

# Reduction in Effort and Favorable Environment Helped to Increase Shrimp Catch in Kuwait

M.S.M. SIDDEEK<sup>a</sup>  
J.M. BISHOP  
M. EL-MUSA<sup>b</sup>  
A.R. ABDUL-GHAFFAR  
J.U. LEE  
F. AL-YAMANI  
P.S. JOSEPH  
S. ALMATAR  
M.S. ABDULLAH  
*Mariculture and Fisheries Department*  
*Food Resources Division*  
*Kuwait Institute for Scientific Research*  
*P.O. Box 1638 Salmiyah*  
*22017 Salmiyah, Kuwait*

## Abstract

The 1988-1989 shrimp catch from Kuwait waters was 5,125 t, representing a 62% increase above the previous record of 3,158 t in 1966-1967. Ninety-eight per cent of the record landing was comprised of *Penaeus semisulcatus* (Penaeidae). The attainment of optimal spawning-stock biomass by reduction in effort, protection of small recruits through delayed season opening, as well as strict enforcement of closed nursery areas, and occurrence of two strong recruitment pulses due to favorable environmental conditions in 1988 appear to be the major reasons for the increase. Unfavorable environmental conditions and far less effort expended in *Metapenaeus affinis* grounds appear to have adversely affected the 1988-1989 production and landings, respectively, of this species.

## Introduction

The shrimp stocks in Kuwait waters had declined over the years largely due to excessive fishing pressure. To revive the stock, a closed season management policy was put in effect in 1980. The fishing season closed between 1 February and 30 April and opened on 1 July. Since the 1986-1987 season, the opening dates have been delayed by one or two months from 1 July (Table 1). This report provides plausible explanations for the record high catch of *Penaeus semisulcatus* (5,023 t) and record low catch of *Metapenaeus affinis* (90 t) in 1988-1989.

## Reduction in Effort

Fishing effort has been systematically reduced from 11,500 boat-days in 1985-1986 to 5,243 boat-days in 1988-1989 (Table 1) because of extended closed season and, more recently, the night fishing ban and reduction

in number of boats. Mathews and Abdul-Ghaffar (1986) concluded that 6,500 boat-days of effort would produce the maximum sustainable yield (MSY). The 1988-1989 effort ( $f$ ) level was about 20% lower than the  $f_{msy}$ , leading to a high spawning stock biomass. Unsurprisingly, the 1989-1990 catch was the second highest on record (4,057 t).

One of the reasons for very low *M. affinis* catch in 1988-1989 appears to be the very low effort expended on grounds where *M. affinis* abounds.

## Night Fishing Ban

A night fishing ban has been enforced, for security reasons since 22 October 1987. The catchability of *P. semisulcatus* is high at night; thus, the ban had reduced effective fishing to near optimum level, producing high yield as well as high spawning stock biomass. The diurnal change in vulnerability of *M. affinis* to fishing gear has not been studied.

<sup>a</sup>Present address: Department of Fisheries Science and Technology, Sultan Qaboos University, Box 32484, Al-Khod, Muscat, Sultanate of Oman.

<sup>b</sup>Present address: P.O. Box 92/888 Amman, Jordan.

Table 1. Summary of data on Kuwait's shrimp fishery, 1981-1990.

Season	Opening date	Duration of fishing season (months)	Catch (t) <sup>a</sup>		<i>P. semisulcatus</i> Spawning biomass index (kg/UKF boat-days)	Fishing effort (UKF boat-days)
			<i>Penaeus semisulcatus</i>	<i>Metapenaeus affinis</i>		
1981-1982	1 Jul	7	828 (48.7)	718 (42.3)	305	9,434
1982-1983	1 Jul	9	1,329 (61.6)	533 (24.7)	116	9,307
1983-1984	1 Jul	9	1,965 (62.6)	735 (23.4)	178	13,274
1984-1985	1 Jul	7.5	790 (47.9)	591 (35.9)	146	10,693
1985-1986	1 Jul	8	918 (51.6)	601 (33.8)	122	11,500
1986-1987	1 Aug	7.5	1,068 (51.7)	954 (46.2)	60	10,400
1987-1988	1 Sep	7.5	1,697 (69.1)	621 (25.3)	165	7,148
1988-1989	1 Sep	7	5,023	90	160	5,243
1989-1990	1 Sep	n.a.	n.a.	n.a.	356	n.a.

<sup>a</sup>Numbers in bracket indicate weight percentage in shrimp catches.

### Delayed Opening of Fishery

The customary 1 February to 30 June closed season was intended for protecting the spawners and recruits of *P. semisulcatus* during periods of spawning and recruitment. Incidentally, the same closed season period almost fully protects the spawning stock of *M. affinis* during its peak spawning period, April to August (Mathews et al. 1987).

The delayed (1 September) season opening has had two beneficial effects: (i) the mean size of *P. semisulcatus* in the catch increased, thus increasing yield, as predicted by various earlier Y/R analyses; (ii) the spawning stock increased, i.e., more young shrimp reached maturity.

The lowest *M. affinis* yield in 1988-1989 appears to be unrelated to the delayed opening because the same opening date for the 1987-1988 season produced a high yield of 621 t (Table 1).

### Favorable Environment

A reduced rate of water temperature increase during the peak spawning and prerecruitment period of *P. semisulcatus* (i.e., March to June) and a drop in mean bottom salinity throughout the year have been observed in Kuwait Bay, central and southern Kuwaiti waters in the two recent successful shrimp seasons (i.e., 1983-1984 and 1988-1989). These effects were likely due to high Shatt Al-Arab freshwater discharge. Unconfirmed reports state that the 1988 discharges were very high.

The drop in the temperature gradient may have provided an extended optimum time period for *P. semisulcatus* spawning. Furthermore, the increased outflow of nutrient-rich freshwater from the Shatt Al-Arab may have encouraged seaweed (*Sargassum* spp.) growth, and the slower rate of seawater warming resulted in seaweed being attached to the bottom for a

longer period, providing the postlarvae and juvenile *P. semisulcatus* with more prime nursery habitat. Thus, two very strong recruitments, one in July and the other in September, occurred in 1988.

Very low salinity is unfavorable for spawning activity of *M. affinis* (Pillay and Nair 1971). Because its spawning grounds are located close to Shatt Al-Arab (Mathews et al. 1987), the very high freshwater flow in the spring and summer 1988 may have reduced the salinity below the threshold level required for spawning. Mathews et al. (1987) hypothesized that a fraction of the advanced postlarval and young juvenile *M. affinis* population migrate upstream from areas close to the Shatt Al-Arab perhaps during late winter and early spring and return in autumn as subadults and adults to the marine environment. *M. affinis* catch rates as recorded by the artisanal fishery, and by *R/V Bahith* have fallen drastically since October 1988, indicating that the recruitment from Iraqi marshes have been severely affected in 1988-1989 by high discharges from the Shatt Al-Arab.

### Predation

A considerable number of by-catch finfish species feed on offshore small shrimp of average size less than 12 mm carapace length (CL) (Euzen 1987). *P. semisulcatus* and *M. affinis* do not recruit to offshore waters until they reach a size larger than 12 mm CL. Reexamination (by J.M. Bishop) of the fish stomachs analyzed by Euzen (1987) led to identification of *Parapenaopsis stylifera*, a species of minor importance to Kuwait's fishery. Predation rates on *P. semisulcatus* on the nursery grounds remain uninvestigated, but the fact that juveniles associate closely with benthic vegetation can be interpreted as a behavioral defense against predators.

### Immigration

Alongshore migration, i.e., recruitment from the Saudi Arabian coast is likely to enhance Kuwait shrimp catches.

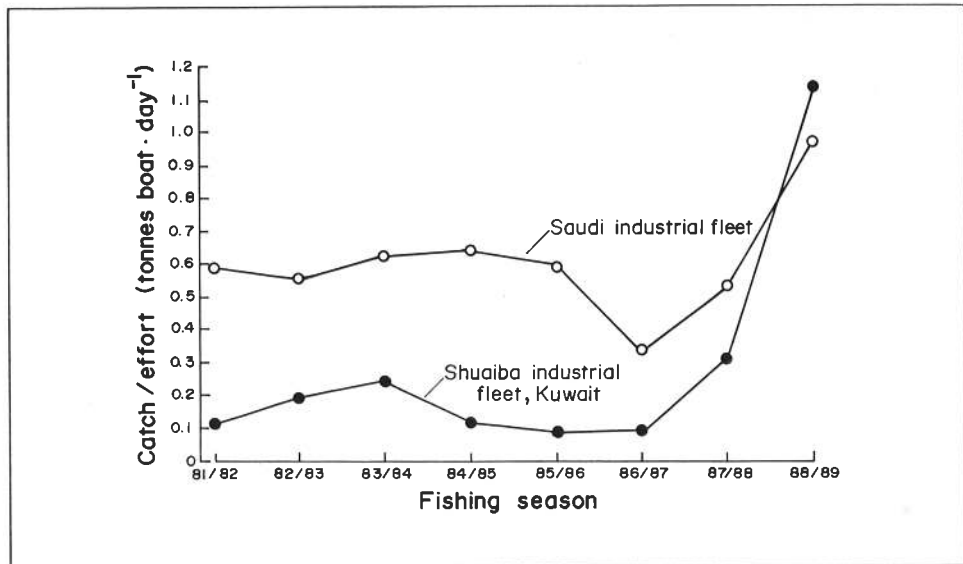


Fig. 1. Catch-per-effort trend of the Saudi industrial fleet and the Shuaiba industrial fleet, Kuwait, for *Penaeus semisulcatus*, 1981-1982 to 1988-1989.

The catch rates in 1981-1982 to 1988-1989 of *P. semisulcatus* by major fishing companies in Saudi Arabia and in Kuwait indicated that the increase of catch/effort with decrease of effort was much sharper in Kuwait since the 1986-1987 season (Fig. 1). This perhaps indicates an improvement in Kuwaiti shrimp stock over the years due to effort reduction in Kuwait, rather than from increased migration from Saudi Arabia. Because of similar production trends in both countries, a firm conclusion, however, cannot be made until elaborate tagging experiments, covering northern Saudi and southern Kuwaiti grounds, have been completed.

### References

- Euzen, O. 1987. Food habits and diet composition of some fish of Kuwait. *Kuwait Bull. Mar. Sci.* 9: 65-85.
- Mathews, C.P. and A.R. Abdul-Ghaffar. 1986. A review of the present status of Kuwait's shrimp fisheries with special reference to the need for effort limitation, p. 100-126. In A.M. Landry and E.F. Klima (eds.) *Proceedings, 1983 Shrimp Yield Prediction Workshop*, Texas University Press, Galveston, Texas.
- Mathews, C.P., J.M. Bishop and S. Salman. 1987. Stocks of *Metapenaeus affinis* in Kuwait and Iraq waters. Kuwait Institute for Scientific Research. MB-54. Report No. KISR 2231.
- Pillay, K.K. and N.B. Nair. 1971. The annual reproductive cycles of *Uca annulifera*, *Portunus pelagicus* and *Metapenaeus affinis* (Decapoda, Crustacea) from the northwest coast of India. *Mar. Biol.* 11: 152-166.

