

# Pool Volume and *Macrobrachium* in the Check Hall River

Texas A&M University  
Dominica Study Abroad 2001

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To:  
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## **Abstract**

Prawns of the genus *Macrobrachium* live in the Check Hall River. Members of this genus can grow to lengths over ten centimeters, but require larger volumes of water to do so. This project maps the Check Hall while studying pool size preference of *Macrobrachium*. *Macrobrachium carcinus* is the dominant species over 10 centimeters, but medium to large *M. carcinus*, *M. crenulatum*, and *M. heterochirus* can be found in increasing abundance as pool size increases.

## **Introduction**

Many species of prawns inhabit the Check Hall River in Dominica (Chase and Hobbs, 1969). This project is designed to determine if there is a correlation of pool size to size, number, and species of the genus *Macrobrachium*. Prawns are different from other Decapods in that they inhabit fresh water and have pinchers on the first and second pairs of pereopods (Chase and Hobbs, 1969). Three species, *Macrobrachium carcinus*, *Macrobrachium heterochirus*, and *Macrobrachium crenulatum* were studied in this project. Pictures and descriptions of each prawn can be found in the Field Guide to Prawns of the Check Hall River (Augustine et al., 2001) or The Freshwater and Terrestrial Decapod Crustaceans of the West Indies with Special Reference to Dominica (Chase and Hobbs, 1969). These species are said to be territorial and this project was designed to see how big these territories are by looking at how many prawns of each *Macrobrachium* species each pool contains. A map of the Check Hall River and comparison of pool size to prawn size and species is included in this project.

## **Materials**

- Dive mask
- Snorkel
- Wet suit
- Underwater flashlight
- Waterproof tablet
- Flagging tape
- Tape measure (in feet)

## **Methods**

### I. Mapping

The first step of this project was to map out the Check Hall River upstream as well as downstream of where the trail from the SCEPTRE Field Station meets the river (Figure 1). The map begins approximately 43 meters upstream of the trail and ends approximately 49 meters downstream of the trail. Also included in the map is a smaller creek that empties into the Check Hall and a dry riverbed. I started drawing freehand at the farthest mapped point upstream and continued drawing the river downstream until ending at the last pool to be studied. Due to the lack of survey equipment and changing conditions this map is not exactly to scale but is still accurate at the current water level.

### II. Location

A number of pools are included in the mapped area of the Check Hall River as well as the tributary stream. Thirty-five pools were chosen from both bodies of water

based on their size and location. Each pool was then measured for length and width at the relative center and depth at the deepest point. After measuring all of the pools the length, width, and depth were converted to meters from feet (Table 1). Pool length, measured upstream to downstream at approximate center, ranged from 0.82 meters in pool 12 to 8.5 meters in pool 18. Pool width, measured bank to bank at approximate center, ranged from 0.73 meters in pool 15 to 6 meters in pool 18. Pool 25 was deepest at 0.85 meters while pool 23 had the shallowest deep spot of 0.15 meters. Approximate pool volume is obtained by multiplying length by width by height of each pool.

### III. Observations

Once the pools were selected four surveys were conducted. Each survey was done between 8:00 and 10:00 P.M. The first survey included only pools 1-18 because of the cold and amount of debris clouding pools downstream. These problems were corrected by beginning downstream and working upstream with the aid of a wetsuit. Surveys 2-4 included all thirty-five pools. The number and size of each *Macrobrachium* prawn species was recorded for each pool. Only prawns larger than 5 centimeters head to tail were recorded. Medium sized prawns ranged from 5 to 10 centimeters, while prawns longer than 10 centimeters head to tail (excluding claws or pinchers on the second pair of peripods) were recorded as large prawns. Only surveys 2-4 were taken into consideration in Figures 2-5 for consistency, but Tables 2 and 3 show all four survey results.

#### **Results:**

*M. carcinus*, *M. crenulatum*, and *M. heterochirus* compete for and require larger volumes of water as the prawn grows in size. As pool volume increases so does the average number of prawns observed in each pool surveyed (Figure 2). Occasional sightings occur in pools from zero to  $3.6 \text{ m}^3$ , but medium to large *Macrobrachium* can be observed consistently in pools with a volume above  $3.6 \text{ m}^3$ . Other than a spike at  $10.7 \text{ m}^3$  and a dip at  $18.7 \text{ m}^3$  the trend of prawn numbers increases in a linear fashion as volume increases (Figure 2).

When the number of large prawns is compared to medium prawns recorded per volume, medium prawns outnumber or equal large prawns 75% of the time in pools with a volume greater than  $5.2 \text{ m}^3$  (Figure 3). This is probably because larger pools can sustain a pyramid of medium and large prawns. *Macrobrachium* is known to be territorial leading to fewer large individuals. Because smaller pools are unable to sustain the pyramid observations of large and medium prawns follow no recognizable pattern in pools with a volume less than  $5.2 \text{ m}^3$  (Figure 3). Some pools have no large or medium individuals, some have only large, some have only small, while others have a combination of large and medium.

Data indicate pools with a volume below  $2.6 \text{ m}^3$  hold an occasional medium prawn but are not species specific (Figure 4). Pools between  $2.6 \text{ m}^3$  and  $7 \text{ m}^3$  regularly have prawns 5 to 10 centimeters in length but also are not species specific. A pool above  $7 \text{ m}^3$  in volume can contain all three species of *Macrobrachium* but usually has a much higher content of one species. *M. carcinus* is dominant in four pools above  $7 \text{ m}^3$  while *M. crenulatum* is clearly dominant in two pools (Figure 4).

While there is no clear dominant species of *Macrobrachium* based on observations of medium prawns, *M. carcinus* is clearly the dominant species above 10 centimeters in length (Figure 5). A large *M. carcinus* is common in pools of volume between 1.8 m<sup>3</sup> and 9.1 m<sup>3</sup>. Large *M. carcinus*, some larger than 15 centimeters, are abundant in pools with volume greater than 9.1 m<sup>3</sup>. An occasional *M. heterochirus* can be spotted in pools greater than 1.8 m<sup>3</sup>, and *M. crenulatum* over 10 centimeters are occasionally observed in pools over 12.3 m<sup>3</sup>. Large *Macrobrachium* are rare in pools with less than 1.8 m<sup>3</sup> of water.

**Table 1:** Pool Measurements

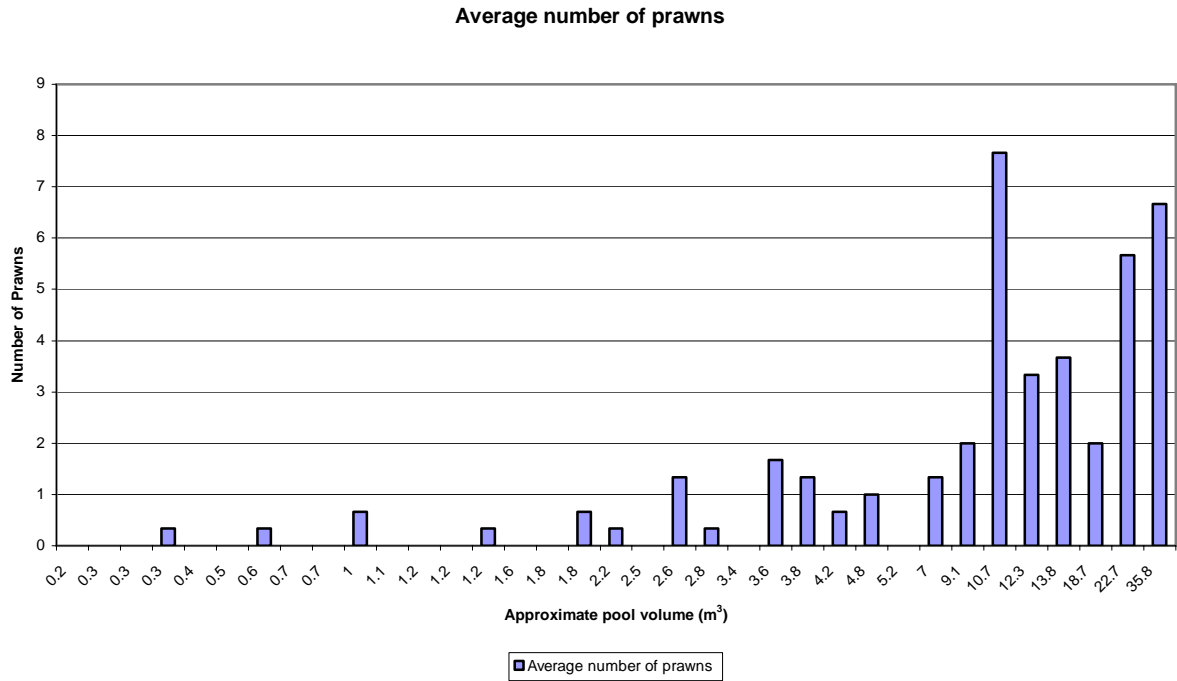
Pool Number	Length (meters)	Width (meters)	Depth (meters)	Approximate Volume (m <sup>3</sup> )
1	6.2	5.8	0.5	18.7
2	5.6	5.4	0.5	13.8
3	1.8	3.2	0.2	1.2
4	2.4	2.7	0.3	2.2
5	0.9	1.6	0.2	0.3
6	2.7	4.0	0.3	3.4
7	2.6	4.7	0.6	7.0
8	1.2	1.3	0.2	0.3
9	1.6	1.9	0.2	0.5
10	3.0	4.2	0.3	4.2
11	3.7	2.6	0.3	2.6
12	0.8	1.2	0.3	0.3
13	4.1	2.4	0.2	1.8
14	2.8	1.2	0.3	1.1
15	1.2	0.7	0.3	0.2
16	1.5	1.2	0.2	0.4
17	3.8	2.2	0.5	3.8
18	8.5	6.0	0.7	35.8
19	3.5	2.5	0.3	2.5
20	4.5	0.9	0.3	1.2
21	4.1	1.9	0.4	2.8
22	3.5	3.0	0.3	3.6
23	1.3	2.1	0.2	0.7
24	2.2	2.7	0.3	1.6
25	3.2	3.4	0.9	9.1
26	3.8	3.7	0.4	5.2
27	1.5	1.7	0.3	0.7
28	5.4	3.4	0.7	12.3
29	7.8	4.8	0.6	22.7
30	5.5	2.9	0.7	10.7
31	2.5	2.1	0.2	1.2
32	3.9	2.6	0.2	1.8
33	1.2	2.3	0.2	0.6
34	5.0	2.8	0.3	4.8
35	2.1	3.1	0.2	1.0

**Table 2:** Survey Results for medium *Macrobrachium* by species

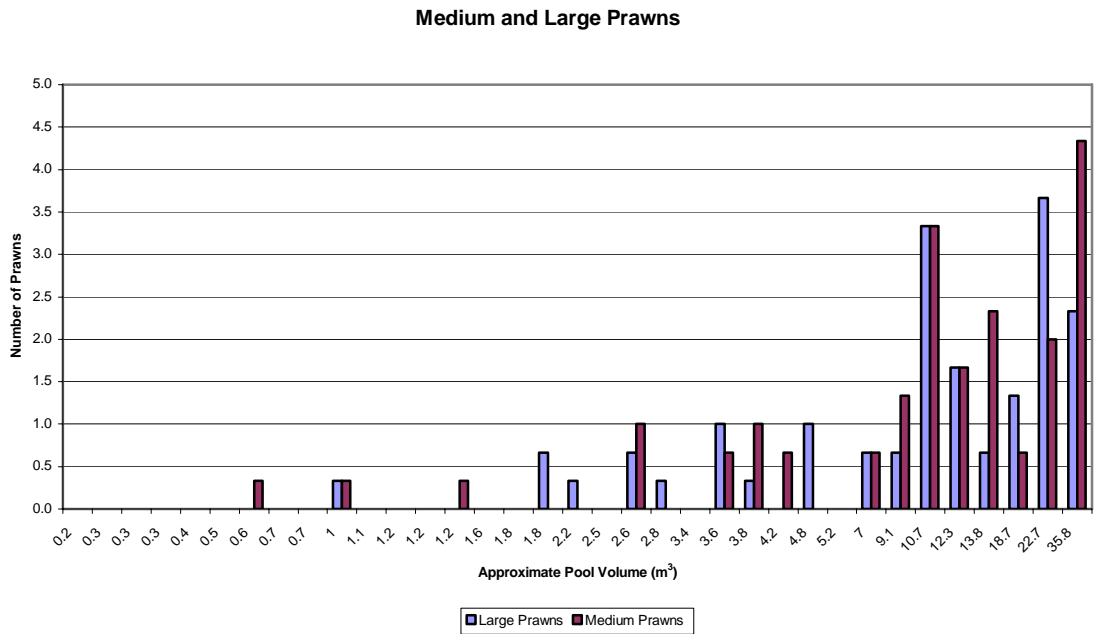
Pool Number	<i>M. carcinus</i>				<i>M. crenulatum</i>				<i>M. heterochirus</i>			
	Survey 1	Survey 2	Survey 3	Survey 4	Survey 1	Survey 2	Survey 3	Survey 4	Survey 1	Survey 2	Survey 3	Survey 4
1			1			1			2			
2				1	1	2	2	1		1		
3							1					
4												
5											1	
6												
7	1		1			1						
8												
9												
10				1							1	
11				1			1					1
12												
13												
14												
15												
16												
17				1	1		1		4		1	
18		1		2	1	1	5	2	4		2	
19												
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21												
22			1								1	
23												
24												
25		2		1								1
26												
27												
28		1	1	1			1				1	
29		3	1	1		1						
30		4	1	3		1				1		
31												
32												
33				1								
34												
35										1		



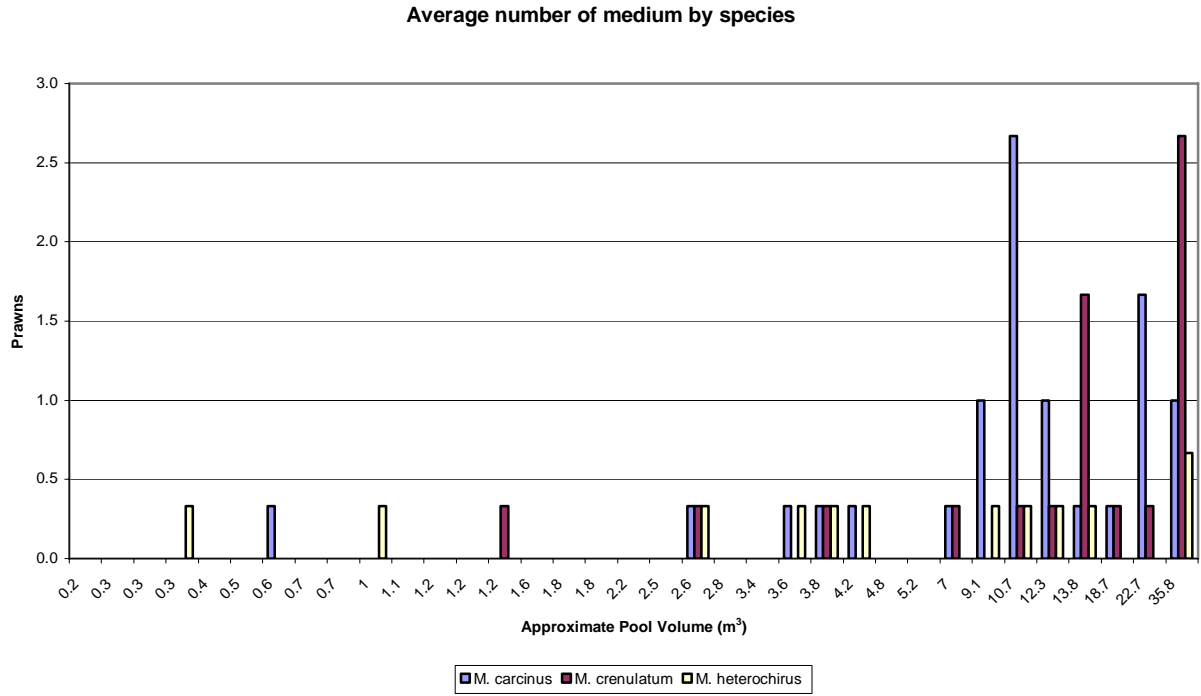
**Figure 2** Average number of prawns recorded per pool in each survey



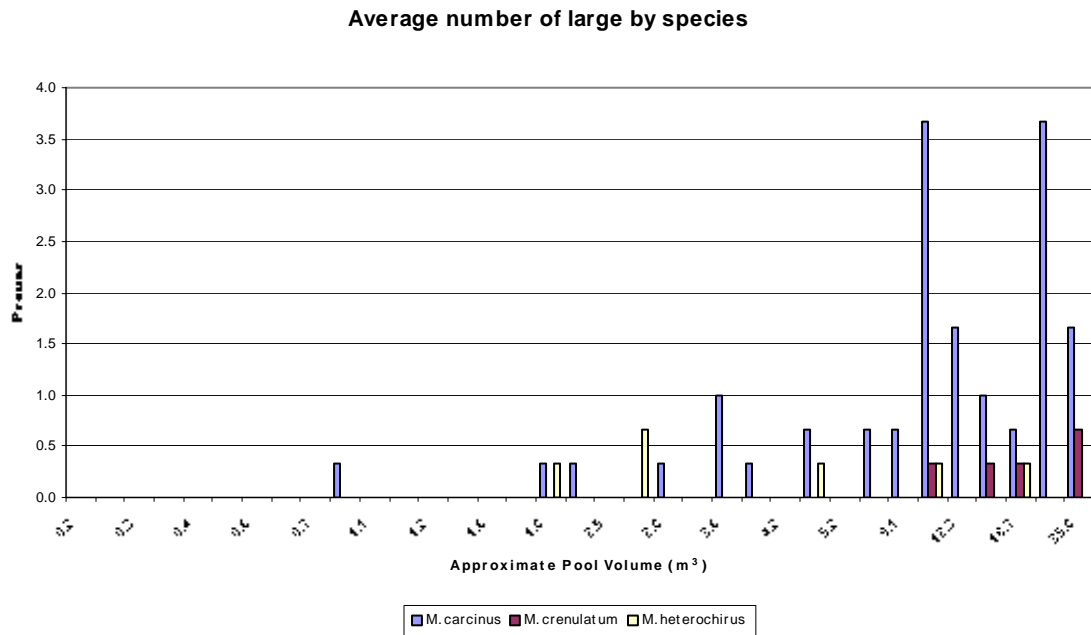
**Figure 3** Comparison of large to medium prawns recorded per pool volume



**Figure 4** Comparison of medium prawns by species per pool volume



**Figure 5** Comparison of large prawns by species per pool volume





## **Discussion**

Prawns of many species are very numerous in the Check Hall River. The present study attempts to focus on the field by studying only three species; however, such an attempt is still a challenge. By choosing thirty-five sites along the river one is faced with the challenge of moving from pool to pool and getting under water with a mask to get a more accurate count of what occurs in each pool. For this reason only three complete surveys were conducted where many more are required for an accurate study.

Several large *Macrobrachium carcinus* measuring around 12 to 15 centimeters reside in the area of the river studied. These prawns are usually hiding under large boulders and none could be captured, measured, or marked as originally intended. One possible avenue of capture is the same method locals use when baiting prawns. A piece of coconut meat is tied to a rock and set in the pool as bait for large prawns. Unfortunately this project lacks information of how many, what size, and what species locals catch, therefore damage to populations by poaching is unknown at this time. Other conditions such as stream flow and organic debris might also affect prawn residence in pools. This project does not attempt to determine effects of these other variables on prawn location.

## **Conclusion**

*Macrobrachium carcinus*, *M. crenulatum*, and *M. heterochirus* compete for and require larger volumes of water as the prawn grows in size. Larger pools of water by volume can sustain a larger population of prawns greater than 5 centimeters in length from head to tail. A larger pool volume yields a more complex structure of medium to large prawns. This structure diminishes as volume decreases until no structure exists at all. Small to medium pools are not species specific with reference to *Macrobrachium* between 5 and 10 centimeters, but larger pools are usually dominated by either *M. carcinus* or *M. crenulatum*. The dominant species of prawns with a length of 10 centimeters or greater is *M. carcinus*.

## **Acknowledgements**

I would like to thank Dr. Tom Lacher and Dr. Bob Wharton for their patience, time, and effort they put into this project. I would also like to thank Holli Swick for helping me measure pools and count prawns.

## **References**

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- Augustine, Sarah, Autumn Griffith, Charles Johnson, and Hee Kim. 2000. Field Guide to Prawns of the Check Hall River. Texas A&M University Study Abroad Program.