Salinity Tolerance of *Tubularia marina*

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Introduction

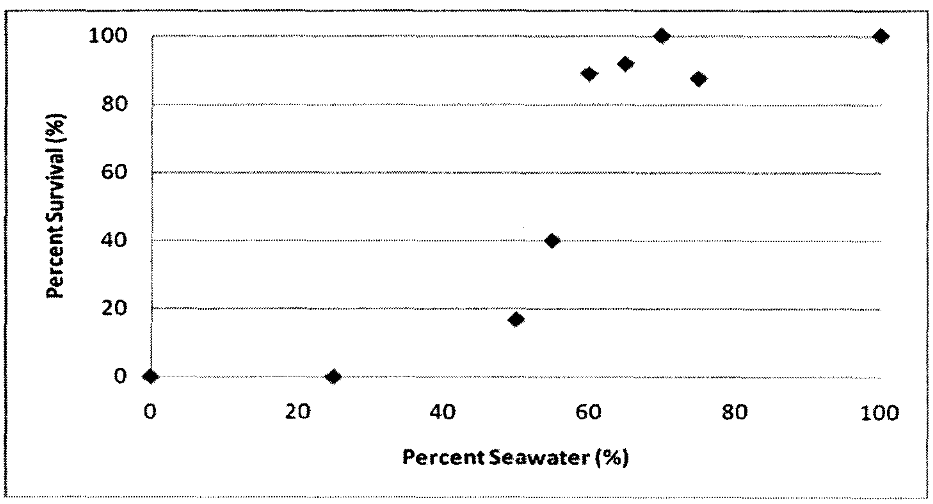
Oceanic animals are adapted to living in the ocean, and more specifically, they are adapted to living in saltwater. Many animals in the ocean are highly specific in their salinity tolerances, while others may be able to tolerate varying salinities. In the ocean the salinity is constant, but there are certain places where salinity can vary. Tidepools and estuaries are both examples of habitats that can vary in salinity due to environmental factors that do not affect the open ocean. Tidepools collect rain which dilutes the salinity, or they lose water through evaporation which would increase the salinity. Estuaries are places where freshwater meets saltwater. The salinity in estuaries varies according to tidal levels, and amount of rain. With more rain the river dumps even more freshwater into the system, lowering the salinity. With a high tide the moon pulls saltwater into the estuaries, while at low tide the moon pulls the other direction draining the estuary of the salt or brackish water. The South Slough of Coos Bay is a relatively pristine estuarine habitat, with water coming from many rivers and dumping into the bay. This creates a salinity gradient between the freshwater coming from land, and the saltwater that comes from the ocean. The ocean has a constant salinity of 35 parts per thousand (ppt) while rivers have 0 ppt. Marine fauna observations make it clear which animals have adapted to tolerating varying salinities. Further up the estuary, away from the ocean, the lower the salinity will be. As you move up the estuary certain animals are no longer found living, while others persist into nearly entirely freshwater areas. I noticed the hydroid *Tubularia marina* living on the dock just south of the Charleston, OR Bridge. Data collected at the Charleston Bridge over the last year recorded salinities ranging from 35 ppt to just under 20 ppt (NANOOS, 2008). The docks where I collected the *T. marina* are very close and probably have salinities very similar, maybe slightly lower than at the bridge if anything since it is further into the estuary. *T. marina* has also been observed in Isthmus Slough in areas with salinities of 18 ppt (Bennet, 2008). After making this observation I hypothesized that *T. marina* is able to tolerate a widely ranging salinities. This could be the wrong conclusion to make and *T. marina* may have a very specific salinity tolerance, and this spot had an unusually unchanging salinity.

Materials and Methods

Tubularia marina was collected from the shipyard boat docks just south of the Charleston Bridge in Charleston, OR. They were found on a PVC pipe alongside the dock. Any predators residing in the colony were removed and they were kept in a flow through container. First I tested a wide range of salinities, 75 % seawater (SW), 50 % SW, 25 % SW, and 0 % SW. Water of each different salinity was measured into a finger bowl with a total of 320ml of water. 75 % had 240ml SW and 80ml FW, 50 had 160ml FW and 160ml SW, 25 % had 240ml FW and 80ml SW, and 0 % had 320ml FW. No 100% SW trial was done, as they were held in 100 % SW during any time other than experimentation. 6-8 of the larger *T. marina* were placed in each bowl after checking each under a dissecting microscope to make sure that it was alive. They were left in the varying salinities for 2 hours. After two hours I observed each while remaining in the salinity used for each, and recorded whether or not they were living. To determine if each was alive or not I observed them for one minute, or until they moved. After the initial survival was taken I placed the specimens into 100 % SW for 2 hours and checked again for survival. After the initial test I narrowed the range and tested four more salinities, 70 %, 65 %, 60 %, and 55 %. These were measured using a graduated cylinder, each finger bowl with a total of 200ml of water. 70 % had 140ml of SW and 60ml of FW, and each was measured with corresponding amounts of SW and FW to their projected percentages. I took the salinity in each finger bowl, and followed the same methods as the earlier trials in every aspect except that I used 9-12 individuals in each trial as opposed to 6-8.

Results

Fig 1. *Tubularia marina* survival at varying salinities.



Tubularia marina salinity tolerance quickly drops between 50 and 60 percent seawater.

In the first trial all the *Tubularia marina* died except for those placed in 75 % SW where only one died. After two hours back in 100 % SW, one of the 'dead' specimens from 50 % was moving again, all others remained either dead or alive as observed initially. In the second trial there were no deaths at 70 % SW, which was 27 ppt. One death was observed in both 65 % and 60 %, which had salinities of 24.5 ppt and 22 ppt respectively. At 55 % SW 6 out of 10 animals died, this test had salinity of 20 ppt. None of the animals in the second trials that died came back to life.

Discussion

My results supported my hypothesis that *Tubularia marina* are able to tolerate widely ranging salinities. My data suggests that *T. marina* should not have a problem dealing with salinities as low as 22 ppt. Data taken over multiple years on salinities at four stations give me some idea of how far up the estuary *T. marina* may be able to live. Charleston Bridge ranges from 15 to 35 ppt year round, and only as low as 20 ppt in the summer (NANOOS, 2008), a relatively stable range for the estuary. Valino Island, south of the collection site, had wider ranging salinities year round but only ranged between 25-35 ppt in the summer (NANOOS, 2008). The two final data collection stations, Winchester Arm and Sengstaken had salinities as low as 10 ppt in the summer (NANOOS, 2008). These salinities suggest that *T. marina* may be able to live quite a ways up the estuary. Valino Island is well above its tolerance so it may be able to make it much further before reaching its lethal limits. There may be some variance in salinities between the salinities measured in the lab and those measured at the various stations. If these did have an effect, the measurements taken in the lab were probably higher than they should have been. If this is the case *T. marina* can most likely tolerate salinities ranging much further up the estuary than I concluded earlier. Another ability that I did not test for was whether or not *T. marina* was able to osmoregulate. If this animal does in fact osmoregulate, they may be able to tolerate lower salinities if given a gradual decrease in salinity instead of the abrupt change. In conclusion *T. marina* can handle salinities as low as 60% SW without trouble, between 50% and 60% survival starts to fall, and below 50% no survival was ever seen. Whether or not a gradual decline in salinity would effect this data is something I would love to look into further.

Works Cited

Bennet, Katie. 2008. Unpublished observations.

NANOOS Pilot Project: Pacific Northwest estuaries and shores. 2008. Data station observations in South Slough.