



# **Developing museum marine invertebrate collections over time, their digitization and the value of such collections – an Australian perspective**

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# Australian Museum

- Founded in 1827, sixth oldest in the world
- Amazing given that Australia colonized only in 1776
- So within 50 years a museum established
- In part due to unique fauna & flora
- Collections initially vertebrates, fossils, minerals
- First invertebrate registered in 1851 an ascidian
- First polychaete registered in 1878

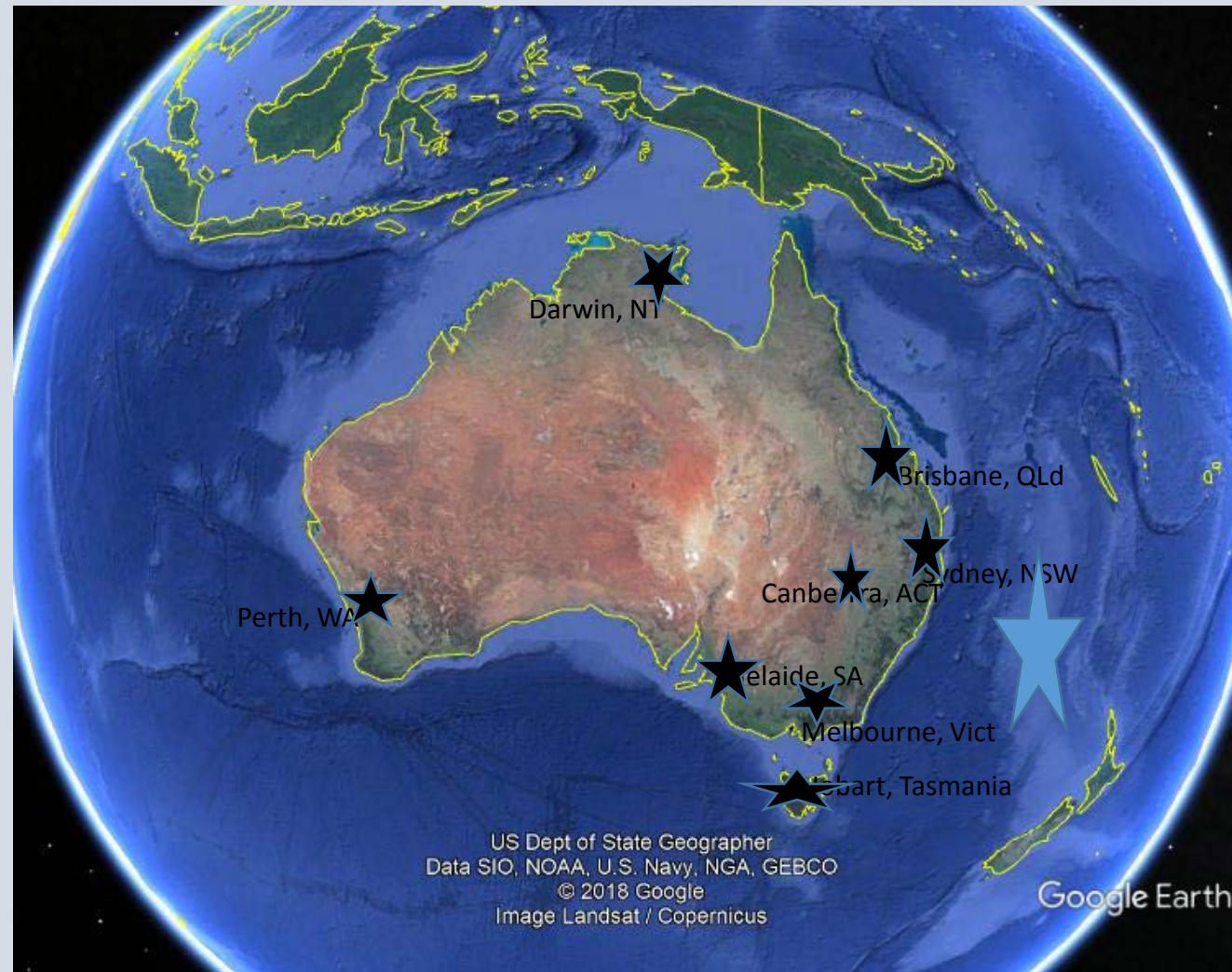


# Natural History Museums in Australia

- Australia a federation of states and territories
- Each state and territory has a natural history museum
- So Australian Museum is actually a state funded museum
- Subsequently museums developed in Tasmania (1846), Victoria (1854), South Australia (1856), Queensland (1862), Western Australia (1891) in respective capital cities and later in 1981 one established in Northern Territory in Darwin
- Only in 1980 was the Museum of Australia established in Canberra, but has no natural history collection
- Museums established by an Act of Parliament, ensures perpetuity of collections

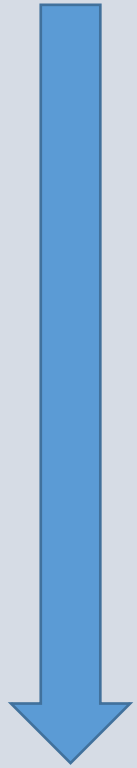


# Natural History Museums in Australia



# Sizes of Australian polychaete collections

reflect having active polychaete researchers



- Australian Museum
- Museums Victoria
- Northern Territory Museum & Art Gallery
- Queensland Museum
- South Australian Museum
- Western Australian Museum
- Tasmanian Museum





# Australian Polychaete researchers

- Reflection of dedicated polychaete researchers
- Appointed 1970, first polychaete researcher to AM
- Subsequently Robin Wilson (current) appointed to Museum of Victoria
- Russel Hanley at Northern Territory Museum & Art Gallery, then Chris Glasby (current)
- Greg Rouse briefly at South Australian Museum
- Now Elena Kupriyanova at AM



# AM marine invertebrate collections

- Total Crustacea: 106,442 registered lots (but includes freshwater)
- Total Echinodermata: 27,138 registered lots
- Total Polychaeta: 51,033 registered lots
  - Australian Polychaeta: 45,500 registered lots
  - non-Australian Polychaeta: 5,600 registered lots
- Large collections of molluscs but both marine, FW & terrestrial;
- Also smaller collections of sponges, bryozoans, corals & other groups
- Numbers only refer to registered lots, all collections have unregistered lots.

# AM Polychaete collections

- Total number of Polychaete types: 2,649 lots
- Australian Polychaete types: 1,761 lots
- non-Australian Polychaeta types: 888 lots
- Number of Polychaete taxa for which types are held: 865 species
- Number of Polychaete taxa for which primary types are held: 552 species (i.e. holotypes)



# Marine Invertebrate collections

- Collections stored in Spirit House Building custom built in 1970, air conditioned, resistant to fire with concrete walls and sprinklers
- Type collection stored in designated areas for rapid removal in case of fire
- Dry collection stored elsewhere, plus SEM stubs and frozen tissues.
- All material registered when identified, for example *Thelepus australiensis* AM W.6127, parts removed for SEM as AM W.6127.01, tissue samples as AM W.6127.02
- Collections maintained by a dedicated Collection Manager and technical staff, responsible for registering, curating, sending out loans



Formalin-fixed material stored in 70% alcohol and ethanol-fixed in 90% for molecular studies. Jars colour coded for holotypes (red) paratypes (blue) and genetic (yellow)

# Marine Invertebrate collections-storage

An example of a compactor which can be moved up and down really allowing maximum utilization of space - purposed built



# AM marine invertebrate collections -cont

## Priorities for registration of material :

1. Type material
2. Published material
3. Material which needs to be documented as part of a research project or Museum contract
4. Material identified to species with core data
5. Material for loan
6. Material temporarily removed for use by the Museum in exhibitions or an area outside of the Collection Management and Research sections
7. Material prepared for study using microscope slides, SEM or for DNA extraction

Date	Registration No.	No. of Specimens	Name or Description	Locality	How acquired	From whom acquired	Reference to Papers	Destination	Remarks
May 10	W: 166	1	Eurythoe complanata	Lord Howe Is.	ob.	no data.			
	167	1	" complanata	"	"	"			
	168	8	"	Madagascar	"	"			Designated 29.4.71
	169	1	" complanata	Lord Howe Is.	"	"			
	170	2	" complanata	"	"	"			
	171	1	" complanata	Freemantle Is.	"	"			
	172	2	" complanata	Lord Howe Is.	"	"			
	173	6	"	Madagascar	"	"			Designated 29.4.71
	174	1	" complanata	Cher Is.	"	"			
	175	3	Pachura-like like possibly Heteropoda tuberosa	Dunk Island	Pres.	C. J. Branfield	B. 12. 1910		Referred to the specimens of Heteropoda tuberosa
	176	1	Calcareous worm-tube	"	"	"			not a worm tube a mollusk
	177	1	Pachura-like "	"	"	"			
	178	1	Calcareous "	"	"	"			
	179	3	Nephtys australis	Antony Bay	"	P. Dargatzis (Antony)			Ident. H. Parker 1972
	180	1	Nereis	Antony Bay	"	"			
	181	18	Peridroma sp.	"	"	"			Ident. H. Parker 1971
	182	1	Bathyporeia	"	"	"			
	183	6	Margarya	"	Coll.	Blackman			
	184	12	Nephtys	"	"	"			
	185	1	Nereis Peridroma sp.	"	"	"			Ident. H. Parker 1971
	186	1	Glycera? (Incomplete, head missing)	"	"	"			
	187	1	Glycera	"	"	"			
	188	1	Margarya	Port Jackson	ob.	no data.			
	189	2	"	"	"	"			
	190	1	"	"	"	"			
May 12	191	3	Phyllodoce	Shadbrook Is. Qld.	"	Mr. Kesteven 1902			
	192	1	Caprellia	Port Jackson	"	no data.			
	193	Many	Phyllodoce	no data	"	"			
	194	3	Caprellia	no data	"	"			
	195	1	Caprellia	Port Jackson	"	"			
	196	1	Ligulia	"	"	Mr. Kesteven, Beckenham			Rep. of E. 180.
13	197	1	Polydora	13-15 fms 25 mbs S.W. from E. toward 21.4.71	Donation	James Jackson, Antea "Antea" coll. Easton's "Antea" coll. Easton's "Antea" coll.			
	198	1	Pholo showing vesicle bottom covered with small white spots	New Zealand	"	"			
	199	1	Amyntos cortis	Wellington Harbour	"	Ed. Thompson, 1910			
	200	1	Amphipoda	Wellington Harbour	"	Ed. Thompson, 1910			Id. F. Fausch 1983
	201	1	" antennata X.P. 51	"	"	Ed. Thompson			
	202	1	Palola bicolor	"	"	"			Id. K. Fausch 1983
	203	1	Nicolaus amaris	"	"	"			Id. P. Hutchings & C. Gledhill 1986
	204	4	Amphipoda rostrata	German New Guinea	"	Ed. Thompson, 1910			
	205	1	complanata	"	"	"			
Aug 20	206	1	Bipalium sp. brown	Sydney	"	Mr. Gard Oct. 1910			Id. Leigh Wilson, Nov. 1976

# Registration and management

Catalogue (1) - Display

File Edit Select View Tools Tabs Parts Archives Multimedia Window Help

[irn: 1411736] - W.37112.002 - Genetic subsample - Marphysa kristiani Zanol et al., 2016 - Australia, New South Wales, Stingray Bay, Cowan Creek, (33° 37' 48" S, 151° 11' 28" E), 19 Feb 2011, cited  
Inventory Status: Sighted  
Author/Year: Zanol et al., 2016  
Substrate: mud with some sand, rich in organic matter, roots of mangrove trees Country: Australia

All Parts

Im	Object	Form of Object
1370898	W.37112 - Marphysa kristiani Zanol et al., 2016 - Australia, New Sout...	Wet
1411647	W.37112.001 - Tissue sample - Marphysa kristiani Zanol et al., 201...	Frozen
1411736	W.37112.002 - Genetic subsample - Marphysa kristiani Zanol et...	Frozen

Is Parent?  
☐ Yes ☒ No

Child  
Parent object: W.37112.001 - Tissue sample - Marphysa kristiani Zanol et al., 201...

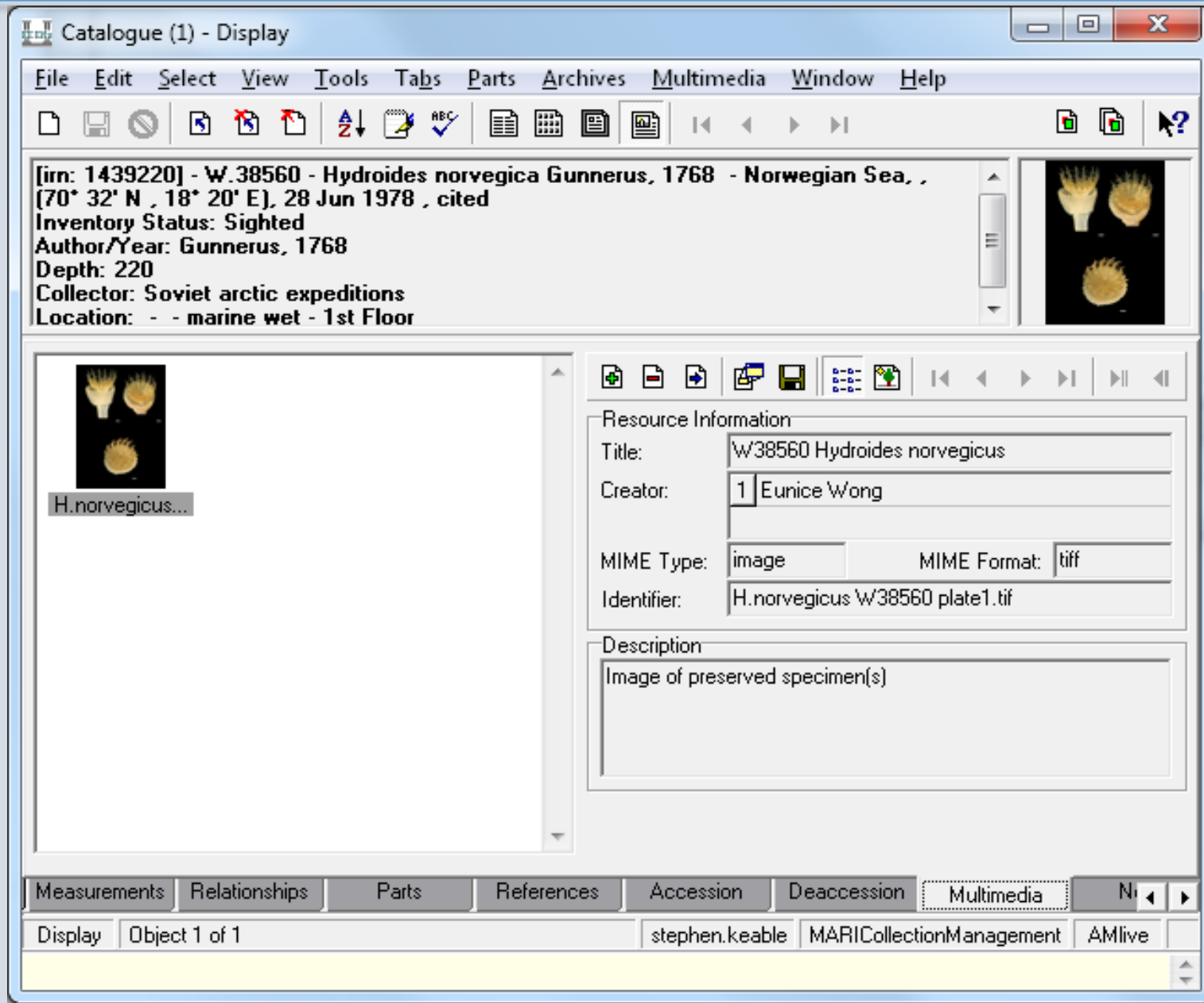
Locations Biology Zoology (1) Zoology (2) Measurements Relationships Parts Refe

Display Object 166 of 453 stephen.keable MARICollectionManagement AMlive

- Polychaetes were registered by hand in a register until 1992
- Now all material registered in Electronic Museum (EMU).
- Same software used AM wide for all collections (anthropology, minerology, DNA, biological and paleontology).
- Database backed up weekly
- A dedicated team looks after EMU.



# A an example of EMU entry





# Rate of acquisition of polychaete collections

1881 - 1890	6
1891 - 1900	14
1901 - 1910	233
1911 - 1920	140
1921 - 1930	604
1931 - 1940	112
1941 - 1950	35
1951 - 1960	61
1961 - 1970	558
1971 - 1980	11,568
1981 - 1990	10,961
1991 - 2000	5,657
2001 - 2010	8,084
2011 - 2018	13,075
Total	51,108

Arrival October 1970



# AM Polychaete collections

- Prior to 1970, the polychaete collections small
- Since then material has been collected from around most areas of the Australian coast as well as in the Indo-Pacific. Collections are largely intertidal and shallow subtidal collected by SCUBA
- Some deeper water material collected during oceanographic cruises.
- Originally material fixed in formalin, stored in 70% alcohol
- Now also some fixed in 95% alcohol for molecular studies
- All material sorted at least to family and organized by state



# Use of collection EMU databases

- Using EMU we were able to document the diversity of Sydney Harbour based just on museum records
- Referring only to fish, molluscs, crustaceans, echinoderms and polychaetes
- Over 3000 species of these groups occur in Sydney Harbour
- One of the most diverse harbours in the world
- Hutchings, P.A., Ahyong, S.T., Ashcroft, M.B., McGrouther, M.A. and Reid, A.L. (2013). Sydney Harbour: its diverse biodiversity. *Australian Zoologist* 36(2): 257-320. <http://dx.doi.org/10.7882/AZ.2012.031>

# Australian Faunal Directory (AFD)

A free online public database that providing taxonomical and biological information on the Australian fauna.

Genus	<a href="#">Pista Malmgren, 1866</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista anneae Nogueira, Hutchings &amp; Carrerette, 2015</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista australis Hutchings &amp; Glasby, 1988</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista chloroplokamia Nogueira, Hutchings, Carrerette, 2015</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista curtuncata Hartmann-Schröder, 1981</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista qwoyarrma Hutchings, 1997</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista kimberliensis Hutchings &amp; Glasby, 1990</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista kristiani Nogueira, Hutchings &amp; Carrerette, 2015</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista pectinata Hutchings, 1977</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista sinusa Hutchings &amp; Glasby, 1988</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista trina Hutchings, 1977</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista trunca Hutchings, 1977</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista turawa Hutchings &amp; Glasby, 1988</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista typha (Grube, 1878)</a>	Valid Name	TEREBELLIDAE
Species	<a href="#">Pista violacea Hartmann-Schröder, 1984</a>	Valid Name	TEREBELLIDAE

# Australian Faunal Directory (AFD)

- Species *Pista australis* Hutchings & Glasby, 1988
- Compiler and date details: Jan 2011 - P. Hutchings & M. Yerman, Australian Museum, Sydney, New South Wales, Australia
- ***Pista australis*** [Hutchings, P.A. & Glasby, C.J. 1988. The Amphitritinae \(Polychaeta: Terebellidae\) from Australia. \*Records of the Australian Museum\* 40: 1-60 \[40-41\].](#)
- Type data: Holotype AM W200877 (complete), Merimbula, NSW [36°53'S, 149°52'E]. Paratype(s) AM W11773 10 specimens, Merimbula, NSW [36°53'S, 149°52'E]; USNM 99977, Merimbula, NSW [36°53'S, 149°52'E]; BMNH ZB 1986.74-91 many, Merimbula, NSW [36°53'S, 149°52'E]; AHF Poly 1474 many, Merimbula, NSW [36°53'S, 149°52'E]; AM W11382 2 specimens, Merimbula, NSW [36°53'S, 149°52'E]; AM W11769 several, Merimbula, NSW [36°53'S, 149°52'E].
- ***Pista typha*** [Knox, G.A. & Cameron, D.B. 1971. Port Phillip Survey 2. \*Polychaeta. Memoirs of the National Museum of Victoria, Melbourne\* 32: 21-41 \[38\].](#)
- Distribution: States of New South Wales, South Australia
- <http://www.environment.gov.au/science/abrs/online-resources/fauna>
- also one for flora



# Atlas of Living Australia (ALA)

- In late 1990's all Australian natural history museums agreed to develop an online database of Australia's fauna regardless of database being used (similar collaboration between herbariums)
- Every few months all museums upload their new registrations up onto the site
- The **Atlas of Living Australia** is a collaborative, national project that aggregates biodiversity data from multiple sources and makes it freely available and usable online (fauna and flora)
- This data is then supplied to GBIF, Encyclopaedia of Life, Biodiversity Heritage Library, Google search, Google scholar
- <https://www.ala.org.au/>





# ALA *Pista australis* entry



**Species:** *Pista australis* | **Spaghetti Worm** Country: Australia  
Institution: Museums Victoria Collection: Museums Victoria Marine Invertebrates Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates:F129949 [View record](#)

**Species:** *Pista australis* | **Spaghetti Worm** Date: 1970-04-11 Country: Australia  
Institution: Museums Victoria Collection: Museums Victoria Marine Invertebrates Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates:F129912 [View record](#)

**Species:** *Pista australis* | **Spaghetti Worm** Year: 1968 Country: Australia  
Institution: Museums Victoria Collection: Museums Victoria Marine Invertebrates Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates:F129906 [View record](#)

**Species:** *Pista australis* Date: 1979-03-13 State: South Australia  
Institution: Australian Museum Collection: Australian Museum Marine Invertebrate Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates - Marine & Other:W.200449 [View record](#)

**Species:** *Pista australis* Year: 1979 State: South Australia  
Institution: Australian Museum Collection: Australian Museum Marine Invertebrate Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates - Marine & Other:W.202285 [View record](#)

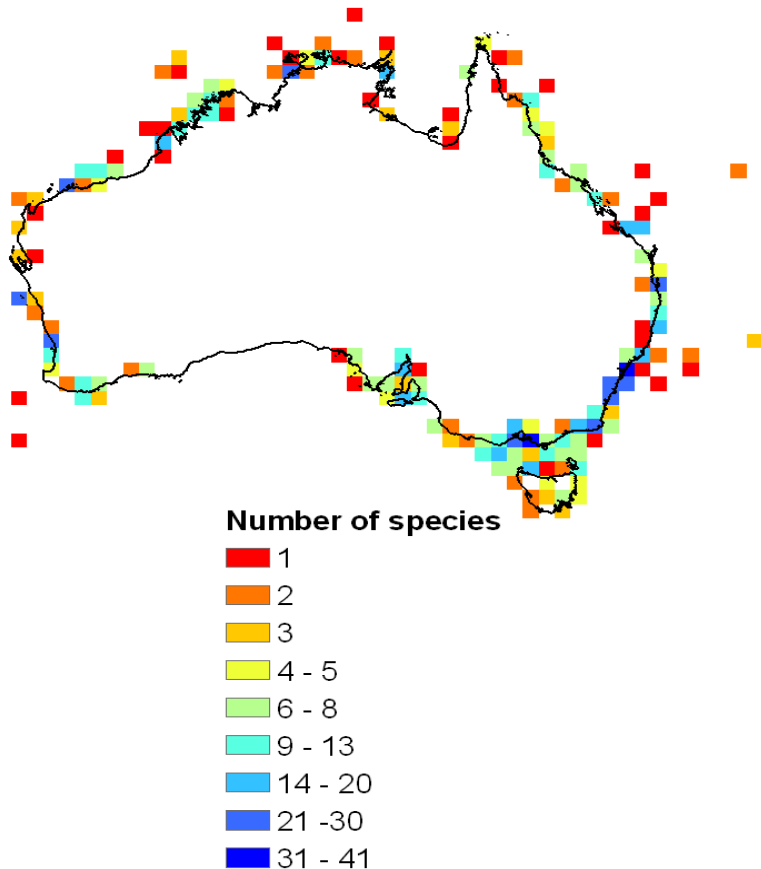
**Species:** *Pista australis* Date: 1972-10-17 State: Australian Capital Territory  
Institution: Australian Museum Collection: Australian Museum Marine Invertebrate Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates - Marine & Other:W.194466 [View record](#)

**Species:** *Pista australis* Date: 1972-04-25 State: Australian Capital Territory  
Institution: Australian Museum Collection: Australian Museum Marine Invertebrate Collection Basis Of  
Record: Preserved Specimen Catalogue Number:Invertebrates - Marine & Other:W.194243 [View record](#)

Each record based on  
a museum specimen



# Use of ALA data



- Distribution of species around Australia
- Useful in defining areas for zoning of marine parks
- Data presented here for terebellids (surface deposit feeders)
- Can compare with other families with different habitats
- Value adding to collections

# Acknowledgments

We would like to thank Dr Steve Keable and Helen Stoddart from Marine Invertebrate Collection Management team of Australian Museum for help in collating some of this data presented here.

Also thanks to Alexander Tzetlin for inviting me to participate in this conference.

