COMMON ASCIDIANS OF THE SYDNEY REGION

Invertebrates account for 99% of the animals on the planet, yet public perception of their significance, even their existence, is limited. Ascidians are common and biologically significant members of marine assemblages and in an evolutionary sense they provide fascinating insights into vertebrate origins. Nevertheless, it is difficult to appreciate anything unless you are aware of if existence and can identify it. Ascidians, or tunicates as they are sometimes referred to, are exclusively marine and with few exceptions occur below the lowest tides. To appreciate them you'll need to get wet! This photographic guide is designed for students, divers and keen amateurs to identify and appreciate the more common ascidians of the Sydney Region (Port Stephens to Ulladulla). It is not exhaustive, nor is it a taxonomic key. My aim was not to replace the monograph series developed by Patricia Kott (1985, 1990a&b, 1992a&b, 2001), but to make her work more accessible. You will encounter species that are not mentioned here and when you do I recommend her monographs to you.

Kott (1997) quite correctly observes that examining the external morphology of species is unlikely to allow the unambiguous identification of ascidians and notes that "specimens must be dissected for identification". Although this statement is difficult to refute there are a number of common species in the Sydney region with characteristic external morphology, or restricted to certain habitats, which allow identification with a high degree of certainty. Wherever possible I support statements in this key with reference to the scientific literature, although I also use it as an opportunity to record some of my own observations or refer to my own unpublished data. I assume that the specimens being examined by the reader are *in situ*, beach cast or freshly collected (Note though the need and importance of scientific collecting permits). Wherever possible I focus on features that aid identification without the need for dissection, but on occasions the reader will have no choice. I have elected to ignore representatives of the diverse Didemnidae in this key. Although members of this family are common and readily identified to the family level, their small zooids render them difficult to ascribe to species. The fourth part of Kott's monograph series (Kott, 2001) is devoted to this troublesome family. For those wishing to familiarise themselves with members of this group I recommend the detailed but readable work by Day (1974) on *Pyura stolonifera*, which is almost indistinguishable from the 'cunjevoi', *Pyura praeputialis*; probably our most accessible ascidian. A good recent general account of the group is given by Stocker (2001), while the excellent diagrams and beautiful photographs in Monniot *et al*. (1991) are well worth examining, even though their focus is on tropical species of New Caledonia. Considerable work remains to be done with this group (Davis *et al*., 1999) but if these pages stimulate students or others to work with these fascinating organisms, then I will have achieved my aim. Finally, I dedicate these pages to the life work of Dr Pat Kott following her rcent passing.

References

Davis A.R., Roberts, D. & Ayre, D.J. (1999) Conservation of sessile marine invertebrates: you don't know what you've got 'til it's gone. *In:* Ponder W. & D. Lunney (eds.) *The other 99%: the conservation and biodiversity of invertebrates.* Transactions of the Royal Society of NSW, Mosman. pp. 325-329.

Day R.W. (1974) An investigation of *Pyura stolonifera* (Tunicata) from the Cape Peninsular. *Zoologica Africana* 9: 35-58.
Kott P. (1985) The Australian Ascidiacea Part 1, Phlebobranchia and Stolidobranchia. *Mem. Qd Mus*. 23: 1-440.
Kott P. (1990a) The Australian Ascidiacea Part 2, Aplousobranchia (1). *Mem. Qd Mus*. 29: 1-226.
Kott P. (1990b) The Australian Ascidiacea, Phlebobranchia and Stolidobranchia, Supplement. *Mem. Qd Mus*. 29: 267-298.

Kott P. (1992a) The Australian Ascidiacea Part 3, Aplousobranchia (2). *Mem. Qd Mus*.32: 375-620.
Kott P. (1992b) The Australian Ascidiacea, Supplement 2. *Mem. Qd Mus*. 32: 621-655.
Kott P. (1997) Chapter 23: Tunicates (Sub-Phylum Tunicata). In: Shepherd S.A. and M. Davies (eds) *Marine Invertebrates of Southern Australia, Part III*. South Australian Research and Development Institute, South Australia. Pp. 1092-1255.
Kott P. (2001) The Australian Ascidiacea Part 4, Aplousobranchia (3), Didemnidae. *Mem. Qd Mus*.47: 1-407.
Monniot C., Monniot, F. & Laboute, P. (1991) Coral reef ascidians of New Caledonia. Orstom, Paris, pp. 247.
Stocker L. (2001) The invertebrate chordata, hemichordata, and chaetognatha. Chapter 17, in Anderson D.T. (ed) *Invertebrate Zoology*, second edition, Oxford University Press, Oxford pp 403-422.

LIST OF TAXA TO BE INCLUDED IN THESE PAGES, WITH AN OUTLINE OF CLASSIFICATION

Phylum Chordata
Class Ascidiacea
Order Enterogona
Suborder Phlebobranchia
- Family Ascidiidae
  - *Phallusia obesa*

Suborder Aplousobranchia
- Family Cionidae
  - *Ciona intestinalis*
- Family Clavelinidae
  - *Clavelina australis*
  - *Clavelina meridionalis*
  - *Clavelina moluccensis*
  - *Clavelina pseudobaudinensis*
- Family Pycnoclavellidae
  - *Euclavella claviformis*
- Family Holozoidae
  - *Hypsistozoa distomoides*
  - *Sycozoa cerebriformis*

Sycozoa pulchra

Family Polycitoridae

Polycitor giganteus
Eudistoma elongatum
Eudistoma laysani
Eudistoma maculosum

Family Pseudodistomidae

Pseudodistoma gracilum

Family Polyclinidae

Sidneioides tamaramae

Order Pleurogona

Suborder Stolidobranchia

Family Styelidae

Subfamily Styelinae

Styela plicata
Cnemidocarpa pedata
Cnemidocarpa radicosa

Subfamily Polyzoinae

Polyandrocarpa lapidosa
Oculinaria australis
Stolonica australis
Symplegma oceania

Subfamily Botryllinae

Botrylloides leachi
Botrylloides magnicoecum
Botrylloides perspicuum

Family Pyuridae

Pyura australis
Pyura gibbosa gibbosa
Pyura spinifera
Pyura stolonifera
Herdmania grandis
Halocynthia dumosa

Eudistoma maculosum Kott, 1990 (Polycitoridae)

Taxonomy

Order: Enterogona Suborder: Aplousobranchia. Family: Polycitoridae
Family: Polycitoridae Michaelsen, 1904
Genus: *Eudistoma* Caullery, 1909
A large, predominantly tropical genus with 28 species (17 endemic) known from Australia. Five species recorded from the Sydney Region, four are endemic.
Original binomial: *Eudistoma maculosum* Kott, 1990
Species: *maculosum* = Lat. spotted (referring to the surface pigmentation)

Notes

This species forms large fleshy colonies between 0.5 and 2 cm thick with rounded borders. Colonies form large adherent sheets that may exceed 50 cm in diameter. Zooids are arranged in simple systems and the two-tone colouration is characteristic. The test is generally white, while pigmentation around the zooid systems is green through to brown. Individuals from South Australia have darker pigmentation around the zooid systems. This species appears to prefer sites with only moderate wave exposure and is frequently encountered at the entrance to caves. Colonies located in the shade of cave entrances tend to be lighter in colour, probably reflecting the effect of shading photosynthetic symbionts. Other members of the genus are known to form such associations (Kott, 1990) and the presence of photosynthetic symbionts is more common than anticipated in temperate regions (Roberts *et al.*, 1999). In relatively calm locations in can be found in as little as 3m of water. It occurs down to at least 25m. *Eudistoma maculosum*, along with other members of this genus (e.g. *E. olivaceum*, Davis & Wright, 1990; Davis, 1991), produce alkaloids which are likely to play defensive roles (Berry *et al*., 1999; Davis & Bremner, 1999). Davis (1998) observed significant antifouling activity with crude solvent extracts of *E. maculosum* at 5% of natural concentration, although whether alkaloids conferred this activity is not yet clear. Kott (1990) reports that a single large embryo is brooded with the larval trunk measuring 0.9 mm and records a reproductive specimen in August in Jervis Bay. Endemic species, distributed from Port Peron (WA) around the southern Australian coast to at least Wollongong (NSW). This species cannot be confused with any other in the Sydney region. The closely related *E. tigrum* is restricted to the tropics and possesses smaller larvae (trunk length 0.75mm). Kott (1990) suggests that where larvae are not available the tropical temperate distribution allows these two species to be distinguished.

References

Berry Y., J.B. Bremner, A.R. Davis & S. Samosorn (2006) Isolation and NMR spectroscopic clarification of the alkaloid 1,3,7-trimethylguanine from the ascidian Eudistoma maculosum. *Nat. Prod. Research* 20: 479-483

Davis, A.R. (1991) Alkaloids and ascidian chemical defense: evidence for the ecological role of a natural product from *Eudistoma olivaceum*. *Mar. Biol.* 111:375-379

Davis, A.R. & J.B. Bremner (1999) Potential antifouling natural products from Ascidians: a review. In: M. Fingerman, R. Nagabhushanam & M.F. Thompson (eds) *Recent Advances in Marine Biotechnology Vol. III: Biofilms,*

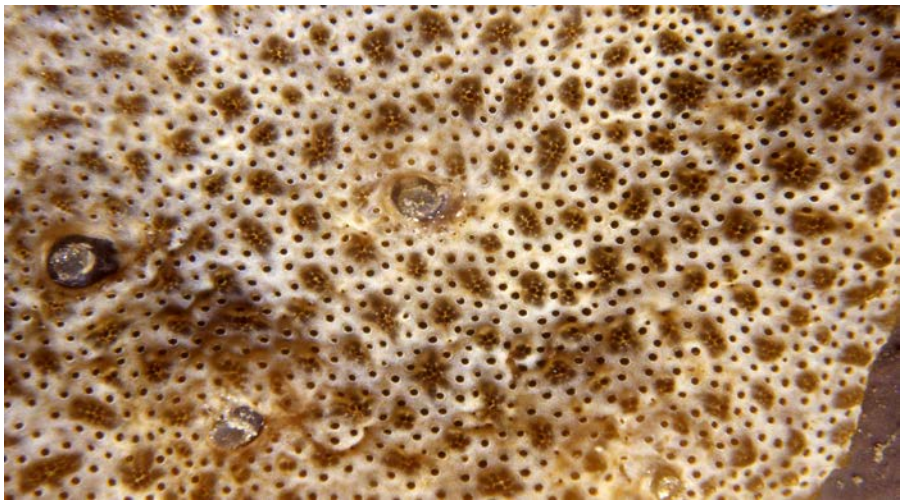
Bioadhesion, Corrosion and Biofouling. Pp. 259-308, Science Publishers Inc., New Hampshire, USA.

Davis, A.R. & A.E. Wright (1990) Inhibition of larval settlement by natural products from the ascidian *Eudistoma olivaceum* (Van Name) *J. Chem. Ecol*. 16: 1349-1357.

Kott P (1990) The Australian Ascidiacea Part 2, Aplousobranchia (1*). Mem. Qd Mus*. 29: 1-266.

Roberts, D.E., S.P. Cummins, A.R. Davis & C. Pangway (1999) Evidence for symbiotic algae in sponges from temperate coastal reefs in New South Wales, Australia. Proceedings of the 5th International Sponge Symposium, 'Origin & Outlook', *Mem Qd. Mus.* 44: 493- 499

Eudistoma maculosum
(Southern NSW)



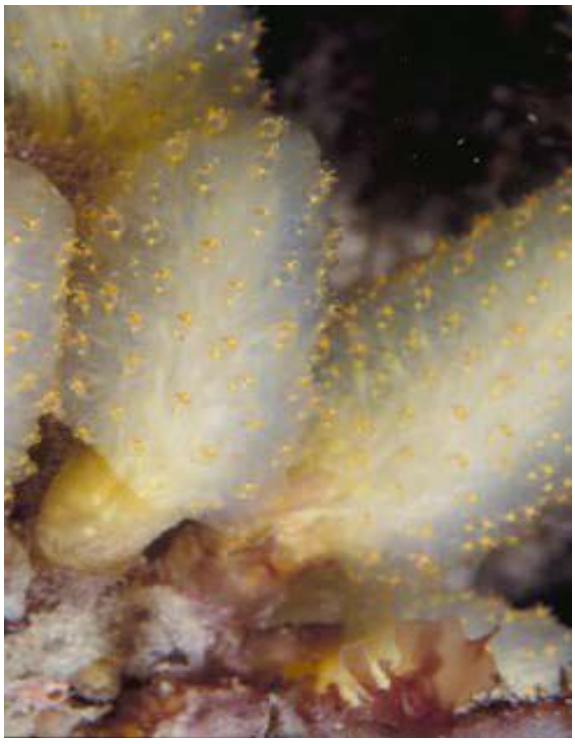
Eudistoma maculosum - close up of colony
(Southern NSW)

Euclavella claviformis (Herdman, 1899) (Pycnoclavellidae)

Taxonomy
Order: Enterogona Suborder: Aplousobranchia. Family: Pycnoclavellidae
Family: Pycnoclavellidae Kott, 1990
Genus: *Euclavella* Kott, 1990
A monotypic genus known only from NSW and northern New Zealand.
Original binomial: *Colella claviformis* Herdman, 1899
Species: *claviformis* = Lat. Club shaped

Notes
This handsome stalked colonial species cannot be confused with any other in this region. The club-like head is borne on a short fleshy stalk and houses completely embedded zooids, which open all around the head of the animal. The glassy semi-transparent test contrasts with the orange pigmentation of the zooids. This species appears to be restricted to deep reefs (15-60m, Kott, 1990) in areas experiencing strong tidal flow (Davis, pers. obs.). This monotypic genus has been recorded from Jervis Bay to Ballina (NSW) and the North Island of New Zealand (Kott, 1990). Kott (1990) notes that up to 8 embryos are brooded within a pouch and are present in May and June. Larvae are large with a trunk length of 1.2 mm (Kott, 1990).

References
Kott P. (1990) The Australian Ascidiacea Part 2, Aplousobranchia (1). *Mem. Qd Mus*. 29: 1-226.



Euclavella claviformis
(Central NSW)