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臺灣西南沿岸海域之草蝦種蝦放流

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RESTOCKING OF SUBADULT GRASS PRAWN, *PENAEUS MONODON*, IN THE COASTAL WATERS OF SOUTHWEST TAIWAN*

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Abstract

Due to the rapid development of grass prawn, *Penaeus monodon* culture industry in Taiwan, spawners of this species were almost depleted from the waters surrounding Taiwan. The release of pond-reared subadults is expected to increase the stock of spawners in the region.

An effective tag for *P. monodon*, modified from a streamer tag, was developed and used for field experiments. It was observed that the recapture rate of *P. monodon* from seawater ponds was much higher than that from brackishwater ponds. This reveals that the condition of the released prawns influences the recapture rate. It was also observed that the highest growth was 9.37 g/week for female and 3.52 g/week for male released subadults. It seems clear that the released prawns grew fast in coastal waters. It is assumed that the restocking of subadults to augment *P. monodon* broodstock in nature has a promising prospect.

Introduction

To solve the shortage of *P. monodon* spawners for seed production, the release of pond-reared subadults in natural waters has recently drawn much attention in Taiwan.

To develop an effective release program, it is necessary to establish tagging and recapturing techniques to evaluate its biological and economic potential. Several types of external tags have been used on prawns with varying degrees of success. Some of these are the Petersen disc tag (Lindner & Anderson 1956), the Atkins tag (Ruello 1970), the tube tag (Kurata et al. 1971), the Floy anchor tag (Hynd 1974), the numbered toggle tag (Penn 1975) and the streamer tag (Marullo et al. 1976). In order to develop an ideal tag, one should consider the following aspects: (1) it has no effect on growth and survival rates, (2) it is inexpensive and easily manufactured, (3) it is easily applied and (4) it is easily detected.

In this study, a modified type of streamer tag was used in pond-reared subadults of *P. monodon* to assess the feasibility of rearing broodstock in the natural environment.

Materials and Methods

The modified streamer tag, made of vinyl sheet, was inserted laterally through the first abdominal segment of the prawn using a sewing needle (Fig. 1).

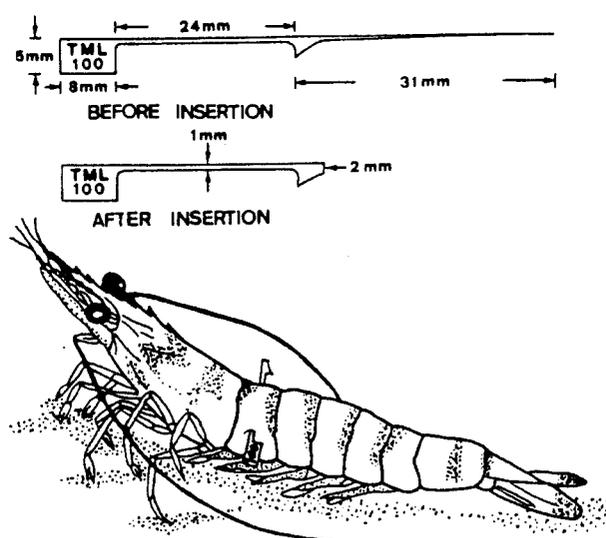


Fig. 1. The modified streamer tag used in this study.

Initially, prawn were reared in eight 10m x 5m x 1m ponds with concrete walls and earthen bottom from 20 May to 2 July 1983. This was conducted to evaluate the effects of tagging on the growth and survival rates.

A total of 6,340 pond-reared *P. monodon* subadults, with body weight ranging from 30 to 50 g, were measured, tagged and released in varying numbers on 16 separate occasions (Table 1) at different locations along the coast of Tungkang (Fig. 2) from August 1983 to June 1984. To ensure maximum recovery of tagged prawns, a system of incentive was used, i.e., the recovery of a tagged prawn rewarded NT\$ 200 (1 US\$ = 30 NT\$) to the finder during this study.

Results

Effects of tagging on *P. monodon*

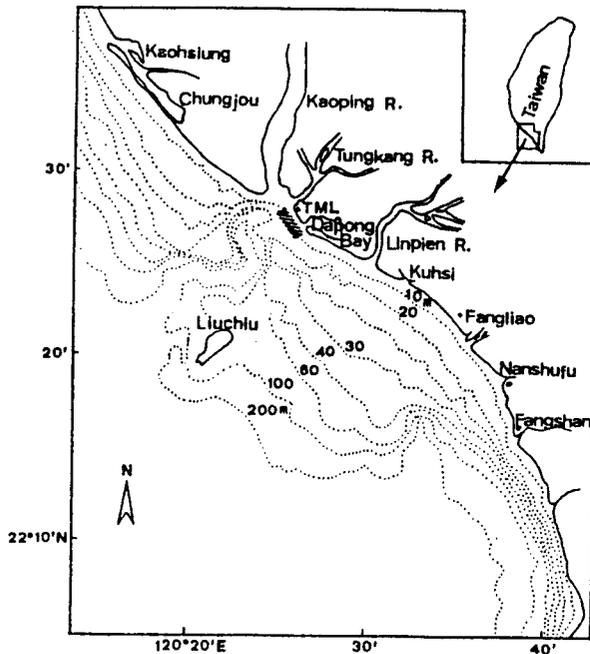


Fig. 2. Map showing the location (shaded area) for releasing subadult *P. monodon*.

Table 2 shows the growth of tagged and untagged prawns reared in experimental ponds for 50 days. There was a significant difference in growth between tagged and untagged prawns. However, there was no significant difference on survival rate between tagged and untagged prawns (Table 3). Mortality attributable to the present tagging method seems negligible.

Tagging and recapturing subadults of *P. monodon*

From the combined yearly data of the tagged and recaptured prawns, 64% had moved northward to the waters off the mouth of the Kaoping River at depths of 20-60 m, and 36% moved southward to waters between the mouth of Dapong Bay and Fangliiao at depths of 10-20 m. The recapture rate of tagged prawns was about 15% for those raised in the seawater ponds of TML and under 5% for those from commercial brackishwater ponds (Table 1). The growth of tagged prawns in the wild ranged from 0.37 to 9.37 ($\bar{x}=2.97$) g/week for females and 0.06 to 3.52 ($\bar{x}=1.67$) g/week for males (Fig. 3). Among the recaptured females, eight were undergoing maturation.

Discussion

The modified streamer tag proved to be cheap and easily made and applied. The tag did not affect the survival rate of the prawns. However, it affected their growth rate. Therefore, the growth data estimated by this tagging method should be calibrated. Comparing the growth rate of tagged and untagged prawns (Table 2), the

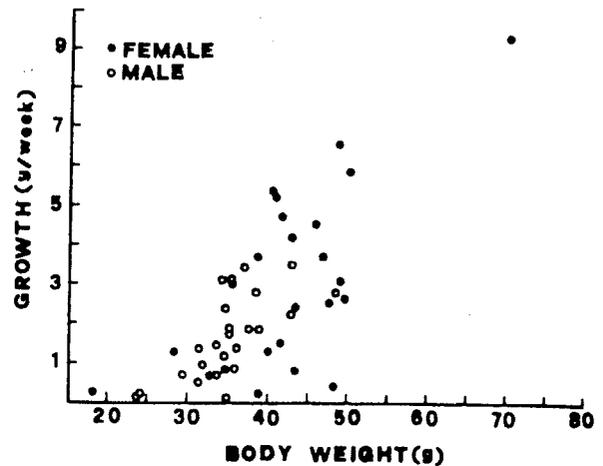


Fig. 3. Body weight and growth of *P. monodon* in the wild, as indicated by the tag and recapture data.

correction coefficient was estimated to be 1.2 for prawns between 5 and 20 g body weight. Since the correction coefficient for subadults (30-50 g BW) is not yet available, the growth rate obtained from this study could not be calibrated and hence it might have been underestimated.

It seemed that the recapture rate for prawns from seawater ponds was much higher than that from brackishwater ponds (Table 1). This suggests that the quality of the released prawns influences the recapture rate. The selection of healthy and stout subadult prawns for releasing purpose is therefore considered to be very important. Based on the tagging and recapturing records, the highest growth rate was 9.37 g/week for female and 3.52 g/week for male subadults in the offshore waters. Liao (1984) reported that the best growth for *P. monodon* subadults in ponds was 2.50 g/week. Some of the recaptured females had maturing ovaries. These results suggest that restocking of subadults of *P. monodon* in the coastal waters of southwest Taiwan for the purpose of rearing broodstock has a promising prospect.

The peak hatchery season for *P. monodon* in Taiwan is from March to June. Natural spawners can be caught during the whole year, but the highest number can be caught from September to November in the waters along southwest Taiwan (Su and Liao 1986). It is therefore suggested that subadults be released from October to December so that the spawners will be available just in time for hatchery use in the following spring.

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Table 1. Data of recaptured subadults of *P. monodon* released from Tungkang coast from August 1983 to June 1984.

Data of release	No. of prawns released	No. of prawns recaptured	Recapture rate (%)	Sources of prawns for release
1983 Aug. 14	500	3	0.60	private farm
Aug. 24	169	7	4.14	private farm
Aug. 25	105	2	1.90	private farm
1984 Jan. 13	283	2	0.70	private farm
Jan. 14	425	11	2.59	private farm
Jan. 26	276	13	4.71	private farm
Feb. 25	488	1	0.20	private farm
Mar. 7	580	3	0.52	private farm
Mar. 10	575	2	0.35	private farm
Mar. 11	392	14	3.57	private farm
Mar. 15	581	2	0.34	private farm
Apr. 3	567	3	0.53	private farm
Apr. 12	477	2	0.42	private farm
May 3	604	1	0.17	private farm
May 23	119	6	5.04	private farm
June 6	199	31	15.57	TML
Total	6,340	103		

Table 2. Growth of tagged and untagged *P. monodon* reared in experimental ponds for 50 days.

Experiment	Treatment	Initial body weight # (g)	t-test	Final body weight # (g)	t-test
A	Control	4.41± 0.46	0.32 ns	18.10± 2.08	6.55 **
	Tagged	4.43± 0.35		16.01± 2.35	
B	Control	4.94± 0.55	0.52 ns	13.43± 1.67	5.18 **
	Tagged	4.99± 0.53		11.84± 1.61	
C	Control	10.19± 1.18	2.07 *	18.09± 2.34	5.55 **
	Tagged	10.56± 1.31		16.14± 2.31	
D	Control	10.76± 1.09	0.73 ns	18.59± 2.50	2.11 *
	Tagged	10.90± 1.05		17.54± 2.65	

: Mean± SD

ns : No significant difference at 5% level

* : Significant difference at 5% level

** : Significant difference at 1% level

Table 3. Survival rate of tagged and untagged *P. monodon* reared in experimental ponds for 50 days.

Experiment	Treatment	Initial number	Survival number	Survival rate (%)	χ^2 test
A	Control	100	98	98	1.73 ns
	Tagged	93	89	95	
B	Control	60	55	92	3.02 ns
	Tagged	57	56	98	
C	Control	100	85	85	3.72 ns
	Tagged	99	91	92	
D	Control	60	56	93	2.46 ns
	Tagged	60	54	90	

ns : No significant difference at 5% level

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