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Seasonal variation of hydroids in a tidal pool on the ecological reserve of Race Rocks, British Columbia, Canada.,

Anita Brinckmann-Voss, Invertebrate Zoology, Royal Ontario Museum, Toronto, Ontario, Canada M5S 2C6.

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Introduction

During research on a census of hydrozoans of the intertidal and subtidal ecological systems on the ecological reserve of Race Rocks (Brinckmann-Voss and Garry Fletcher in preparation) it was found that one of the tidal pools on the West side of the island does not only represent an unusual large number of species on a very small space, but also seemed to fluctuate in the occurrence and reproductive state of the species during the seasons. Therefore a detailed survey of the tidal pool area was started in 1984 to be followed more in detail by mapping the different species in different months of the year in 1988/89. Unfortunately work on the site cannot be done from November to February because low tides are at night and the area becomes inaccess ble.

After numerous observations in the pool from 84 to 87 for the general survey,detailed work on the seasonality of the species in the pool was done on following dates: July 8-12, August 28, September22, October 11, 1988; March23, April 10, June 2-5, 21, August 15,24,1989.

In order to understand the ecology of the tidal pool a short statement of its geography is necessary (fig.1 a,b):Great Race Rocks is the largest in a group of very small islands or mere rocks , some only exposed fully at low tide, in the Juan de Fuca Straight about 3 km(?)south of the South coast of Vancouver Island. The area of the tidal pool studied is on the South West side of the Island This side consist of steep rocks often near vertical cliffs which are however often broken up into small platforms or ledges with channels in between running more or less parallel to the outer coast of the island. Some of these channels are blocked by rocks at either end and are therefore only partly emptied at low tide, thus forming separate ecological entities of tidal pools. The depth of the tidal pool remains the same during a medium and low tide, because the water cannot drain. However once the water gets in over the outer ledge at incoming tide the high water level varies with different dates of the month or year depending on the maximum high water mark as explained in diagram (fig.1c). As the open sea on the Southwest side of the Island is typical of often rough or violent strong swells from the West plus very fast moving tidal currents (max. miles/hour) the water which gets over the ledge into the tidal pool with incoming tide is more or less foaming probably with a very high oxygen content although measurements were not taken. Therefore, although protected through the outer ledge the water in the pool will never get stagnant.These physical conditions combined with an extremely rich plankton in the Race Rocks area(observations by author) are probably the cause for the large number of species in the tidal pool reported in this study.

Acknowledgemnts.

I am tremendously grateful for the help of three friends: This study would not have been possible without the untiring enthusiasm and help of Garry Fletcher (Pearson College and warden of the ecological reserve of Race Rocks). He showed me the site of the here researched tidal pool and pointed out to its high variation of invertebrate species.Joan and Charles Redhead, lighthouse keepers until September 1989 followed my work with intense interest and invited me to stay in their residence on Race Rocks for several days at various low tide periods . This made repeat observations possible and the in depth study so much more satisfyin

Results

The results are divided into three parts:

1. Distribution of hydroids in the pool. Fig 2 shows a map of the tidal pool,its different hydroid species with their depth at low or intermediate tide .
2. Table 1 lists the species of the tidal pool and their seasonal occurrence. Question marks in the table means that the species were very small and could not be observed with certainity each time. (The small species can only be detected when removed from the pool with their substrates and searched for under a microscope. As I tried to remove as litlle material as possible I was not able to determine the occurence of the smaller species each time.).
3. Fig.3, shows the development of a colony of Orthopyxis compressa and Obelia geniculata on the South West wall of the pool during the summer months 1989.

Discussion.

It appears concluding from the results listed above that numerous species in the tidal pool do not have a pattern of appearance or disappearance (see Calder 1990), but that most colonies of the hydroids regress to their stolons or small colonies.However much more work needs to be done to evaluate the results of this study. For instance as numerous of the species listed here depend on plants as substrate the occurrence and growth of algae and Phyllospadix (the only higher plant in the tidal pool) has to be recorded.

Explanation of figures

Fig.1a : Map of the Island of Great Race Rocks.

1b: Insert A from fig.1a: map of tidal pool.

1c: cross section of tidal pool on level c of fig. 1b. This diagram explains the different water levels of the pool area at low and high tides.

Fig .2 :Distribution of hydrozoans in the tidal pool.(numbers in brackets give depth in cm.).

Fig.3 : Growth pattern of two colonies of Orthopyxis compressa and

Obelia geniculata on the South Western Wall of the pool during the period from April to August 1989.

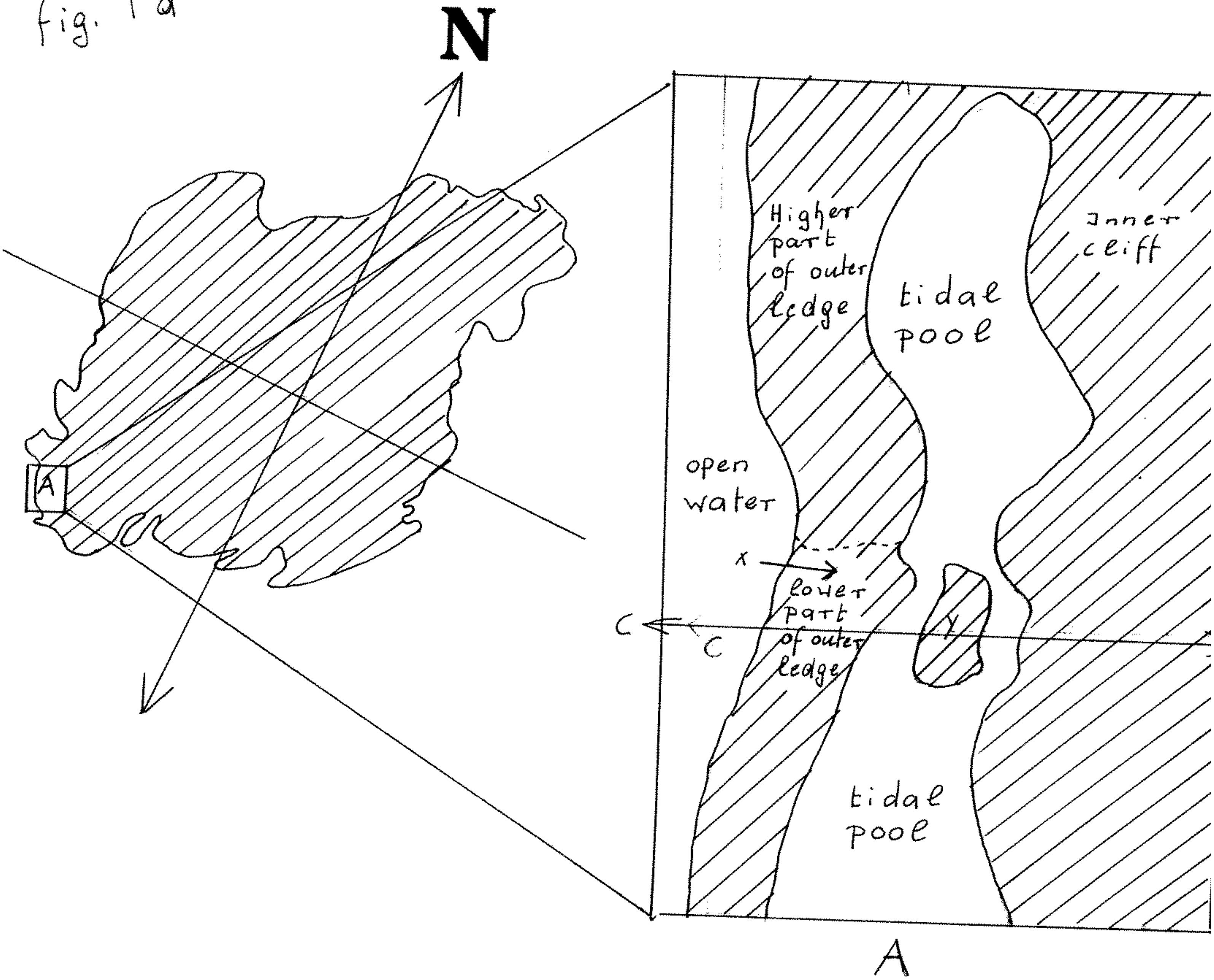
Table 1.Seasonal variation of hydrozoan species in the tidal pool from March to October

– :species absent + :species present ++ : with gonophores

species	March	Apr.	May	June	July	Aug.	Sep.	Oc.
Rhizogeton eozoense	?	?	+	?	?	?	?	?
Hataia parva	?	?	?	+	?	?	?	?
Bougainvillia ramosa	+	+	+	++	++	++	+	+
Garveia annulata	+	+	++	++	++	++	++	++
Garveia groenlandica	+	+	++	++	+	?	?	?
Hydractinia milleri	+	+	++	++	++	++	+	+
Hydractinia armata	–	+	+	++	++	++	+	+
Rhysia sp.	?	+	+	++	++	++	++	++
Eudendrium sp.	+	+	+	+	+	+	+	+
Stylantheca petrograpta	present throughout year, however gonophores not verified.							
Hybocodon prolifer	++	++	+	+	+	+	+	+
Tubularia sp.	–	–	++	++	++	++	+	+
Sarsia eximia	very small		larger with gon.				+	+
Sarsia sp.	?	?	+	+	++	++	+	+
Campanulina sp. (?)	–	–	+	+	++	++	++	++
Calycella syringa	?	?	++	++	++	++	+	+
Obelia geniculata	+	+	++	++	++	++	++	+
Campanularia ritteri	?	?	+	++	++	++	++	+
Campanularia urceolata	–	–	colonies covering all bases of algae in the pool.					
Orthopyxis compressa	as stolon only +				++	++	++	++
Clytia sp.	?	?	?	+	++	++	++	++
Plumularia setacea	+	++	++	++	++	++	++	++
Aequorea victoriae	?	?	?	?	+	?	?	?
Halecium pygmaeum	+	+	+	++	++	+	+	+
Abietinaria amphora	+	+	++	++	++	++	++	++
Sertularella turgida	+	+	++	++	++	++	++	++
Aglaophenia inconspicua	+	+	++	++	++	++	++	++

fig. 1a

fig. 1b



x : point where water comes in first at incomin[g] tide.

Y : Island within tidal poo[l]

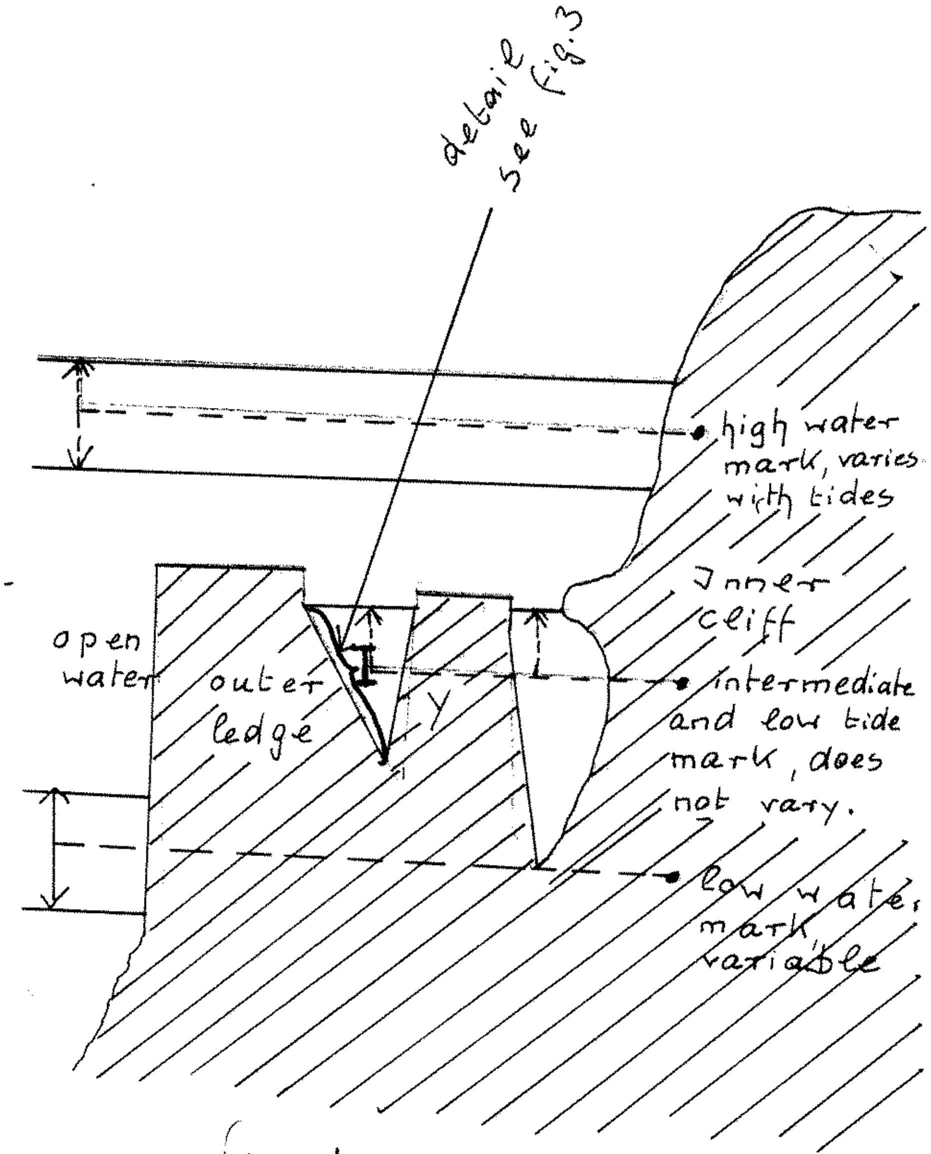
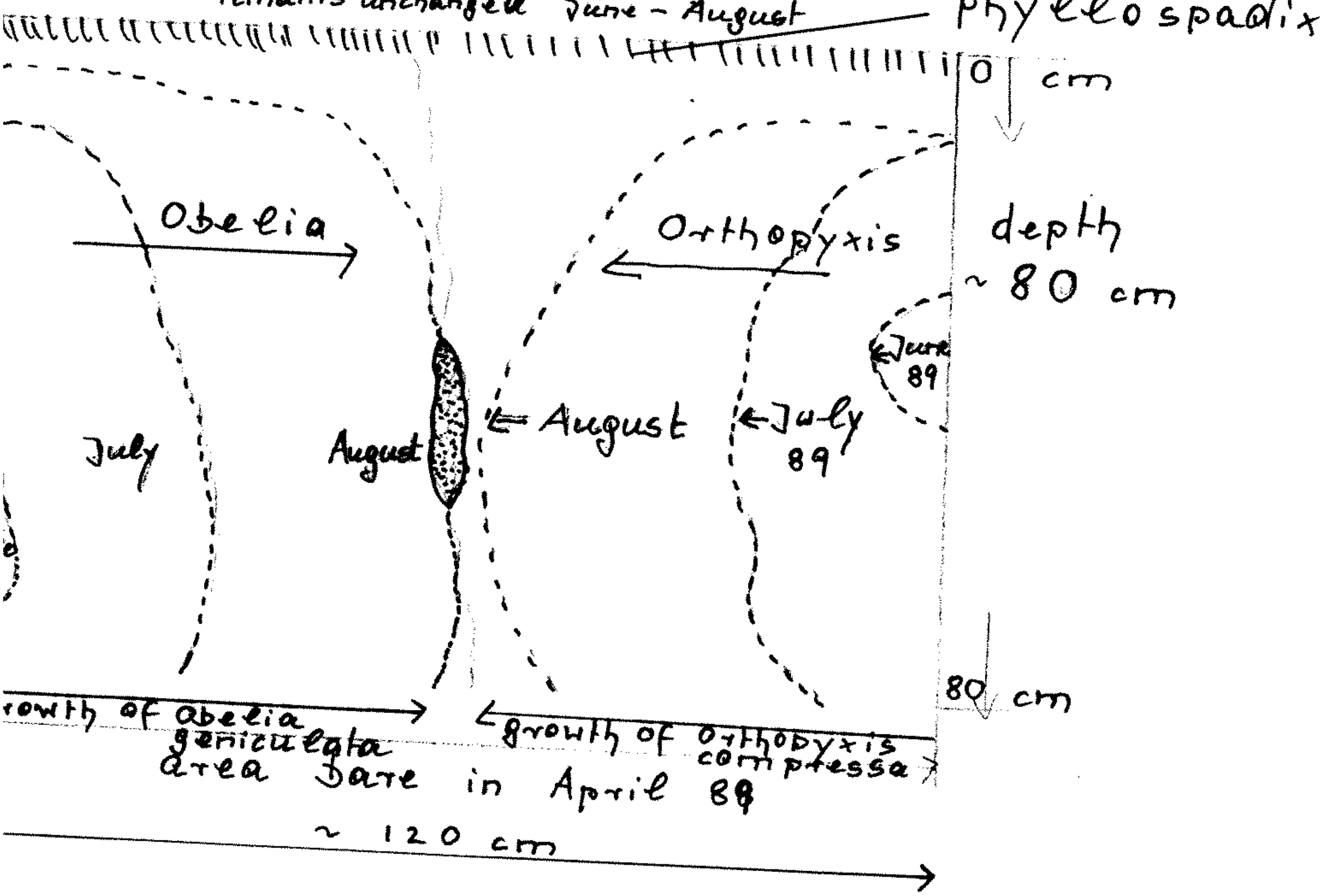

detaile
see fig.3
high water
mark, varies
with tides
Inner
cliff
intermediate
and low tide
mark, does
not vary.
low water
mark
variable
open
water
outer
ledge
Y

fig.: 1 C

fig. 3 elevation of area I of fig. 1c

---- outer limit of colonies in June, July, August

small colony of Hydractinia milleri remains unchanged June – August



Explanations of fig.2:

Rhizogeton eozoense

Hataia parva
Bougainvillia ramosa
Garveia annulata
Garveia groenlandica
Hydractinia milleri
Hydractinia armata
Rhysia sp.
Eudendrium sp.

Stylantheca petrograpta
Hybocodon prolifer
Tubularia sp.
Sarsia eximia
Sarsia sp.

Campanulina sp. inc. sedis with medusa buds

Calycella syringa
Obelia geniculata
Campanularia ritteri
Orthopyxis compressa
Clytia sp.

Campanularia urceolata
Aequorea victoria (?)

Halecium pygmaeum
Abietinaria amphora
Sertularella turgida
Aglaophenia inconspicua
Plumularia setacea

1 on coralline algae, 20cm
2 """"", 30 cm
27 10-30cm
3 20-50cm
26 5-10cm.
4 20-50 cm
5 5-30 cm
6 20-40cm
7 20-40 cm

8 0-30 cm.
9 20-30 cm
10 10-50cm
11 5-10 cm
12 30 cm on Semibalanus cariosus

13 0-10cm. mostly on leaf base of Phyllospadix
14 20-50 cm
15 20-50 cm
16 10-30 cm
17 10-50cm
18 about 30 cm on Mytilus cal.
19 0-50cm
20 30cm on Semibalanus cariosus
21 20cm
22 40-50 cm
23 20-50 cm
24 20-50cm
25 20-30 cm

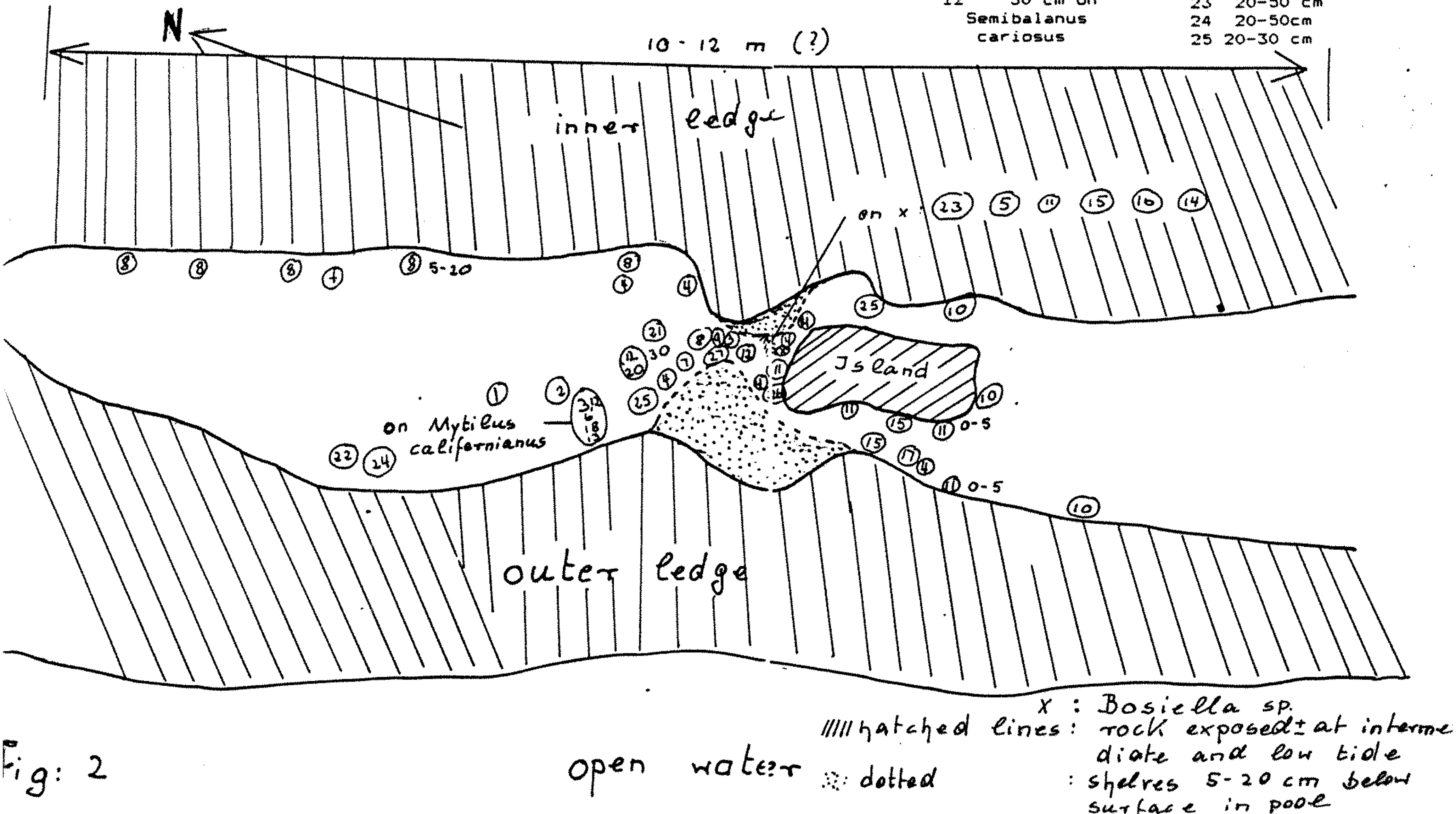


Fig: 2

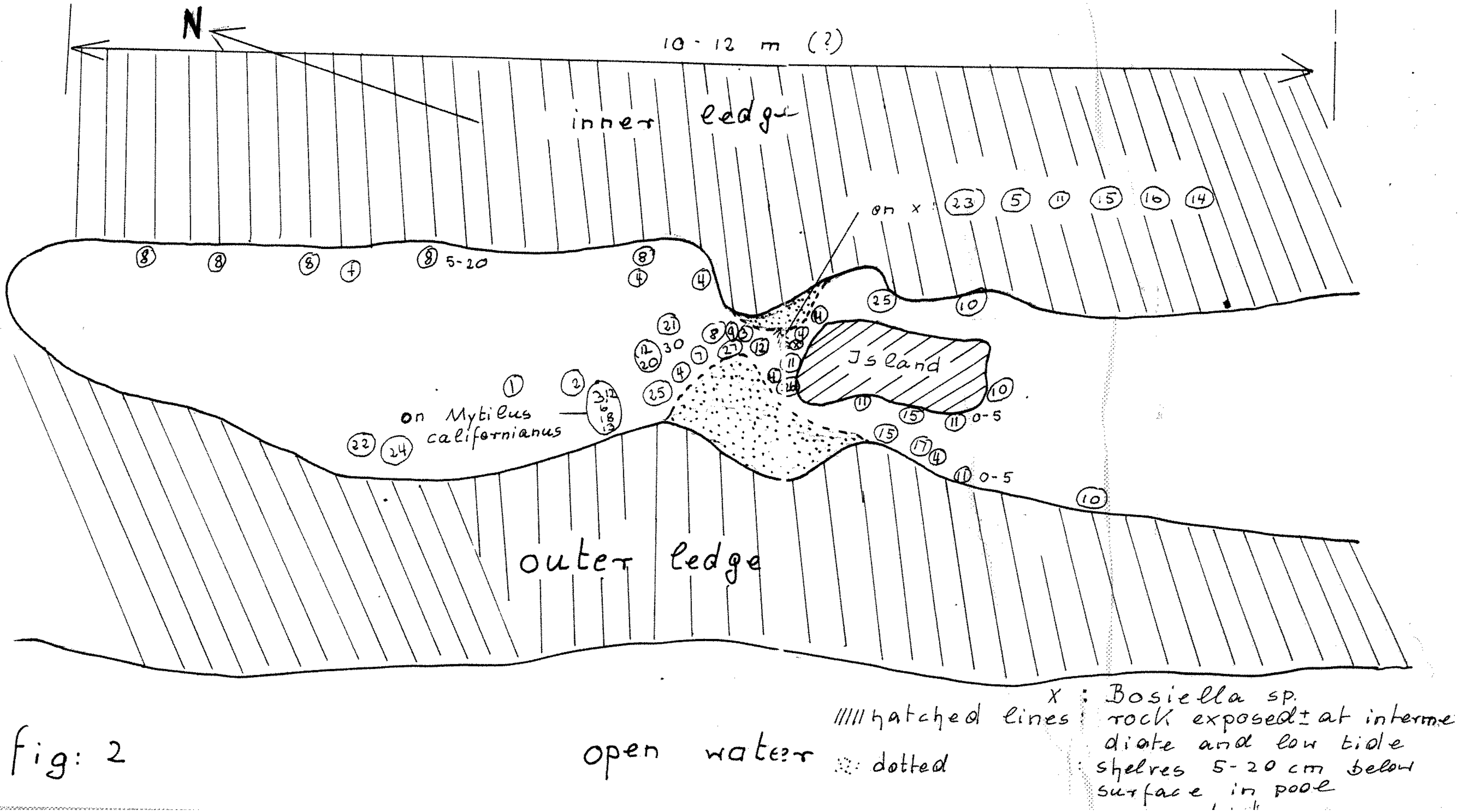

10 - 12 m (?)
N
inner ledge
on x :
on Mytilus californianus
Island
outer ledge
open water
⁘ dotted : shelves 5-20 cm below surface, in pool
X : Bosiella sp.
///// hatched lines : rock exposed ± at intermediate and low tide

fig: 2

Explanations of fig.2:

Rhizogeton eozoense	1	on coralline algae, 20cm
Hataia parva	2	""""", 30 cm
Bougainvillia ramosa	27	10-30cm
Garveia annulata	3	20-50cm
Garveia groenlandica	26	5-10cm.
Hydractinia milleri	4	20-50 cm
Hydractinia armata	5	5-30 cm
Rhysia sp.	6	20-40cm
Eudendrium sp.	7	20-40 cm
Stylantheca petrograpta	8	0-30 cm.
Hybocodon prolifer	9	20-30 cm
Tubularia sp.	10	10-50cm
Sarsia eximia	11	5-10 cm
Sarsia sp.	12	30 cm on Semibalanus cariosus
Campanulina sp. inc. sedis with medusa buds	13	0-10cm. mostly on leaf base of Phyllospadix
Calycella syringa	14	2o-50 cm
Obelia geniculata	15	20-50 cm
Campanularia ritteri	16	10-30 cm
Orthopyxis compressa	17	10-50cm
Clytia sp.	18	about 30 cm on Mytilus cal.
Campanularia urceolata	19	0-50cm
Aequorea victoria (?)	20	30cm on Semibalanus cariosus
Halecium pygmaeum	21	20cm
Abietinaria amphora	22	40-50 cm
Sertularella turgida	23	20-50 cm
Aglaophenia inconspicua	24	20-50cm
Plumularia setacea	25	20-30 cm