



PHYLUM: CHORDATA

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Citation

Parker-Nance S. and Atkinson LJ. 2018. Phylum Chordata In: Atkinson LJ and Sink KJ (eds) Field Guide to the Offshore Marine Invertebrates of South Africa, Malachite Marketing and Media, Pretoria, pp. 477-490.

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Phylum: **CHORDATA** Subphylum: Tunicata

Sea squirts and salps

Urochordates, commonly known as tunicates or sea squirts, are a subphylum of the Chordata, which includes all animals with dorsal, hollow nerve cords and notochords (including humans). At some stage in their life, all chordates have slits at the beginning of the digestive tract (pharyngeal slits), a dorsal nerve cord, a notochord and a post-anal tail. The adult form of Urochordates does not have a notochord, nerve cord or tail and are sessile, filter-feeding marine animals. They occur as either solitary or colonial organisms that filter plankton. Seawater is drawn into the body through a branchial siphon, into a branchial sac where food particles are removed and collected by a thin layer of mucus which is pulled into the intestinal tract. The excess water is pumped out along with any waste matter through the atrial siphon or opening. The subphylum Tunicata is divided into three classes, two of which commonly occur in South African waters, namely Ascidiacea (sea squirts) and Thaliacea (salps).

Class Ascidiacea (Sea squirts)

Ascidians are solitary or colonial animals with a firm, incompressible body wall called a test or tunic. This test or tunic surrounding the body of ascidians is made up of a cellulose-like compound, tunicin, resembling that found in plants. These organisms are generally sessile and almost all are hermaphroditic, producing both sperm and eggs, but self-fertilisation does not occur. Larvae may develop externally or within the individual or zooid. The larvae resemble tadpoles; the tail helping them move in the water column until they are fully developed and a suitable habitat is found. Many colonial species also reproduce asexually through stolons or budding, forming new zooids.

The most recent checklist compiled for this group indicates 147 reported species for South Africa. Global estimates indicate more than 2 800 species.

Class Thaliacea (Salps)

In contrast with ascidians, salps are free-swimming in the water column. These organisms also filter microscopic particles using a pharyngeal mucous net. They move using jet propulsion and often form long chains by budding off new individuals or blastozooids (asexual reproduction). These colonies, or an aggregation of zooids, will remain together while continuing feeding, swimming, reproducing and growing. Salps can range in size from 15-190 mm in length and are often colourless. These organisms can be found in both warm and cold oceans, with a total of 52 known species that include South Africa within their broad distribution. No endemic species are known from the region.

Collection and preservation

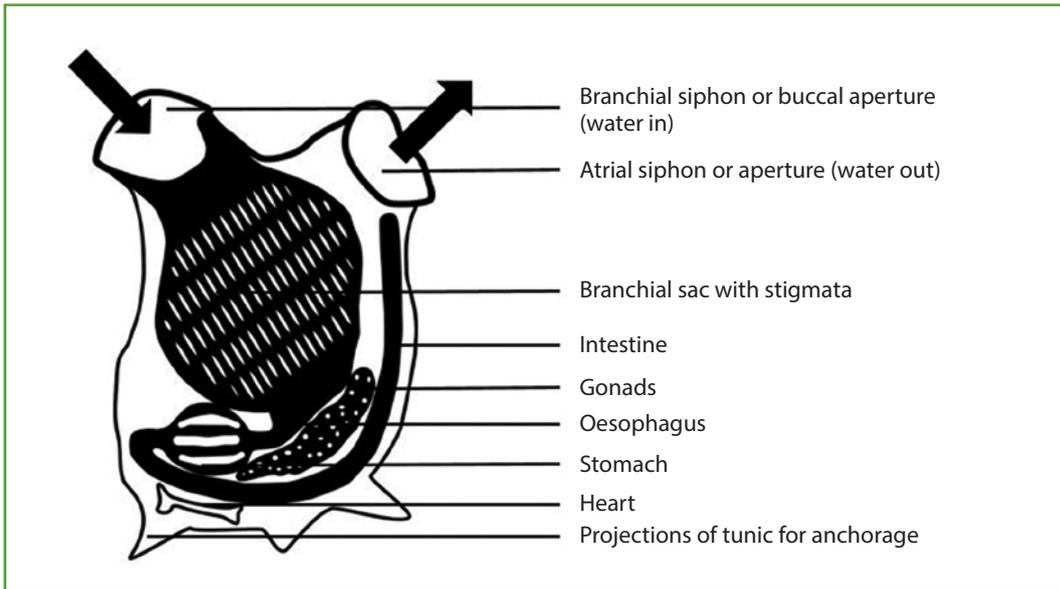
Tunicates require microscopic examination for identification beyond genus level. Tunicates should be relaxed in seawater with menthol crystals for 2 to 4 hours and then preserved by adding 5-10% buffered formalin to the relaxed specimen without disturbing the animal. Ascidians have muscular bodies and characteristics of the branchial sac are an essential tool in classification to genus and species level. When specimens – of both colonial and solitary species – are not relaxed and gently anaesthetised in formalin, essential characteristics important in the description of new species are obscured by contraction of the specimen caused by the traumatic death. This results in a specimen that cannot be used in species identification or description.

For molecular studies a small section of colonial species (containing a few zooids) should be preserved in 96% ethanol and the rest relaxed and preserved as above. In the case of solitary species, place piece of the atrial siphon (inner tissue only) in 96% ethanol. Then keep the specimen from which the tissue was removed, along with a whole similar specimen (if possible), relax and preserve as above.

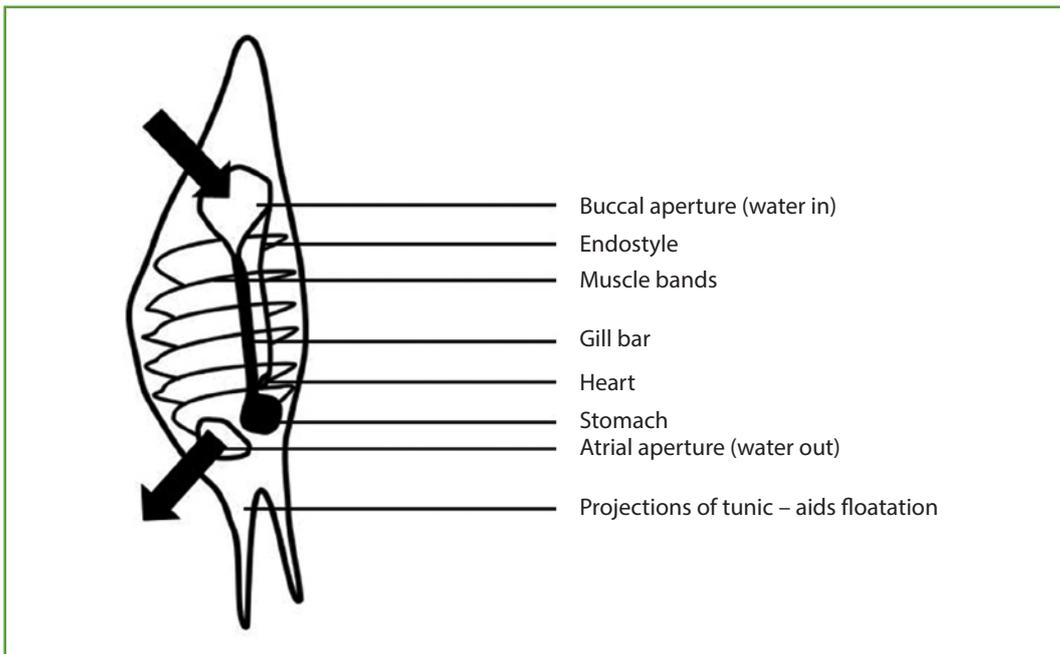
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- Deibel D and Lowen B. 2011. A review of the life cycle and life-history adaptations of pelagic tunicates to environmental conditions. *ICES Journal of Marine Science* 69(3): 358-369.
- Jones G. 2008. *A field guide to the marine animals of the Cape peninsula*. Southern Underwater Research Group Press, Hout Bay, Cape Town, South Africa 271pp.
- Kott P. 1985. The Australian Ascidiacea part 1, Phlebobranchia and Stolidobranchia. *Memoirs of the Queensland Museum* 23:1-440.
- Kott P. 1990. The Australian Ascidiacea part 2, Aplousobranchia (1). *Memoirs of the Queensland Museum* 29:1-266.
- Kott P. 1992. The Australian Ascidiacea part 3, Aplousobranchia (2). *Memoirs of the Queensland Museum* 32:375-620.
- Kott P. 2005. Pycnoclavella (Tunicata: Ascidiacea) species from the western Indian ocean. *African Zoology* 40(2):205-212.
- Monniot C, Monniot F and Laboute P. 1991. *Coral Reef Ascidiaceans of New Caledonia*. Paris: Éditions de l'ORSTOM.
- Williams GC and van Syoc, RJ. 2007. Methods of preservation and anesthetization of marine invertebrates. *Preservation and Anesthetization*: 36-41.
- Zhang, Z.-Q. (Ed.). 2013. Animal Biodiversity: An Outline of Higher-level Classification and Survey of Taxonomic Richness (Addenda 2013). *Zootaxa*, 3703, 1-82.

A) Sea squirt general body plan:

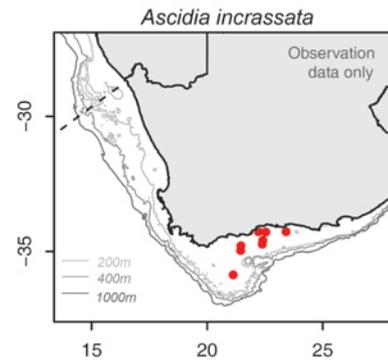


B) Salp general body plan:



***Ascidia incrassata* (Asclnc)**

Phylum:	Chordata
Subphylum:	Tunicata
Class:	Asciacea (sea squirts)
Order:	Phlebobranchia
Family:	Asciidae
Genus:	<i>Ascidia</i>
Species:	<i>incrassata</i>
Common name:	Orange sea squirt



Distinguishing features

Characteristic red bands between each of the eight branchial siphon lobes. Colouration of lobes may be obscured when the siphons are closed and retracted. Both siphons, situated on the anterior part of the elongated globular body, may be covered in varying degrees of mud and sand. Body colour varies from red to orange and yellow. If no bands occur, photograph and retain specimen.

Colour

Orange to red or even purple tunic (outer body wall), with red bands on inside of siphon.

Size

Up to 140 mm.

Distribution

Southern African endemic. West and South Coasts of South Africa to Mozambique. Recorded as invasive off the Pacific Coast of Panama. Intertidally to a depth of 114 m.

Similar species

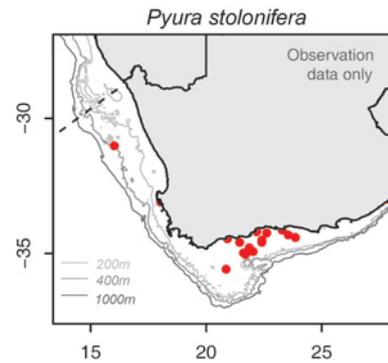
Pyura stolonifera (red bait) is yellow brown and has a tough, leathery tunic but no red bands on siphons.

References

- Branch GM, Griffiths CL, Branch ML and Beckley LE. 2016. *Two Oceans. A guide to the marine life of southern Africa*. Fourth edition. Struik Nature, Cape Town. p. 246.
- Carman MR, Bullard SG, Rocha RM, Lambert G, Dijkstra JA, Roper JJ, Goodwin A, Carman MM and Vail EM. 2011. Ascidiaceans at the Pacific and Atlantic entrances to the Panama Canal. *Aquatic Invasions* 6(4): 371-380.
- Jones J. 2008. *A field guide to the marine animals of the Cape Peninsula*. Southern Underwater Research Group Press, Hout Bay, Cape Town, South Africa. 271pp.
- Millar RH. 1956. CXIX. Ascidiaceans from Mozambique, East Africa. *Journal of Natural History*. 9(108):913-932.

Pyura stolonifera (Rbait)

Phylum:	Chordata
Subphylum:	Tunicata
Class:	Ascidiacea (sea squirts)
Order:	Stolidobranchia
Family:	Pyuridae
Genus:	<i>Pyura</i>
Species:	<i>stolonifera</i>
Common name:	Red bait



Distinguishing features

Large, solitary ascidian, commonly found in aggregations or groups. Leathery, slightly wrinkled tunic, beige to brown to dark slate coloured, bare or with various attached epibionts. Siphons large, anteriorly placed, with distinct, slightly scalloped edges forming four lobes. Pointy papillae NOT present at the base of the siphons.

Colour

Beige to slate black, with sides or areas more brown or orange in colour. May be heavily overgrown with algae, sponges and other ascidians. Interior test whitish, with orange to red viscera.

Size

Large, typically 150 mm in height, but can grow considerably larger than this.

Distribution

West and South Coasts, very widespread off southern Africa.

Similar species

Pyura herdmani, which has large, pointed papillae on the tunic particularly around the siphons. Not as abundant as *P. stolonifera* and occurs in sheltered areas.

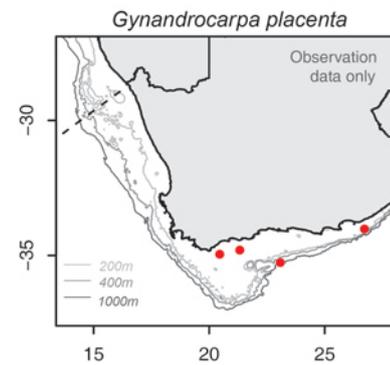
References

Branch GM, Griffiths CL, Branch ML and Beckley LE. 2016. *Two Oceans. A guide to the marine life of southern Africa*. Fourth edition. Struik Nature, Cape Town. p. 246.

Monniot C, Monniot F, Griffiths C and Schleyer M. 2001. Ascidians of South Africa. *Annals of the South African Museum* 108(1): 1-141. pp. 113-114.

***Gynandrocarpa placenta* (GynPla)**

Phylum:	Chordata
Subphylum:	Tunicata
Class:	Ascidiacea (sea squirts)
Order:	Stolidobranchia
Family:	Styelidae
Genus:	<i>Gynandrocarpa</i>
Species:	<i>placenta</i>
Common name:	Elephant's ears ascidian



Distinguishing features

Short wrinkled stalk or peduncle supporting an oval to large, laterally flatted disc-shaped head. Test of the head is cartilaginous and firm, tunic white, cream or pink in colour. Siphon apertures of embedded zooids distinctly visible on colony surface. Stalk often encrusted with epibionts, especially hydroids.

Colour

White to pink tunic; zooids pink in life; pale orange brown peduncle.

Size

Colonies can reach up to 200 mm in length, but mostly small individuals retained in trawls. May also be found on the carapace of crabs, e.g. *Pseudodromia latens*.

Distribution

South Coast, South Africa.

Similar species

None known.

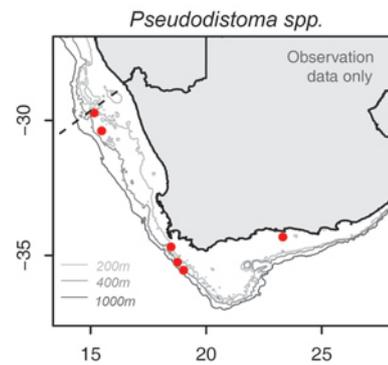
References

Branch GM, Griffiths CL, Branch ML and Beckley LE. 2016. *Two Oceans. A guide to the marine life of southern Africa*. Fourth edition. Struik Nature, Cape Town. p. 248.

Monniot C, Monniot F, Griffiths C and Schleyer M. 2001. Ascidians of South Africa. *Annals of the South African Museum* 108(1): 1-141. pp. 88-91.

***Pseudodistoma* spp. (AscBul)**

Phylum:	Chordata
Subphylum:	Tunicata (Tunicate)
Class:	Ascidiacea (sea squirts)
Order:	Aplousobranchia
Family:	Pseudodistomidae
Genus:	<i>Pseudodistoma</i>
Species:	spp.
Common name:	Soft lightbulb ascidian



Distinguishing features

Soft gelatinous body with distinct stalk, lightly impregnated with fine sand particles visible through the milky transparent test. Zooids visible through the test of globular head, patterned arrangement may or may not be visible. Stalk attached by root-like structures to the substrate.

Colour

Translucent/opaque white and light brown (due to the presence of sand particles within test of stalk). White zooids are visible through milky test, brown dots are faecal matter contained within the zoid gut.

Size

Variable, from 20-100 mm in length.

Distribution

West and South Coasts of South Africa. Wide distribution.

Similar species

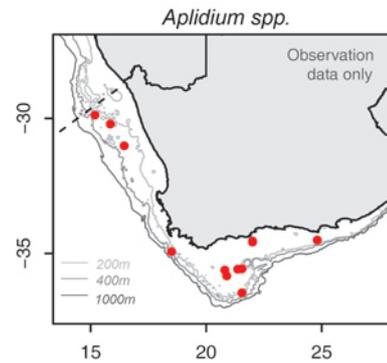
Pseudodistoma delicatum, *P. fragile* and *P. obscurum*, however microscopic examination is required to distinguish further.

References

Monniot C, Monniot F, Griffiths C and Schleyer M. 2001. Ascidiacea of South Africa. *Annals of the South African Museum* 108(1): 1-141.

***Aplidium* spp. (AscSan)**

Phylum:	Chordata
Subphylum:	Tunicata (Tunicate)
Class:	Ascidiacea (sea squirts)
Order:	Aplousobranchia
Family:	Polyclinidae
Genus:	<i>Aplidium</i>
Species:	spp.
Common name:	Sandy club ascidian

**Distinguishing features**

Soft, gelatinous head with or without small amount of fine sand particles. Long, thin but firmer sandy stalk; may be slightly enlarged; attaches to substrate. Elongated head more gelatinous than the stalk, which is covered with fine sand particles.

Colour

Light yellow to brown.

Size

Stalk 50 mm, head 40 mm in length.

Distribution

West and South Coasts of South Africa. Wide distribution.

Similar species

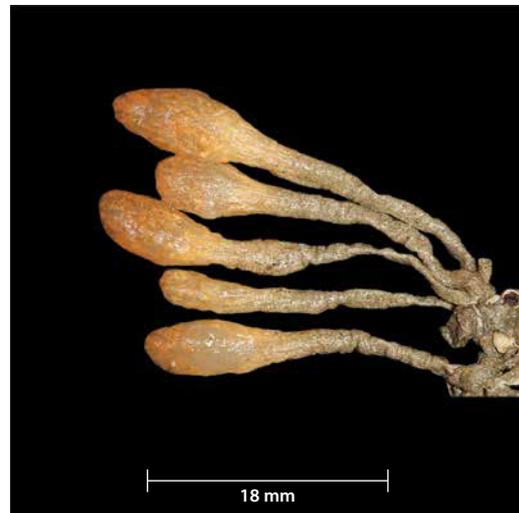
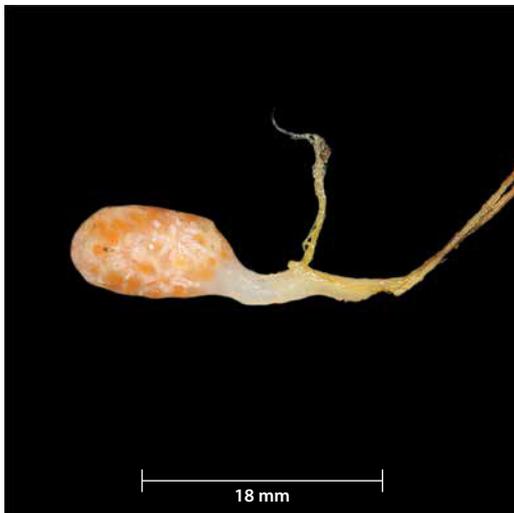
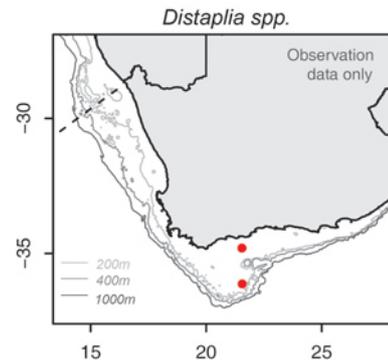
Aplidium colelloides (Herdman, 1886) off Cape of Good Hope (Miller, 1962); *Aplidium australiense* Kott, 1963 West and South Australia.

References

- Herdman WA. 1886. Report on the Tunicata collected during the voyage of H.M.S. Challenger, during the years 1873-1876. Part II. Ascidiæ Compositæ. *Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873-76*. Ed. Wyville Thomson and John Murray Publisher: Neill & Co., Edinburgh.
- Kott P. 1992. The Australian Ascidiacea Part 3, Aplousobranchia (2). *Memoirs of the Queensland Museum* 32(2):375-620.
- Millar RH. 1962. Further descriptions of South African ascidians. *Annals of the South African Museum* 56 (7): 113- 221.

***Distaplia* spp. (AscSta)**

Phylum:	Chordata
Subphylum:	Tunicata
Class:	Ascidiacea (sea squirts)
Order:	Aplousobranchia
Family:	Holozoidae
Genus:	<i>Distaplia</i>
Species:	spp.
Common name:	Stalked ascidian



Distinguishing features

Soft gelatinous body with distinct stalk and attachment "roots" forming a club-type shape. Firm opaque stalk, no sand externally or internally. Attachment may carry several stalked heads. Broader, softer, slightly elongated head.

Colour

Whitish zooids, arranged into systems that may or may not be visible. Orange colouration may be visible through semi-transparent test of the head at times when developing ova and larvae are present during the breeding season.

Size

Variable, from 20 mm in length.

Distribution

West and South Coasts of South Africa. Wide distribution.

Similar species

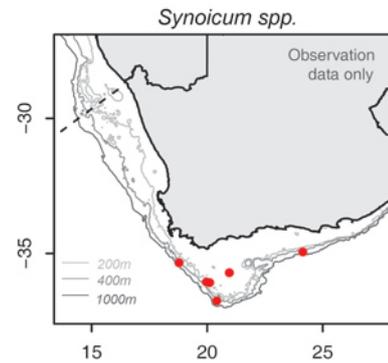
Distaplia durbanensis Millar, 1964 (collected off Durban, 411 m, sandy mud habitat).

References

Millar RH. 1964. South African ascidians collected by Th. Mortensen with some additional material. *Videnskabelige meddelelsen fra Dansk Naturhistorisk Forening* 127: 159-180.

Synoicum spp. (BbBat)

Phylum:	Chordata
Subphylum:	Tunicata
Class:	Ascidiacea (sea squirts)
Order:	Aplousobranchia
Family:	Polyclinidae
Genus:	<i>Synoicum</i>
Species:	spp.
Common name:	Baseball bat ascidian



Distinguishing features

Gelatinous sandy body, with distinct stalk and attachment “roots” forming a baseball club-type shape. More rigid and firm structure than other club-shaped ascidians. Sandy texture, with grains of sand coating the outer body wall.

Colour

Translucent/opaque brown to pink, often covered with fine sediment.

Size

Variable, up to 70 mm in length.

Distribution

West and South Coasts, South Africa.

Similar species

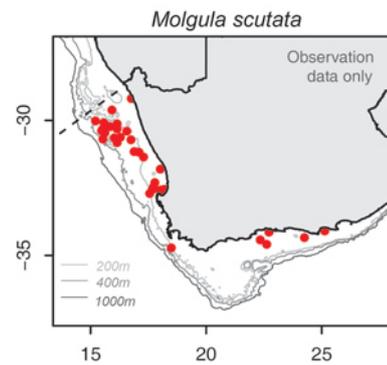
Synoicum capense Millar, 1962 (False Bay, South Africa).

References

Millar RH. 1962. Further descriptions of South African ascidians. *Annals of the South African Museum* 56(7):113-221.

Molgula scutata (SanCol)

Phylum:	Chordata
Subphylum:	Tunicata (Tunicate)
Class:	Ascidiacea (sea squirts)
Order:	Stolidobranchia
Family:	Molgulidae
Genus:	<i>Molgula</i>
Species:	<i>scutata</i>
Common name:	Sand ascidian



Distinguishing features

Sand-covered globules of gelatinous mass together forming clusters. Attach to each other and to many other structures, even to polychaete tubes anchored in the sediment. Often attach to the carapace of *Exodromidia* sp.

Colour

When washed and free of sand, the body is opaque/translucent.

Size

Individuals about 20 mm diameter, but together form larger clusters up to 150 mm diameter.

Distribution

Southern African endemic. West and South Coasts, South Africa.

Similar species

Molgula cryptica Millar, 1962 (False Bay, South Africa); *Molgula conchata* Sluiter, 1898 (South West Indian Ocean); *Molgula manhattensis* (invasive), however microscopic examination is required to distinguish further.

References

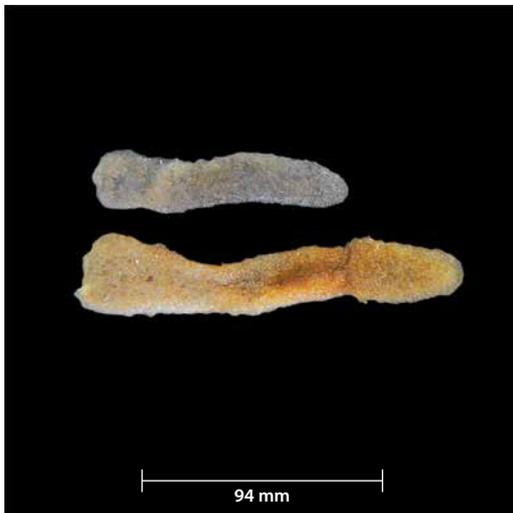
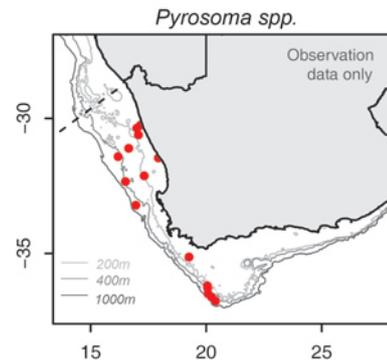
Millar RH. 1955. On a collection of ascidians from South Africa. *Proceedings of the Linnean Society* 125(1):169-221.

Millar RH. 1962. Further descriptions of South African ascidians. *Annals of the South African Museum* 56(7):113-221.

Sluiter CP. 1898. Beiträge zur Kenntniss der Fauna von Süd-Afrika. Ergebnisse einer Reise von Prof. Max Weber in Jahre 1894. II. *Tunicaten von Süd-Afrika* 11:(1-64).

***Pyrosoma* spp. (Pyrosm)**

Phylum:	Chordata
Subphylum:	Tunicata (Tunicate)
Class:	Thaliacea (salps)
Order:	Pyrosomatida
Family:	Pyrosomatidae
Genus:	<i>Pyrosoma</i>
Species:	spp.
Common name:	Fire roller

**Distinguishing features**

Planktonic colonial tunicates, cylindrical, globular or conical shaped. Made up of thousands of zooids embedded in gelatinous tunic. Distinct bumps (zooids) form on the outside of the colony, but the inside is much smoother.

Colour

Mottled brown-orange or paler pink, with translucent/opaque body.

Size

Variable, ranging from 50 mm to 300 mm.

Distribution

West and South Coasts of South Africa throughout water column, very widespread.

Similar species

Pyrosoma aherniosum; *Pyrosoma atlanticum*, however microscopic examination is required to distinguish further.

References

Branch GM, Griffiths CL, Branch ML and Beckley LE. 2016. *Two Oceans. A guide to the marine life of southern Africa*. Fourth edition. Struik Nature, Cape Town. p. 244.

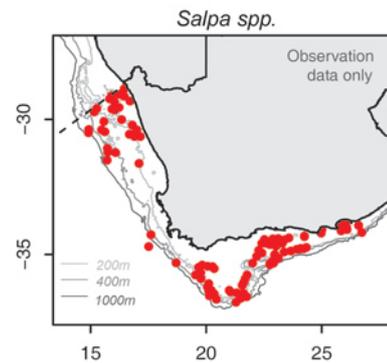
Lazarus BI and Dowler D. 1979. Pelagic tunicata off the west and south-west coasts of South Africa, 1964-1965. *Fisheries Bulletin South Africa*. 12:93-119.

Van Zyl RP. 1960. *A preliminary study of the salps and doliolids off the west and south coasts of South Africa. Investigational Report, Division of Fisheries, Union of South Africa*. v.40, 31pp.

Iziko Museums of South Africa Biodiversity Explorer <http://www.biodiversityexplorer.org/mm/tunicates/pyrosomatidae.htm>. (Accessed February 2018).

Translucent salp (Salps)

Phylum:	Chordata
Subphylum:	Tunicata (Tunicate)
Class:	Thaliacea (salps)
Order:	Salpida
Family:	Salpidae
Genus:	<i>Salpa</i>
Species:	spp.
Common name:	Sea salps



Distinguishing features

Pelagic tunicates, often cylindrical. Can be colonial or solitary, but colonies usually break apart in trawl net. Very thin body wall, transparent and slimy, with brown globular intestinal tract and stomach visible.

Colour

Transparent or translucent, but with digestive organs or other parts of the musculature visible within the transparent body.

Size

Individuals usually up to 60 mm in length.

Distribution

West and South Coasts of South Africa throughout water column, very widespread.

Similar species

Many species of salps occur in the region and further identification requires dissection and a microscope. *Brooksia*, *Cyclosalpa*, *Helocosalpa*, *Ihleia*, *Metcalfina*, *Pegea*, *Ritteriella*, *Salpa*, *Soestia*, *Thalia*, *Thetys*, *Traustedia* and *Weelia* spp.

References

Lazarus BI and Dowler D. 1979. Pelagic tunicata off the west and south-west coasts of South Africa, 1964-1965. *Fisheries Bulletin South Africa*. 12:93-119.

Van Zyl RP. 1960. *A preliminary study of the salps and doliolids off the west and south coasts of South Africa. Investigational Report, Division of Fisheries, Union of South Africa*. v.40, 31pp.

Iziko Museums of South Africa Biodiversity Explorer <http://www.biodiversityexplorer.org/mm/tunicates/salpidae.htm>. (Accessed February 2018).