THE ASCIDIAN FAUNA OF SOUTHAMPTON WATER

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SUMMARY

Forty-four species of ascidians have been recorded from the English Channel. Thirteen of these occur in Southampton Water. The morphology, diagnostic characteristics and distribution of these species are described. Factors affecting the distribution of ascidians in the area are discussed.

INTRODUCTION

ASCIDIANS (sea-squirts) are very common marine animals which can be inconspicuous or superficially plant-like. They can be solitary or colonial; solitary forms such as *Ciona intestinalis* or *Styela clava* tend to be large and well adapted to standing clear of other sessile organisms on a surface. Colonial squirts are smaller and consist of several zoids (individuals) usually arranged in systems. The zoids may be grouped in close association, as in the common local species *Botyrullus schlosseri*, or in a looser alliance, as in *Clavelina lepadiformis*, where the zoids are united only at the base.

Ascidians are very common members of fouling, or epizoan, communities. Various species appear at different stages during the colonization of a surface, many disappearing as the fouling association progresses to its mature state. This maturity is itself usually characterized by the presence of one or more species of solitary ascidian as well as colonial forms.

The class Ascidiacea is wholly marine and its members live in habitats ranging from the mid-tide level in the littoral zone to a depth of over 6,000 metres in the abyssal zone. Most members of the class are filter feeders and move a stream of water by ciliary action through their branchial basket where food particles are sieved out and gaseous exchange for respiration also takes place. The branchial (incurrent) siphon is always terminal; the atrial (outcurrent) siphon may be lateral, terminal or sub-terminal. All ascidians are hermaphrodite, containing male and female gonads which usually ripen simultaneously. In most species eggs and sperm are shed into the water where fertilization and larval development take place. Hatching occurs at up to 30 hours after fertilization at normal summer temperatures and the larva then has a free-swimming life of only a few hours or days before settling and metamorphosing to the adult form. Some species, including almost all the colonial ones, incubate the larvae within the body cavity or the common tunic of the colony, releasing them into the sea some time after hatching. In such species hatching usually does not occur until several days or weeks after fertilization, a characteristic associated with the presence of very large, yolky eggs in these ovoviviparous forms. In all ascidians the larval stage serves the dual function of dispersal and habitat selection.

Proc. Hants. Field Club Archaeol. Soc. **30**, 1975, 9–15.

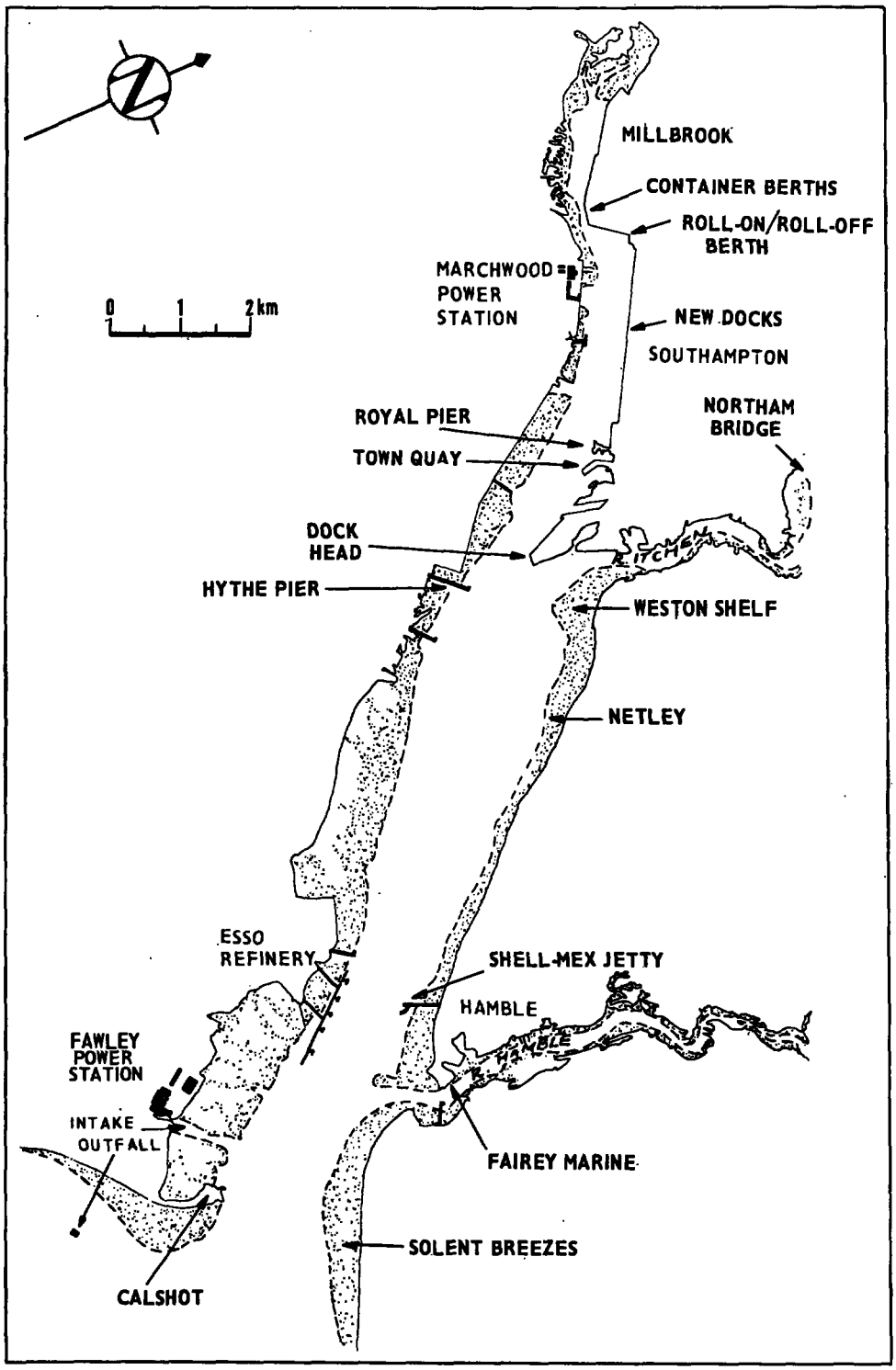

Fig. 1. Location map, Southampton Water.

This account is an attempt to place on record the known status of the ascidian fauna of Southampton Water. The distributions described were determined during a programme of field work commencing with the opening of the C.E.G.B's Marine Biological Laboratory in 1969, although earlier observations have also been included. Sixty species of ascidian are known from British waters, forty-four having been recorded from the English Channel. Of these, thirteen have been found in Southampton Water north of a line drawn between Calshot Spit on the west and Solent Breezes on the east. Most of the unrecorded thirty-one species are colonial forms that are easily missed during collection and that are also extremely difficult to identify when collected. It is thus probable that the complete list of ascidians from Southampton Water will prove to be longer than that presented here.

The Local Species

Order ENTEROGONA

Suborder Aplousobranchiata
Family Clavelinidae
Subfamily Clavelininae
Clavelina Savigny 1816
Clavelina lepadiformis (Müller 1776)

Family Polyclinidae
Morchellium Giard 1872
Morchellium argus (Milne-Edwards 1841)

Family Didemnidae
Diplosoma Macdonald 1859
Diplosoma listerianum (Milne-Edwards 1841)

Suborder Phlebobranchiata
Family Cionidae
Ciona Fleming 1822
Ciona intestinalis (Linnaeus 1767)

Family Perophoridae
Perophora Wiegmann 1835
Perophora listeri Forbes 1848

Family Ascidiidae
Ascidiella Roule 1883
Ascidiella aspersa (Müller 1776)
Ascidiella scabra (Müller 1776)
Ascidia Linnaeus 1767
Ascidia conchilega Müller 1776

Order PLEUROGONA
Suborder Stolidobranchiata
Family Styelidae
Styela Fleming 1822
Styela clava Herdman 1882
Dendrodoa MacLeay 1825
Dendrodoa grossularia (van Beneden 1846)
Botryllus Gaertner 1774
Botryllus schlosseri (Pallas 1766)
Botrylloides Milne-Edwards 1841
Botrylloides leachi (Savigny 1816)
Family Molgulidae
Molgula Forbes 1848
Molgula manhattensis (De Kay 1843)

HABITATS AND DISTRIBUTION

All ascidians in European waters are sessile, remaining fixed throughout life at the spot where the original settlement took place. Though some species are known which can live in compacted sediments, all the Southampton Water species are adapted to life on a hard surface and, moreover, one which remains free of silt. Most such surfaces locally are artificial, for example the concrete or steel piling of quaysides and of piers in the docks area, the piles of the Esso and Shell-Mex jetties and the various navigational beacons and buoys throughout the area. Squirts will also settle upon shells and stones and upon living or dead barnacles. The colonial forms in particular will grow over the surface of the larger solitary species; *Styela clava*, with its rough, leathery test is very popular whilst *Ciona intestinalis* which has a smooth, somewhat gelatinous test, is never overgrown in this way.

Five species are common in the intertidal zone of the sheltered upper regions of the Water. These are the solitary forms *Ascidiella aspersa*, *Styela clava* and *Ciona intestinalis*, and the colonial *Botryllus schlosseri* and *Botrylloides leachi*. Only *Styela clava* is to be found higher than about 0.3 metre above the level of extreme low water spring tides (ELWST), the other forms being less able to withstand tidal emersion (at 0.3m above ELWST the animals are out of water for 4% of the time, usually about the hours of 0600 and 1800). *Clavelina lepadiformis* also is found in the locality of Royal Pier just above ELWST. With increasing exposure to wave action and tidal currents towards the mouth of Southampton Water all these species become less common intertidally, until at Calshot Spit or at Solent Breezes only *Styela clava* is to be found anywhere on the shore.

Sublittorally the ascidians are more evenly distributed. *Styela clava*, *Ascidiella aspersa* and *Ciona intestinalis* are all common on suitable surfaces at the upper end of the Water, i.e. at Marchwood, Millbrook, Royal Pier and at Dock Head and into the R. Itchen as far as Northam Bridge. The piling of the roll-on/roll-off dock and of the new container berths was too recently installed when examined to support any fouling. At Royal Pier *Molgula manhattensis* and *Perophora listeri* are very occasionally found on sublittoral cables in the more sheltered spots. *Molgula manhattensis* is generally found in small numbers on artificial settlement panels at Royal Pier.

Styela clava is numerically dominant on the piles of the Royal Pier area from low tide level down to at least 4m below ELWST (the limit of observation) where densities of up to 300 per square metre were recorded in 1970. Elsewhere, especially on the shelly mud of the Weston Shelf – Netley area, *Ascidiella aspersa* becomes dominant, with *Ciona intestinalis* and *Styela clava* being present, though less abundant than on the piles. However, *Styela clava* remains the dominant solitary form on the buoys of the Weston Shelf area. The encrusting colonial forms *Botryllus schlosseri* and *Botrylloides leachi* are common on hard surfaces or on other animals throughout the whole of the Royal Pier, Marchwood and New Docks area, as well as the River Itchen and on the buoys.

The sublittoral ascidian fauna of the west side of Southampton Water is sparse, due partly to a lack of suitable settlement surfaces. However, *Styela clava* is present on the shelly bottom off Hythe, just to the north of the Esso Marine Terminal, being sometimes found associated with *Botryllus schlosseri* and *Botrylloides leachi* on shell fragments. On the east side, the beacons off Netley support a varied ascidian fauna, with either *Ciona intestinalis* or *Ascidiella aspersa* assuming dominance, though *Styela clava*, *Botryllus schlosseri* and *Botrylloides leachi* were well represented. These beacons also sustain a sizeable population of *Molgula manhattensis*, a species that is more abundant on the floating pontoons in the Hamble river, for example at Fairey Marine, where it is co-dominant with *Styela clava* though associated also with *Ciona intestinalis* and *Ascidiella aspersa*.

The fauna of the sea bottom south of the Hamble on the east, and south of the Esso Marine Terminal on the west, is only poorly known. *Styela clava*, *Ascidiella aspersa* and *Ciona intestinalis* have all been found there, but not in great numbers. A few specimens of *Ascidiella scabra* were recorded from here in 1965 and in 1973 this species was found, apparently for the first time, in fair numbers in the culverts of Marchwood power station. It has never been found on the artificial settlement panels maintained at seven sites between Calshot and Marchwood. The red styelid *Dendrodoa grossularia*, which is extremely abundant sublittorally in the Solent, penetrates up Southampton Water as far as the mouth of the Hamble. It is generally found attached to small stones and oyster shells. Several colonies of the polyclinid ascidian *Morchellium argus* have been collected recently from the sea bottom near Solent Breezes; it is possible that this species is even more widely distributed as the colonies are small and easily overlooked.

The colonial didemnid *Diplosoma listerianum* has been found on artificial settlement panels at the south end of Southampton Water, in the inlet dock to Fawley Power Station. It has been found growing on aquarium glass in the open circulation system of the Fawley Marine Biological Laboratory (1970 and 1971), as well as in the closed circulation system of the Oceanography Department of Southampton University between 1965 and 1970. This species is almost certainly widespread in the area, but being thin, gelatinous and transparent it is easily missed. Many specimens of *Ascidiella scabra* and *Ascidia conchilega* have been found in the open circulation of the Fawley Marine Laboratory. The latter species has not been recorded from 'natural' habitats in Southampton Water. This may be due to the fact that *Ascidia conchilega* can be mistaken for *Ascidiella aspersa*. A more searching investigation may show *conchilega* to be a significant component of the local sublittoral fauna.

Discussion

The distribution of ascidians in an area depends to a marked degree on the availability of suitable settlement surfaces. Such surfaces are common throughout Southampton Water, yet there is a distinct difference between the ascidian fauna of the upper end of the Water compared with that of the lower end near the Solent. Of the eleven naturally occurring species (omitting for the moment *Diplosoma listerianum* and *Ascidia conchilega*, which have not yet been found 'in the field'), *Morchellium argus*, *Dendrodoa grossularia* and *Ascidiella scabra* are all absent from the docks area, where the solitary forms *Ascidiella aspersa*, *Ciona intestinalis* and *Styela clava* dominate the epizoan communities. The number of species increases at the Solent end of Southampton Water from where only *Perophora listeri* is absent, although no species is very abundant or dominant in the epizoan faunas.

These differences cannot be ascribed to changes in salinity along the length of Southampton Water, as the three rivers Hamble, Test and Itchen discharge relatively little fresh water, even in winter, and observed salinity gradients are slight. The lower end of Southampton Water offers a much greater variety of sublittoral habitats than does the docks area where the bottom is uniformly muddy with an assortment of solid objects embedded in it. Current velocities here are low and wave action slight compared with the lower end. These differences in physical characteristics tend to promote a uniformity of habitat in the sheltered docks area, and a variety of habitat in the exposed Solent area. It thus seems probable that the characteristics of the ascidian fauna of any locality within Southampton Water and the Solent may be more easily correlated with the nature of the habitats available, type of bottom sediment and general degree of exposure than with salinity changes.

What the ascidian fauna of the docks area lacks in diversity it more than makes up for in sheer biomass. There are some five miles of deepwater quayside, excluding the fresh surfaces of the new container berths, every inch of which supports a mass of fouling. The concentration of ascidian larvae in this area during the summer months ensures that no suitable surface remains for long uncolonised.

Acknowledgement

This work was carried out at the Fawley Marine Biological Laboratory of the Central Electricity Research Laboratories and is published by permission of the C.E.G.B.

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This is in no sense an exhaustive reference list, but mentions the most useful works in identifying local ascidians.

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