MORPHOMETRIC CHARACTERIZATION AND PERFORMANCE EVALUATION OF DIFFERENT *MACROBRACHIUM ROSENBERGII* STRAINS AND OTHER COMMERCIALLY IMPORTANT FRESHWATER PRAWNS IN THE PHILIPPINES

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INTRODUCTION

Extensive studies in the Philippines and in adjacent countries revealed that 528 caridean prawn species are found in this region alone (Chan 1998). Of all the known species, the giant freshwater prawn is considered the most commercially important. Except for the Philippines, culture of the giant freshwater prawn *Macrobrachium rosenbergii* has already made substantial contributions to the local aquaculture production in Southeast Asia, i.e., in Thailand, Malaysia and Indonesia. However, efforts are now being made to improve the aquaculture production of *Macrobrachium rosenbergii* in the Philippines, thus, optimal methods for the culture and propagation of this high value freshwater aquaculture species are being developed by the Philippine Government fishery agencies as well as other research and academic institutions.

The ASEAN-SEAFDEC Special Five-Year Program (Aquaculture Component) enabled the Bureau of Fisheries and Aquatic Resources, the Mindanao State University and the Aquaculture Department of SEAFDEC to jointly conduct studies on the genetic characterization, domestication and improvement of *Macrobrachium rosenbergii* stocks in the Philippines in order to improve the aquaculture production of the giant freshwater prawn. Under the collaborative project, specific research activities under "Morphometric characterization and performance evaluation of different *Macrobrachium rosenbergii* strains and other commercially important freshwater prawns in the Philippines" were conducted, and their preliminary results are summarized as follows:

A. Collection, Identification and Validation of *Macrobrachium* Samples

Macrobrachium rosenbergii and other species that closely resemble the giant freshwater prawn can be caught in some of the 25 commercial fishing grounds in the Philippines (Rosario and Tayamen, 2004). Agasen (2001) identified about twelve species of freshwater prawns in a survey of river tributaries and lakes in Luzon, Philippines. An assessment of freshwater prawns in Visayan and Mindanao provinces where even larger *Macrobrachium rosenbergii* samples have been observed, has yet to be undertaken. Although studies that characterize caridean prawns have already been conducted, the exact identities of local species are often difficult to ascertain (Chan 1998). In the Philippines, the need to validate the identity of freshwater prawn stocks, specifically *Macrobrachium rosenbergii* being collected and used by the various local research and government fishery agencies has been emphasized.

Confusion over the exact identity of both wild and hatchery-bred *M. rosenbergii* stocks stems from the fact that many of the existing hatchery stocks of the giant freshwater prawn originated from an imported stock from Thailand which was brought in and later promoted by the Philippine Bureau of Fisheries and Aquatic Resources for commercial aquaculture. Studies have shown that the Malaysian, Indonesian and Thai stocks of *Macrobrachium rosenbergii* basically of the western subspecies (*M. rosenbergii dacqueti* Sunier 1925), are different from the eastern subspecies (*M. rosenbergii rosenbergii* De Man 1895) found mainly in the Philippines (New 2002; De Bruyn et al 2004; Chand et al 2005).

This study was conducted to: (a) taxonomically validate the identity of the existing hatchery-bred and wild *Macrobrachium rosenbergii* stocks used in commercial aquaculture and *Macrobrachium* research in the Philippines; (b) identify possible sources of good quality *Macrobrachium rosenbergii rosenbergii* in the Philippines (particularly in Visayas and/or Mindanao) which can be used for domestication and selective breeding programs; and (c) characterize other indigenous *Macrobrachium* species that may have some aquaculture potential.

During the implementation of the project in September 2004, arrangements were made for Dr. Daisy Wowor and Prof. Peter Ng (noted crustacean taxonomists from the National University of Singapore or NUS) to help validate the identity of the freshwater prawn samples collected from selected localities in the Philippines. The samples collected from each of the various sources comprised of at least 3 adult males, 3 adult females (preferably berried) and four juveniles. Individual morphometric measurements (rostral teeth, carapace length, body length, total length) were recorded and individual samples were photographed. The collected samples were initially kept for two weeks in 80% ethanol. After two weeks, the samples were individually wrapped in cheesecloth, placed in labeled plastic bags and sealed before these were sent off for validation at NUS. Table 1 shows the number and identity of the samples collected from hatchery and wild sources in Bulacan and selected sites in Mindanao. The Mindanao samples were procured by Prof. Henry Dejarme of the Mindanao State University

Table 1. Freshwater prawn samples collected for taxonomic identification

Source	Number of samples	Identity
A. Wild		
Calumpit, Bulacan (Luzon)	11	*Macrobrachium rosenbergii dacqueti*
	9	*Macrobrachium rosenbergii rosenbergii*
Dinas (ZDSMindanao)	5	*Macrobrachium rosenbergii dacqueti*
	5	*Macrobrachium rosenbergii rosenbergii*
Siay (ZDS Mindanao)	4	*Macrobrachium rosenbergii dacqueti*
	6	*Macrobrachium rosenbergii rosenbergii*
Tambulig (Mindanao)	11	*Macrobrachium mamillodactylus*
(Panguil Bay	12	*Macrobrachium equidens*
	2	*Macrobrachium rosenbergii dacqueti*
	8	*Macrobrachium rosenbergii rosenbergii*
Mangagoy (Mindanao)	12	*Macrobrachium mamillodactylus*
	1	*Macrobrachium latidactylus*
Lake Lanao (LDN/ LDSMindanao)	10	*Macrobrachium latidactylus*
Lake Mainit (SDN Mindanao)	10	*Macrobrachium lanceifrons*
B. Hatchery		
SEAFDEC/AQD	10	*Macrobrachium rosenbergii dacqueti*
BFAR 0	5	*Macrobrachium rosenbergii dacqueti*
BFAR 1	10	*Macrobrachium rosenbergii dacqueti*

The distinguishing characteristics of each species which were identified from the samples collected are briefly described below:

1) *Macrobrachium rosenbergii (*giant river prawn*)*
Eastern form*: M. rosenbergii rosenbergii (De Man, 1879)*
Western form: *M rosenbergii dacqueti* (Sunier, 1925)

There are several subtle differences between these two forms or subspecies of *Macrobrachium rosenbergii*. However the main difference between them is the basal crest of the rostrum. The basal crest of the *M rosenbergii dacqueti* is higher than that of the endemic *M. rosenbergii rosenbergii*. Apart from this feature, the body of the *M rosenbergii dacqueti* is dark green to grayish blue with longitudinal streaks of darker and lighter color while that of the *M rosenbergii rosenbergii* has some pattern as shown below.

The body color and pattern of the wild-sourced M. rosenbergii rosenbergii (left) is distinctly different from the M. rosenbergii dacqueti (right)

The giant prawn's long rostrum extends beyond the antennal scale and has 11-14 upper teeth and 8-14 lower teeth. The *M. rosenbergii*'s second legs are very large, robust and of same size. In adult males, the entire second leg is densely covered with spines and sharp tubercles. The giant river prawn is the largest known *Macrobrachium* species. From the samples that were analysed, the largest adult individuals were obtained from Dinas and Tambulig, with total lengths of 23.6 cm. and 23.5 cm, respectively. In *M. rosenbergii rosenbergii* all antenna are blue while in *M. rosenbergii dacqueti*, only the second antennae are blue, the rest are brown

Macrobrachium equidens (Rough river prawn or estuarine prawn)
This prawn is rarely found in pure freshwater. They normally thrive in lower parts of streams, river mouths, estuaries where the water has a higher salinity (brackishwater) as it breeds in brackish and seawater (Chan, 1998). From the samples analysed, 13 individuals from Tambulig were *M. equidens* (2.2 cm average carapace length, 9 cm. total length, 7.2 cm. body length, and 9 upper and 5 lower rostral teeth, as shown below). The rostrum of the *M. equidens* almost always exceeds the distal end of the antennal scale. The large second legs are marbled like tortoise shell.

2) *Macrobrachium mamillodactylus* (knobtooth prawn)
The distinct feature of this species is the shape of the rostrum (below). The tip of the rostrum does not reach the distal end of antennal scale. The large second legs are longitudinally striped. The fingers of the second legs are not covered by soft short hair, but instead have rows of tubercles along the cutting edges. Samples of *M. mamillodactylus* were obtained from Tambulig and Mangagoy in Mindanao. The average measurements of the samples were: 3.6 cm. carapace length, 12.1cm. total length and 10cm body length. The rostrum has 11-13 upper teeth and 3-5 lower teeth.

M. mamillodactylus from Tambulig

3) *Macrobrachium latidactylus* (scissor river prawn)
This species is found mainly in estuarine and inshore marine waters. Adults are commonly found in tidal freshwater but larval development is in sea or brackishwater. One of the distinguishing features of this species is the unequal size of the large second leg even in young specimens (Figures A and B below). *M. latidactylus* samples were obtained from Mangagoy and Lake Lanao. The largest sample was obtained from Mangagoy (2.8 cm carapace length, 7.1 cm body length and 8.1cm total length).

A.

B.

M. latidactylus sample from (A) Mangagoy and(B) Lake Lanao

4) *Macrobrachium lanceifrons* (Philippine river prawn)

This species is locally known as hipon tagunton, It is one of the commercially important prawn species in Laguna de Bay as it is used for human consumption and for duck food. The tip of the rostrum of *M. lanceifrons* is slightly curved upwards in full grown individuals but straight in the young. The second pair of walking legs or chelipeds is equal in length in young specimens but unequal in fully grown.

Fully grown males are best distinguished from fully grown females by the length and shape of the second leg or cheliped. In the male, this is longer and is provided with felted hairs on the mobile finger. Samples of *M. lanceifrons* were identified from the collection obtained in Lake Mainit. The Lake Mainit samples had a 1.5cm average carapace length, 4.3 cm. body length and 5.3cm total length.

Samples of M. lanceifrons from Lake Mainit (southern Mindanao)

More samples will be collected and observations on the breeding behavior and distribution in specific habitats/microhabitats will be noted in order to determine their exact nature (that is whether they are found naturally in the collection areas as wild stocks or as accidental/intentional introductions from hatchery populations). Samples especially of *M. rosenbergii dacqueti and M. rosenbergii rosenbergii* shall be processed for genetic marker analysis (mt DNA sequence and msDNA analysis) at the SEAFDEC-based Aquaculture Biotechnology Laboratory in early 2006. Samples of these two subspecies will be collected from various populations and analysed to determine the level of intraspecific variation among the populations and their phylogenetic relationships as many of these stocks are now found mixed in several commercial fishing grounds in the Philippines.

A. Evaluation of Growth Performance of Two Strains of *M rosenbergii* in Cages in Laguna de Bay

Macrobrachium rosenbergii from two separate stocks (CAL- progenies of the native strain from Calumpit, Bulacan; and BFAR-progenies of the strain from BFAR, originally from Thailand) were reared in net cages in Laguna de Bay at a stocking density of 15 prawns/m^2.

Two runs have been conducted for five months, the first run from October 2004 to March 2005 and the second from April to September 2005. In the first run, CAL showed significantly better specific growth rate (SGR) than BFAR (4.6 vs 3.9%) but no differences in final weight, yield, and feed conversion ratio (FCR). Although CAL showed slightly better survival than BFAR, the difference was not significant (74.3 vs 69.1%). For the second run, survival (80.4 vs 61.1%), SGR (2.9 vs 2.6%), and FCR (2.1 vs 2.7) were significantly better in CAL than BFAR. Like in the first run, there were no significant differences in the final weight of the two strains (24.0 vs 24.3g). Figures 1, 2 and 3 show the weight, SGR and survival trends in both BFAR and CAL stocks during the two runs.

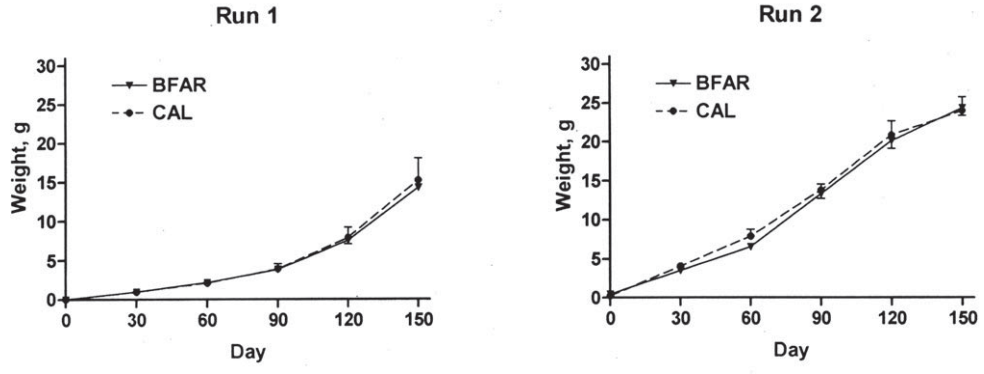

Fig. 1 Graphs showing the increase in weight of the stocks, BFAR and CAL during the two experimental runs

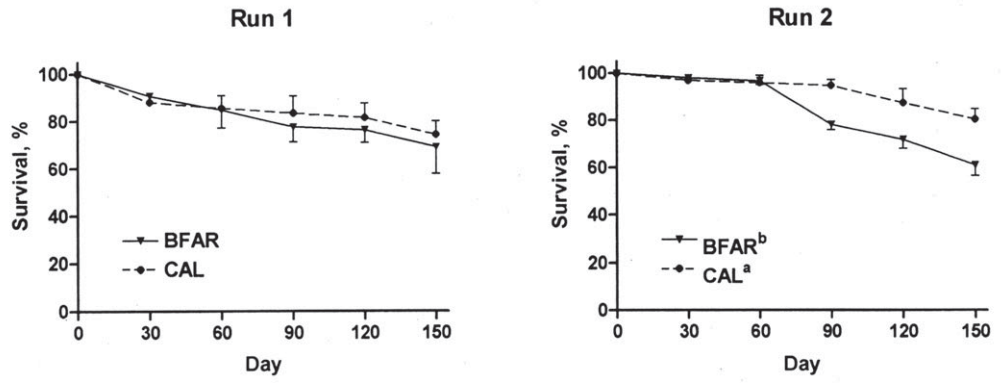

Fig. 2 Graphs showing the percentage survival of the stocks, BFAR and CAL during the two experimental runs

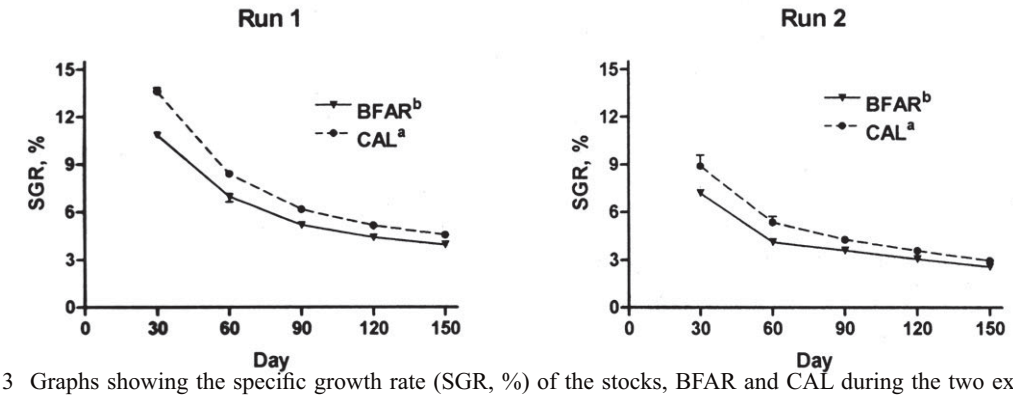

Fig. 3 Graphs showing the specific growth rate (SGR, %) of the stocks, BFAR and CAL during the two experimental runs

C. Reproductive efficiency of two *M. rosenbergii* stocks at different protein levels

Spawning sets (1male:5 females) of four-month old *Macrobrachium rosenbergii* from a hatchery stock (BFAR strain, *M. rosenbergii rosenbergii*) and a wild stock (Calumpit strain, possibly *M rosenbergii rosenbergii* x *M. r. dacqueti* F_1s) were placed in replicate 2x2x1 outdoor concrete tanks in April 2005. Stocks were fed using the following treatments: Treatment A: low protein (commercial fish feed pellets) at 2% of the prawn biomass; Treatment B: high protein (prawn feed pellets) at 2% of the prawn biomass and Treatment C: low protein (commercial fish feed pellets), given *ad libitum*. The reproductive efficiencies of the stocks were compared.

Six months after stocking, preliminary observation showed that the BFAR stock fed low protein diet (fish feed pellets) *ad libitum* spawned more frequently (average number of spawning episodes = 15.7) than prawns given fixed amounts of fish feed (10.7) and prawn feed (6.3). Calumpit stocks spawned less frequently at 9 (Treatment C), 8.7 (Treatment A) and 6 (Treatment B) spawning episodes.

The average number of hatchlings produced per gram body weight of the female prawn broodstock was highest in the BFAR stocks at 669.7 (for treatment C), 665.28 (for treatment B) and 567.2 (for treatment A). The same ranking was observed in the Calumpit stock at 598.4, 532.7 and 438.7 respectively. Last month, a similar experiment was set up in lake-based netcages using five-month old prawns to determine if the reproductive efficiency of the two strains is influenced by the type of spawning system.

The survival of postlarvae produced from the spawns obtained in this run was quite low (0.17% to 3.54%) for both BFAR and Calumpit stocks. The highest postlarval survival rate of 66.4% was achieved for one batch of spawn produced in an earlier trial run conducted in November 2004 (these F_1s were reared further to become parents of the breeders used in the on-going experiment). To improve the survival of larvae from both the BFAR and Calumpit stocks, refinements in the larval rearing method will soon be made by *Engr. Emiliano V. Aralar* and *Mr. Manuel A. Laron* who attended a month-long training course on Freshwater Prawn Hatchery Operations in Suratthani, Thailand.

D. *Macrobrachium rosenbergii* and other Indigenous *Macrobrachium* species in Mindanao and Visayan Island

The present study was conducted in pursuit of the general objectives of ASEAN-SEAFDEC AQD's Special Five-Year Program on Sustainable Fisheries in the ASEAN Region and the specific objectives of the collaborative project on the Genetic Improvement and Seed Production of the giant freshwater prawn, *Macrobrachium rosenbergii*.

The activities were focused on the survey and specimen collection of local stock of *Macrobrachium rosenbergii* and other indigenous Macrobrachium species in Mindanao. For reason of proximity some part of Visayan Islands were also considered as collection sites. The specimens were ethanol-preserved for description and measurements at MSU Naawan, preliminary taxonomic identification at SEAFDEC Binangonan and taxonomic verification with the assistance of taxonomists.

From September to December 2004 up to the current year we surveyed known prawn grounds and collected specimens of adult and juvenile Macrobrachium specimens from in Lake Lanao, Lanao del Sur; Tambulig and Aurora, Zamboanga del Sur in the upper tidal reaches of Panguil Bay; Dinas, Zamboanga del Sur in the riverine and estuarine areas in Illana Bay; in dendritic rivers connecting Sebuguey Bay in Siay, Zamboanga Sebugay; in Mangagoy River, Bislig Bay, Surigao del Sur, and in Lake Mainit, Caraga Region. The collected specimens were recorded in terms of place and date of collection, sex, rostral teeth, carapace length, total length, and body weight (Appendix Tables A-D). A number of preserved specimens were sent to the National University of Singapore (NUS) for morphometric characterization and taxonomic identification. Five species were identified by NUS taxonomists, namely: *Macrobrachium rosenbergii rosenbergii*, *M. equidens*, *M. mammillodactylus*, *M. lanceifrons*, and *M. latidactylus* (Table 1). The sources of Macrobrachium specimens used in the study are Lake Mainit, Panguil Bay, and Illana Bay (see Appendix Tables).

Table 1. Macrobrachium species in Mindanao

Collection Date	Collection Site	# species	Species
11/29/04	Panguil Bay	10	*M. r. rosenbergii*
		13	*M. equidens*
		10	*M. mammillodactylus*
12/11/04	Lake Maiinit	10	*M. lanceifrons*
12/15/04	Sebuguey Bay	10	*M. r. rosenbergii*
12/15/04	Illana Bay	10	*M. r. rosenbergii*
02/06/05	Bislig Bay	12	*M. mammillodactylus*
		5	*M. latidactylus*
09/02/04	Lake Lanao	10	*M. latidactylus*

Collection of specimen in other parts of Mindanao (Agusan River, Misamis Oriental, Davao provinces, Rio Grande de Mindanao in Cotabato, Zamboanga peninsula, and Sulu-Jolo area) will be conducted for ethanol preservation and subsequent taxonomic identification. Collection of live specimen from these areas and from previous collection sites will also be done for future laboratory cross breeding activities at MSU Naawan and SEAFDEC Binangonan.

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Appendix Table A. Macrobrachium from Lake Mainit (collection date 11/12/04)

Sample #	Sex	Rostral Teeth	Remarks	CL (mm)	TBL (mm)	BW (g)
1	M	9\3		17	55	5.09
2	M	9\4		27	62	5.62
3	M	9\4		18	55	4.79
4	M	Broken Rostrum		18	66	4.9
5	M	9\3		17	52	4
6	M	9\4		16	56	4.76
7	M	8\4		18	58	4.94
8	M	10\4		18	57	4.84
9	M	9\4		18	56	5.01
10	M	9\4		16	60	5.73
11	M	8\3		21	64	6.59
12	M	9\3		17	59	5.8
13	M	9\3		14	51	3.33
14	M	9\4		19	59	4.62
15	F	10\4		12	41	1.32
16	F	10\3		11	41	1.28
17	F	10\4		12	46	1.99
18	F	8\4		12	43	1.71
19	F	8\3	Berried Brown	14	46	2.16
20	F	10\4		10	26	0.88
21	F	7\3		13	48	2.07
22	F	8\3		10	37	1.03
23	F	9\3		10	41	1.58
24	F	8\3	Berried Black	9	39	1.18
25	F	9\3		12	42	1.6
26	F	8\3	Berried	11	39	1.28
27	F	9\4		10	36	1.29
28	F	8\3		10	37	0.98

Appendix Table B. Macrobrachium of Illana Bay (collected date 11/12/04)

Sample #	Sex	Rostral Teeth	Remarks	CL (mm)	TBL (mm)	BW (g)
56	M	14\11		66.5	176.5	161.44
57	F	3+10\10		56	160	85.81
58	M	3+9\9		67	170.5	148.08
59	M	12\9		69	186	160.21
60	M	11\10		72	186	175.23
61	F	14\11		48	143	70.78
62	F	Broken rostrum Newly molted		47	133	54.98 57.49
63	F	14\11		45	135	83.34
64	F	12\10		54	146	56.22
65	F	12\10		44	133	53.29
66	F	12\10	Berried brown	42	138	45.8
67	F	12\10	Berried orange	40	118	65.63
68	F	13\11		46	138	124.17
69	M	13\10		64	167	45.16
70	F	13\11		42	123	27.2
71	J	12\10	Newly molted	32	102	43.89
72	F	12\11		42	121	36.96
73	F	11\10		41	119	22.21
74	J	11\10		31	106	62.84
75	F	12\11		47	138	70.73
76	F	13\11	Berried orange	46	137	45.13
77	F	13\11		41	120	33.77
78	F	12\10		38	112	44.92
79		13\11		45	123	31.88
80		12\11		37	110	

Appendix Table C. Macrobrachium from Panguil Bay (collected date 11/12/04)

Sample #	Sex	Rostral Teeth	Remarks	CL (mm)	TBL (mm)	BW (g)
1	M	1+11\4		35	107	26.37
2	M	1+10\5		36	102	23.25
3	M	1+11\4		38	113	32.49
4	M	1+10\4		39	114	37.49
5	M	1+10\4		33.5	100	22.26
6	M	1+11\4		39	104	34.58
7	F	1+10\4		37	105	27.88
8	F	1+9\3		35	101	24.06
9	F	1+10\4		37	110	28.24
10	F	1+11\4		30.5	96	20.08
11	F	3+9\9	Brown eggs	47.5	144	79.17
12	F	3+11\11		52	147	82.03
13	F	3+10\11	Brown eggs	44	130.5	58.86
14	M	4+9\11		70.5	181.5	152.97
15	F	3+9\10	Orange eggs	45	134	61.37
16	F	2+10\9	Orange eggs	47	138	67.44
17	F	3+11\10	Gray eggs	45.5	136	69.25
18	M	3+10\10		63.5	167.5	122.31
19	F	3+9\11	Orange eggs	42.5	124.5	45.14
20	M	2+10\10		54	147	84.13
21	J	2+10\11		29.5	91.5	16.09
22	M	3+10\10		30	87	17.06
23	F	3+10\10		32	99.5	21.53
24	F	4+10\10		25.5	84	12.32
25	M	2+10\10		32	98	20.64
26	M	3+9\10		30.5	95.5	17.36
27	M	3+10\9		27.5	85	14.35
28	F	3+10\7		28	91	16.43
29	F	2+9\10		28	87	13.94
30	F	11\4	Black eggs	24.5	75	10.71
31	F	2+8\4		25.5	77.5	12.22
32	F	2+8\5		24	75	8.54
33	J	3+8\5		23	71	8.85
34	F	3+9\6		24.5	74	10.56
35	F	3+9\5		21.5	87.5	6.95
36	F	10\5		24	74	10.26
37	J	9\5		23	87	8.06
38	M	13\4		29	88	15.51
39	J	11\5		23	71	9.42
40	F	9\4		25	76	9.55
41	J	2+7\5		22	71	7.99
42	F	9\5		24	76.5	10.21
43	F	9\6		23.5	72	9.31
44	F	10\4		24.5	77	9.94
45	J	9\4		23.4	66.5	7.06
46	F	10\4	Yellow eggs	25.5	76	12.15
47	J	6\4		23	69	8.69
48	F	12\5		26	80	12.42
49	F	12\4	Yellow eggs	25	78	12.03
50	F	11\3		28	83	11.53
51	J	12\4		22	74	9.2
52	F	11\4		25	77	11.27
53	F	8\3	Brown eggs	23	77.5	10.58
54	F	10\4		26	82	12.76
55	F	11\3		27	81	11.53

Appendix Table D. Macrobrachium from Panguil Bay (collected date 11/12/04)

Sample #	Sex	Rostral Teeth	Remarks	CL (mm)	TBL (mm)	BW (g)
81	M	Broken	Newly molted	77	207	210
82	M	13\10		72	193	231.5
83	M	11\12		70	189	169.7
84	M	13\10		60	168	133.45
85	F	10\10		55	159	104.62
86	F	13\11		57	156	94.17
87	F	14\9		49	147	73.46
88	M	14\12		69	189	178.02
89	F	12\9		51	141	74.29
90	F	12\10		39.5	120.5	41.36
91	F	12\10		39	123	45.8
92	F	12\10		42	125	49.48
93	F	13\10	Orange egg	42	136	63.25
94	F	14\10	Orange egg/ Newly molted	42	126	53.18
95	J	12\9	Newly molted	44	127	48.27
96	J	12\10		39	112	32.52
97	F	14\9		42	130	52.53
98	F	13\11	Newly molted	40	120	41.4
99	J	12\10		34	92	21.84
100	J	10\10		32	100	23.35
101	J	13\10		27	82	13.01
102	J	12\10		27	85	14.8
103	J	12\11		26	79	12.05
104	J		Newly molted/ Broken	27	76	11.75
105	J	12\11		25	79	11.21
106	J	11\9	Newly molted	35	97	25.45
107	J	Broken	Newly molted	35	103	26.99
108	J	12\9		28	88	15.23
109	J	11\10		32	95	20.56
110	F	12\9		45	132	55.14
111	J	13\10		33	98	21.96
112	J	11\10		36	104	28.41
113	J	12\10		29	90	17.03
114	J	11\11		24	81	11.81
115	J	11\8	Newly molted	27	87	16.09
116	J	11\9		26	83	12.78
117	J	11\10		32	98	21.21
118	J	13\12		32	97	19.24
119	J	12\9		27	81	11.96
120	J	11\8		28	88	16.35
121	J	12\10		31	93	19.08
122	J	12\10		30	96	21.02
123	J	12\9		25	79	8.82
124	J	11\11		27	83	13.05
125	J	11\9		28	81	12.69
126	J	11\9		19	87	14.31
127	F	12\9		40	122	44.51
128	F	11\11		40	123	47.24
129	F		Newly molted	40	118	36.27
130	F	10\7	Newly molted/ head separated	39	110	31.66
131	F	11\10		40	117	40.2
132	F	12\10		38	112	37.57
133	F	12\10		39	115	S