Chapter 7. Organisms Fouling Hulls and Sea Chests of Tankers

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7A. Purpose

Historically, fouling organisms on ships have been a major source of introduced species (Carlton 1979a, 1979b, 1987, 1989). Modern anti-fouling paints and high ship speeds greatly reduce the amount of fouling today. However, fouling is often common in sea chests and at certain points on the bottom. We sampled tankers during routine maintenance in dry dock, selected to estimate the potential range of fouling and diversity of fouling organisms.

7B. Methods

We sampled the fouling communities of two ships in dry dock: the S/R Baytown (in San Francisco Bay), which had not been cleaned in dry dock for approximately 2 years; and the S/R Benicia (in Portland), which had been cleaned in dry dock within about 6 months. The S/R Baytown had remained within San Francisco Bay for several months without making an ocean voyage prior to haul out, providing time for further accumulation of fouling organisms. Representative patches of fouling communities were scraped from the bottoms of the ships within 6 hours of haul out and before any cleaning had commenced. The sea chests and strainers of the ambient water intakes were also sampled. All samples were preserved in 10% formaldehyde and returned to the laboratory for sorting and identification using a dissecting microscope.

7C. Results

The two ships exhibited divergent extremes in the quantity and diversity of organisms (Table 7.1). The ship that had not been in dry dock for approximately 2 years exhibited extensive fouling communities, with abundant mussels and associated worms, crustaceans, and sediments. At least one NIS for the west coast (the mussel *Musculista senhousia*) was identified specifically on this ship. In contrast, the ship that had been hauled recently had a relatively sparse number of organisms, with most of the hull completely clean of fouling communities, and only organisms present in the sea chest. However, even this ship had organisms that are NIS for the west coast (e.g., the striped bass *Morone saxatilis*) in its water intake strainers.

7D. Conclusions

We hypothesize that these two vessels represent the extremes in fouling communities, corresponding to the length of time since the last entry into dry dock for bottom cleaning. However, there are two other features that may contribute to these overall patterns. First, the S/R Baytown had been resident in San Francisco Bay for over 6 months, and may have developed an unusually rich fouling community. Second, the other vessel entered relatively fresh water of the Columbia River that may have had an adverse effect on the resident community of fouling organisms. To distinguish the effect of dry dock schedule on fouling community structure (from these other confounding variables), it would be valuable to sample more ships which differ in time since last haul out, but preferably sampled at the same dry dock to control for potential effects of different salinity. Nevertheless, both ships carried NIS, which indicates that this is an active mechanism of transport and introduction.

Table 7.1. Organisms from hulls and sea chests of two oil tankers in dry dock (*=NIS).

S/R Baytown	S/R Benicia
Algae	**Cnidaria**
Ulva sp.	*Garveia franciscana **
Diatomacea	**Mollusca, Bivalvia**
Protozoa	*Mytilus sp.*
Folliculina sp.	**Crustacea, Cirripedia**
Cnidaria	*Balanus sp.*
*Cordylophora caspia **	**Crustacea, Amphipoda**
*Garveia franciscana **	*Corophium sp.*
Nematoda	**Pisces**
Unidentified sp.	*Morone saxatlis **
Nemertea	*Sardinopsis sagax*
Unidentified sp.	
Polychaeta	
Neries sp.	
Ophelidae, unidentified sp.	
Polydora sp.	
Mollusca, Bivalvia	
*Musculista senhousia **	
Mytilus sp.	
Crustacea/Copepoda	
Cyclopoida, unidentified sp.	
Harpacticoida, unidentified sp.	
Crustacea/Amphipoda	
Corophium sp.	
Gammaridae, unidentified sp.	
Crustacea/Isopoda	
Unidentified sp.	
Crustacea/Brachyura	
Unidentified sp.	
Bryozoa	
Bowerbankia	
Membrenipora	
Victorella sp.	

7E. References

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Table 7.1. Organisms from hulls and sea chests of two oil tankers in dry dock (* = NIS).

S/R Baytown	S/R Benicia
Diatomacea	**Cnidaria**
Protozoa	*Garveia franciscana* *****
Folliculina sp.	**Crustacea, Cirripedia**
Cnidaria	*Balanus* sp.
Garveia franciscana *****	**Crustacea, Amphipoda**
Cordylophora caspia *****	*Corophium* sp.
Hydroid – unident sp.	**Mollusca, Bivalvia**
Bryozoa	*Mytilus* sp.
Bowerbankia sp.	**Pisces**
Canopeum sp.	*Morone saxatilis* *****
Victorella sp.	*Sardinopsis sagax*
Nemertea	
Unidentified sp.	
Nematoda	
Unidentified spp.	
Polychaeta	
Ophellidae, unidentified sp.	
Polydora sp.	
Nereis sp	
Crustacea/Copepoda	
Harpacticoida, unidentified sp.	
Cyclopoida, unidentified sp.	
Crustacea/Amphipoda	
Gammaridae, unidentified sp.	
Corophium sp.	
Crustacea/Isopoda	
Unidentified sp.	
Crustacea/Brachyura	
Unidentified sp.	
Mollusca, Bivalvia	
Musculista senhousia *****	
Mytilus sp.	
Algae	
Ulva sp.	