Elleslie '79
Reisig

Mc Gill

Ellerslie '79
Reissue

McGill

Prince Edward Island Project June - July 1979

Yoldia limatula (SAY)

26. 30 June

Preliminary Survey - dredge + Grab for Benthic fauna

2 July Project Review:

John Carol 1. Size / dry wt relationships
Growth Lines : size / age relationships
Size / frequency distributions for early July, late July, Aug.

Procedure: collect, sieve → water table 24 hrs → feces Collection → dry → to McGill for measurement + weight, decalcification, etc

Collect feces for particle size + organic content analysis

Carol 2. Reproduction: a) Histology,
b) Gamete release in lab
c) Spat collection: size/freq analysis over time.

Henry 3. Food: a) Gut contents - i) histology
ii) dissection

b) Fecal Collection - i) particle size - microscope or Coulter counter
ii) organic content
iii) gut clearance Rate - w/o seds / with seds
(to chart each organism for defecation rates)

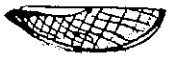
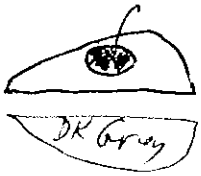
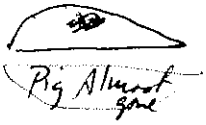
Henry 4. Respiration: a) without sediments in BOD bottle w stirrer
b) w/ autoclaved sediments in Bottle - aliquot for Resp
Run with controls
c) Resp of sediments w/o animals.

Carol 5. Behavior: in glass aquaria

6. Literature search: Yoldia limatula (Say)

Not sized

2 July 79

	1	2	3	4	5
Time	~ 3 pm	~ 3 pm	3 pm	3 pm	3 pm
Collect	Station 1	Station 2	Station 3 Never alive!	Station 2 broken shell	Station 3
Blade area Drawn	 5:30 pm	 5:30	 5:30	 5:30	 5:30
+3.5 hrs	No change 9 00 pm	" 900	DEAD SHELL 900	" 900	 clearing 9:00
+15.5 hrs	 GREY 9 am	 DK Grey 9 am	 DK Grey 9 am Black spot on lower Valve at Contact None Dead or Never Alive?	 Pig almost gone 9 am	 Pig Almost gone 9 am
Fecal 9 am quantity	++ frags.	++ frags		- very little Dead?	+++ Small frags No spines

Pigment loss — Must be Oxidation reaction in Organic layer of shell - Not Light since bottom shell is on glass - must be oxygen exchange with water.

Collect feces — (F) 3:30 pm 3 July | (F) .. | (None) | (F) .. | (F) .. + 5 more →

Rinse 2x water

Feces Dists 60° C oven at 5 00 pm 3 July 79 - 9 specs here plus 6 pm water table (24 hrs clearance) for total of 15 specs. (In 2 vials after Drying)

Label Total collection as (Feces F-1)

2 July

Not signed

	6	7	8	9	10
Collect	3pm Station 3	3pm Station 3	3pm Station 3	3pm Station 2	3pm Station 3
Draw Blade at	 5:30	 5:30	 5:30	 5:30	 5:30
Clearing	 9:00 pm	" 9:00	" 9:01	 9:00	" 9:00
	 9 pm	Cleared 9 pm	Cleared 9 pm	Cleared 9 pm	Cleared 9 pm
Quantity of feces	+ dead?	++ pcs	None Dead?	++++ spirals	+++
Collect feces	3:30pm 3 July (F)	→ " (F)	→ " (F)	→ (F)	→ (F)

In water table Not sized

2 July

Dead shells

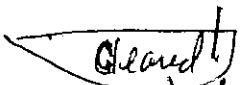
Recent Dead

"11" "12" same size

mottle

5:30 pm

overall somewhat lighter 9:00



Cleaned

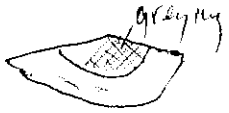
9 am Not Gray

Long Dead

3-4"

mottle

5:30 pm



graying

9 00

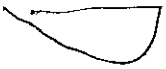
Very slightly gray

5

5:30 pm

general grayer

9 00



Clear!

Fish Gut Analyses

Flounders in Dredge 2 July 79

#1 - Tellina + Retusa

#2 (Nothing)

#3 ~ 200 Tellina + 20 Retusa (stomach + intestine)

#4 (Nothing)

(NONE with Yoldia)

Dispersed -

3 July 79

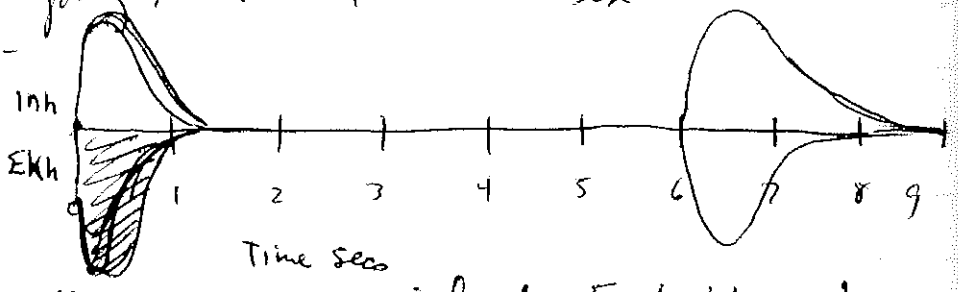
Collected feces of 9 specs at 3:30 pm - Wash down together into 2 mms of Fresh water → to Vial + Dry at 60°C for 24 hrs - Label [1 Feces F-1]

John, Carol + Sami out to grab more specs ~ 3pm; hand ~~scored~~ picked those from mud. ~ [11 mature specs total] plus one grab TBL trawled for small ones.

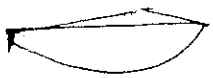
Removed Yesterdays catch of fecal Producers + Behavior Specs, rinsed the Yoldia in FW 2x + into 60°C drying oven for 24 hrs Yoldia [Label: 2 July 79] (24 hr table cleanse for defecation, rinse 2x H2O + dry)

Set up new 5 specimens for More fecal Collections → In at 5 pm in Jars 3 July 79 specs

Observed Carols specs in coplin jar; all 3 specs w respiratory currents going well - inhalant + exhalant current at same time -



Pumping pulse rather even in period of 5 to 10 secs but does vary with time. Appears no shell movt or foot movement involved - probably Gills more acting as a diaphragm pump.

Collection 3 July specs	3 pm	3 pm	Not spawned 3 pm	3 pm	3 pm	
Jar #	1	2	3	4	5	
F2						
into Jar	5 pm	5 pm	5 pm	5 pm	5 pm	
Feces Collection	F2					3 Jul/70 Label Set/ Feces Voided in
Set 1 11 pm (6 hrs) (5-11 pm) ~~Fasted~~	#1 - OK ✓ Photo	#2 - OK ✓	# 3 - OK ✓	# 4 - OK ✓	# 5 - OK ✓	11:30 pm 38½ hr
	Placed into vial by pipette; Rinse ONCE in Dist H_2O → to 60°C oven					
	No evidence of spawning or gamete release!					out 2 pm 5th
Set 2 5 am (6 hrs) (11 pm to 5 am)	#1 Mod	2 mod	3 SCANT Almost No true feces	4 - Mod	5 - little	in oven 9:30 am out 2 pm 5th 28½ hr
Set 3 11 am (6 hrs) (5 to 11 am)	#1 little	2. mod	3 scant	4 - V. little	5 - None - (No Sample Taken)	in oven 11:30 Am out 2 pm 5th 26½ hr
Set 4 5 pm (6 hrs) (11 pm to 5 pm)	1 - Little	2 None (No Sample taken)	3 Little	4 None (No Sample taken)	5 - None (No Sample taken)	in oven dry 27 hrs
Measured overall length 5 pm	32.9 mm	32.45 mm	30.8 mm	29.65 mm	28.5 mm	
Disposition	~~Fixed~~ Fixed Formalin for Dissection	Dry (in at 5:30 pm 4th July) ↓ (out 8 pm 5th July)	Dry (26½ hrs) at 60°C	Dry	Fix Formalin for Dissect	
Dissection Results						

4 July

Dredge with Finer Mesh Bag Collect ~ 1500 hrs

4 dredge sets plus 1 quantitative grab.
(washed dredge on board Whaler)

Live Yoldia from Dredge

26 Large ~ >2 cm
25 Med ~ 0.8 - 1.5 cm
33 Small < 0.8 cm
total 84 total

Feces F3

Not sized
Set up Fecal Collection at 5:30 pm 10 specimens for 24 hour sample (not to keep separate - to pool contents for Drying)

Out at 7pm 5th July 25½ hrs - Washed into one Vial + Placed in Oven at 60°C at 8pm ~~5th~~ July 5.
Label F3; out at 12 Noon July 7
Time Dry 48 hrs

4
24
12
40 hr

5 July 79

a) Trip to Victoria to pick up Muffle furnace

b) Test input water System: T°C = 19.5

SG = 1.0195

Calc Sal = **26.5‰ S.**

Calculate Strick + Parsons Nomograph O_2 saturation

493 ug at O_2/L ← ? is this supposed to be 2x because makes O_2?

× 8

3.944 mg/l O_2

c) Respiration Test #R-1 carried out [History of spec uncertain if in mud or water?]

? - O_2 meter used!

8 resp chambers put together

Chamber #	Volumes in ml
1	93 ml
2	92 ml
3	90 ml
4	90 ml
5	90 ml
6	90 ml
7	90 ml
8	90 ml

d) Heavy Rain All Day

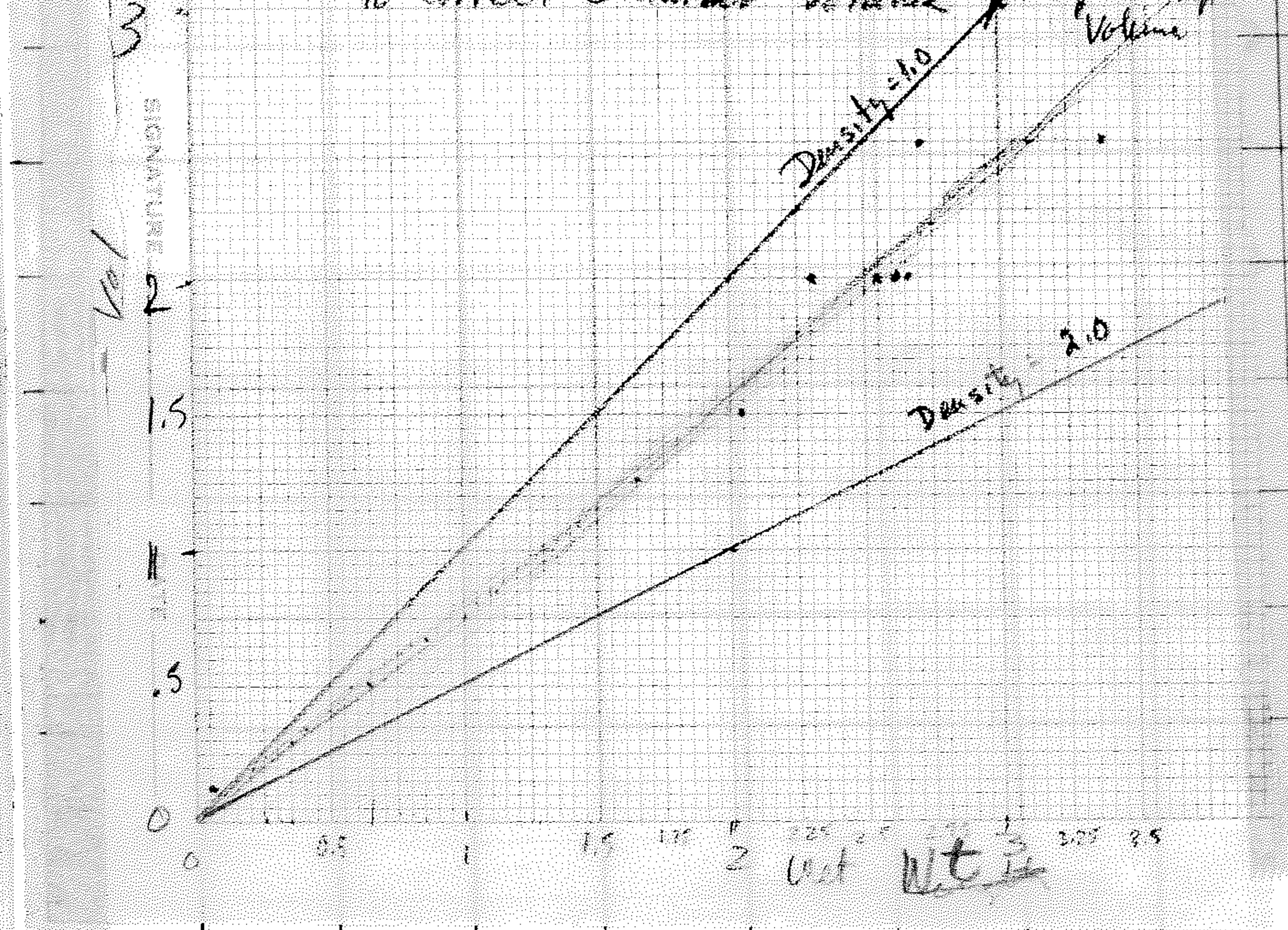
Respiration

(IN LIGHT)

Subject Resp Animal	Date Time collect	Date Time Start	Chamber # (Vol ml)	Water Temp Start/End	Water Density S.G. START	Calc Salinity o/oo	Calc Satur O_2 mg/l	Elapsed Time Read
R-1	4 July 4pm 1600	5 July 19:05	1 (93 ml) (in LIGHT)	19.5°C / 17°C	1.0195	26.3‰	8.03 / 7.9	2:00
Control	–	5 July 19:05	2 (92 ml) (in LIGHT)	19.5°C / 17°C	1.0195	26.3‰	8.03 / 7.9	2:00

History Not recorded in water of mut No 2 thru 2.

Data from R2-R7 Respiration
to Correct Chamber Volume for Spec Vol



(Oxygen conc. • V in ℓ — expt code [D-f in ℓ - Spec. vol])

for Reference only

O₂ Meter? Measured?

O_2 Content Start mg/l	Oxygen Content End mg/l	Use mg/l Total	Spec length (cm)	Spec Total wet wt (mg)	Use: mg O_2/hr per mg spec total wet wt			
— Not meas'd?	4.82	—	3.79	—	—			
— Not meas'd?	6.90							

95 7.91 7.855 8.25 7.8825
25.45 25.85 26 21.40 21. 26.3

6 July 79 FRIDAY

Work in Lab - AM

PM boat Collection: 4 Dredges + 4 grabs
+ Placed Sami's stations at these areas

Slow Dragging game
Good Catch

Sami's Stns Near Dredge

4 — 1 Outermost dredge
Much grass, Small Yoldia - None large

3-4 — 2. area with still much grass + Young - mostly ½" + down

3 — 3. Better - more large ones + cross section/size range, little grass

2 — 4. Biggest + best range; sticky mud, little grass, more shell debris

Respiration Set 2 at Evening
~~Respiration Set 3~~
Laid out "large Specs" in bowls for Fecal Mass Collection - F4 — ½ Dried in on 7 July 9 pm - out 9 July 11 pm 50h
½ frozen put frozen 7 July 9 pm
24 hr collect?

Froze Specimens after 24 hr egestion 54 animals total

6 July Eve Resp Set 2 FRI Evening

DARK!

Subject	Collected Date/Time	Incub Start Date/Time	Chamber Number (Volume)	Water Temp	Density Water S.G	Calc Salinity S	Calc O_2 saturat mg/l	Measured O_2 Content Start
R_2	6 Jul 16.00	6 Jul 18.55	1 (93)	18.8°C	1.022*	29.3‰	7.81 mg/l	8.12 mg/l (19°C)
R_3	"	"	2 (92)	"	"	"	"	"
R_4	"	"	3 (90)	"	"	"	"	"
Cntl	/	"	4 (90)	"	"	"	"	"
R_5	"	"	5 (90)	"	"	"	"	"
R_6	"	"	6 (90)	"	"	"	"	"
R_7	"	"	7 (90)	"	"	"	"	"
Cntl	/	"	8 (90)	"	"	"	"	"

$$\left(\frac{O_2 \text{ Conc Cntl 1} + O_2 \text{ Conc Cntl 2}}{2} - O_2 \text{ Conc Exptl}\right) \cdot (\text{Vol Exptl chamber} - \text{Wet Wt Spec}) \cdot \frac{60}{T_{min}}$$

O_2 Meter used:

Time of O_2 Measmt END	Final O_2 Conc mg/l	Spec Length Cm	Spec wet wt (g)	Spec Volume (ml)	O_2 Use mg/hr/gwet wt			
20:07	5.36	4.0	2.64	2.5	.0629			
20:10	5.12	4.29	3.37	2.5	~~.0557~~ .0528			
20:05	5.72	3.52	2.04	1.5	~~.0749~~ .0699			
20:13	7.41	/	/	/	/			
20:22	3.88 (SPERM)	3.93	2.55	2.0	~~.0961~~ ~~.0928~~ (SPERM)			
20:~~25~~	5.21	4.0	2.61	2.0	.0577			
20:16	5.30	3.71	2.27	2.0	.0712			
20:19	7.80	/	/	/	/			

~~O_2 Conc Control − O_2 Conc~~

$$\left(\frac{[O_{c_1}] + [O_{c_2}]}{2} - [O_{ex}] \right) \cdot (V_{ex} - V_{sp}) \cdot 60$$

$$W_{sp} \cdot T$$

$C_1 C_2$ = controls
ex = experimental
sp = specimen

O = Oxygen conc in mg/l
V = Volume in liters
W = Weight in grams (wet weight)
T = Time in minutes of incubation

Resp # 3 - Set

Animal / Control	Chamber Number (Vol)	Collected Date Time	Incubation START Date Time	WATER Temp	Water Density S.G.	Salinity (Calc)	O_2 Satur calc	O_2 conc measd START
R8	1 93	6 Jul 1600	7 Jul 0846	18.5°C	1019	25.3‰	8.1 mg/l	6.53 mg/l (Water Table)
Control	2 92	"	"					
R9	3 90	"	"					
R10	4 90	"	"					
Control	5 90	"	"					
R11	6 90	"	"					
R12	7 90	"	"					
R13	8 90	"	"					

O_2 meter record.

END Incub Time	O_2 Conc End mg/l	Spec Length cm	Spec Wet wt (g)	Spec Approx vol ml	O_2 use mg/hr/g				
10:04	5.37	3.43	1.64	1.25					
10:09	6.68	/	/	/	/	/			
10:12	5.38	3.22	1.50	1.0					
10:07	5.93	2.87	1.08	0.75					
09:59	6.56	/	/	/	/	/			
10:01	5.62	3.10	1.45	1.0					
09:56	5.94	2.76	0.86	0.75					
09:53	5.98	2.90	1.09	0.75					

Control
6.68
6.56
6.62

Animals long in Lab! Resp set 4

Anml/control	Chamber Number (vol)	Collected Date/Time	Incubat Started Date/Time	Water Temp	Water Density	Salinity Calc	O_2 Satur Calc mg/l	O_2 measured Start mg/l	
R14	1 93	6 July 1600	7 July 1935	19°C Start	1.025	33.2	7.65	7.65 Pipe input	
R15	2 92	"	"	(20°C End)					
R16	3 90	"	"						
R17	4 90	"	"						
~~R~~18	5 90	"	"						
Control	6 90	"	"						
Control	7 90	"	"						
R19	8 90	"	"						

O2 Meter measured?

Time Out	O2 Conc End mg/l	Spec Length cm	Spec wet Wt g	Spec Vol. approx	O2 Use mg/hr/g wet wt			
21:40	6.51	2.415	0.58	0.5				
21:29	6.43	2.36	0.54	0.5				
21:37	6.60	2.32	0.54	0.5				
21:34	6.55	2.30	0.56	0.5				
21:23	6.26	2.46	0.67	0.5				
21:42	7.22	/	/	/	/			
21:31	7.05	/	/	/	/			
21:27	6.30	2.30	0.56	0.5				

Calcul 7.22
7.05
14.27
7.135

19

7 July 79 Saturday

Worked on Sami's station 1; worked on O2 nomograph + Organic Carbon sealing unit.

8 July - Day off. Sunday

9 July Monday.

Dredge + Orab ~10:30 Am left in wind + worked until at 4:30 pm for fresh Yoldia for fixation

Then worked Sami's transect

Worked late into night collecting Feces FS

+ Trying to repair Oxygen meter - out of commission.

No Respiration today - try to set up Winkler for tomorrow.

See over for feces. FS

Yoldia Collected ~ 10:30 Am 9 July
Wash from Mud in S.W. at ~ 16:30

Place in Container at 1700 hrs for Feces Collection F-5

Jar #	Specimen	I Collection of Feces 6 hrs	II Collection of Feces 12 hrs	III A Collection 24 hrs	wet weight
1	1 Specimen	2300	—	1700 10 July	.93g
2	1 "	"	—	"	1.03
3	1 "	"	—	"	0.80
4	1 "	"	—	"	1.00
5	1 "	"	—	"	0.99
6	1 "	"	—	"	0.76
7	6 medsize	"	—	"	2.82 aggreg
8	6 smaller	"	—	"	1.60 aggreg
9	6 smallest	"	—	"	0.89 aggreg
10	1 largest	"	—	"	1.64g
1 small	1 med	"	1100 10th	8	1.10
2 sm	1 med	"	"	One	1.39
4 sm	1 med	"	"	Sample	1.16
7 sm	1 med	"	"		1.21
8 sm	1 med	"	"		1.35

6 hr feces collection
Pipetted rinse vials, rinse once in dist water + 60°C dry
Start 2400 9 July out 1100 11 July (35 hr)

← 12 hr set rinse oven in at 1100 10 July 79 out at 0900 11 July 79 (47 hrs)

Int Oven 11 vials in 1800 10 July out 1900 11 July (39 hrs)

To Freeze
30 Specimens at ~2000 hrs

10 July / Collected Dredge + 2 grabs ~ 10:30 AM; Dredge in the Lab area.

Length

2.83 cm
2.95
2.54
2.87
2.80
2.60
2.11, 2.25, 2.15
2.11, 2.09, 2.34
2.02, 1.69, 1.92
1.98, 1.74, 1.66
1.67, 1.59, 1.56
1.41, 1.29, 0.96
3.32
2.94
3.14
2.95
3.01
3.07

Set up Winkler Set for Oxygen since meter is not working.

Volumes will be taken as 90 ml in chambers used before for O2 meter. Reagent factor to be calculated from Dawson cruise Data; same reagents + pipette used but 90 ml sample instead of 50/300 ml.

Late PM Dove in Semi at Station # 1, Z = 9' (2.9 m)

x̄ 2.185 Lots of medusae -
x̄ 1.635 Put in sediment traps
x̄ 1.42 Took first sed core - OK
Collected Microcosmos sponge + sponge in aquaria

3.02 Eve - Resp + fecal collections

Resp Set 5+6

F5 ctnd

Resp 5

Winkler

Animal / Control	Chamber # Vol	Collected Date/Time	Incub start Date/Time	Water Temp	Water Density SG	Salinity Calc	O_2 Sat Calc	O_2 measure Start
Control	1 (93)	10 July 1030	10 July 1340	20°C	1.023	30.8‰ S	7.58 mg/L	.148 mL
R-20 Spec	2 (92)	"	"					
R-21 Spec	3 (90)	"	"					
R-22 Spec	4 (90)	"	"					
Control	5 (90)	"	"					
R-23 Spec	6 (90)	"	"					
R-24 Spec	7 (90)	"	"					
R-25 Spec	8 (91	"	"					

Start Winkler

Incubation End	O_2 Conc End mg/l	Spec. Length	Spec wet wt	Spec Vol approx	O_2 use mg/hr/mg/gr wet wt				
14:40	.140 M	/	/	/	/				
14:41	.111 M	3.83 cm	2.67 g	2 ml					
14:42	.096 M	4.11 cm	3.35 g	2.5 ml					
14:43	.112 M	3.69 cm	2.20 g	1.75 ml					
14:44	.147 M	/	/	/	/				
14:45	.104 M	3.73 cm	2.27 g	1.75 M					
14:46	.093 M	3.86 cm	2.58 g	2.0 ml					
14:47	.097 M	3.59 cm	2.31 g	1.75 ml					
~~14:48~~									
Extra Spec Measured		~~4.61 cm~~	~~4.91 g~~						

.148
.147

$\bar{x}$ .1475

Resp 6

Winkler

Animal / control	Chamber # ml Vol	Collected Date Time	Incub Start Date Time	Water temp	Water Density	Salinity Calc S ‰	O2 Satur Calc	O2 measmt Start
Control	1 93	10:30 10 July	19:45 10 July	21.5°C	1.018	24.7‰	7.65 mg/l	.159 ml
Control	2 92							
R-26 Shell (Part Clean) Clean Rt valve	3 90							
R-27 Vol-1	4 90							
Shell (part clean) Clean Left valve R-28	5 90							
Vol-1 (R29)	6 90							
Vol-1 (R30)	7 90							
Vol-1 (R31)	8 90							

with Rb

Innat Ent	O2 Conc Ent	Spec Length Cm	Spec wet wt	Spec Vol approx	O2 use mg/hr/gwet		
21:45	.156M	~~4.60~~ Rt 4.64	/	/	/		
21:46	.160	/	/	/	/		
21:47 ΔT 2.03	.153 7.68 mg/L	4.60cm Rt value *	~~.09gr~~	/	-.24832 mg O2/L		
21:48	.154	1.17cm	0.08 gr				
21:49 2.	.153 7.68 mg/L	4.60 * left value	/	/			
21:50	.153	1.25cm	0.10g				
21:51	.149	1.20cm	0.11gr				
21:52	.156	1.05cm	0.05gr				
Spec before dissection *		Live spec 4.60cm	4.91gr				

Controls
.156
.160
.158 = 7.93 mg/L

50.196
50.189

N: 28

Spec L	Calc wet Wt
3.97	2.83 gm
3.90	2.70
3.70	2.32
3.32	1.66
3.24	1.52
3.26	1.56
3.18	1.43
3.22	1.48
3.20	1.45
3.12	1.36
3.08	1.30
3.16	1.41
3.06	1.27
3.01	1.20
3.08	1.30
3.05	1.26
3.06	1.27
3.04	1.24
3.00	1.20
3.07	1.28
2.93	1.10
2.96	1.14
2.98	1.16
2.83	1.00
2.97	1.15
2.86	1.08
2.94	1.12
2.85	1.02

Tot 39.81 gms wet wt

$\bar{X}$ = 1.4218 gm

? Set of Frozen specs for Gut analysis A-1

11 July

Collection at ~ 11 Am + Sami's Station 2.

Set up Feces Collection F6 w 4 specs per bowl in 7 bowls at 12^00 Noon - to accumulate for 1 vial + frozen. 28 specimen ~~after~~ feces. Total specs ~ 50 or more

Resp^n started ~~at~~ 12:25

Collected Feces at ~ 5pm 12 July → 1 vial to freezer; settled volume = 15mm in small vial

Feces producers fixed in Formalin - JSR Call these F-6 specimens 11-12 July.

---

12 July - Respiration Set Voldia #9 completed AM.

P.M. - Dive on SY station #1 to recover Sediment traps - Did not find

Done station #2 + obtain Core - Core #2.

Resp 7

Animal / Control	Chamber Vol	Collected Date time	Incub Start	Water Temp	Water Density	Salinity	O2 Sat Calc	O2 Start meas	
Control	1 93	1100 11 July	12:25 11 Jul	21.5°C	1.019	26.1	7.58 mg/L	.145 M	
Yol -3 sm (R-32)	2 92								
Yol 3 sm (R33)	3 90								
Yol 2 sm (R-34)	4 90								
Control (R-35)	5 90								
Yol-1 (R-35)	6 90								
Shells Blank R-36	7 90								
Yol 1 (R-37)	8 90								

Incub-Stop	O_2 Conc end	Spec Length	Spec Wet Wt	Spec Vol approx	O_2 Use mg/hr/gm wet			
13:31	.1454	/	/	/	/			
13:32	.1094	1.78 - .30g 1.81 - .27g 1.93 - .32g						
13:33	.1094	2.05 - .35 2.10 - .39 1.99 - .36						
13:34	.1094	2.18 - .45 2.25 - .51						
13:35	.1414	/	/	/	/			
13:36	.0944	3.37 - 1.96g						
13:37	.1354	3.81	shells	/				
13:38	.1084	3.15	.94g					

45
Wt
143

Resp 8 O_2 Conc Start: .114 at bubble

Collected 1100 11 July 79 Water Temp 22°C Salinity 27.6‰
Incub Start 15:23 11 Jul Density 1.020 O_2 Sat Calc. 7.46 mg/L

Spec/Control	Chamber / Vol	END Incub Time	O_2 Conc Winkler	Spec Length	Spec wet wt	Spec Vol approx	O_2 use mg/hr/gm		
Vol-1 (R-38)	1 93	17:29	.133	1.97cm	0.34g				
Vol-3 (R-34)	2 92	17:30	.112	1.78 1.66 1.65	.28g .22g .21g				
Vol 2 (R-40)	3 90	17:31	.117	1.50 1.68	.19g .23g				
Vol 2 (R-41)	4 90	17:32	.106	1.88 1.92	.29g .33g				
Vol-6 (R-42)	5 90	17:33	.138	(1.04cm - .055g) (0.75cm - .02g) (0.86 - .035g) (0.98cm - .05g) (0.83 - 0.03g) 0.71 - 0.015g)					
Control	6 90	17:34	.148	/	/	/			
Control	7 90	12:35	.147	/	/	/			
Vol-5 (R-43)	8 90	17:36	.111	(1.44 - .14g) (1.25 - .10g) (1.43 - .15g) (1.44 - .15g) (1.29 - .11g)					

.113

Resp Q

O_2 Conc Start .131

Spec / Control	Chamber Vol	END Incub Time	O_2 Conc (mg/l)	Spec Length	Spec Wet wt	Spec Vol approx	O_2 use mg/l/hr/g	
Y-1 (R-44)	1	09:23	.120 -9	2.42cm	.65g			
Y-1 (R-45)	2	09:24	.113 -16	2.74	.93g			
Y-1 (R-46)	3	09:25	.114 -15	2.75	.90g			
Control	4	09:26	.130	/	/	/		
Vol-1 (R-47)	5	09:27	.114 -15	2.62	.76g			
Vol-1 (R-48)	6	09:28	.115 -14	2.38	.59g			
Control	7	09:29	.128 -	/	/	/		
Vol-1 (R-49)	8	09:30	.111 -18	2.84	.97g			

Collected 11:00 July 11

Incub start 0900 July 12

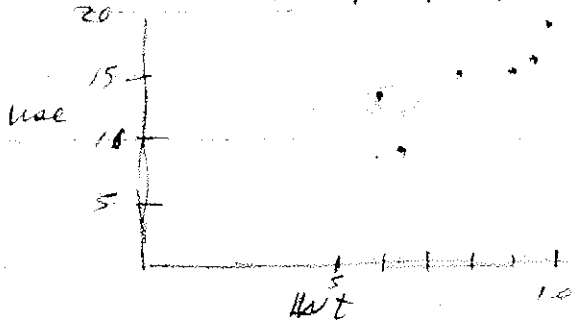
Water Temp 20.2°C

Water Density 1.020

Salinity 27.1‰

O_2 saturation 7.73 mg/l

$\bar{x}$ control .129



13

7.28

655.2 mg O2 = .145 ml thiosulfate

45 / 18.6 mg O2 = 1 ml thiosulfate / 1 ml thiosulfate

3,164.3 ml O2 =

13 July 79 - Friday

Spent part of day pumping diving tanks
Worked on Core respiration system - Constructed 2nd
Stirring bar for short Core

Winkler Reagents - Calibrate with Air Saturated water:
S. Grav 1.019, T° = 23.5°C Calc Sat = 7.28 mg O2/l
= μg O2/ml

Set up saturated bottle & filled 9 small BOD bottle (90 ml)
Winkler titration: 1 : .145 ml Thiosulfate
2 : .146 ml
3 : .146
4 : .145
5 : .143
6 : .149
7 : .143
8 : .145
9 : .143

$\bar{X}_9$ = .145 ml Thiosulfate

$\frac{7.28}{.145}$ = 50.207 as Conversion from ml thiosulfate to mg O2/liter in 90 ml bottle only!

(for unknown sample or other bottle volume use
50.207 · 90 = 4518.6 to give μg O2/ml

ie $\frac{(X \text{ ml thiosulfate}) \cdot (4518.6)}{\text{vol. sample in ml.}}$

Core # 2 – Set up at 17:20 hrs

A. Original water; .134 ml thiosulfate
(at Return + 1hr lat.) 80 ml sample

B) Added water .125 ml thiosulfate
Kept in JAR + Headspace – Control 16 hrs 90 ml sample

C) Water in Core after 16 hrs (10:20 am morning / 13th)
.031 ml thiosulfate –
80 ml Volume

Core

301.7

mean : 1.002.39 mg

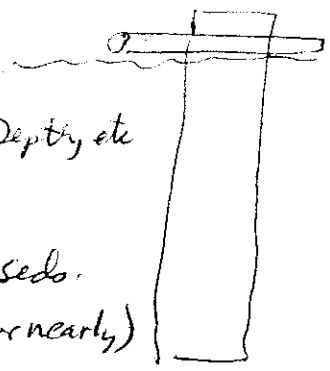
Control lost 222.73

∴ corrected use 779.66 mg 16 hrs

48.73 mg / hr

or 3.395 mg O2 / cm2 / hr

Procedure for Core Respiration



1. Take Core in field by SCUBA to ~~Bottom~~ of handle
   - Cap top, remove, Cap bottom - record Time, Date, Station, Depth, etc
2. Return to lab & Set on Stand.
3. Remove top & stir <u>SLOWLY</u> to prevent suspension of sedo.
   (~½ hour should bring water back to saturation or nearly)

4. Prepare 3 Small BOD bottles; have on hand ~200 ml of water for feeding into over-core water (Water table water or filtered, etc...).
5. ~~Stop~~ stirrer, record time, remove 100 ml by pipette & fill one BOD bottle (#1) Poison it for Winkler; <u>Gently</u>! refill Core with water from source of 4 above; ~~put~~ in stirrer, seal top without bubbles & ~~stir gently for ½ to 1 hr~~. start stirrer. Fill BOD bottle (2) with source water, poison for winkler & record time. Stir core for ½ to 1 hr.

90 ml

6. Stop stirrer, record time; Remove top & stirrer; Remove 100 ml from core water & fill BOD bottle #3. Poison for winkler.

(7 If continuing for successive series repeat filling & stirring steps.)

Calculate O_2 use per cm^2 of sediment surface:

(over)

Corer Dimension

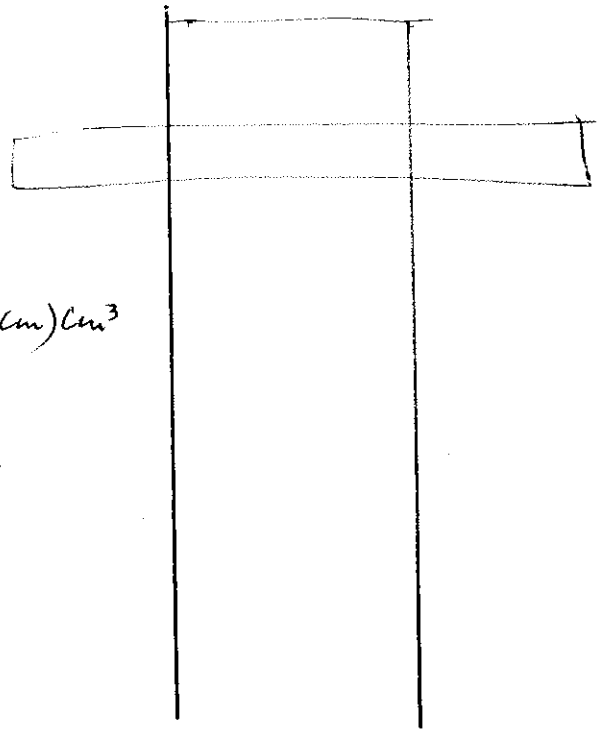
Int. Diam = 4.275 cm

Radius = 2.1375 cm

Area = 14.3536 cm^2

Vol per cm height = 14.3536 (ht in cm) cm^3

Top 4 cm tube = 46 ml w/o BAR



Sample Calculation of Use of O_2 employing 100 ml fill + empty steps

Conc ① · (Total water Vol − 100 ml) + Conc ② · 100 ml = Total µg O_2 Start in core

Conc 3 · Total water Vol = Total µg O_2 End

Difference = Use in µg O_2 for incubation

$$\text{Rate} = \frac{O_2 \text{ Start} - O_2 \text{ End}}{\text{Time (hrs)} \cdot \text{Surface Area } (14.3536)\ cm^2}$$

When took the 2nd O2 15th after oversite

total vol 172.3 ml

use 88ml bottle

Core #2 example

Start $72.3 \cdot \cancel{5.69}\ 5.75 + 100 \cdot \cancel{7.526}\ 7.599 =$

$= \cancel{411.82}\ 415.8 + \cancel{752.6}\ 759.9 =$ $\cancel{1,164.42}\ 1,175.7$ µg O_2

(effect 6.758 µg/ml)

1/2 hr

End $172.3 \cdot \cancel{5.848}\ 5.905$ (77.7% sat) = $\cancel{1,007.6}\ 1,017.43$ µg O_2

used $\cancel{158.82}\ 158.32$ µg O_2 1/2 hr

(13.5% avail)

Rate $= \frac{\text{use}}{1/2 \cdot 14.3536} =$ $\cancel{21.85}\ 22.06$ µg $O_2/cm^2/hr$.

or 15.442 ml $O_2/cm^2/hr$

14 July Saturday

Collecting water Samples at SV Station #3 - work most of day.
Grabbed a few Yoldia on return trip - very few found.

15 July Sunday - Trip to West Coast

16 July Monday -

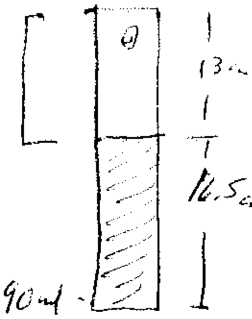
Dive to station 1 to retrieve Seed traps
(Whaler battery down - No start - Charging)
used row dinghy to get there.
Collected Traps + a few sprigs Microcosm to test grafting.

Moved to Blue Boat "Cufatin" to Dive Station 3 to put in Sed traps + obtain 2 cores -
Core #(3) long + #(4) short.

Evening work on Core Respirations: over.

~~Spy Graft photos BW close @ 20.00 hrs (2~~

Water Vol 159 ml



Core #3

Collected 1600 Station # 3 long tube

16:50 remove water sample in lab – Fix – .148 ml thereafter 90 ml –

19:25 start mixing for oxygenation

Start I – ① 19:36 out .115 ml

② 19:38 in .147 ml

I Start Stir 19:47 / End Stir 20:17 (½ hr)

③ 20:18 out .121 ml

④ 20:22 in .141

II Start Stir 20:25 / End Stir 20:55 ½ hr

⑤ 20:56 out .114

⑥ 21:00 in .148

III Start Stir 21:02 / END Stir 22:02 1 hr

⑦ 1 hr control .137 ? Not considered

⑧ 22:02 out .116

⑨ 22:07 in .143

IV Start Stir 22:10 / END Stir 23:10 1 hr

⑩ 23:10 out .115

I Start Sample in .115 (50.207) = 5.775 · 59 = 340.7
.147 · C = 7.38 · 100 = 738
1078.7
End .121 · C = 6.075 · 126 = 965.13
112.7782 / 14.8536 = 15.713 µg O₂/cm²

II .121 · C = 6.075 · 59 = 358.4
.141 · C = 7.079 · 100 = 707.9 → 1066.3
.114 · C = 5.724 · 159 = 910.05
156.2583 / 14.8536 = 21.77 µg O₂/cm²

III .114 (59) 337.7
.148 (100) 743.1 = 1080.76
926
1043.65 (struck out)
.116
.116
use 154.7
343.6
717.9
1061.57
918
143.5

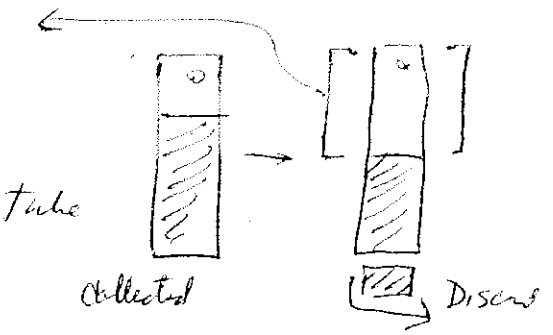
Calc was T

I 0.5 hr	11.0 µl/hr/cm²	= 15.713 µgm/hr/cm²	
II 0.5 hr	15.24 "	21.77	"
III 1 hr	7.55 "	10.78	"
IV 1 hr	7.00 "	10.00	"

15.6
18

Set Resp 9/1/2

Total V1 = 115 cc



Core # 4

Collected 1600 Station #3 short tube

16:54 sample of water removed
.117 ml thiosulfate
(67 ml sample)

23:55 Start sequence

①	out 23:52	.102	
②	in 23:58	.140	
	Start 23:55 Stir		
	End 24:25		
③	out 24:25	.118	
④	in 24:30	.136	
	Start stir 24:32		
	END Stir 1:02		
⑤	out 1:04	.120	
⑥	in 1:08	.138	
	Yoldia in 1:09 – Ventilating good		
	burrow in 1:20; 2nd burrow = 1:35		
	Start Stir 1:22		
	END Stir 1:52		
	respiring well – ventilating		
⑦	out 1:54	.102	
⑧	in 1:57	.137	
	Start Stir 1:58		
	Stop stir 2:28		
⑨	out 2:31	.103	

I 33 min

II 39 min

III 36 min

IV 33 min

Sal .140 = 7.03
all values corrected & interpolated & corrected

.102 · 50.207 · 115 = mg O2 in start with 76.817 → 779.715

.140 · 50.207 · 100 = mg O2 added 702.898

.118 · 50.207 · 115 = mg O2 at end 681.31 ①

.118 · 50.207 · 15 mg O2 carried over 88.866 → 771.68

.136 · 50.207 · 100 = O2 added 682.815

.120 · 50.207 · 115 = mg O2 at end 692.857 ②

.120 · 50.207 · 15 = O2 carry over 90.3726 → 783.22

.138 · 50.207 · 100 O2 added 692.8566

(3.92 cm spec) ← R50 Assuming a Mud dwelling Spec in Lab

.102 · 50.207 · 115 = total 588.92811

.102 · 50.207 · 15 = left 76.817 → 764.65

.137 · 50.207 · 100 = added 687.836

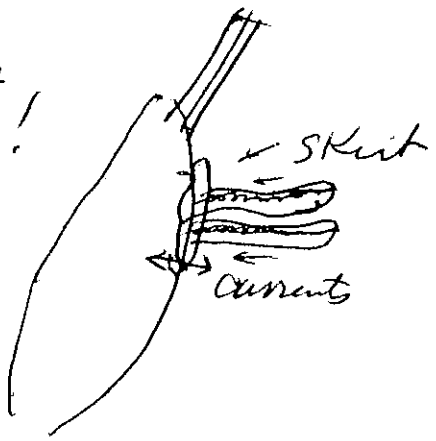
.103 · 50.207 · 115 = end 594.702

To divide by 14.3536 for rate per cm²

				Rate use	
I1	33 min	.55 hr	98.406 µgO2	178.92 µgO2/hr	155.37 / 169.78
I2	39 min	.6772 hr	78.825	127.82 µgO2/hr	
I3	45 min	.883 hr	194.3009	220.046 µgO2/hr	Yoldia 94.29 → 66.676
I4	36 min	.60 hr	169.951	283.252	135.13 / 129.88 / X2 = 114.71

Observed Yoldia feeding in Core Sediments
Palp proposites excavate tubes - accept anything - exclude large particles - forams etc - + their own feces. Take in mainly fecal pellets of Polychaets

Currents in + Out at same time
All right - large particles go in!
Match current flushing around proboscides skirt also during siphon extension + retraction which appears continuous



End observations 3 Am.

17 July 79 Rain all day

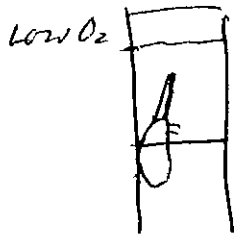
Graphed Microcosmia collected Yesterday - A-A, B-B, C-C Controls
A-B, A-C, B-C Tests

at ~ 11:30 AM - left in with table

Photos Neg # 3-33 pos

BW photos Yoldia in Core 3,92 cm spec

period of resp shortens (increase rate of ventillation bouts) as O2 drops + water stagnates. Color moves up into ~~the~~ water



When oxygenated well enter water currents (stirring bar in) the Yoldia moves down, & when respiring, has greater time span between respiratory flushes (decrease rate of ventillation bouts)

Temperature Water Not recorded!

P.M. - Bailed out whales & tried recharged battery - Not strong enough; switched to spare V.W. battery & OK. Use this while other is recharging

18 July 79 - Wed

9 Am - out to collect Yoldia - John;
Dredge ~ 15 min at 9:30 - results 124 Yoldia + very few of these small - in the Junction area Smelt + pauls creek.

Respiration R-10 with 6 large black specimens.

Respiration R-11 with 6 small specs

Afternoon: - to Station 3 to pick up S.Y. Sed traps
↓ to Stn 4 to put in Sed Traps + get Cores
all OK. 2 cores Short + Long

Evening Sami Ran Long Core → over 2 pages.

Station 4
samples 1 mud
(4)
(5)
(6)
(7)

R-10

Spec/Control	Chamber # + Vol	End Incub Time Date	O_2 Conc Winkler	Specimen Length cm	Spec wet wt	Spec Approx Volume	O_2 use mg/hr/gm wet	
RS1 Spec	1 93	11:55 18 Jul	.072	4.34 cm	3.57			
RS2 Spec	2 92	11:56	.081	3.73	2.34			
RS3 Spec	3 90	11:57	.086	3.80	2.68			
RS4 Spec	4 90	11:58	.075	3.90	2.71			
RS5 Spec	5 90	11:59	.073	4.15	3.22			
RS6 Spec	6 90	11:60 (1200)	.072	3.77	2.38			
Cont.	7 90	11:61 (1201)	.101	/	/			
Cont.	8 90	11:62 (1202)	.104	/	/			
Cont	9 90 starting		.101	/	/			

Collected 09:30 hrs 18 July – all large Blade spec
Start Incub 11:24 hrs 18 July

Water Spec Gravity 1.018
Temp 20.2°C
Sal Calc 24.3‰
Calc O_2 Sat 7.85 mg/l

Control
.101
.104
.205
/2 = .1025

R-11

Spec / Control	Chamber # Vol	End Incub	O_2 Conc (water)	Specimen Length	Spec. wet wt	Spec approx vol	O_2 use mg/kg/hr		
Spec RS7	1 93	19:52	.061 ml	2.02 cm	.355 gm				
Spec RS8	2 92	19:53	.095	1.80	.245				
Spec RS9	3 90	19:54	.080	1.60	.20				
Spec R60	4 90	19:55	.066	1.77	.25				
Spec R61	5 90	19:56	.070	1.73	.23				
Spec R62	6 90	19:57	.071	1.96	.385				
Control	7 90	19:58	.103	/	/				
Control	8 90	19:59	.101	/	/				
Control	9 90	Starting	.102	/	/				
Saturated	10 90	~20:10	.147 OK						

Collected 0930 18 July
Start Incub 14:05 18 July

Specif Grav Water 1.018
Temp 20.5°C
Sal Calc 24.4 ‰
O_2 Satur Calc 7.82 mg/l

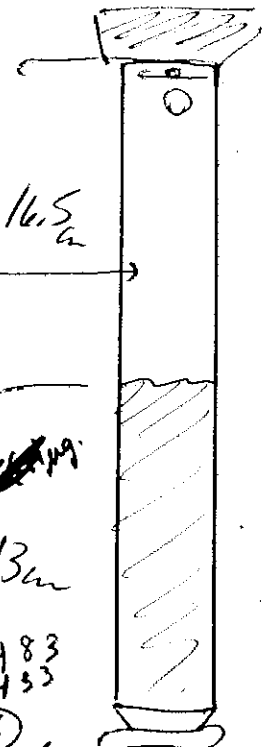
Long Core - 18 July 79 - Stn 4

16:45 Collected

17:45 Remove in Lab 100 ml → .139 wink

Replace w 109.4 ml filt water .140 wink

Measure total water volume (223) ml w bar in



[21:20] Start Resp

I 30 min

Remove 100 ml → (1) BOD wink .137
add 100 ml filt water → (5) bod .144 } av .140 846 722 > 1569
Control 910 ml " for 30 min - end .146 use (191.84)

21:28 Start Stir

[21:50] Stop, 100 ml out to (4) bod - (.123) av .133 759.6 722.98 1483 1433 use (49.45) use 59.25

II 31 min

21:53 add 100 ml filt .146

21:56 start stir

[22:21] Stop; 100 ml out → (7) BOD → (.128) → 790 733 > 1523 av .136 1534

III 30 min

22:26 add 100 ml filt .146

22:45 Start stir (difficulty)

[22:51] Stop; 100 ml out → (2) BOD (.137) av .141 846 733 1579

IV 30 min

22:55 add 100 ml filt .146

22:57 Start Stir 1533

22:59 Subsample filt water → (3) Bod .146

[23:21] Stop; 100 ml out → (8) BOD → (.137) ave .141 1579

V 30 min

23:25 add 100 ml filt .146

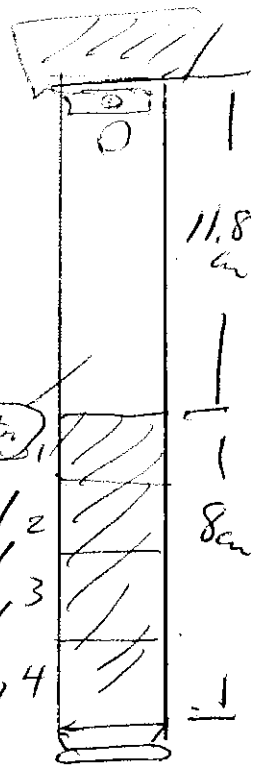
23:28 Start Stir } use 1226

[23:51] Stop; 100 ml out → (9) BOD - .130

Take Sed Samples push out.

Stn 4 also

18 July Short Core – collect –
16:45 collect
Removed bottom of Core & permit Resp Study.
Calc volume of water over core w bar:
46 + 111.9 = 157.9 ml – 12 ml BAR vol =
145.4 ml total water



Mud samples taken in Frozen

19 July
13:40 add 120 ml + oxygenate for clearing delt

I (47m)
14:00 Stop; 100 ml out → ① BOD .122 → .140 ml
14:05 add 100 ml table water Sat → ② BOD .148
14:07 Start Stir
use 79.75 .012/hr

II (47m)
14:47 Stop; 100 ml out → ③ BOD .129 → of 140
14:51 add 100 ml – N.S. .146
14:52 Start Stir
use 70.78 .0124/hr

III (47m)
15:34 Stop; 100 ml out → ④ BOD .131 → of .140
15:37 add 100 ml Sat water ——— ⑤ BOD .144
15:39 Start Stir
use 94.38 .0187/hr

IV (47m)
16:21 Stop; 100 ml out → ⑥ BOD .127 → of .140.1
16:25 100 ml in .146
16:27 Stir Start
use 88.10 .0156/hr

17:08 Stop 100 ml out → ⑦ BOD .128

Divided into 4-5cm Sects < each < dry part / Freeze part

19 July Thursday

Am - Fill gas
Do winches on long Core Resp

Trip to Stn 4 w S.Y. for water collection

Return - Store Sponge Grafts - approx 48 hrs

	A	B	C
A	Acc	Rej	Rej
B		Acc	Rej
C			Acc

All rejects except identities for Microcosm proliferation ie complex recognition system at cellular level + Rapid!

Some evidence at 48 hrs of histological damage ie one is killing the other; but need longer term study for proper documentation of pathology of these.

PM - Run Resp on Short Core from 18 July; Station 4.

Next book 8:33 PM

Tied Graft of "self" micrcosm for Repetition Photog B.W.

19 July	17:30	Tie Graft	
	20:00	photo ① (@ 2:30 hrs after contact)	1/15 sec f 5.6
	23:00	" ② (@ 5:30 " ")	(accepting?)
20 July	09:45	③ (@ 16:15 " ")	
	12:30	④ (@ 19:00 " " ")	
21 July	09:00	⑤ (@ 39:30 " " ")	(rejecting?)

end

F-7

20 July. Friday

Early dredge collection: ~1000 hrs

Cleaned spicule preparation - Problem without Nitric acid

Observed Specimen in Dish/Jar w spicule augmented seab.

12:40 in seab.

Spec (A): size?

by 12:50 by 2 pellets

12:55 > 5 pellets 60 sec (5)

13:00 > 5 pellets 60 sec (5)

Pellet Sequence Start

13:05 > 5 pellets 60 sec (5)

13:06:20 > 1 pellet 80 sec (1)

13:07:35 > 1 pellet 75 sec (1)

13:10.10 > 1 pellet 165 sec (1)

13:12:20 > 1 pellet 130 sec (1)

13:14:20 > 1 pellet 120 sec (1)

13:15:10 > 1 pellet 50 sec (1)

13:16:05 > 1 pellet 55 sec (1)

13:16:55 > 1 pellet 50 sec (1)

13:17:55 > 1 pellet 60 sec (1)

~~Resp~~ Ventilation Rate 6/~~min~~ = (10 sec period) total interval 2 min

Tests for spicule richness

13:20 Neg

13:35 Neg

13:45 Neg

~~Resp~~ Ventilation Rate 5/~~min~~ = (12 sec period) total interval 5 min

Pellet Sequence start

13:59:45

13:53:10

6:35

13:53:10

13:53:50 40 sec (1)

13:54:50 60 sec (1)

13:56:10 80 sec (1)

13:57:10 60 sec (1)

13:58:40 90 sec (1)

13:59:45 65 sec (1)

Test spicule

13:60 - Neg.? some pcs (1hr 10 min)

14:06 Neg? some pcs (1hr 26 min)

14:25 Neg? some pcs (1hr 45 min)

21 July - Sat

10 am check fresh pellet + definite spicules in

Saterday
21 July Worked with Sami on Water Collection

22 July - Sunday

Collected Yoldia ~ 900 pm

Presented fresh collected specs at ~10 am

Dissected one spec. - Photographed

placed specs in Sed Jar 11:30 w specials - 3 specs in one Jar

Tried fecal collections but

Not saved
- (A) - 12:15, 12:30; 2:00 - Then only sparse feces.
- (B) - 12:30; 2:00 - Thereafter only sparse feces.
- C) 12:30 2:00 " " " "

Possibly dense specimens in sed or contaminants of Cleaning are inhibiting normal intestinal activity

Note: Same specs? or different? Not clear

Evening - started separate specs in 2 Jars

	(A) 1800 pm start	(B) 1800 start
Dried in Vials (fecal collections)	(1) - 845-900 pm	(1) 8:45-900 pm
	~~(2)~~	(2) 10 am 23 July - from bottom accum.
	(2) 11 AM 23 July fresh	(3) 11 AM 23 July fresh

Done w S.Y. on Stations 1, 3, 4.

#C

$L =$ 3,99 cm

Calc wet wt ~ 2,88 gm wet wt.

#D

$L =$ 3,84 cm

2,56 gm wet wt

23 July Monday

Collecting feces w spicule AM - Not rewarding.

F-9 The spicules of 22nd had ceased or near ceased fecal pellet production

PM - S.Y. water collection station 2

PM - 415 dredge Yoldia JBL at Creek Junctions

Set up 2 C&D specimens in mud samples at ~ 8:20 pm

add spicule-mud suspension at 9 pm for one hour

Collections:

	(C)	(D)
Pre-exposure: (1)	9 pm	(1) 9 pm. (9-10 pm)
(Exposure & spicule sed 9-10 pm)		
Collection for (2)	10 pm (Rinse jar in water table water & remove suspended spicules)	(2) 10 pm (no water rinse)
(3)	9 Am 24 July (12 hrs)	(3) 9 Am 24 July (12 hrs)
(4)	10 Am (=9am-10am fecal Prod.) (1 hour)	(4) 10 Am (=9-10am fecal prod 1 hr)

Monitored time of production of pellets

9:46:40
9:48:00 > 1:20
9:50:50 > 2:50
9:54:45 > 3:55
] x̄ 2:40

(5)	2 pm (10am - 2pm Accumul)	(5) 2 pm (10am - 2pm Accumul)
(6)	3 pm (2-3pm Accumul)	(6) 3pm (2-3pm Accumul)
(7)	4pm (3-4pm Accumul) (timed production at 3:51-4:00; 10 minute interval produced 10 pellets - ie 1 pellet per minute	(X) no pellets animal burrowing; constructing subsurface respiratory cavity and no feces reaching surface

Continued

	(C)	(D)
(8)	5 pm (4-5 pm accumulation)	-None - animal burrowing as before - No feces reaching surface..
(9)	8:30 pm (5-8:30 pm Accumulation)	-None - "
(10)	8 30 AM 25 July (12 hr accumulation)	

≠ END

24 July

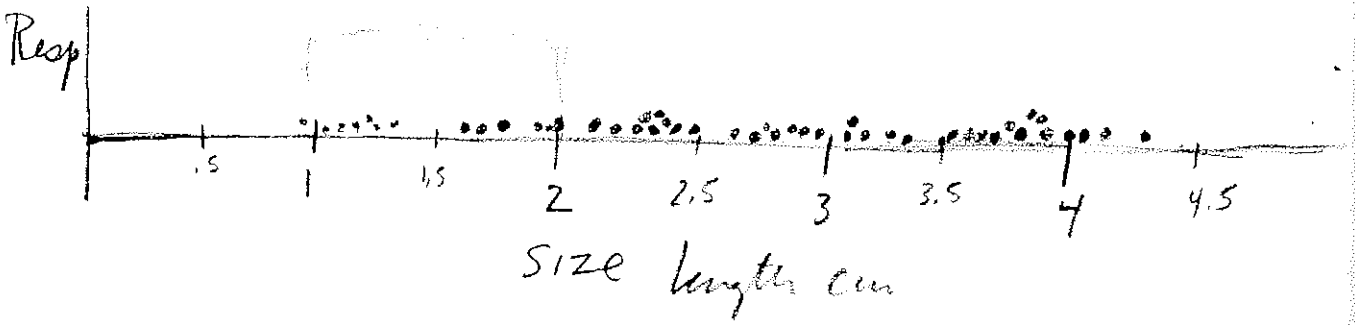
Grabs taken at station 2 - took mud sample (Frozen) of top + -2 cm mud layer → Frozen

↑ ↑

Surveys of Microscope Preparations in Oct - Dec 1979 were not informative; Possibly spicules came through as indicated by smears (Resuspension filtered onto membrane filters, cleared + mounted) but apparently spicules adhered to fecal pellet surfaces in spite of washing + are present even in earliest time periods -!

∴ not useful for timing Gut passage.

≃ 4521.38 mg of O₂/ml thio



WARWICK UNIVERSAL LTD.
MONTREAL, QUEBEC

No. 625

Made & Printed in Hong Kong
Fabriqué à Hong Kong