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Marine Adaptations

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## Cancer Magister Carapace Shape In Juveniles and Adults

### **Introduction**

The entire surface of *C. magister* and the lining of the gut is covered with a tough exoskeleton (Warner). The heavily calcified exoskeleton provides protection from predators. Crabs are not always protected by their exoskeleton as it is shed everytime they grow. This process of shedding the exoskeleton is termed moulting, and it occurs in late winter for male Dungeness crabs (Niesen). Juvenile crabs moult 11 or 12 times before they reach sexual maturity at two years old (Pauley et. al). At two years the average carapace widths are 11.6 cm for males and 10 cm for females (Pauley et al). At about 4 years of age most males have a carapace width of over 15.9 cm. The maximum carapace width can be up to 21.8 cm in males and 16 cm in females (Pauley et. al). For crabs to achieve such large sizes they have to be 8-10 years old, which is thought to be the maximum lifespan of *C. magister* (Pauley et. al).

For crabs to reach adulthood they have to survive the first year of life when they are most vulnerable. Dungeness crabs are born as small larva which are preyed upon heavily by various fishes and crustaceans (Pauley et. al). *C. magister* has serveral larval stages before becoming an early post-larval crab. The early post-larval crabs have an extremely rounded carapace, with widths between 5 - 8.5 mm. I think that the rounded carapace would be a disadvantage because it would make it more difficult for the crabs to walk sideways into narrow crevices for hiding. When the crabs are full grown, their carapace is more rectangular than rounded, which allows for hiding in comparitvely narrow spaces. It would thus be an advantage to achieve a less rounded carapace as fast as possible. Since the early post-larval crabs have a disadvantageous rounded

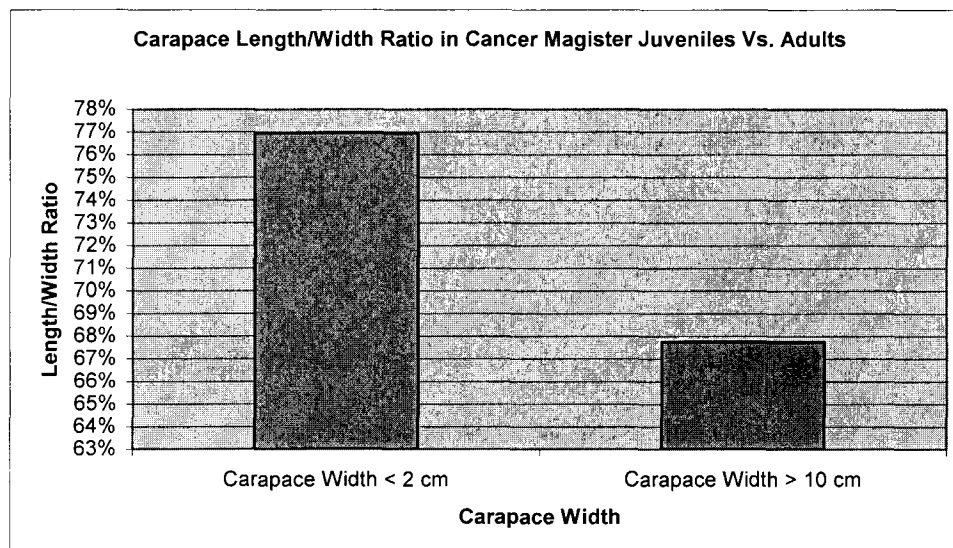
carapace, I want to confirm that the juvenile crabs also have a rounded carapace. My hypothesis is that the juvenile crabs will have a rounder shaped carpace than adults.

## Methods

The carapace of each crab was measured using calipers for their width and length. The width measurement was taken just above the largest lateral horns of the carapace. The length measurement was taken from the middle carapace horn between the eyes to the back of the carapace. The crabs were collected using crabbing pots on 3 different occasions. The crabs collected from pots were measured and thrown back. The largest 15 of the crabs were taken from a holding tank at OIMB.

## Results

To interpret the data I used a ratio of carapace width over carapace length. This ratio comes out as the percent of the carapace length to the carapace width. A higher percentage of this ratio indicates a rounder carapace. The juveniles ranged from 73.7% to 82.4%. The adult crabs over 10 cm ranged from 62.8% to 71.1%. The averages are shown below for juveniles (less than 2 cm) and adults (over 10 cm).



In the second graph the carapace length to width ratio was compared to carapace length in a scatterplot to demonstrate that the smaller crabs have a more rounded carapace. In the third graph the carapace length is compared to width, but it is difficult to tell from the graph that the smaller crabs have a more rounded shell.

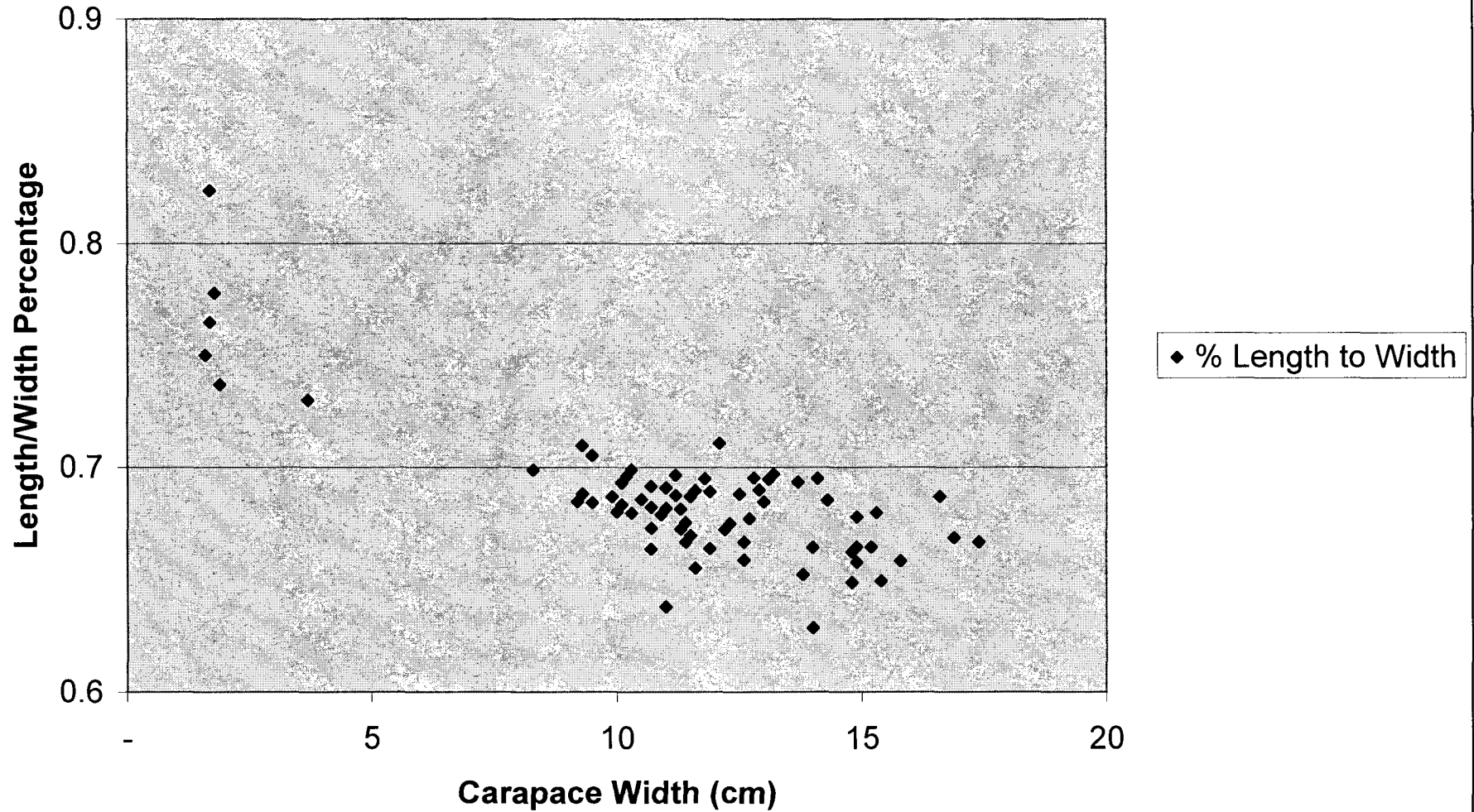
### **Discussion**

There is a significant difference in carapace shape when juveniles are compared to adults. The juveniles have comparatively longer carapace lengths than do the adults. This gives the appearance of a rounder carapace. A round carapace yields a high length to width ratio as shown by the graph above. Adult Dungeness crabs have a lower length to width ratio, which gives their carapace a more rectangular appearance. As a crab molts over the first two years, the carapace essentially becomes less round. A less round carapace could lead to the ability to hide in more narrow crevices. For a future experiment I would like to hypothesize that juveniles have a rounder carapace because of the anatomy of the larval stage crab. The larval megalops of *C. magister* has a long length and short width of its carapace. As the megalops takes form to an early post larval crab the carapace is extremely rounded and somewhat resembles the carapace of the megalops. As the early post larval crab molts, the length to width carapace ratio will decrease and the carapace will become less rounded.

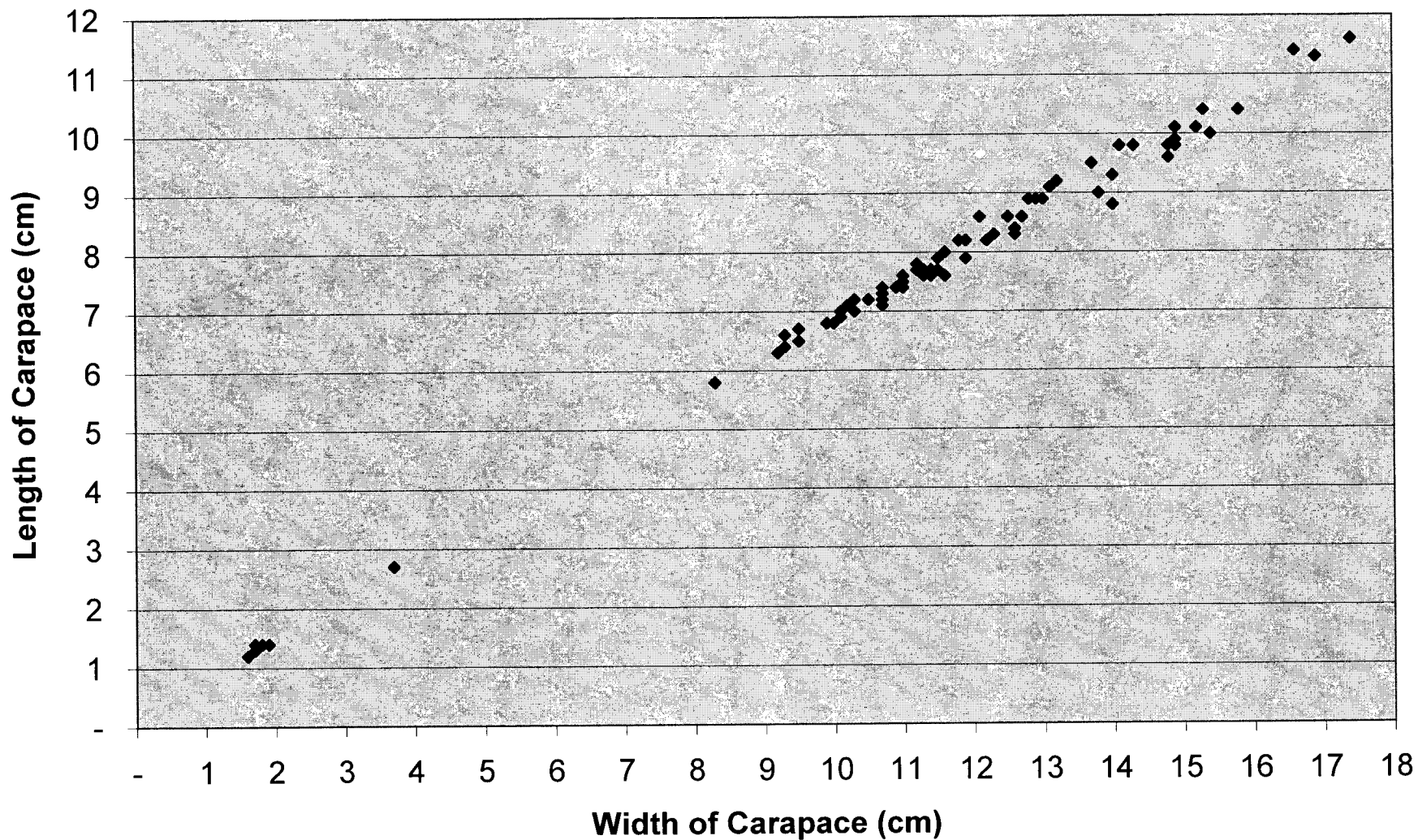
Works Cited

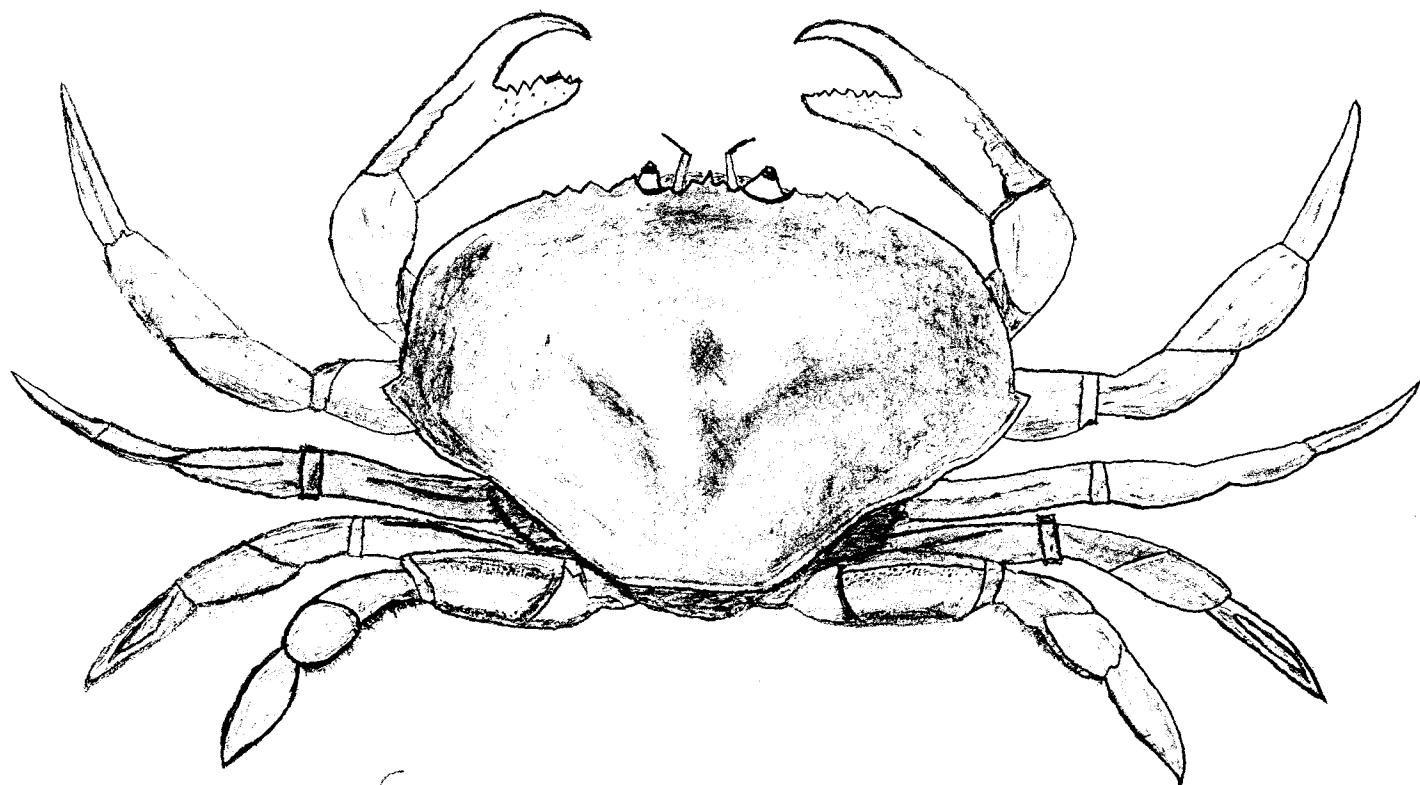
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# Carapace Width Vs. Carapace Length/Width Percentage In Cancer Magister



# Carapace Width Vs. Length In Cancer Magister





Cancer      Magister  
(actual size of smallest crab over 1  
year old used in experiment)