papillae (the remaining Australian species have dorsal and ventral patches of the pharynx bare of papillae). *Phyllodoce naydra* sp. nov. and *P. malmgreni* are readily distinguished: *P. naydra* sp. nov. has large papillae on the distal region of the pharynx while in *P. malmgreni* the distal pharynx has rows of tubercles; *P. naydra* sp. nov. has as oval dorsal cirri with rounded tips compared with the rhomboidal dorsal cirri in *P. malmgreni*, and *P. naydra* sp. nov. has broader, more rounded ventral cirri compared with the ventral cirri in *P. malmgreni* which are more elongate and have pointed tips.

The distal part of the pharynx of *P. naydra* sp. nov. is similar to that of *P. longipes* Kinberg, 1866 but in *P. naydra* sp. nov. the basal part of the pharynx does not have the extensive bare patches dorsally and ventrally. Also, *P. naydra* sp. nov. does not have the extended dorsal neuropodial lobe present in *P. longipes* and the dorsal cirri in *P. naydra* sp. nov. are also more elongate than the nearly circular dorsal cirri of *P. longipes*.

The molecular analysis also shows *P. naydra* sp. nov. to be closest to *P. longipes* Kinberg, 1866. For COI, *P. longipes* had an average pairwise distance of 28.7% to the *P. naydra* sp. nov. sequences. Between the two subclades contained within *P. naydra* sp. nov. there is a net pairwise divergence of 5.7% for COI.

Description. Holotype 104 segments, 0.3 mm wide (0.4 mm including parapodia), 28.3 mm long (Fig. 12A). Pigmentation pattern in life, prostomium uniformly pale light blue-white with a single irregular bright white patch on the dorsum of each segment and in the middle of most dorsal cirri; eyes superficial, dark red (Fig. 12B). Preserved specimen pale cream colour with faint disjointed bands of pale brown speckling on dorsum of each segment extending to dorsal cirri, not visible on ventral side; bright white areas no longer visible; eyes darker red. (Fig. 12C-D).

Prostomium with dorsal posterior incision, 1.3 times longer than maximum width. Paired antennae widest



Figure 12. *Phyllodoce naydra* sp. nov.; A-E, holotype (NMV F315351); F, paratype (NMV F315345), G, paratype (NMV F315064). A, whole animal, dorsal view, live; B, close-up of prostomium, dorsal view, live; C, close-up of prostomium, dorsal view, preserved; D, close-up of prostomium, ventral view, preserved; E, parapodium of median segment, preserved; F, articulation of chaetae; G, everted pharynx, lateral view, preserved. Scale lines: A-D, 1.0mm; E, 0.25mm; F, 0.02mm.; G, 0.5mm.

basally, tapering evenly to tip, half as long as prostomium, length as long as palps. Palps at base slightly wider than paired antennae, tapering evenly to tip. Prostomial protuberance indistinct. Median antenna present as a papilla (Fig. 12B-D). Segment 1 not visible dorsally, covered by posterior projection of prostomium, with one pair of tentacular cirri reaching segment 9. Segment 2 dorsal cirri reaching segment 11. Ventral tentacular cirri of segment 2 circular in cross-section; reaching segment 7. Segment 3 dorsal cirri reaching segment 11. Chaetae first present on segment 4.

Dorsal cirri of median segments elongate, 1.6 times longer than maximum width; large, prominent and longer than neuropodial lobe; evenly rounded, without an obvious tip or angle. Dorsal cirri of median segments asymmetrical. Neuropodium of median segments with separate dorsal and ventral prechaetal lobes; with dorsal lobe rounded and similar in shape to ventral lobe. Ventral cirri of median segments horizontally oriented; 1.8 times longer than wide; longer than neuropodium; tips pointed (Fig. 12E). Rostrum of chaetal shaft with

large number of pointed teeth, longer than wide, decreasing slightly in size proximally; blade slightly serrated (Fig. 12F). Pygidial cirri long, widest at base and tapering, longer than wide.

Pharynx retracted and not dissected in holotype, described from paratypes with everted pharynx: NMV F315064, NMV F315072 and partially everted in paratypes NMV F314743 and NMV F314885: pharynx divided into anterior and posterior regions. Basal region papillae covering entire region; in distinct rows; comprising 12 rows; each row with 7-9 papillae. Distal region shorter than basal region, with papillae in irregular arrangement, papillae larger than in basal region (Fig. 12G). Pharynx terminally with a ring of papillae; comprising about 6 papillae (paratype NMV F315072 has six papillae which are larger and round, unlike the pointed papillae elsewhere, and therefore are here considered to comprise terminal ring). Pharynx in paratypes NMV F315064 and NMV F315072 have very short triangular bare patches of papillae in basal-most region but have

distal one-third to half of basal region with papillae covering the pharynx completely.

Variation (from paratypes). Size range 0.2–0.4 mm wide, 8.2–33.5 mm long, 50–155 segments. Preserved specimens with darker brown pigmented spots on the prostomium and on dorsum of some anterior segments, otherwise pigmented as in the holotype. Segment 1 tentacular cirri reaching about segment 7 (7 in life). Segment 2 dorsal cirri reaching about segment 11 (11 in life). Ventral tentacular cirri of segment 2 reaching segment 6–7 (6–7 in life). Segment 3 dorsal tentacular cirri typically reaching segment 11 (11 in life).

Morphometric data - Tentacular cirrus segment 1: paired antenna length 2.2–6.8 (2.3–5.6 in preserved specimens; 2.2–6.8 in live specimens). Dorsal tentacular cirrus segment 2: paired antenna length 5.3–10.8 (4.6–10.5 in live specimens). Prostomium width: paired antenna length 2.1–4.3 (1.6–3.6 in live specimens). Prostomium length: paired antenna length 1.7–3.7 (1.5–2.7 in live specimens). Palp: paired antenna length 0.6–1.3 (0.8–1.3 in preserved specimens, 0.6–1.0 in live specimens). Segment number: body width 128–539 (165–539 in preserved specimens, 128–419 in live specimens). Segment number: body length 3.4–8.4 (in live and preserved specimens). Body width-parapodia: body width 1.5–2.4 (1.5–2.4 in preserved specimens, 1.6–2.4 in live specimens). Prostomium width: eye separation 1.3–3.9 (1.4–1.7 in live specimens). Dorsal cirrus length: dorsal cirrus width 1.2–2.0. Ventral cirrus: dorsal cirrus length 0.5–0.6 (no data for live specimens). Parapodium: ventral cirrus length 0.6–0.9 (no data for live specimens).

Distribution & habitat. South-eastern Australia from Williamstown to Martha Cove, and Sandy Point (Fig.1). Intertidal in seagrass, algae, and encrusting invertebrates.

Etymology. The species name ‘naydra’, used as singular noun is apposition, is derived from a fictional character from the video game *Zelda: Breath of the Wild* - one of three wyrm-like dragon spirits bearing a resemblance to a phyllodocid worm.

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