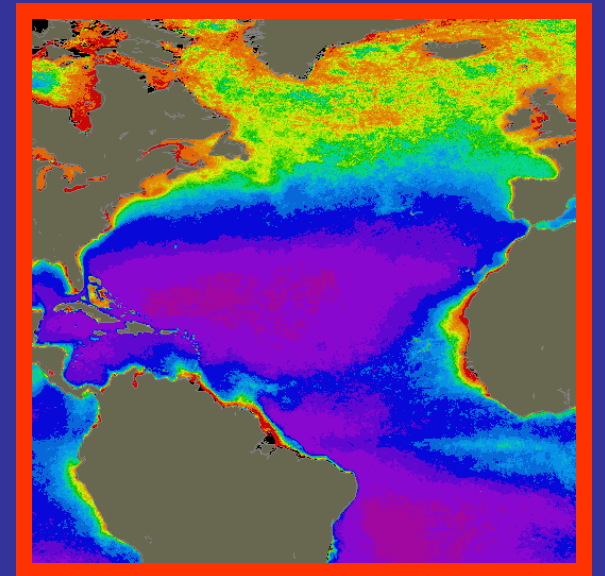


Globigerinoides sacculifer:
gametogenic response with
favorable nutrient rich
surface waters - North
Atlantic Equatorial Surface
Current



A good temperate to
tropical microfossil for
testing
palaeoproductivity &
current migration with
time (down hole)



John E. B. Baker
12/2009

Core num	Depth (M)	Wt. Length	Date	Lat (N)	Lon (W)	Core Length (cm)	% Gametogenic	% Non-gametogenic	% Left Coil	% Right Coil	Length of test	specimens	% Fair	
VM23-103	4645	25	11/11/1966	17.7	29.867	1421	51	49	60	40	433	133	19	
VM22-205	3823	24	5/27/1966	15.91	24.233	658	54	46	60	40	463	126	20	
VM23-110	3746	27	11/16/1966	17.31	45.833	821	43	57	59	41	433	136	28	
VM22-28	4072	18	2/9/1966	5.807	37.267	132	41	59	58	42	421	198	28	
VM22-193	4956	48	5/26/1966	9.91	20.967	1743	68	32	65	35	457	86	28	
VM21-23	3418	33	11/5/1965	13.01	79.25	517	55	45	56	44	476	101	23	
VM2-32	3623	34	4/10/1966	14.167	45.733	1225	49	51	60	40	433	101	24	
VM22-190	3491	36	5/19/1966	6.033	21.267	1110	51	49	57	43	528	140	41	
VM22-26	3720	46	2/8/1966	8.717	41.25	356	57	43	61	39	519	240	20	
VM21-222	4060	50	11/18/1965	14.45	77.233	295	57	43	62	38	534	279	24	
VM12-109	1701	21	7/16/1967	11.8	68.55	866	49	51	58	42	537	92	20	
							52.2	47.6	59.6	40.3	475.8	1818	1632	25
											>250um Sieved			

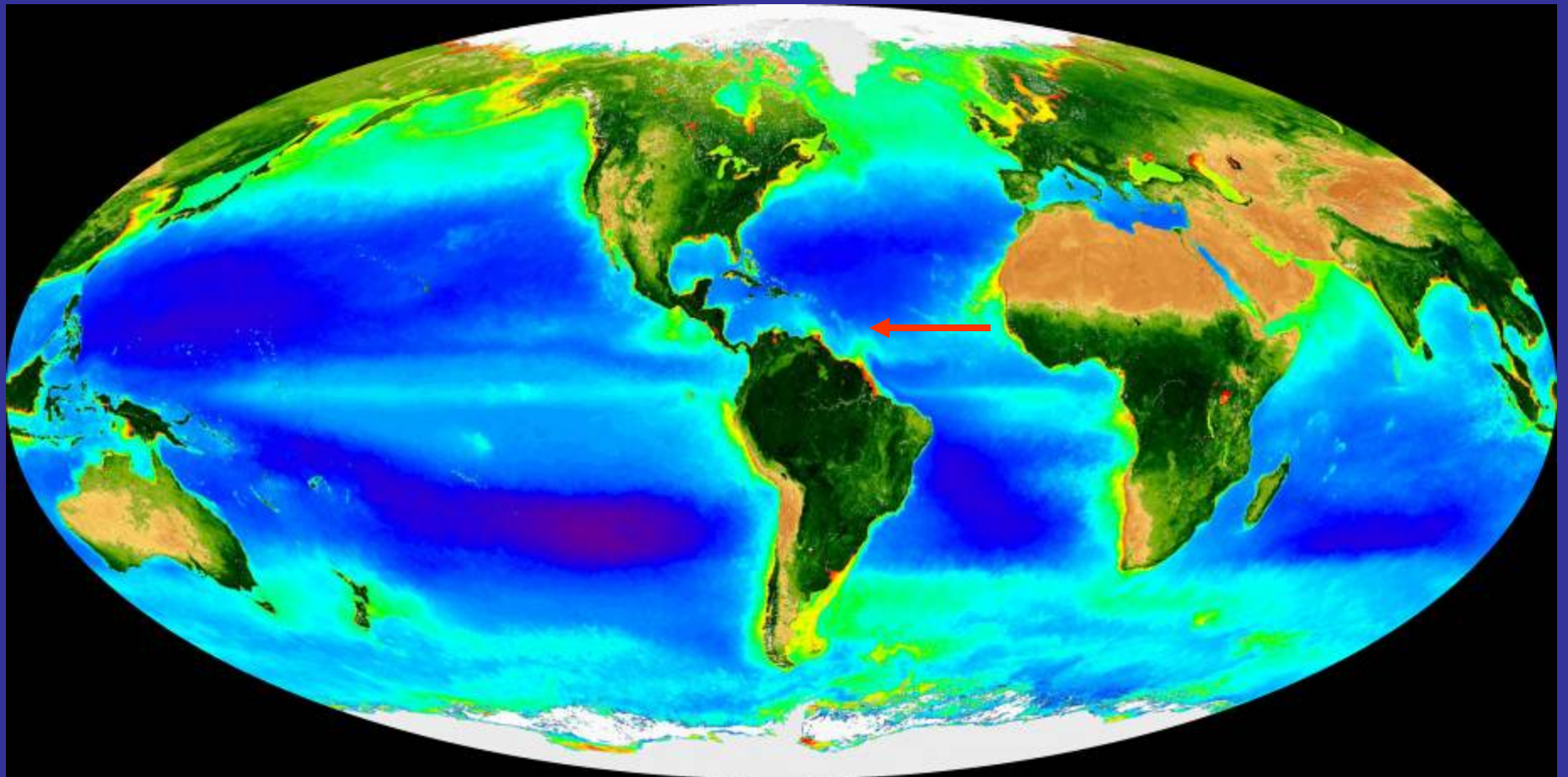
52.3% gametogenic, 47.6% nongametogenic

60% Left coilers, 40% right coilers

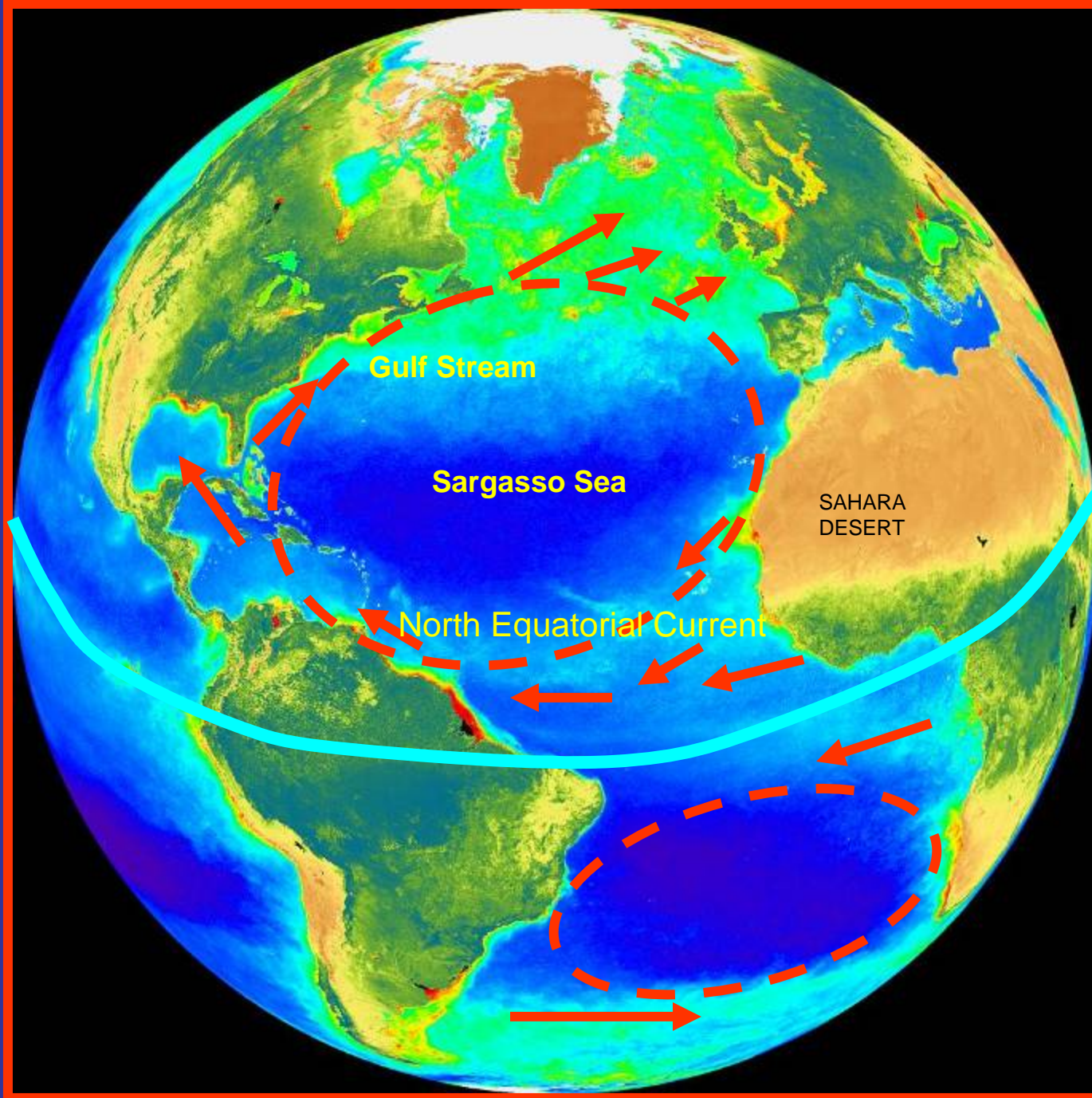
25% of planktonic foraminifera fauna 41% at VM22-190

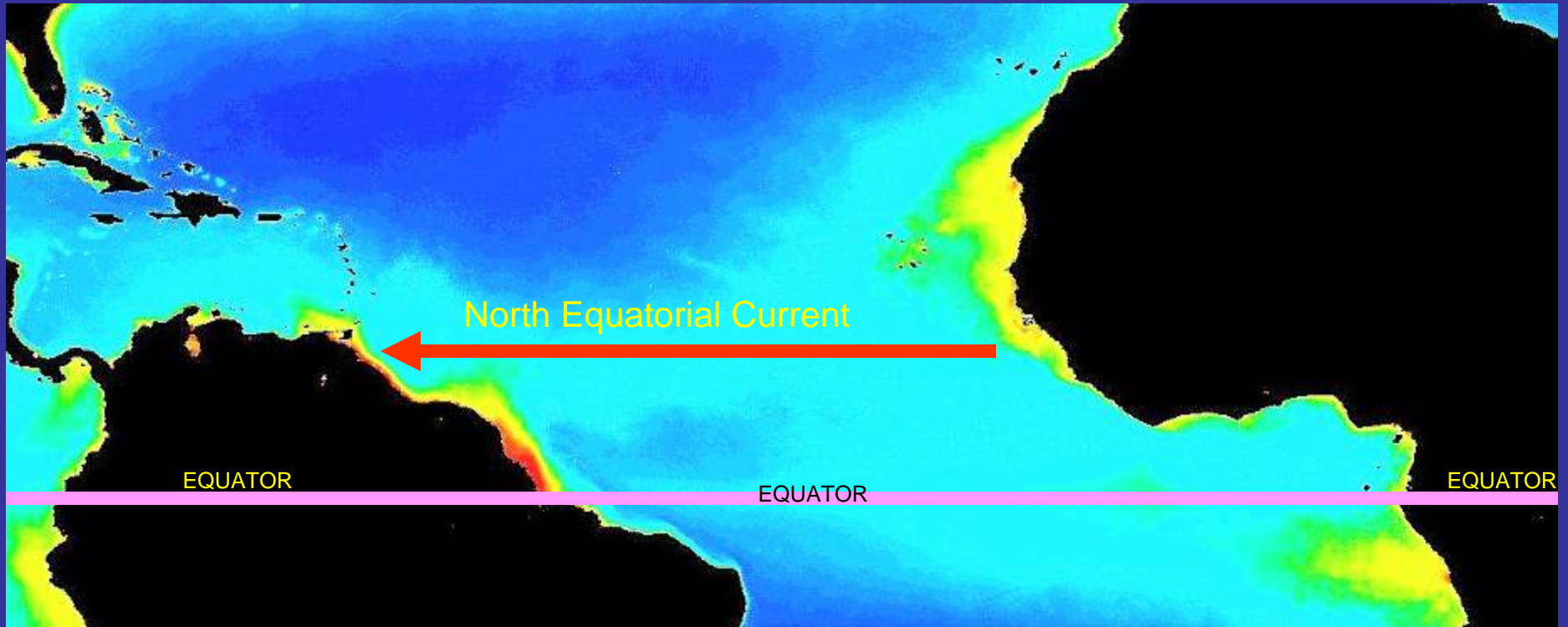
Average length above 250 μ m sieve size is 476 μ m

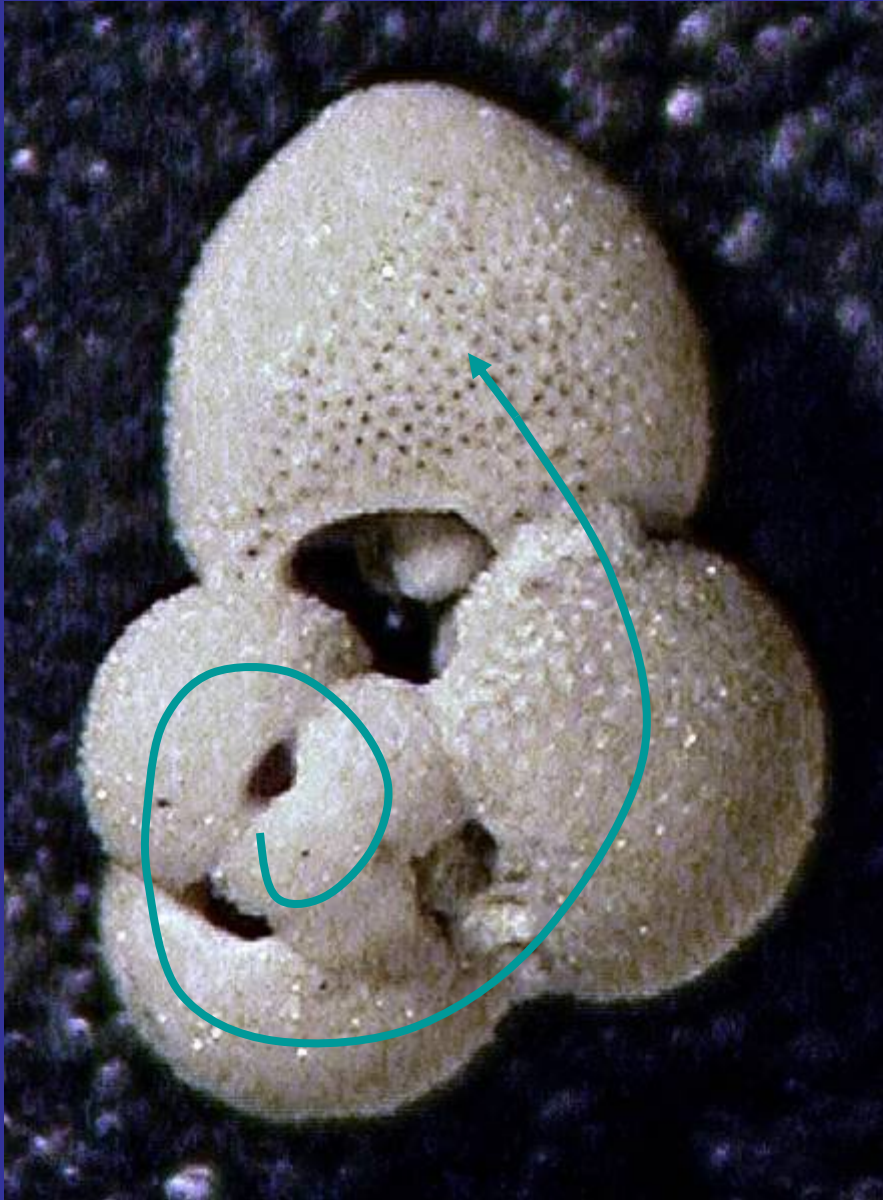
11 piston core trigger weight top samples were examined and over sixteen hundred specimens of *Globigerinoides sacculifer* were analyzed for 1. coiling direction, 2. maximum length, 3. apparent pre-death gametogenetic activity using the shape/size of the final chamber or 'sac' and 4. percent of total planktonic foram population. The results were plotted on SeaWifs Satellite images of chlorophyll levels as a measure of productivity of sea surface waters. Individual core data is summarized in 22 appended graphs. Sahara dust blown onto Atlantic sea surface enhances nutrients & thus growth & gametogenesis.



SeaWifs(NASA) image of chlorophyll and thus surface water phytoplankton and the relative productivity of the marine part of the biosphere

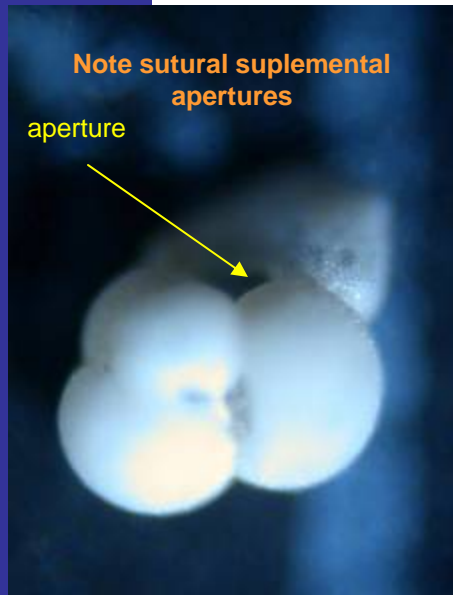
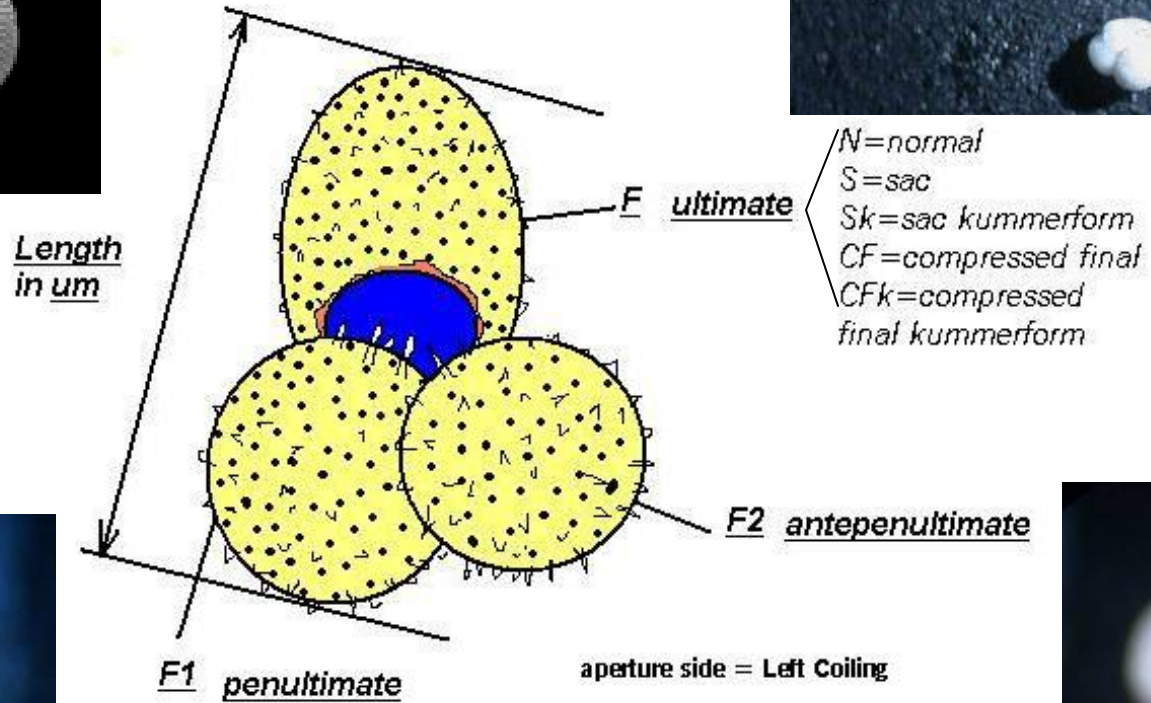
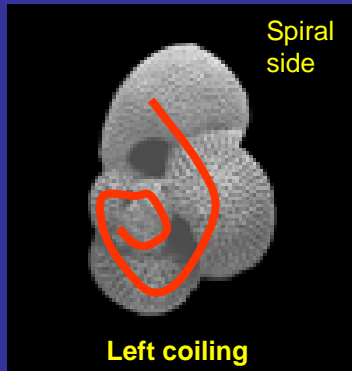




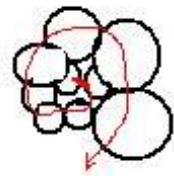


Globigerinoides sacculifer

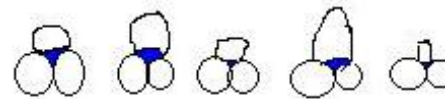
Left coiling
gametogenic individual
– note supplemental
sutural apertures –
spiral side view

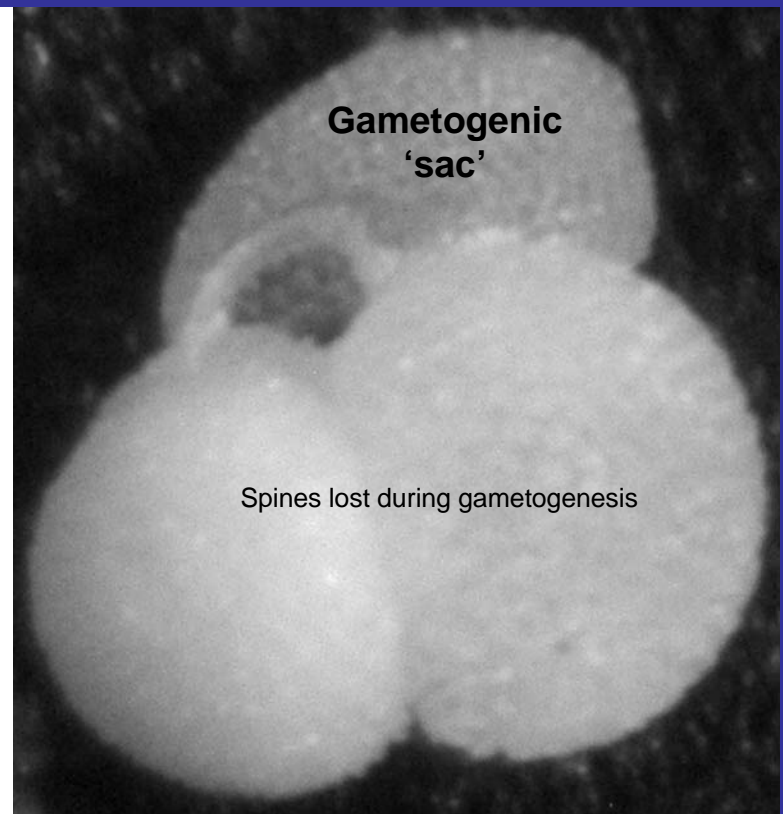
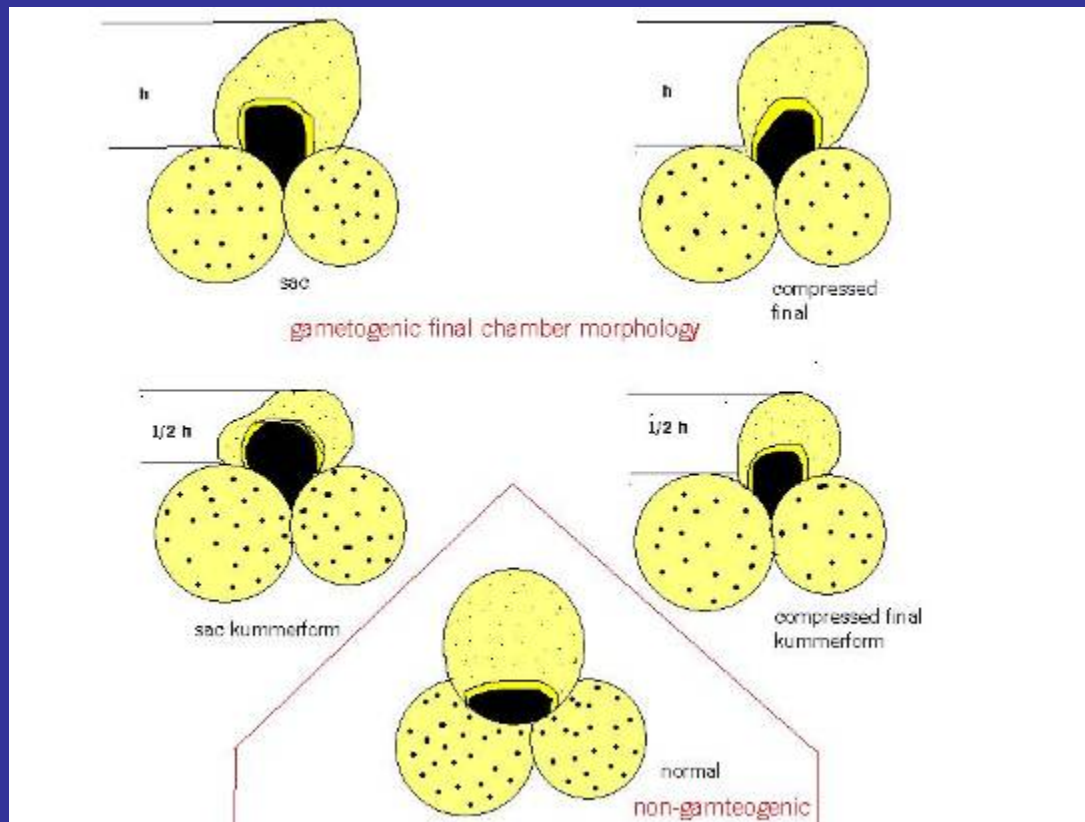


Globigerinoides sacculifer



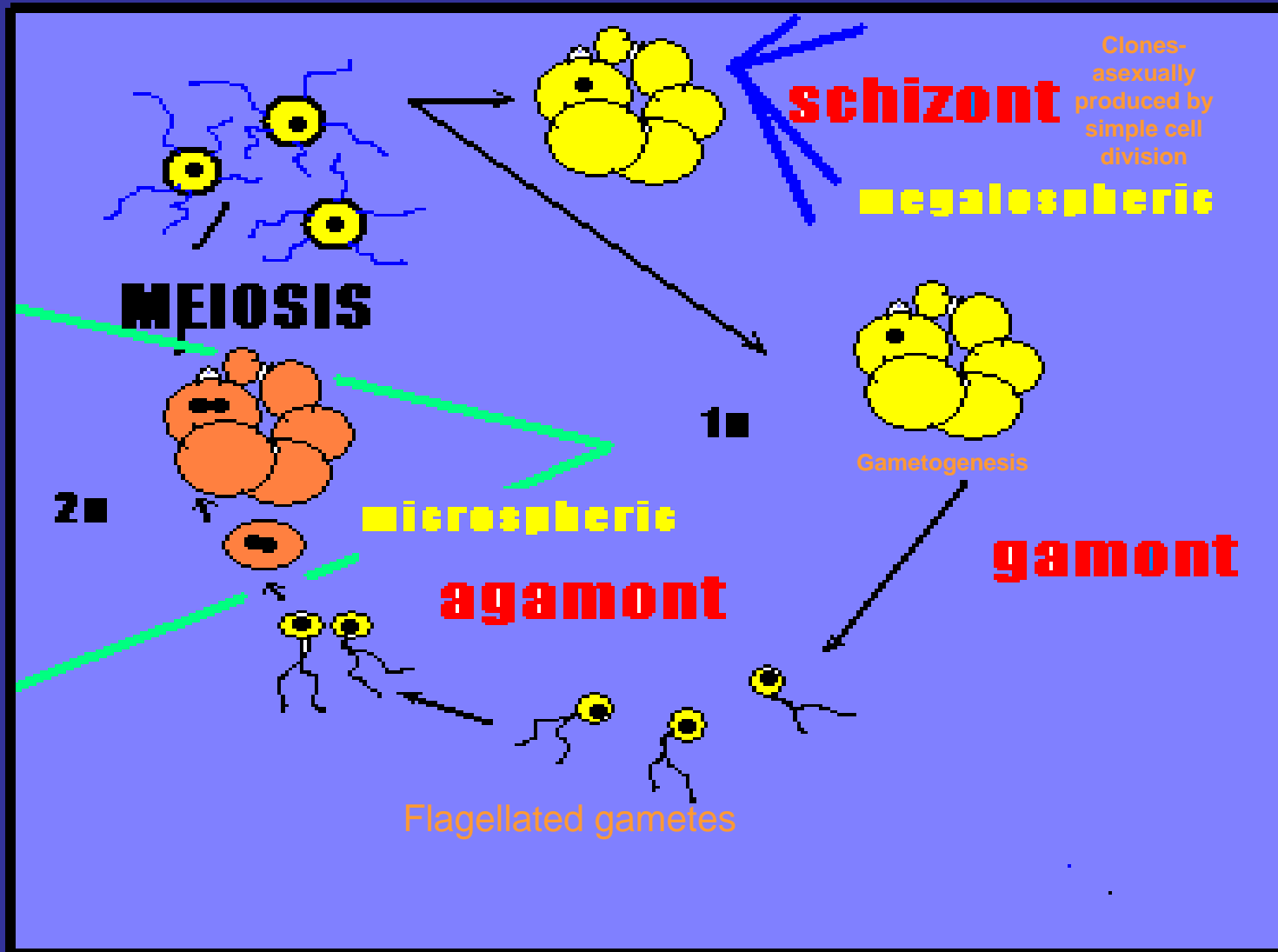
spiral side = Right Coiling

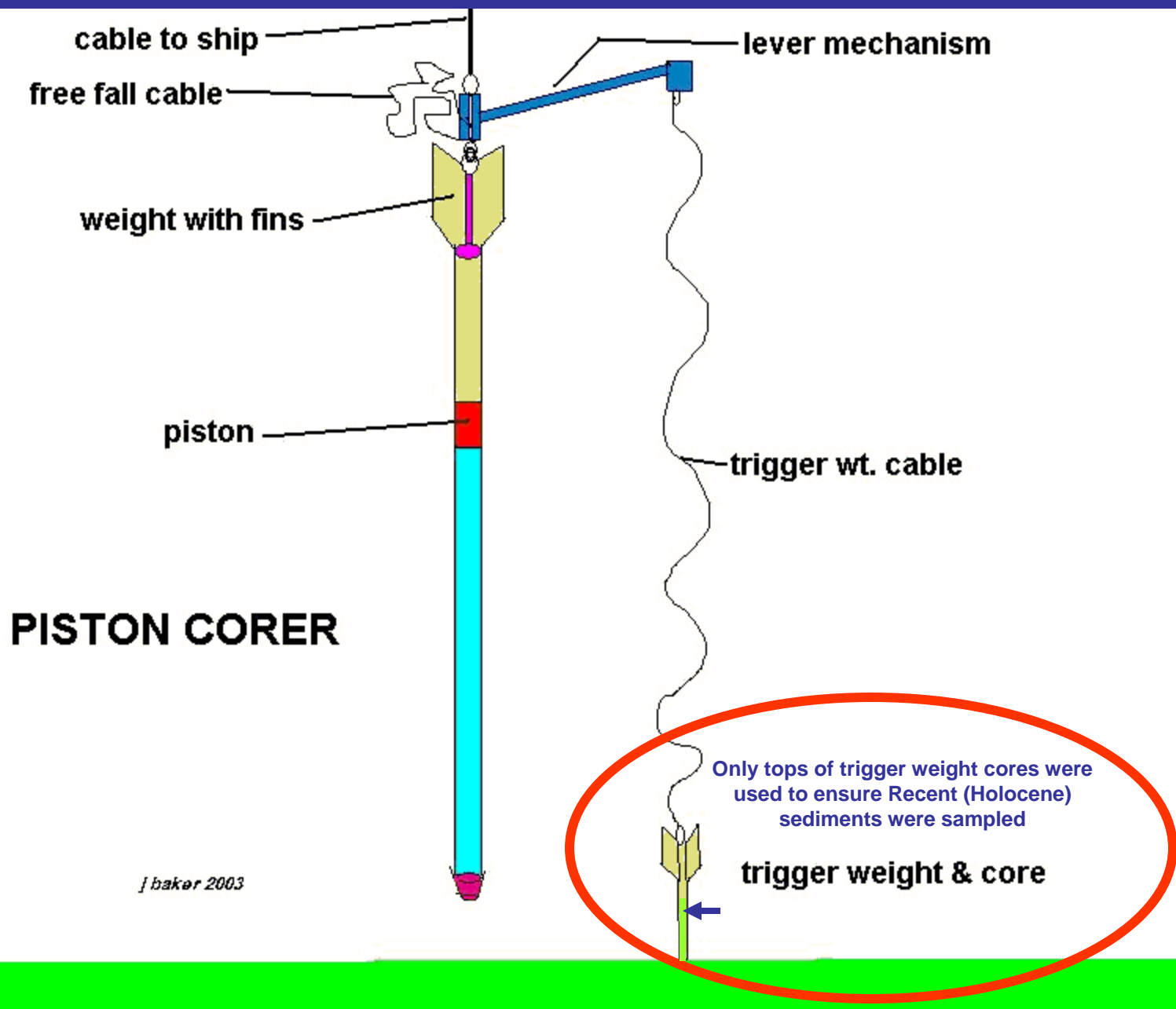




Globigerinoides sacculifer is an excellent marine microfossil 'tool' for the determination of palaeoproductivity of Neogene surface waters. These planktonic Foraminifera produce a unique final chamber during the development and release of flagellate gametes that stays intact when the test descends to the ocean floor. Thus, providing a fossil witness to the nutrient levels, phytoplankton and consequent zooplankton when they lived on the surface. They carry and farm out their own dinoflagellate symbiotic algae as a source of many nutrients, but they need a steady diet of small crustaceans (ie one copepod) about every 4 days to reach optimum gameteogenic maturity.

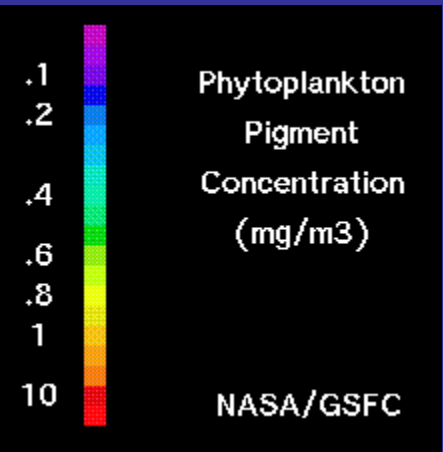
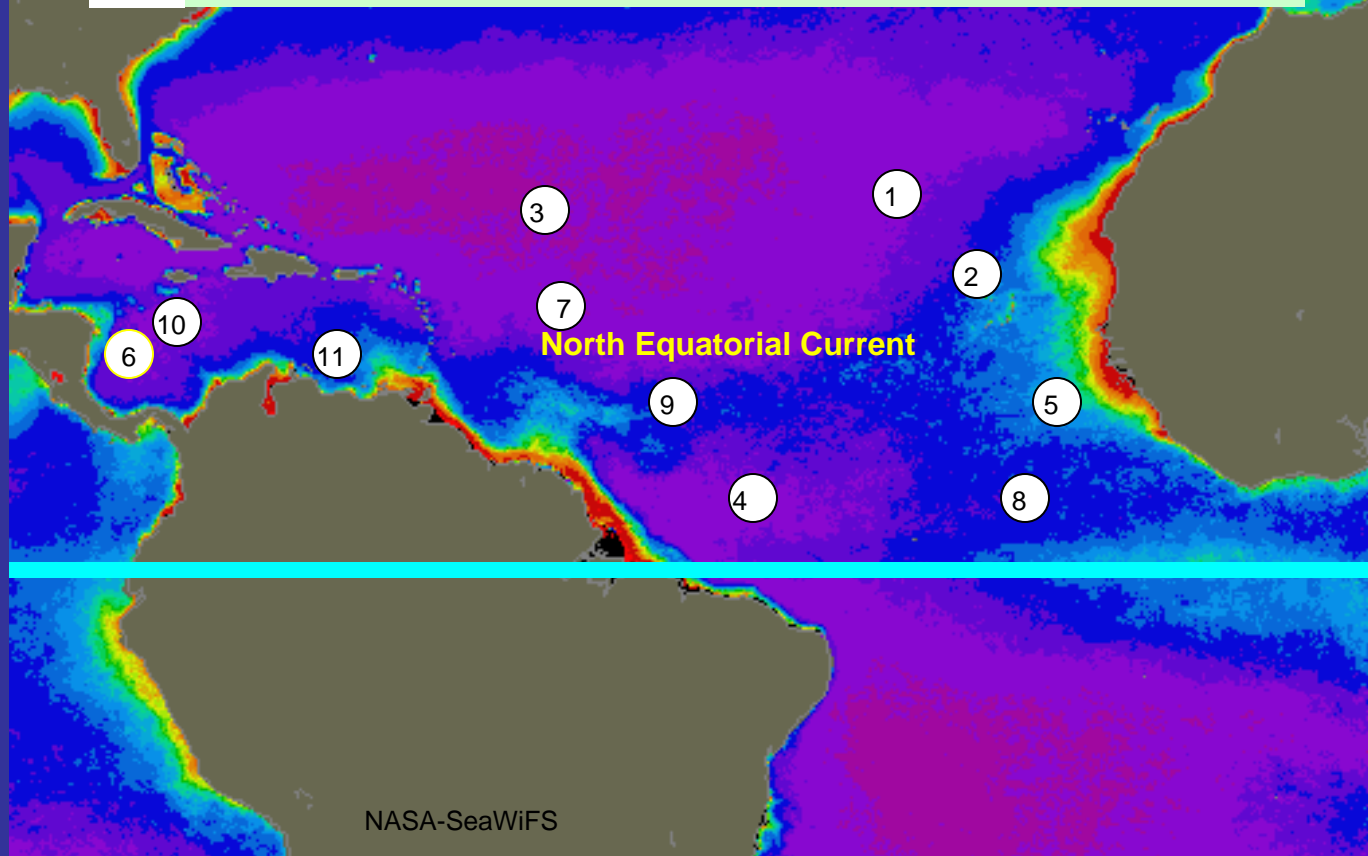
Simple Life Cycle of FORAMINIFERA

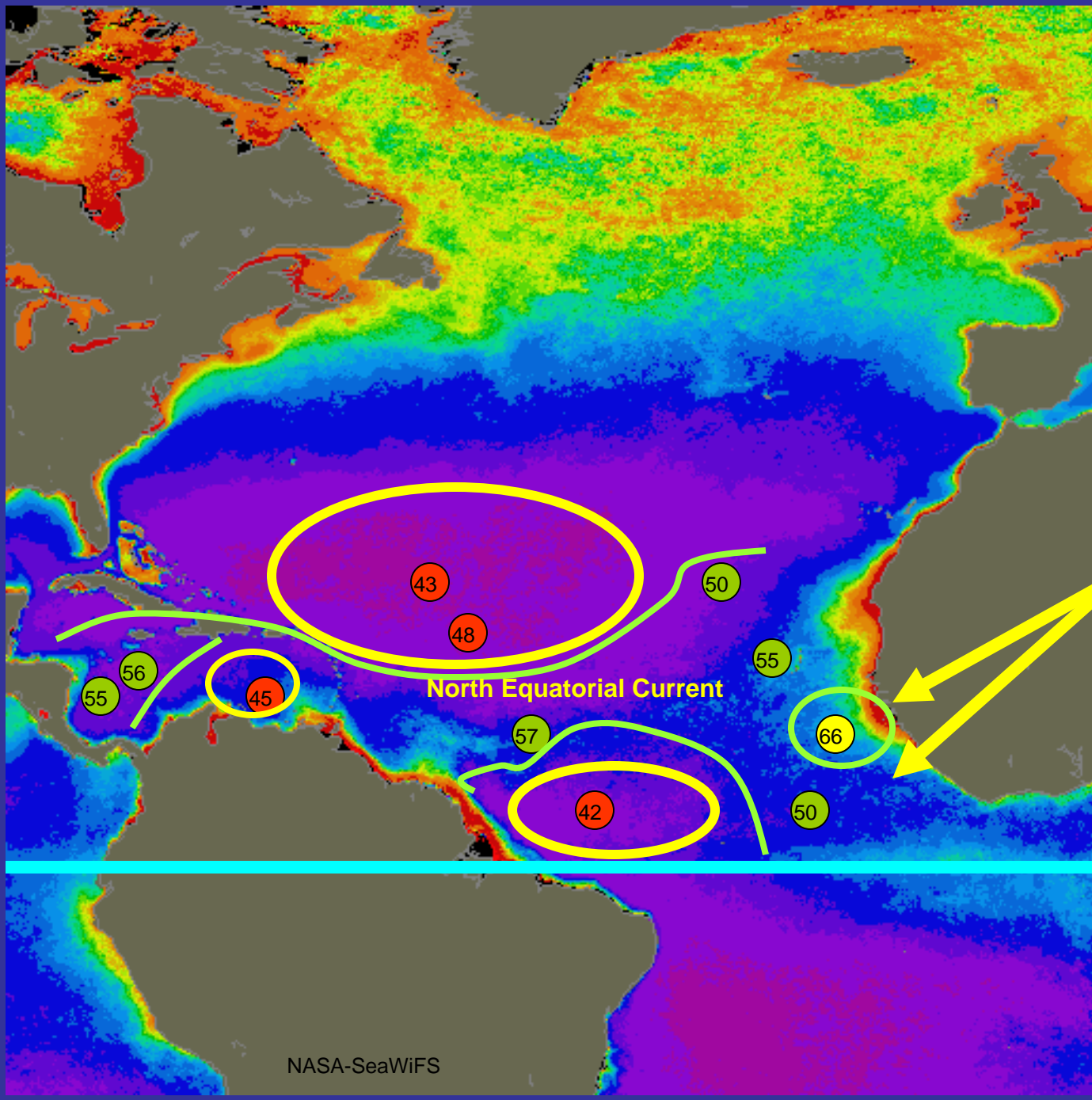




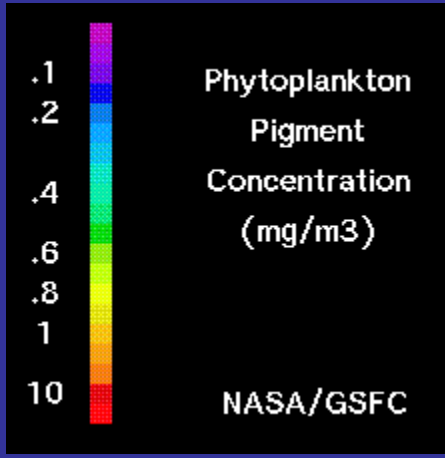
#	RV Vema Trip	Depth M	Trig.Wt. Length CM	Date	N Lat	W Long
1	VM23-103	4645	25	11/11/1966	17.7	29.867
2	VM22-205	3823	24	5/27/1966	15.91	24.233
3	VM23-110	3746	27	11/16/1966	17.31	45.833
4	VM22-28	4072	18	2/9/1966	5.807	37.267
5	VM22-193	4956	48	5/26/1966	9.91	20.967
6	VM21-23	3418	33	11/5/1965	13.01	79.25
7	VM9-32	3623	34	4/10/1956	14.167	45.733
8	VM22-190	3491	36	5/19/1966	6.033	21.267
9	VM22-26	3720	46	2/8/1966	8.717	41.25
10	VM21-222	4060	50	11/18/1965	14.45	77.233
11	VM12-109	1701	21	7/16/1957	11.8	68.55

Location of 11 piston cores and their trigger weight core tops used in this study

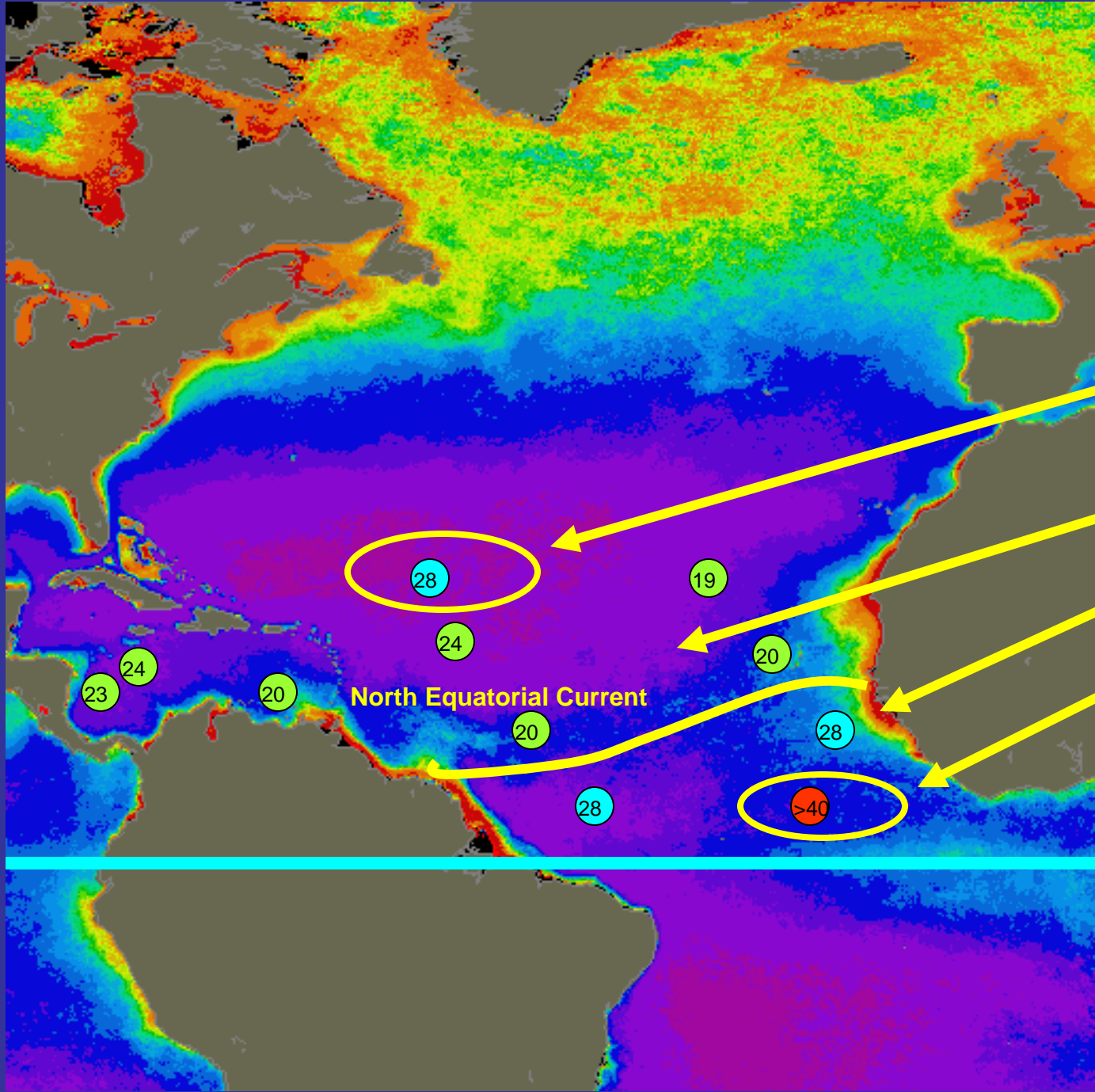




Average Gametogenic %:
 note windblown Sahara nutrient effect and easterly trades blowing phytoplankton and thus zooplankters like *G. sacculifer*



NASA-SeaWiFS



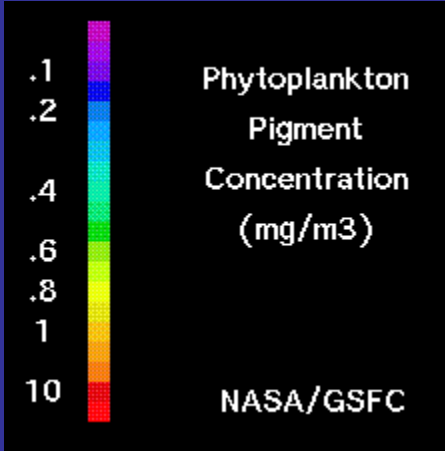
% of Planktonic Foram Fauna

~28%

19% -24%

28%

>40%



North Equatorial Current

28

19

24

20

23

24

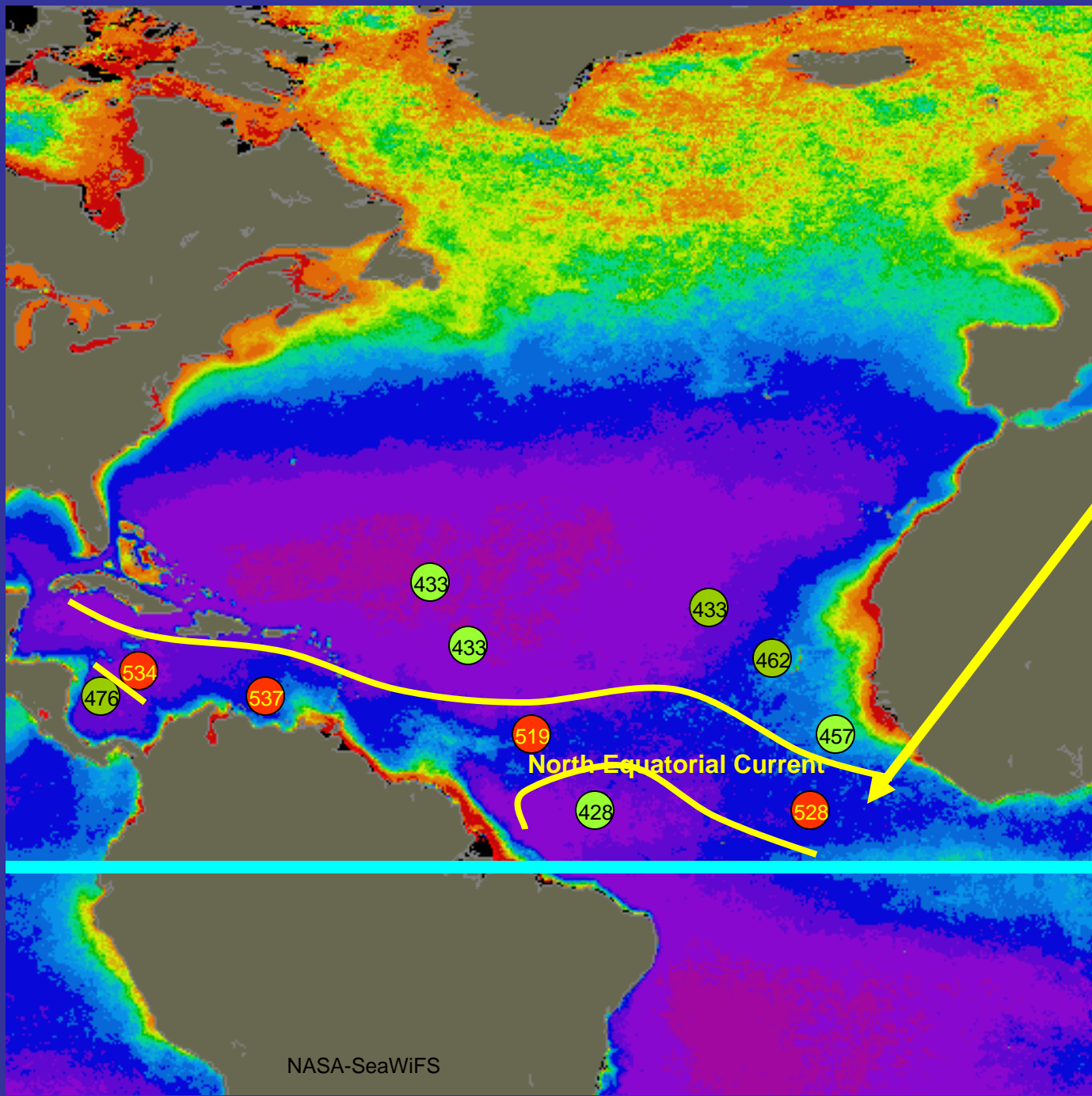
20

20

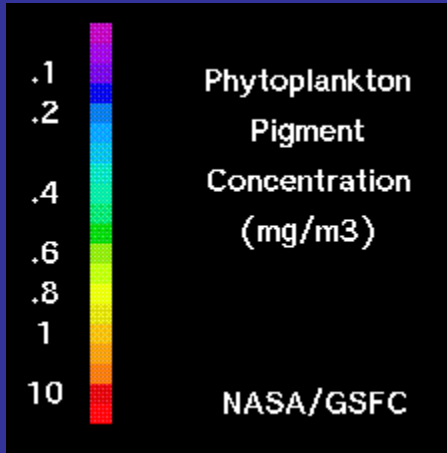
28

28

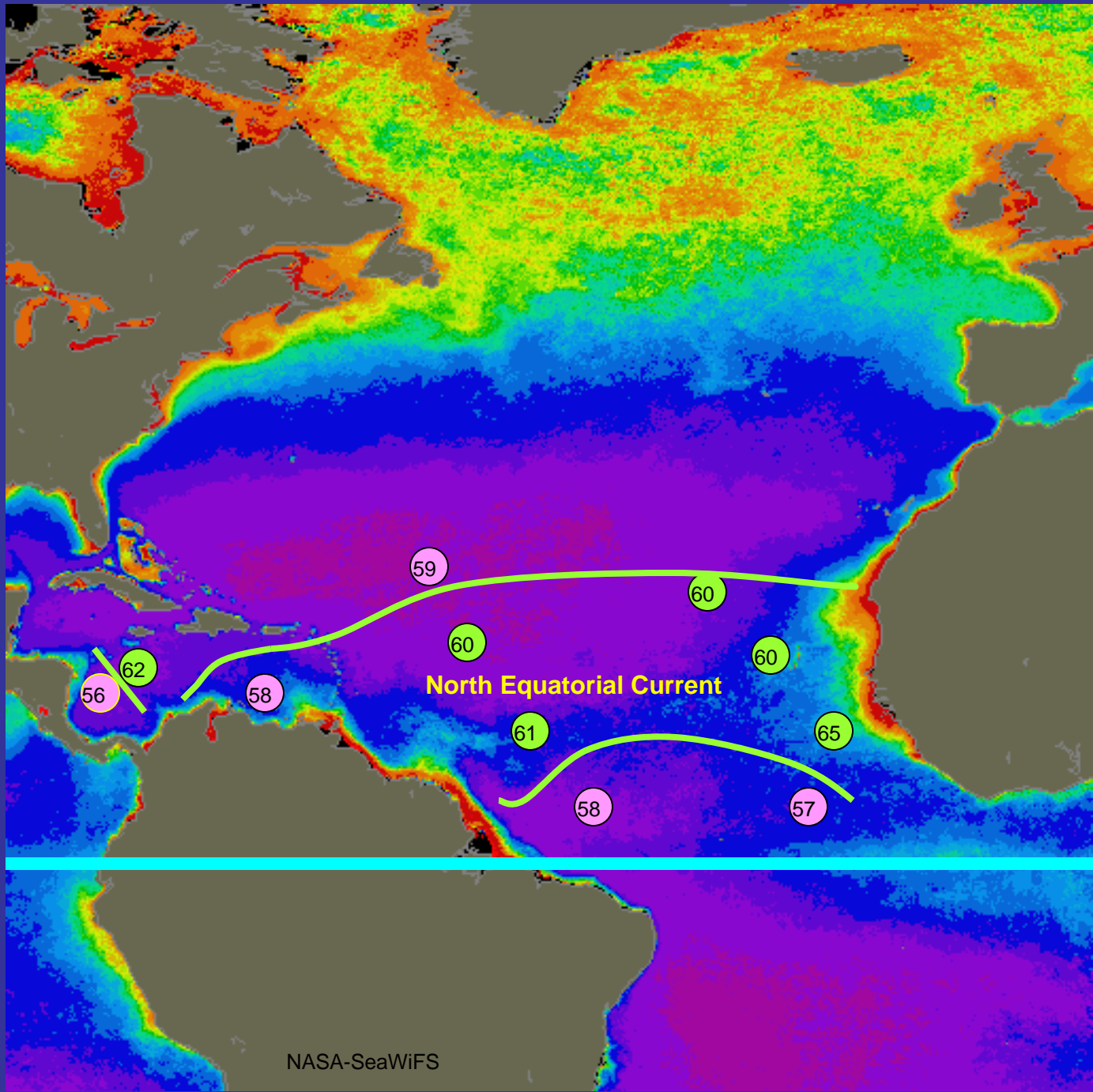
>40



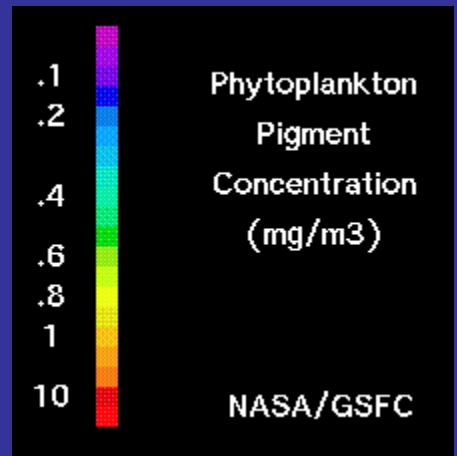
>500 um length
average size-
follows nutrient
flow of Atl. NEC



NASA-SeaWiFS



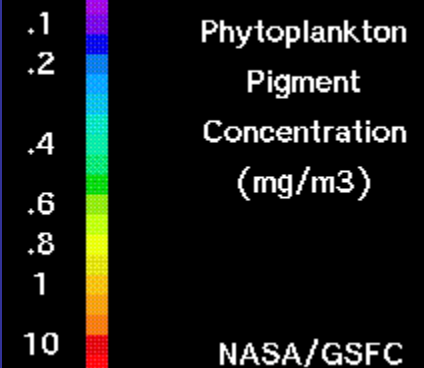
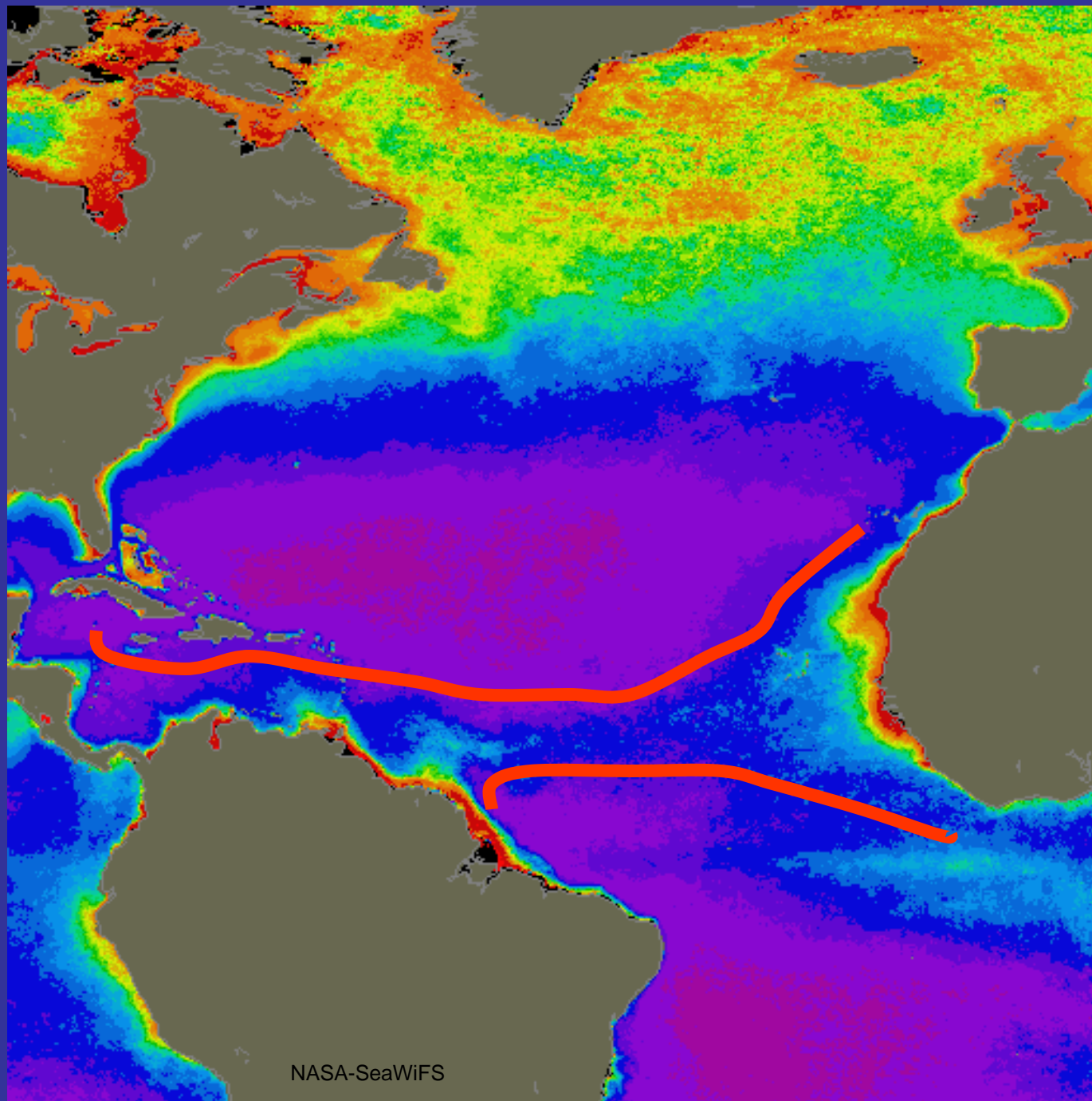
Greater than
60% left coiling



NASA-SeaWiFS

Summary

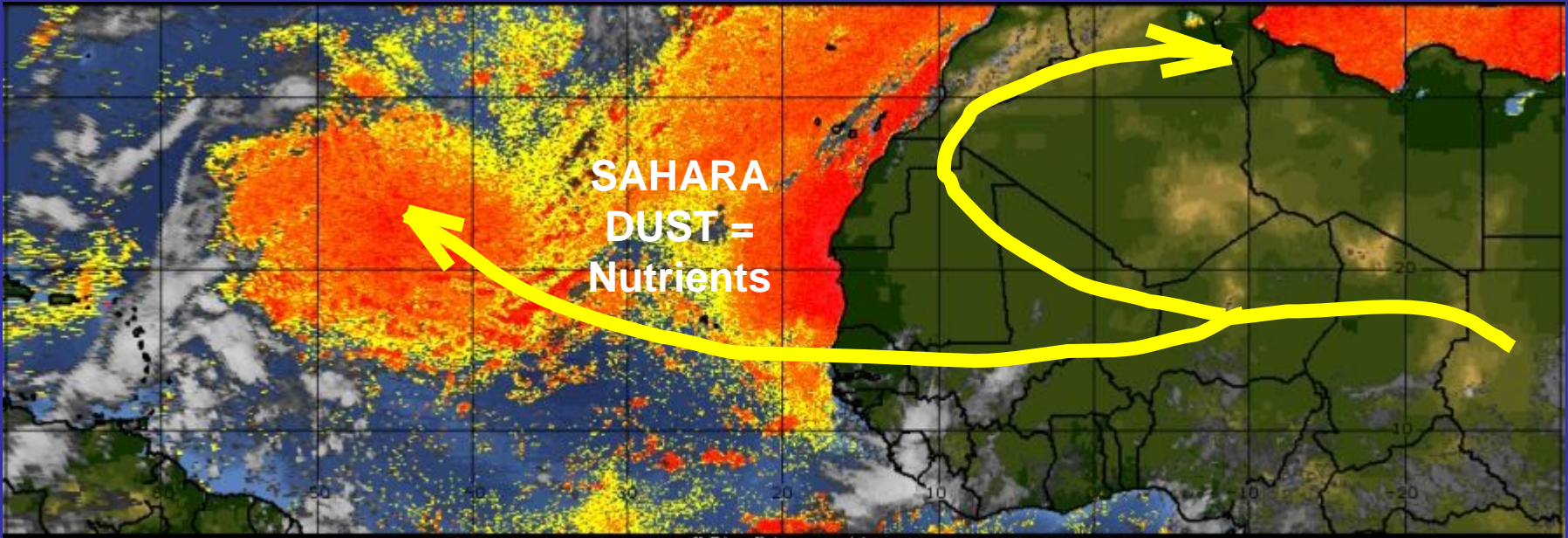
The study demonstrates that the productivity - nutrients (Sahara, windblown), & therefore phytoplankton & zooplankton levels are at their optimum in the North Equatorial Current (RED LINES on SeaWifs image) and consequently that *G. sacculifer* grows largest, reaches sexual maturity, are mostly Left Coiling and form 20- 40% of the Planktonic foraminifera population within this same Current.



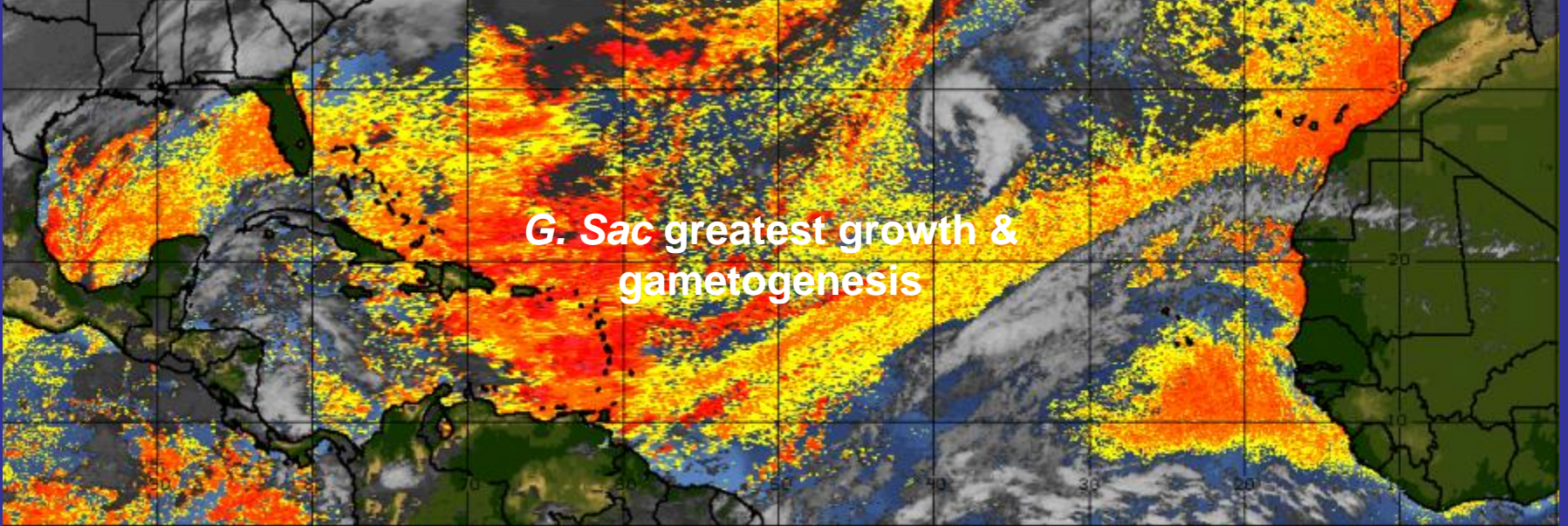
NASA-SeaWiFS



Looking EAST, towards Africa, at sunrise – from Sarasota Florida. Red color is from Sahara dust
2 views from same location: Nutrients dropped onto sea surface provide for growth of plankton

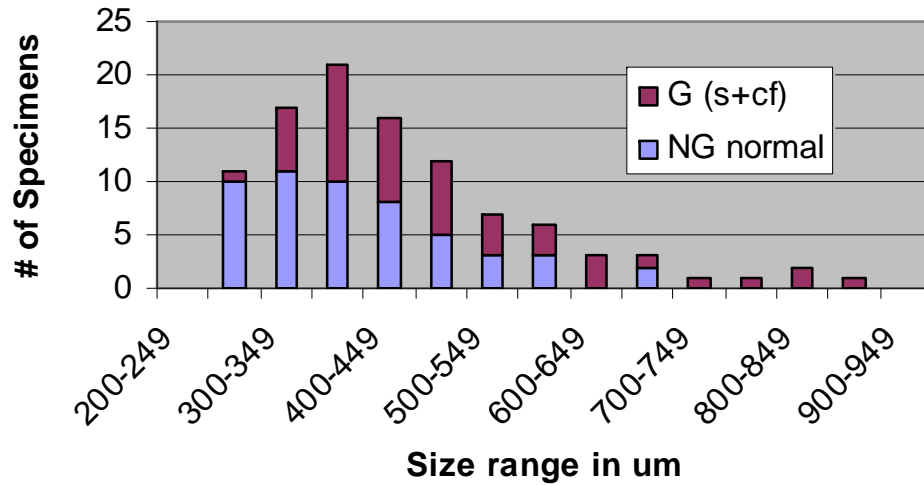


3 METEOSAT-8: SAHARAN AIR LAYER TRACKING PRODUCT 12:00 UTC 18 JUL 05 UW-CIMSS/NOAA-HRD

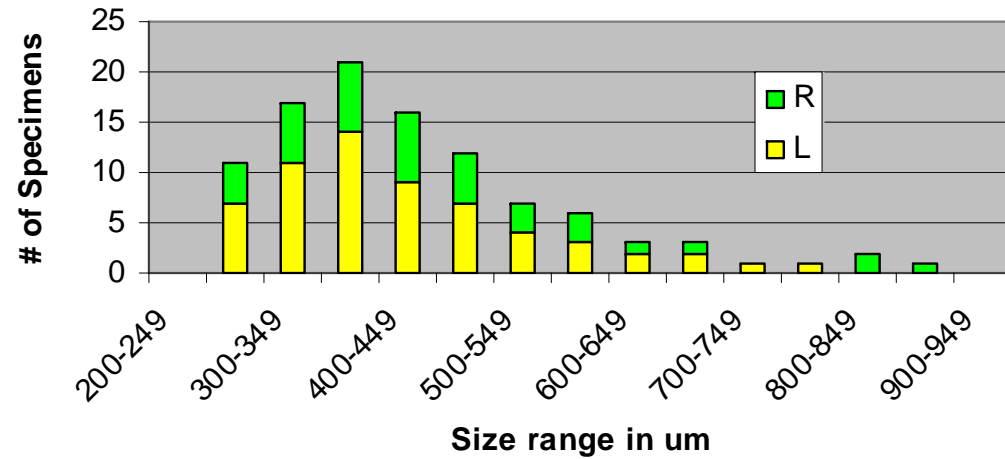


1 METEOSAT-9/GOES-11 COMBINED: SAHARAN AIR LAYER TRACKING PRODUCT 12:00 UTC 29 DEC 07 UW-CIMSS/NOAA-HRD/CIAS

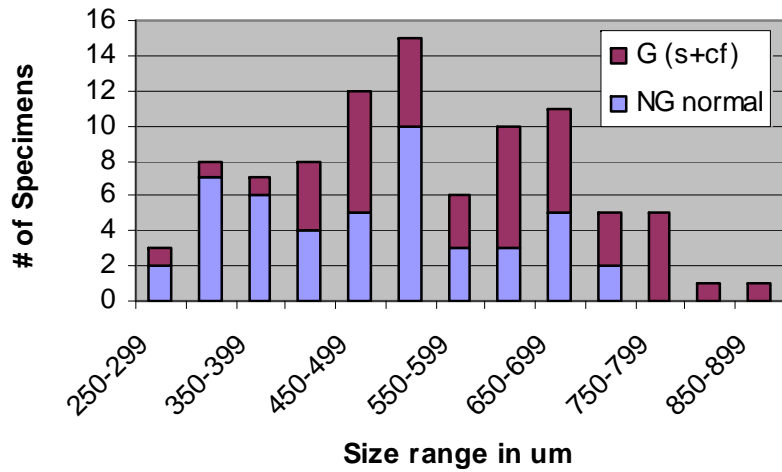
VM09-32 Gametogenic vs. Non-gametogenic



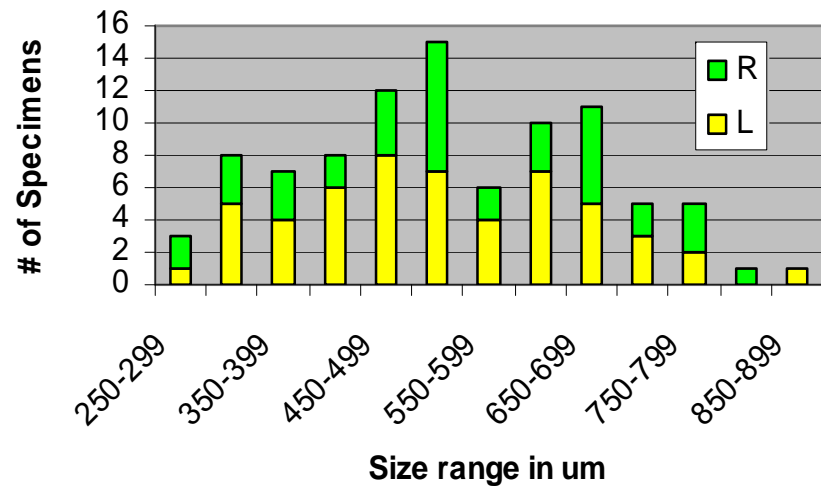
VM09-32 Left coil vs. Right coil



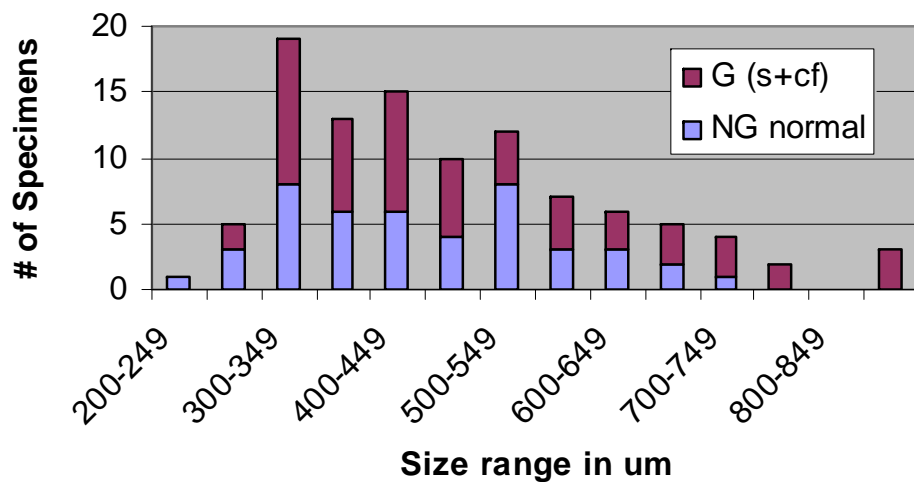
VM12-109 Gametogenic vs. Non-gametogenic



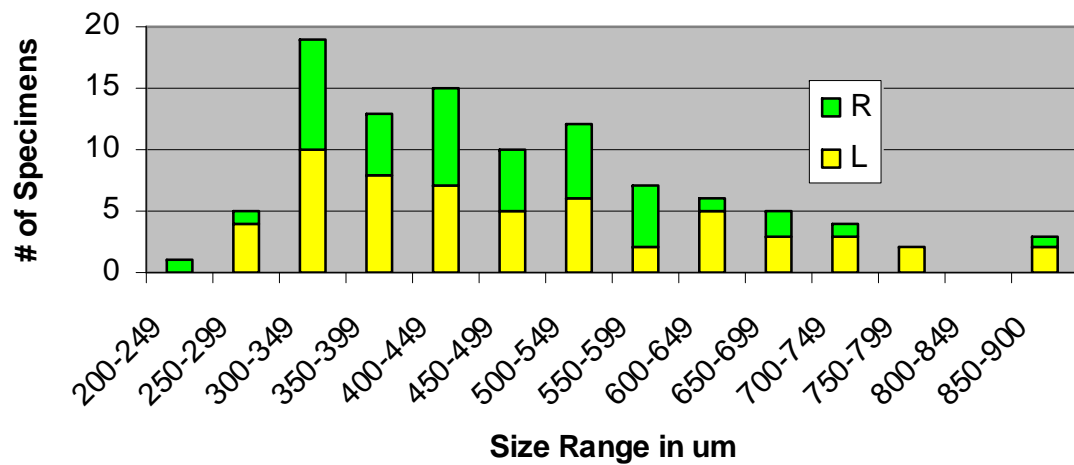
VM12-109 Left coil vs. Right coil



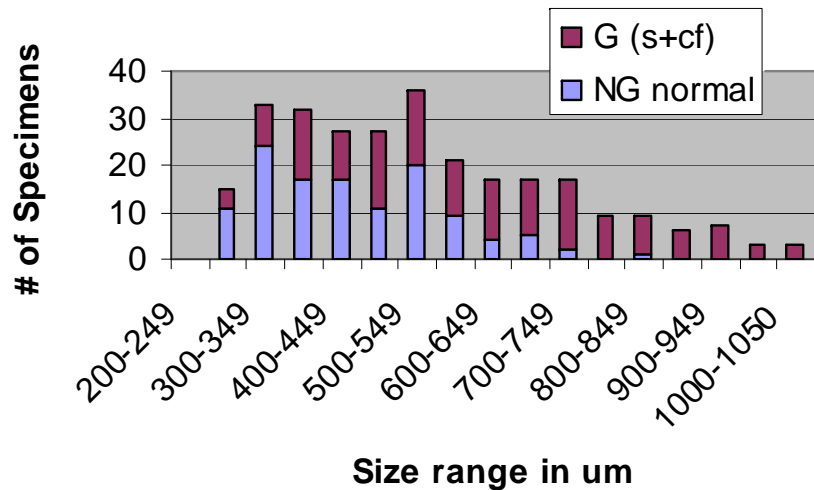
VM21-23 Gametogenic vs. Non-gametogenic



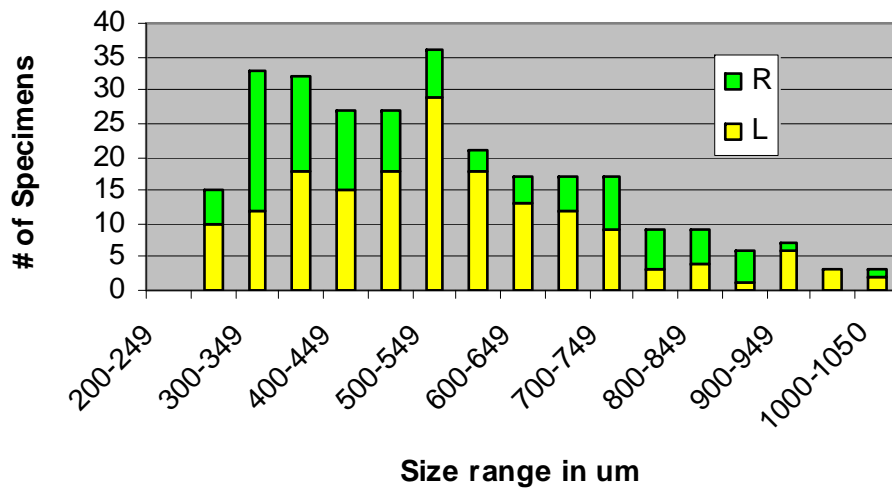
Left coil vs. Right coil



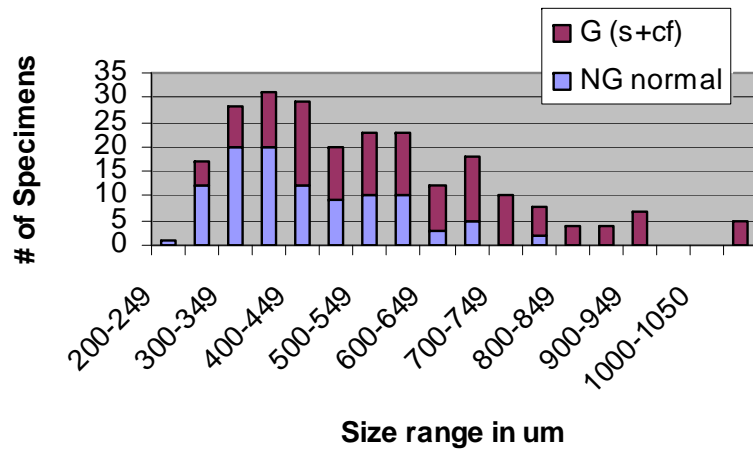
VM21-222 Gametogenic vs. Non-gametogenic



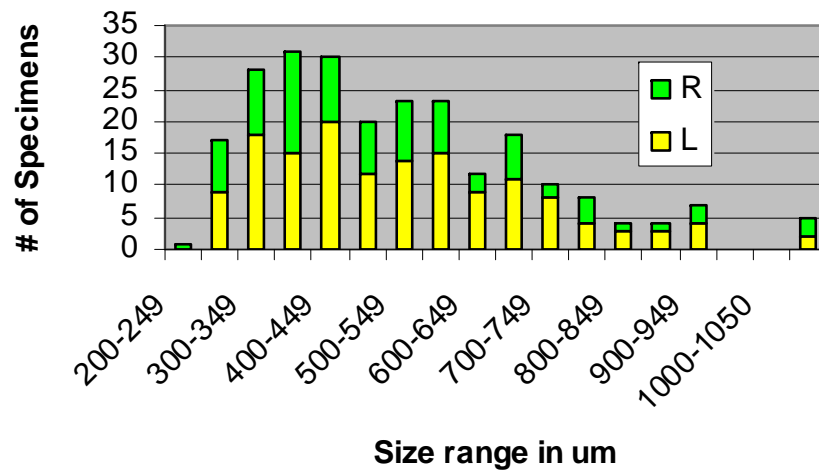
VM21-222 Left coil vs. Right coil



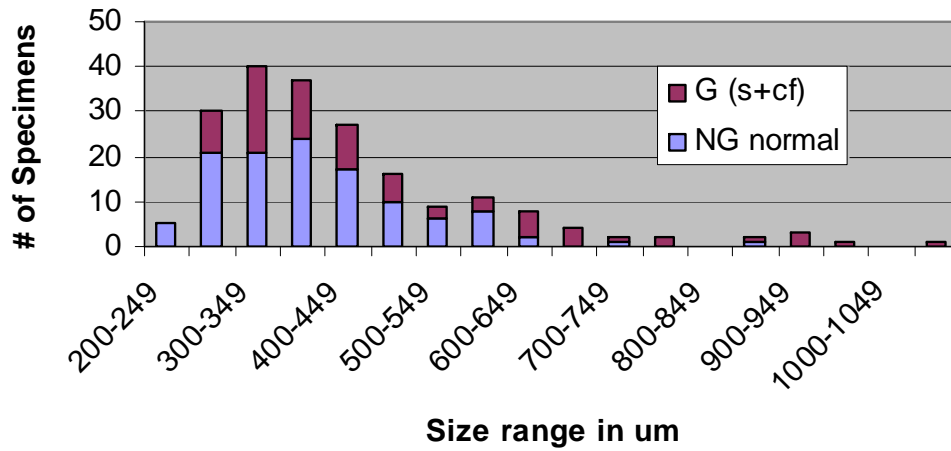
VM22-26 Gametogenic vs. Non-gametogenic



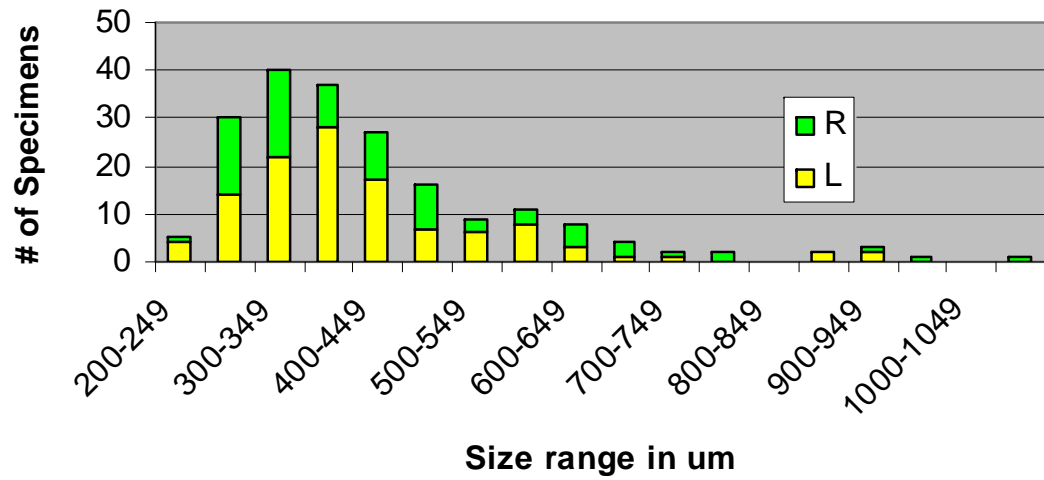
VM22-26 Left coil vs. Right coil



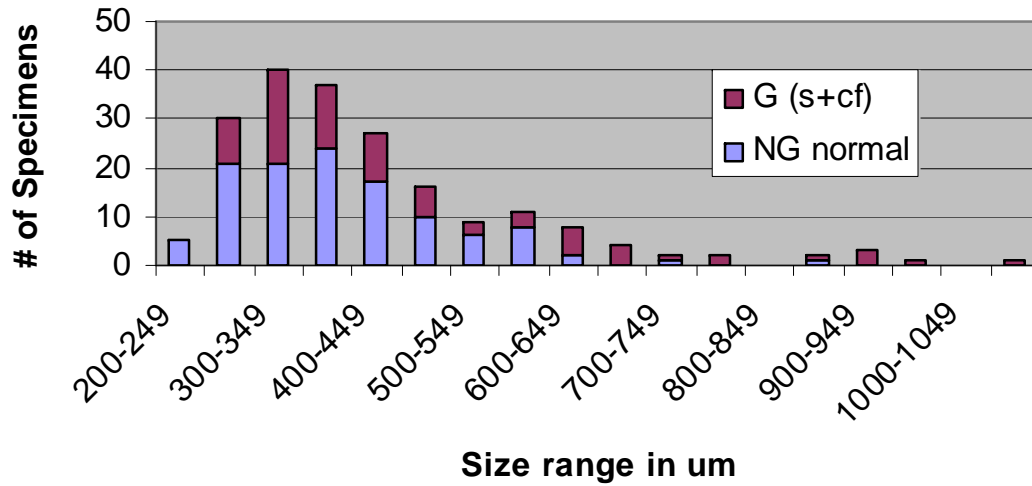
VM22-28 Gametogenic vs. Non-gametogenic



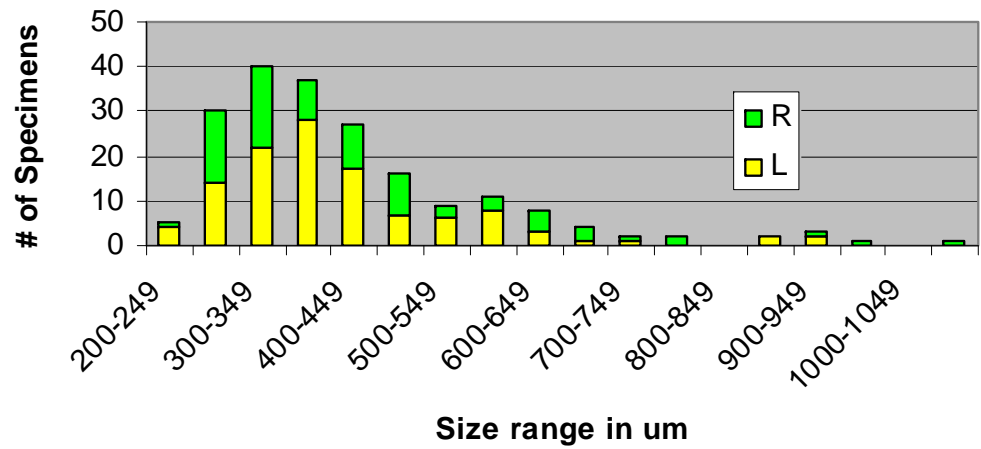
VM22-28 Left coil vs. Right coil



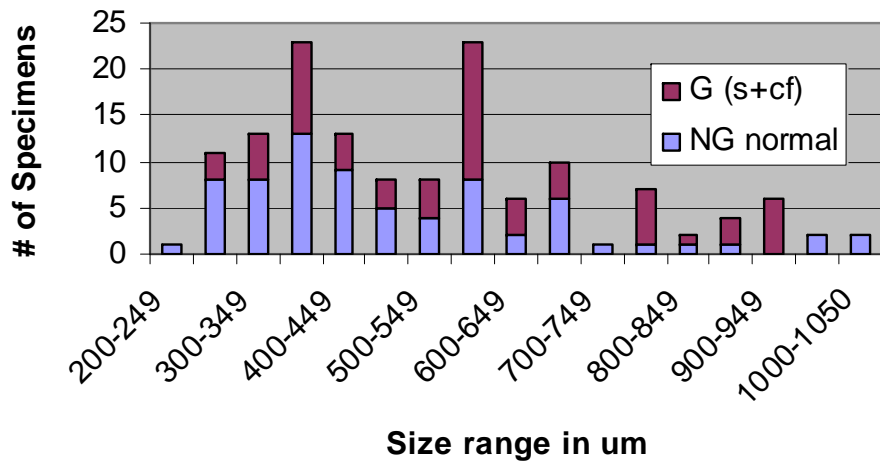
VM22-28 Gametogenic vs. Non-gametogenic



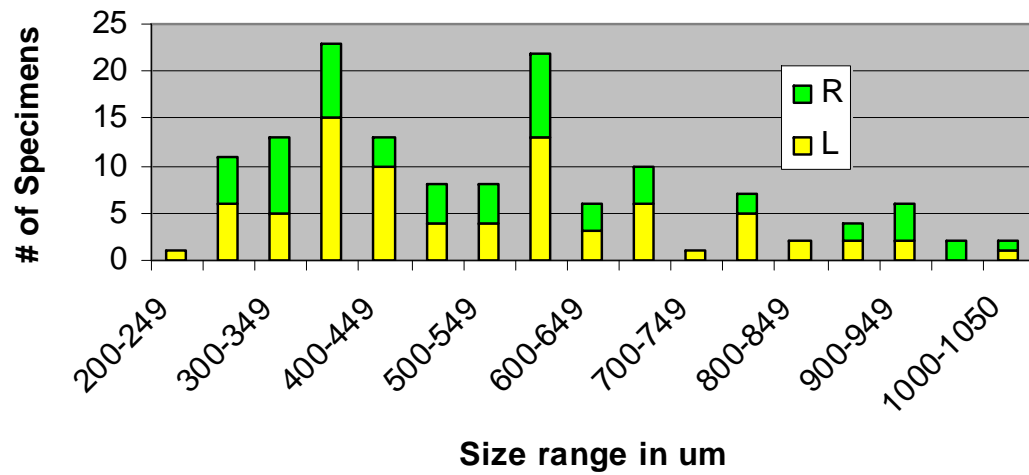
VM22-28 Left coil vs. Right coil



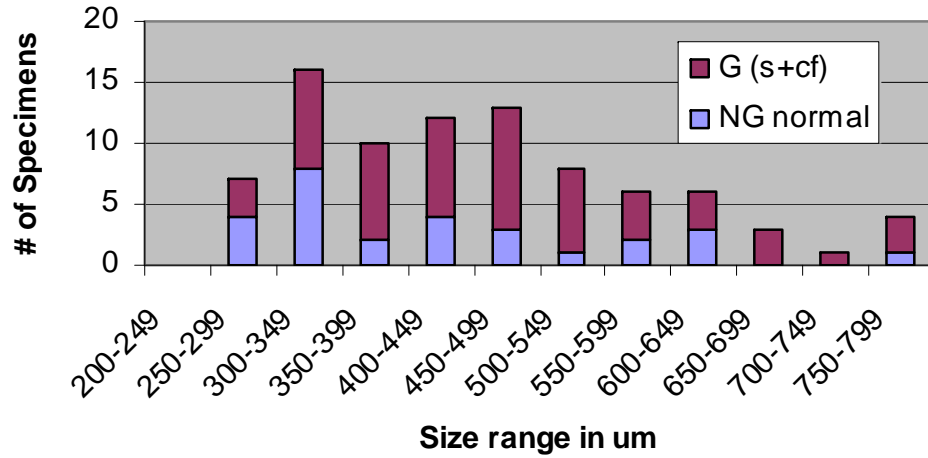
VM22-190 Gametogenic vs. Non-gametogenic



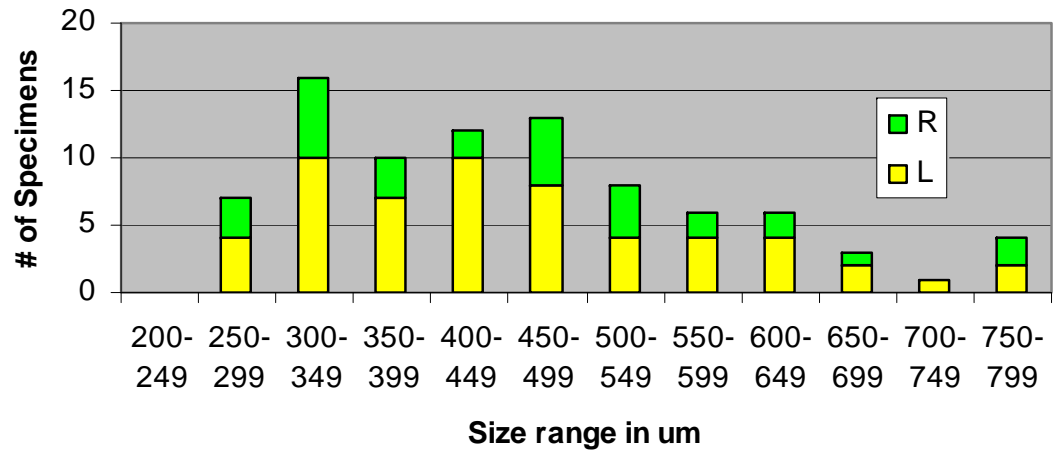
VM22-190 Left coil vs. Right coil



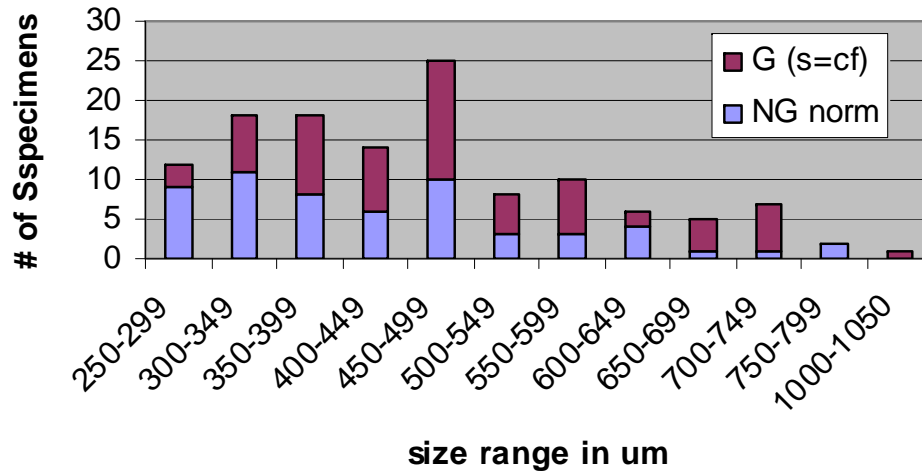
VM22-193 Gametogenic vs. Non-gametogenic



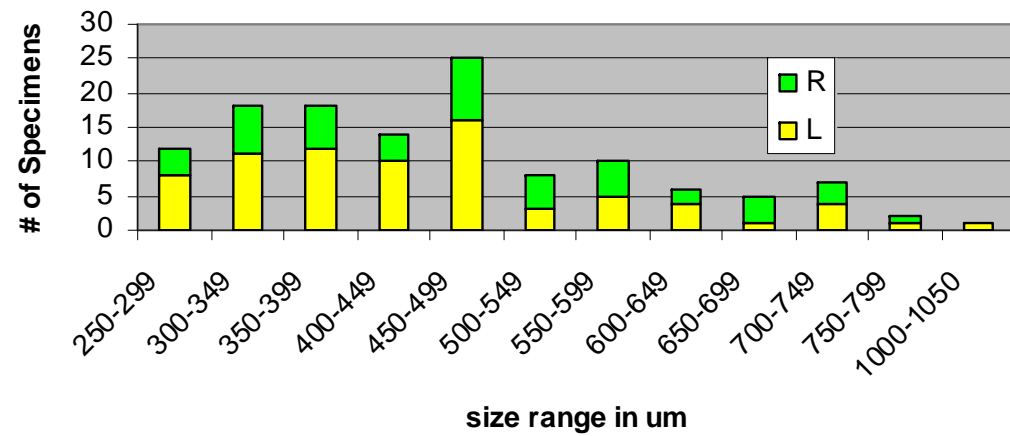
VM22-193 Left coil vs. Right Coil



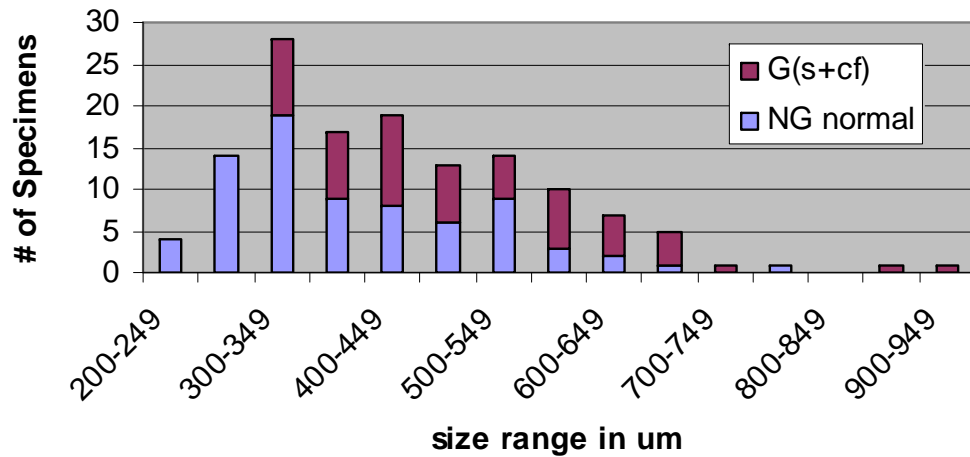
VM22-205 Gametogenic vs. Non-gametogenic



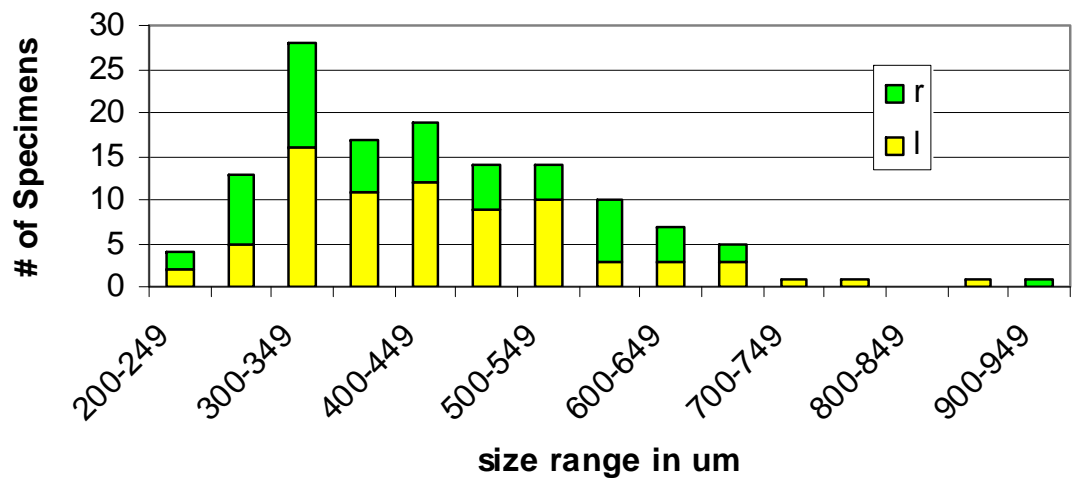
VM22-205 Left coil vs. Right coil



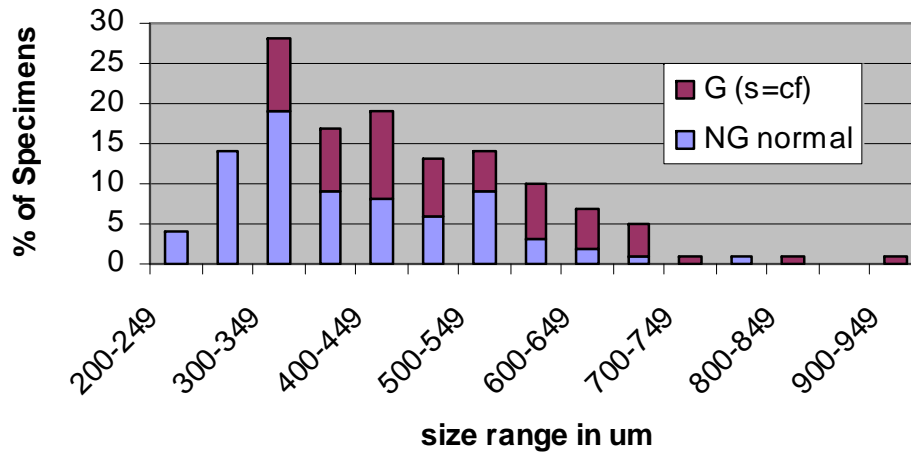
VM23-103 Gametogenic vs. Non-gametogenic



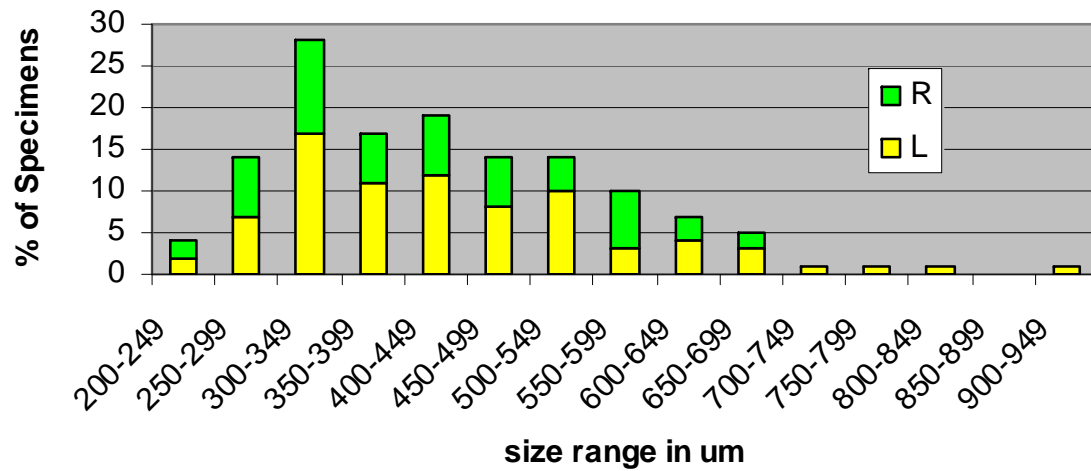
VM23-103 Left coil vs Right coil

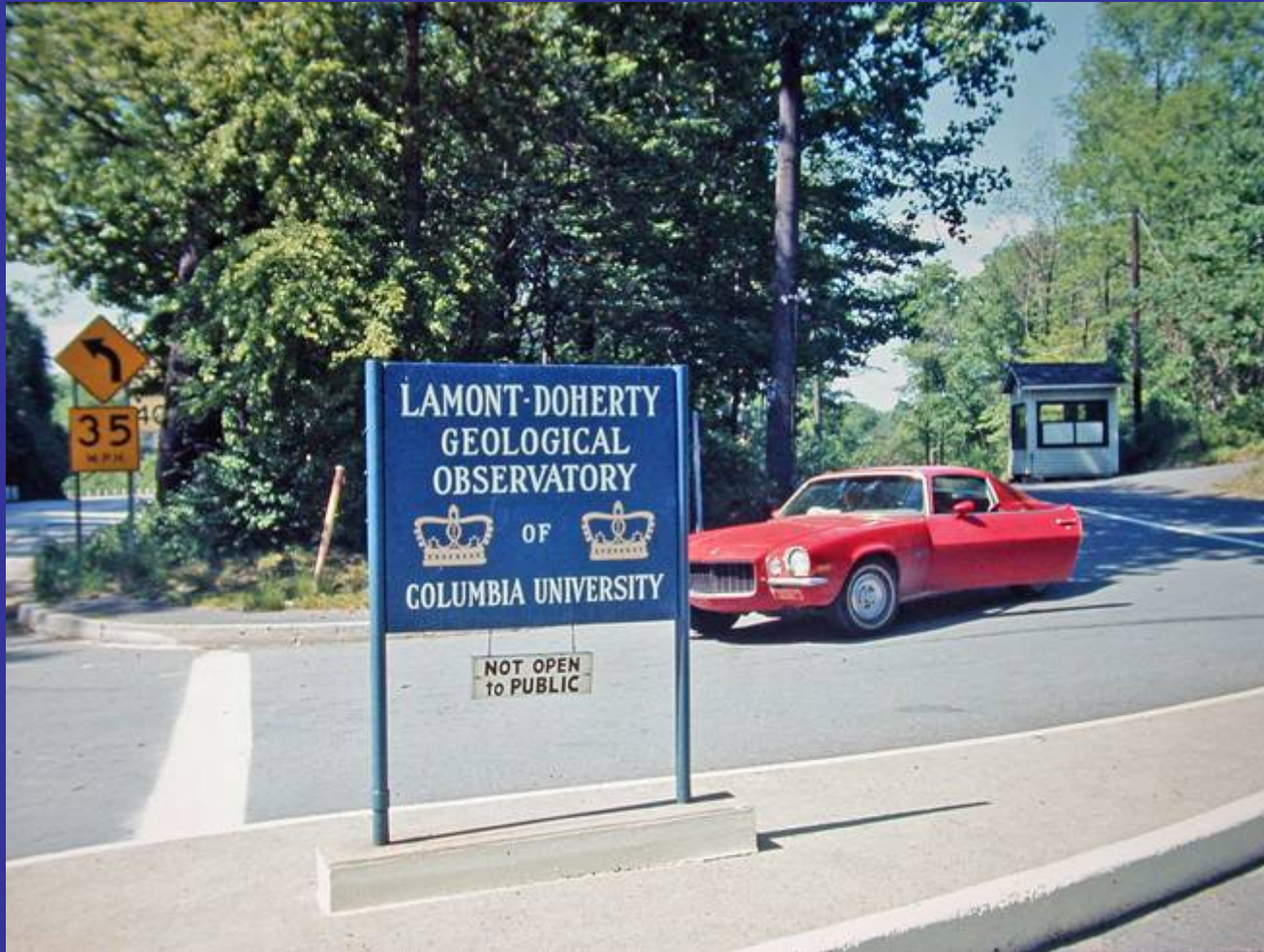


VM23-110 Gametogenic vs. Non-gametogenic



VM23-110 Left coil vs. Right coil











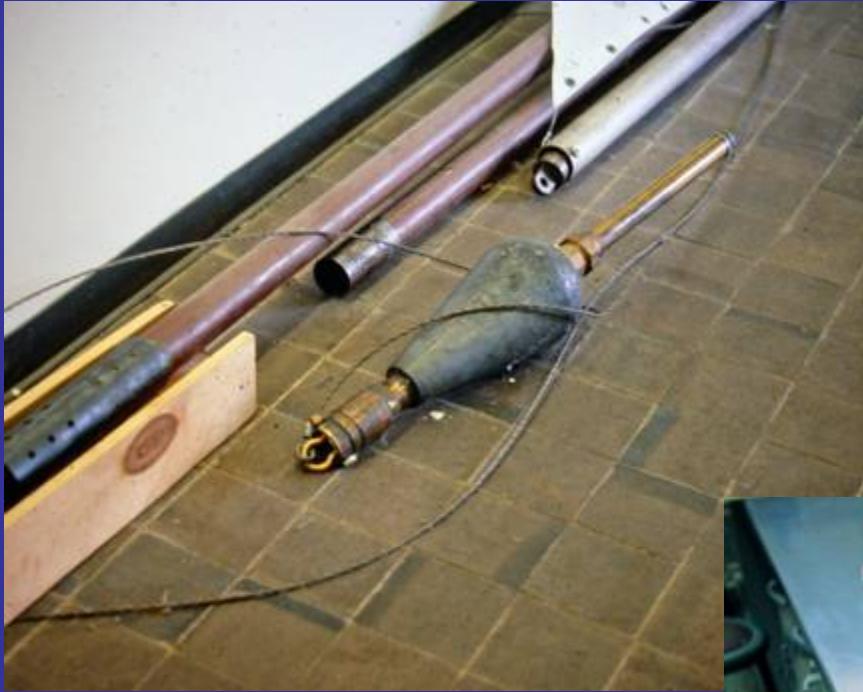


**RS VEMA of Columbia University's
Lamont-Doherty Earth Observatory**





Trigger Wt. Corer & Results









**Core Storage
At 'NEW CORE LAB'**

This work was originally done at the Deep Sea Core Repository with the help and direction of Alan W. H. Bé of Columbia University's Lamont Doherty Earth Observatory on the Palisades, NY during 1981 and 1982. His untimely death in 1983 abruptly ended the project. However, I feel it is best to put the information that was gained from our work out on the internet almost 30 years later... John E.B. Baker, Florida.