A Unique Collection of Baseline Biological Data: Benthic Invertebrates From an Under-water Cable Across the Strait of Georgia.

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A UNIQUE COLLECTION OF BASELINE BIOLOGICAL DATA: BENTHIC INVERTEBRATES FROM AN UNDERWATER CABLE ACROSS THE STRAIT OF GEORGIA.

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INTRODUCTION

This is a brief report on the benthic organisms that were collected on a 52 year old telephone cable that reached from near Nanaimo to off Point Grey, Vancouver, B.C. Data for species composition are as yet incomplete because of taxonomic problems and time limitations, but partial results and field observations allow some interpretation. A segment of the collection was frozen, so that analyses for heavy metals, pesticides, and other environmental contaminants are possible. Levels of contaminants have not been reported from benthic organisms in the deeper parts of the Strait of Georgia, even though the long-lived, sedentary organisms are good integrators of water quality. Baseline data from the Strait are urgently required, as the demand for information on water quality becomes more strident. It is hoped that this short report will draw the attention of investigators interested in this unique collection of organisms.

LOCATION OF THE CABLE

The cable was the most southerly of the four shown crossing the Strait of Georgia on Canadian Hydrographic Chart No. 3577 (1972 Edition) (Figure 1). It was laid in April 1921 (Anon, MS, 1973a). The section which was recovered while we were observing (August 14 and 15, 1973)

stretched from approximately 0.4 km south of Orlebar Pt. (Gabriola Island) to 11.1 km southwest of Point Grey. The cable was in remarkably good condition and was subsequently relaid at Nelson and Lasqueti Islands.

COLLECTING FROM THE CABLE

The diameter of the cable was 3.0 cm (1.2 in) and the outer covering was composed of gutta percha. Under the outer layer, the core of the cable was wrapped in jute. The copper wires for message transmission were wrapped in thin strands of steel wire for induction of electrical current.

The cable was retrieved by winding it on a large drum (Figure 2a) mounted on a barge, which moved the barge and towboat across the Strait at about 0.3 to 0.5 kts. The cable passed through a large pulley on the bow of the barge which was fitted with a revolution counter, providing an estimate of distance along the cable. Radar positions were frequently obtained on M/V STORM QUEEN, one of the vessels involved in the cable pickup.

Specimens were obtained by scraping or hand-picking the encrusting organisms (Figure 2b) off the cable as it passed over the deck of the barge to the large winding drum. Most specimens were damaged in their passage through the bow pulley; however, some were collected virtually intact. Many of the larger organisms, such as large specimens of *Paragorgia, Eunicea?, Aphrocallistes* and *Chonelasma* (see Table 1) broke

off the cable when they reached the water surface or the pulley.

IDENTIFICATION OF FAUNA

Only the larger organisms (larger than about 1 cm) are considered in this report. Most were identified using the taxonomic references cited in McDaniel (MS, 1973).

RESULTS

Epifaunal organisms were found on the cable at three general areas (Figure 1). Organisms were infrequently observed at Area A, which was located between the beginning of the haul and a point approximately 7.4 km northeast of Entrance Island. Beyond this point, a very rich assemblage of organisms was encountered, and the dense fauna continued for close to 0.9 km of cable. This location was called Area B. East of Area B, the cable evidently was buried in soft mud, and the only fauna observed were a few scaphopods and maldanid polychaetes which were carried to the surface in the mud adhering to the cable. All the mud observed was grey and did not smell foul. At a point about 12.9 km southwest of Point Grey (designated Area C) a short segment of the cable about 0.4 km long bore epifauna. Fewer types of organisms were collected at this area.

The organisms identified to date, from each of the areas, are shown in Table 1 and classified in Table 2. Or-

ganisms frozen for analyses of environmental contaminants are shown in Table 3. The list will be upgraded as time becomes available to identify the fauna. Some of the organisms, especially the anemones, may be new records for B.C., but sufficient taxonomic information is lacking.

DISCUSSION

The taxonomic composition of the organisms found on the cable was quite diverse, which suggests that physical factors, for example, oxygen levels, were not limiting or abnormally low. Oxygen values for bottom waters at a recent oceanographic station located about midway along the cable haul (Station 39 of Crean and Ages, MS, 1971) ranged from 2.91 to 3.80 ml L^{-1} (average 3.26 ml L^{-1} in 3 samples per season). These values compare favourably with those observed in the same area by Waldichuk in September 1952 and March 1953 (app. 3.7 ml L^{-1}) Waldichuk (1957). Unfortunately, data on epifaunal communities from similar depths elsewhere in the Strait of Georgia are not available for comparative purposes.

Table 1 shows that fewer types of organisms were collected in Area C, off Point Grey, compared to Areas A and B, off Entrance Island. It is possible that some organisms, for example the gorgonians, are not present in Area C because of heavy sedimentation by the Fraser River. This sediment may be carrying environmental contaminants, since Parsons et al (1973) have reported accumulation of heavy

metals in biota from the Fraser delta.

The vast majority of the cable was apparently buried in mud, but where it was exposed, larvae from epifaunal organisms settled and grew on this man-made substrate. The parent organisms of the first colonizers must have been located in other areas of Georgia Strait where natural hard substrates are available. In the vicinity of the Fraser plume (Area C) the parental organisms must have been quite distant, since the substrate under the plume is strongly influenced by the sedimentation of Fraser River mud and rocky areas are rare. A large portion of the Strait of Georgia is characterized by level-bottom mud substrates (Waldichuk, 1953; Pharo, MS, 1972), but the sides of this basin are steep and rocky. The samples from off Entrance Island (Area B) were collected from an area where a steep dropoff exists, and the cable apparently hung over the precipice. The topography at Area C (off the Fraser River) was not noted, but as mentioned above the area is characterized by level muddy bottom. The cable may have been suspended over a trench or hole.

At the Strait of Georgia workshop (Anon, MS, 1973b), a number of persons suggested that baseline collections of environmental contaminants be made available, and this was part of the rationale for this work. Some of the organisms collected from the cable are ideal for this (Table 3). More than 500 g (wet weight) of tissue of the anemone (*Metridium senile)* are available for analyses. Sampling from cables may

have a continuing role in pollution ecology, since cables often are laid in harbours and other industrialized areas. Periodic raising and inspection or analyses of the fauna growing on them could be a useful monitoring procedure. According to Mr. Peter Shields, whose company regularly lifts underwater cables, a cable raised from deep sections of Saanich Inlet had very few organisms growing on it, which is to be expected because the bottom waters of this inlet are anoxic most of the time. A cable raised close to Newcastle Island (near Nanaimo Harbour) had lush growths of epifauna on it, suggesting water quality in this area is not seriously degraded.

In the past, organisms from underwater cables have shed light on biological oceanographic problems. For example, animals clinging to a broken cable from 1200 fathoms in the Mediterranean were examined by Milne-Edwards in the 1860's (Thomson, 1874 cited in Deacon, 1971). This information refuted the theory of Edward Forbes, who believed that life did not exist below 300 fm (Deacon, 1971). The biology of most deep sublittoral organisms remains unknown yet deserves attention because of potential disruption by underwater pipelines, undersea drilling, ocean mining, etc. Data on growth rates can provide clues on rates of recovery of disrupted communities. By sampling cables and organisms which have been in place for various lengths of time, it might be possible to determine age-length (or weight) relationships

and hence growth rates, of certain species of epifauna. Dimensions of some of the larger epifauna in the present work were as follows: *Eunicea* ? - fan 58 cm wide x 45 cm tall; *Aphrocallistes vastus* - 60 cm tall; and *Paragorgia arborea* - 45 cm tall. These organisms could not have been more than 52 years old since the cable was laid in 1921.

SUMMARY

1. In August 1973, epifaunal invertebrates were collected from a 52 year old underwater telephone cable that reached across the Strait of Georgia. The majority of the organisms were obtained at two locations: 7.4 km northeast of Entrance Island (350 m) and 12.9 km southwest of Point Grey (300 m).

2. The collections of organisms were quite diverse, suggesting that water quality in this part of the Strait of Georgia has not adversely affected invertebrate communities. Some organisms were frozen, and are available for analyses of environmental contaminants.

3. Periodic raising of cables and inspection/analyses of epifauna growing on them could be a useful tool for monitoring water quality. Such work might also provide data on growth rates of epifauna.

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TABLES

Table I. Distribution of organisms along B.C. Telephone underwater cable.

Legend:

Area A - between Orlebar Pt., (Gabriola Isl.) and cable Section B

Area B 7.4 km north-east of Entrance Island

Area C - 12.9 km south-west of Point Grey

Comments:

OBS - specimens observed, but not collected

FORM -specimens fixed in formalin, preserved in isopropanol

FROZ -specimens frozen

Organism	Location			Comments
Aphrocallistes vastus	A	B		FORM/FROZ
Chonelasma calyx		B		OBS
Esperella occidentalis		B		FORM
Iophon pattersoni		B		OBS
Demospongia A		B		FROZ
Demospongia B		B		FORM
Demospongia C		B		FORM
Demospongia D	A			FORM
Companulinidae A	A			FORM
Abietinaria sp.	A			FORM
Hydrallmania distans	A			FORM
Metridium senile		B	C	FORM FROZ
Actinaria A		B		FORM
Actinaria B		B	C	FORM/FROZ
Caryophyllia alaskensis	A			FORM
Paragorgia arborea		B		FORM

Table 1: cont'd

Organisms	Location			Comments
Psammogorgia sp.	B			FORM
Eunicea ?	B			FORM
Clavularia sp.	B			FORM
Cheilostomata A	B			FORM
Laqueus californianus	B			FORM/FROZ
Polyplacophora A	A			FORM
Fusitriton oregonensis	B			FROZ
Trichotropis cancellata	A			FORM
Cidarina cidaris	A			FORM
Doridae A	A			FORM
Pectinidae A	A			FORM
Hiatella arctica	B			FORM
Dentalium sp.	A		B→C (mud)	FORM
Harmothoe aspera				FORM
Lepidonotus caelorus	A	B		FORM
Enipo cirrata	A			FORM
Nereis sp.	B			FORM
Syllis sclerolaema		C		FORM
Branchiomma burrardum	A	C		FORM/FROZ
Protula pacifica	B			FORM/FROZ
Crucigera irregularis	A	B		FORM/FROZ
Neoamphitrite robusta	A			FORM
Nicomache lumbricalis	A			FORM/FROZ
Asychis sp.	A		B→C (mud)	FORM
Siphonocoetes sp.	A	B		FORM
Chorilia longipes	B	C		FORM
Asteroidea A	B			FORM
Asteroidea B	B			FORM
Ophiuroidea A	A			FORM
Holothuroidea A	B			FORM
Apristurus brunneus (egg cases only)	A	B		FORM/FROZ

Table 2: Species list of organisms collected from B.C. Telephone underwater cable (between Orlebar Pt. and Point Grey).

PORIFERA

Cl. Hexactinellida
Aphrocallistes vastus
Chonelasma calyx

Cl. Demospongia
Esperella occidentalis
Iophon pattersoni
Demospongia A
Demospongia B
Demospongia C
Demospongia D

CNIDARIA

Cl. Hydrozoa
F. Campanulinidae
Campanulinidae A
F. Sertularidae
Abietinaria sp.
Hydrallmania distans

Cl. Anthozoa

Subcl. Zoantharia

O. Actinaria
Metridium senile
Actinaria A
Actinaria B

O. Madreporaria
Caryophyllia alaskensis

Subcl. Alcyonaria

O. Gorgonacea
Paragorgia arborea
Psammogorgia sp
Eunicea ?

O. Stolonifera
Clavularia sp.

Table 2: cont'd - classification of organisms from cable.

ECTOPROCTA

Cl. Gymnolaemata

O. Cheilostomata

Cheilostomata

BRACHIOPODA

Cl. Articulata

Laqueus californianus

MOLLUSCA

Cl. Amphineura

O. Polyplacophora

Polyplacophora A

Cl. Gastropoda

Subcl. Prosobranchia

O. Mesogastropoda

Fusitriton oregonensis
Trichotropis cancellata

O. Archeogastropoda

Cidarina cidaris

Subcl. Opisthobranchiata

O. Acoela

F. Doridae

Doridae A

Cl. Bivalvia

O. Pterioidea

F. Pectinidae

Pectinidae A

O. Myoida

Hiatella arctica

Cl. Scaphopoda

F. Dentallidae

Dentalium sp.

ANNELIDA

Cl. Polychaeta

Subcl. Errantia

F. Polynoidae

Harmothoe aspera
Lepidonotus caelorus
Enipo cirrata

Table 2: cont'd - classification of organisms from cable.

F. Nereidae
Nereis sp.
F. Syllidae
Syllis sclerolaema

Subcl. Sedentaria

F. Sabellidae
Branchiomma burrardum
F. Serpulidae
Protula pacifica
Crucigera irregularis
F. Terebellidae
Neoamphitrite rebusta
F. Maldanidae
Nicomache lumbricalis
Asychis sp.

ARTHROPODA

Cl. Crustacea

O. Amphipoda
F. Corophidae
Siphonocoetes sp.

O. Decapoda
SubO. Brachyura
Chorilia longipes

ECHINODERMATA

Cl. Asteroidea
Asteroidea A
Asteroidea B

Cl. Ophiuroidea
Ophiuroidea A

Cl. Holothuroidea
Holothuroidea A

CHORDATA

Cl. Chondrichthys
Apristurus brunneus (egg cases only).

Table 3. Organisms frozen for analyses of environmental contaminants

Sample #	Area	Fauna	Wet Weight (gm)
1	A	*Aphrocallistes vastus* (basal portions)	6
2	A	*Branchiomma burrardum*	4
3	A	*Nicomache lumbricalis*	5
4	A	*Branchiomma burrardum* (tubes)	3
5	B	Actinaria B	500
6	B	*Fusitriton oregonensis*	29
7	B	*Aphrocallistes vastus* (basal portions)	17
8	B	Demospongia A	14
9	B	*Protula pacifica* (tubes)	9
10	B	*Crucigera irregularis* *Metridium senile*	460
11	B	Actinaria B	126
12	B	*Apristurus brunneus* (egg cases)	25
13	B	*Laqueus californianus*	4
14	C	*Metridium senile*	730
15	C	Actinaria B	280

A - between Orlebar Pt. and 7.4 km. northeast of Entrance Island.

B - 7.4 km northeast of Entrance Island

C - 12.9 km southwest of Point Grey

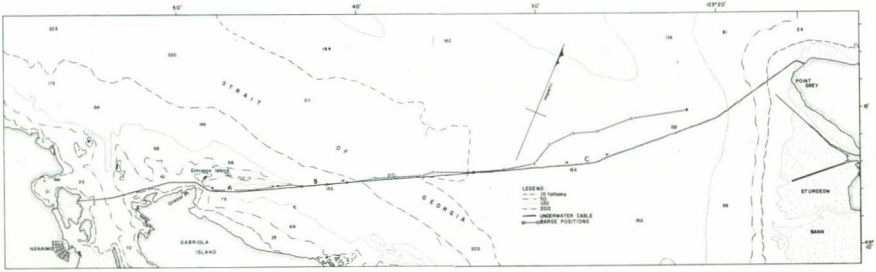

Fig. 1. Position of the cable as shown on C.H.S. Chart No. 3577, and the course followed by the barge retrieving it. The approximate locations of the three areas where organisms were collected are indicated.

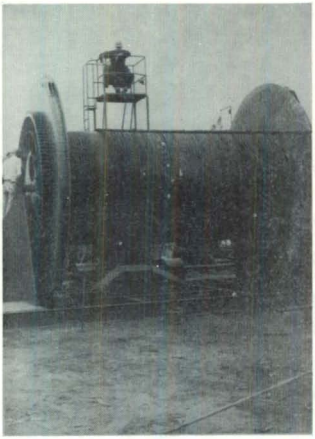

Fig. 2. A. A large drum on which the cable was wound during the retrieval. Organisms seen on the cable (near centre of drum) are *Metridium senile* and other unidentified anemones.

B. Epifauna (anemones) on cable as they cleared the surface of the water at the bow of the barge. Circular object in foreground is the bow pulley.