

Zooplankton size distribution in relation to that of phytoplankton

Katy Geri
University of Washington
School of Oceanography
kgeri@u.washington.edu
2623 177th St SE
Bothell, Washington 98012
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206-427-2103

Summary.

Zooplankton size distribution will be determined at 5 sites around the Galapagos Islands to understand the relationship between the size distribution of zooplankton to that of phytoplankton. Samples will be collected from *R/V Thompson* and zooplankton samples will be split into two subgroups (64-200 μm and >200 μm size zooplankton) and then will be analyzed by the 100 count method to find the size distributions of each subgroup, and hopefully classify them by class, order and genus, of the 100 zooplankton seen. This data will be used to compare the size distribution of zooplankton to that of phytoplankton, this data will be collected by Tasha Snow at the same stations that my samples are from, and to have a class (or even order or genus) index of zooplankton found.

Introduction.

Phytoplankton and zooplankton are at the base of the marine ecosystems, understanding their properties and relationships between them will allow us to detect and avoid a potential crash in the ecosystem (Figueroa and Hoefel 2005, Conway 2005). From the knowledge I possess, I hypothesis that where the size distribution of phytoplankton is shifted to larger sizes, the size distribution of zooplankton would also be shifted to larger sizes. This study would strongly be linked to the iron fertilization theory, in which adding iron to high-nitrate, low-chlorophyll areas would increase the phytoplankton biomass and removing a significant amount of atmospheric CO₂ (Marin et al. 1994). When the iron is added to these areas, larger phytoplankton are favored, because they have small surface area to volume ratio. Since there is ample nutrients, surface area is less important but with a large volume they can survive better. Iron

fertilization studies have been on short term studies, not allowing enough time for larger zooplankton equilibrate with the phytoplankton and to come in and start grazing on these larger phytoplankton. In these studies it is hard to see a relation between the two.

I will sample at 5 stations around the Galapagos Islands (Table 1, and fig 1) that hopefully have various different sizes of phytoplankton. These sizes found will generally be the sizes of the phytoplankton on a long term scale, unlike that of the iron fertilization projects, and the sizes of zooplankton found will reflect that they were able to equilibrate to the surrounding phytoplankton sizes.

Proposed Research.

Collection:

All research will be done aboard the *R/V Thompson* during the 21 of January to the 28 of January, 2005, at 5 stations around the Galapagos Islands (Table 1, and Fig 1). Zooplankton will be collected using a 0.75m-diameter net tow with 60 micron mesh net off the boat to a depth no more than 180 meters, this is to roughly reach the bottom of the chl curve, that is the depth Tasha will be sampling to. Once the net tow is brought on board the *R/V Thompson*, the sample will then run through a 200 micron mesh sieve. This will allow for 2 different size groups to be analyzed separately, 64-200 μ m size zooplankton and >200 μ m size zooplankton, I will call these my subsamples. By separating these sizes I will be able to do more studies between the two, a similar study was done by Bollens and Landry (2000), but they had more fractionations. Also by making 2 subsamples I will be able to measure a larger amount of zooplankton, and hopefully it will be easier measuring when all the zooplankton are of similar size. After I

have my 2 subsamples at each station, I will mixed very gently to avoid damaging the zooplankton but making sure the zooplankton specimens are uniformly distributed. With an eyedropper, I will take a small collection of the mixed subsample and place it on a Petri dish for analysis.

Collecting the Data:

I will then perform a 100 count on each subsample, this entails me to measure and record the size of the first 100 zooplankton I see in the microscope, using the micron ruler inside the scope to determine the size. While I am recording the size, I will also roughly identify (to class, order and maybe genus, and/or if it is a copepod or not) of the zooplankton, hopefully with help from Diego Figueroa, who has studied and is interested in the Galapagos zooplankton species. Even with Diego's help, classifying to the species level will be very difficult if not impossible, since zooplankton species are very unknown around the Galapagos Islands.

Data Interpretation:

At the same 5 stations that I sampling from, Tasha Snow will also be taking samples of the size fractionation of phytoplankton. With all the data I have and the data Tasha collects, I will be able to compare the size distributions of zooplankton to phytoplankton. With the rough classifications of the zooplankton found at each of the subsamples at each station, I get some sense of the zooplankton community structure around the Galapagos Islands. Hopefully this information will be a useful tool for others wanting to know more about the zooplankton communities around the Galapagos Islands.

Proposed Budget.

Total Equipment needed:

During the 7 day cruise on the *R/V Thompson*, the equipment I will be using during the cruise for may data collection and analysis will be provided by the boat at no cost to me, will be; one 0.75m-diameter net tow with 64 micron mesh, 200 micron mesh sieve, three 1-liter glass jars (or one 1-liter glass jar and two smaller glass jars), one glass stirrer, one eyedropper, two Petri dishes, one microscope with a micron ruler in the view, and one camera mounted on the microscope. The full cost breakdown is found on Table 2.

References.

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Table 1. Station points, Latitude, Longitude, Equipment and Time required for each of the 5 stations.

Sta or Way Pt	Latitude	Longitude	Equipment To be used	Estimated Time Req'd
1	0° 37' S	90° 00' W	64micron net tow	30 mins
2	0° 55' S	90° 00' W	64micron net tow	30 mins
3	0° 35.33' S	90° 54.5' W	64micron net tow	30 mins
4	0° 13' S	91° 1.25' W	64micron net tow	30 mins
5	0° 13.6' S	91° 36.4' W	64micron net tow	30 mins

Table 2. Total costs, assuming that glass jars, a stirrer and 2 Petri dishes will be provided at no cost.

Equipment	Cost/day	Days needed	Actual Cost	Cost to me
<i>R/V Thompson</i>	\$18,000	7	\$126,000	\$0
0.75m diameter - 64 micron net tow	Free	7		\$0
200 micron mesh sieve	Free	7		\$0
1-Liter glass jar (3)	Free	7		\$0
Glass stirrer	Free	7		\$0
Petri dish (2)	Free	7		\$0
Microscope	Free	7		\$0
Camera mounted on Microscope	Free	7		\$0
Total	\$18,000	7	\$126,000	\$0

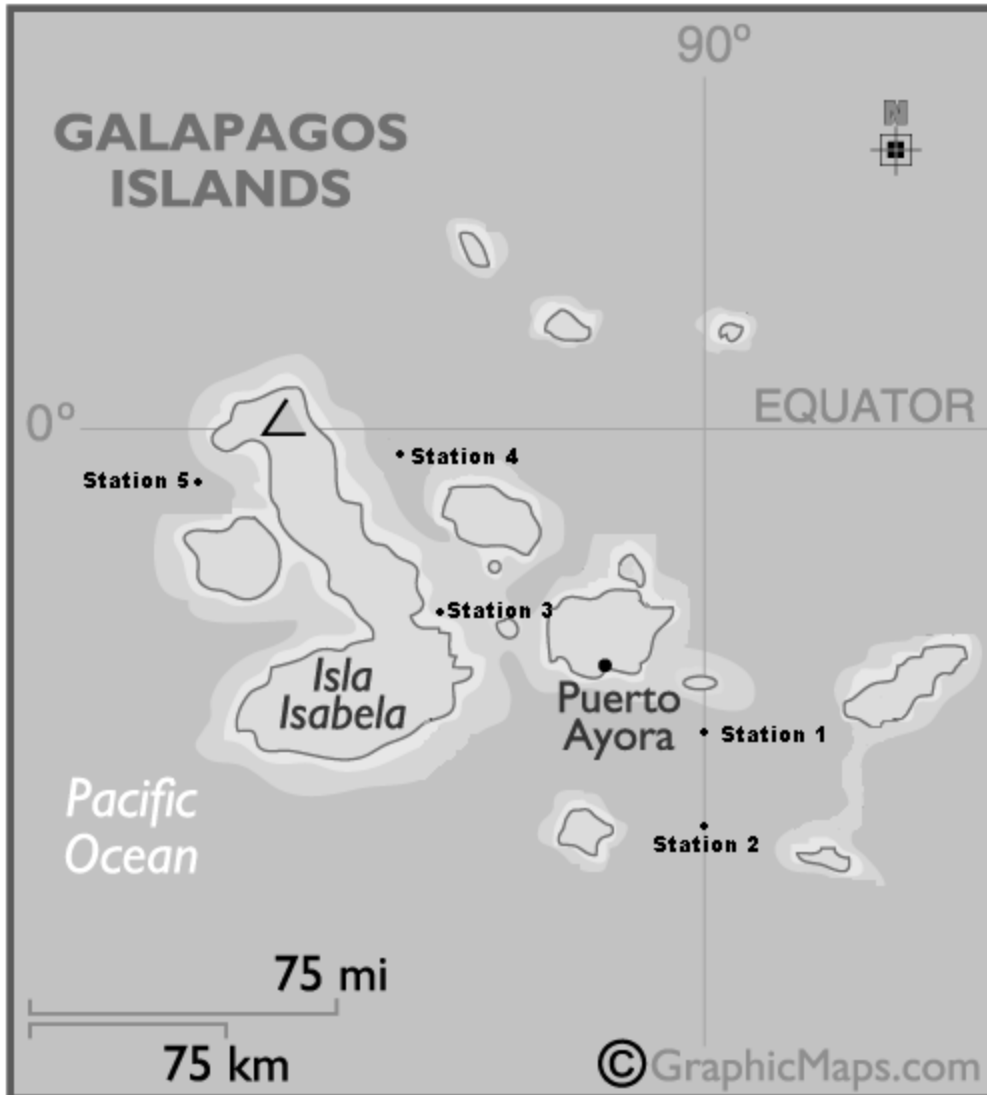


Figure 1. Map of Galapagos Islands, station points are approximate, for exact locations of stations see Table 1.