

A First Record of Whip Lobsters *Puerulus sewelli* from Oman with Notes on Size, Condition and Length-Weight Relationships

Abdullah Al-Nahdi*¹, Abdulaziz Al-Marzouqi¹, Johan C. Groeneveld¹
and Ahmed Al-Hosni²

¹Marine Science and Fisheries Centre, P.O. Box 227
PC 100, Muscat, Sultanate of Oman

²Ministry of Fisheries Wealth, P.O. Box 427
PC 100, Muscat, Sultanate of Oman

التسجيل الأول لشارخة السوط العربية في سلطنة عمان مع ملاحظات في الحجم، الحالة
والعلاقات الطول بالوزن

عبدالله النهدي، عبدالعزيز المرزوقي، جوهان جرونفلدي وأحمد الحوسني

الخلاصة: تم تسجيل أول ظهور لشارخة السوط العربية (*Puerulus sewelli*) أو شارخة الأعماق في المياه العمانية في عام ٢٠٠٧ م. ويمتد تواجدها المعروف جنوب شرق بحر العرب حوالي ٢٠٠ كيلومتر باتجاه الشمال الغربي من حدودها السابقة عند رأس فرتك في اليمن. تم اصطياد الشارخة بواسطة المصائد الاستكشافية خلال رحلات صيد استكشافية بالجرف على عمق يتراوح ما بين ٢٣٠-٧٨٧ مترا. تراوح حجم ٦٧ عينة ما بين ٥١-٨٧ مم لطول الدرع (٤, ٣١ - ٧, ١٦١ جرام للوزن الكلي). وتبين أن الإناث أكبر حجما من الذكور، كما أن توزيع الأطوال يوضح أن هناك منحنى ثنائي يبين الإمدادات لصغار الشارخة وأخر لكبار شارخة الأعماق. بالإضافة إلى أن وزن الذيل لدى الإناث أثقل منها لدى الذكور نسبياً. اتضح من خلال العينات أيضاً أن ما نسبته ٨ % من الإناث كانت ذات قشرة ناعمة و ١٩ % تحمل بيضا خارجيا و ٧٧,٧ % لديها مبايض ناضجة.

ABSTRACT: Arabian whip lobsters *Puerulus sewelli* were for the first time reported from the waters of Oman in 2007, extending its known range along the southeastern coast of the Arabian Peninsula by ~200 km northeastwards from its previous boundary at Ras Fartak in Yemen. The lobsters were caught in exploratory trawls at 230–787 m depth. The size of 67 lobsters ranged from 51–87 mm CL (31.4–161.7 g whole weight, WW). Females were larger than males. The size distribution was bimodal, showing recent recruits and post-recruits. Female tail weight (TW) became progressively heavier than male TW, relative to increasing, but equivalent CL or WW-values. Of the females, 8% were soft-shelled, 19% carried external eggs, and 77.7% had maturing or ripe gonads.

Keywords: *Puerulus sewelli*, size, Oman.

Introduction

The Arabian whip lobster, *Puerulus sewelli* Ramadan, 1938 (family: Palinuridae) (Fig. 1) has patchy distribution in the Indian ocean region especially in the waters of Somalia, the Gulf of Aden, Yemen, Pakistan, and SW coast of India and the Gulf of Mannar (Fischer and Bianchi, 1984, Holthuis, 1991). In the present paper, the occurrence of *P. sewelli* in the waters of Oman is reported for the first time. The

lobsters were caught during an exploratory demersal trawl survey conducted in October and December 2007 at depths between 230 and 787 m.

Puerulus sewelli has been of considerable interest to fisheries (Holthuis, 1991). In 1974–1977 and 1983 it was commercially fished off eastern Somalia (Johnsen, 1985), and in the Gulf of Aden experimental trawling returned average catches of 10–129 kg/h. Off SW India rich fishing grounds were found and in the Gulf

*Corresponding author. E-mail: alnahdi22@hotmail.com



5 cm

Figure 1. *P. sewelli* collected off Oman.

of Mannar it was available in varying quantities along the depth belt of 150-500 m (see www.fsi.gov.in). Off Yemen, a trawl fishery in the 1970s landed between 112 and 428 t annually, but this fishery seems to have collapsed by 1993 (Sanders, 1981; Anon., 2004), and no catches were reported for 2000–2002.

Biological information on *Puerulus sewelli* is scattered among various unpublished reports (Sanders, 1981; Johnsen, 1985) and fisheries survey bulletins (see www.fsi.gov.in). Notably, it inhabits a substrate of coarse sand, hard mud and shells, reaches a maximum total body length of about 200 mm (average of 150 mm), grows fast, and has a mean lifespan of 3 years while in the exploited phase (Sanders, 1981; Holthuis, 1991).

The aims of this study were to report on the geographical range extension, and provide information

on the size, composition, length-weight relationships, and the reproductive condition of *P. sewelli* in a sample taken in Oman.

Materials and Methods

Exploratory trawls at depths >230 m were executed during daylight on the 10th of November (2 trawls) and the 8th of December 2007 (1 trawl), in the region between Mirbat and the Yemen border. A trawl net with an 18 mm mesh in the codend was used, and the start and end points of each trawl that caught *P. sewelli*, depth range, trawl speed, distance between trawl doors and duration of trawls are shown in Table 1. CTD drops were made at the end of each trawl to determine bottom temperature.

Captured lobsters were frozen on-board and transferred to the MSFC laboratory. After defrosting, the total length (TL \pm 1 mm; from the ridge between the eyes to the tip of the uropod) and carapace length (CL \pm 1 mm; ridge between the eyes to the posterior edge of the carapace) of each lobster were measured using Vernier calipers, and the whole weight (WW \pm 1 g) and tail weight (TW \pm 1 g) determined. Linear regressions were fitted to CL versus TL, and WW versus TW, and non-linear regressions to CL versus TW and CL versus WW using a least-squares algorithm in Microsoft Excel.

Gender was determined from external characteristics, and female gonads were categorized into one of four groups based on colour: stage 1 or immature – white; stage 2 or developing – yellow to very light orange; stage 3 or maturing – orange; and stage 4 or ripe – red (Groeneveld and Melville-Smith,

Table 1. GPS readings at the start and end of three exploratory trawls, depth, trawl speed, and duration of trawls and the distance between trawl doors and lobster catch.

Start trawl	End trawl	Depth (m)	Trawl speed (knots)	Distance between trawl doors (m)	Duration of trawl (min)	Lobster catch (kg)
16°44'68N 53°57'41E	16°44'04N 53°58'43E	253–399	3.5	110.45	19	<1
16°43'73N 53°59'10E	16°42'79N 54°00'07E	442–787	3.5	116.30	30	1.8
16°44'72N 53°57'18E	16°44'02N 53°58'32E	230–410	3.3	95.85	20	6.4

Table 2. Comparison of average (\pm S.D.), minimum and maximum CL, TL, WW and TW of male, female and all *P. sewelli* caught in exploratory trawls in 2007. Sample size shown in parenthesis.

Variable	Gender	Average \pm S.D.	Minimum	Maximum
CL (mm)	All (67)	69.7 \pm 8.8	51	87
	F (37)	72.0 \pm 9.0	52	87
	M (30)	66.8 \pm 7.8	51	77
TL (mm)	All	159.6 \pm 18.6	119	195
	F	166.8 \pm 18.7	124	195
	M	151.2 \pm 14.9	119	172
WW (g)	All	83.7 \pm 28.8	31.4	161.7
	F	91.9 \pm 31.1	31.4	161.7
	M	73.2 \pm 21.7	34.0	112.4
TW (g)	All	26.6 \pm 10.5	11.1	53.6
	F	31.6 \pm 11.1	11.9	53.6
	M	20.5 \pm 5.2	11.1	32.5

1994). The proportions of females with ovaries in stages 2-4 per 2-mm size class were fitted to a logistic equation of the form $P=1/(1+\exp(a-bTL))$ where P is the proportion of mature females in each length class and a and b are constants, and the CL at 50% maturity determined.

Results and Discussion

The easternmost point at which *P. sewelli* was previously recorded on the southeastern Arabian continental slope was off Ras Fartak in Yemen (15°35' N 52°12' E (Sanders, 1981). The exploratory trawls in Oman encountered the species up to 16°42' N 54°00'

E, thus extending its known range by approximately 200 km northeastwards. The depth range covered in the exploratory trawls off Oman (230–787 m) was similar to the 200–600 m range where *P. sewelli* was most often fished in Yemen (Sanders, 1981). Bottom water temperatures in Oman were 12.6°C, 12.4°C and 13.6°C for the three trawls, and the trawlable area (i.e. soft substrate without significant reefs) was small, based on acoustic data collected during the survey using the vessel’s hull-mounted 38 kHz transducer. Additional data on bycatches and CTD information are stored on the survey database under Oma0701, for station numbers 318–321, and Oma0702, station numbers 379 and 380.

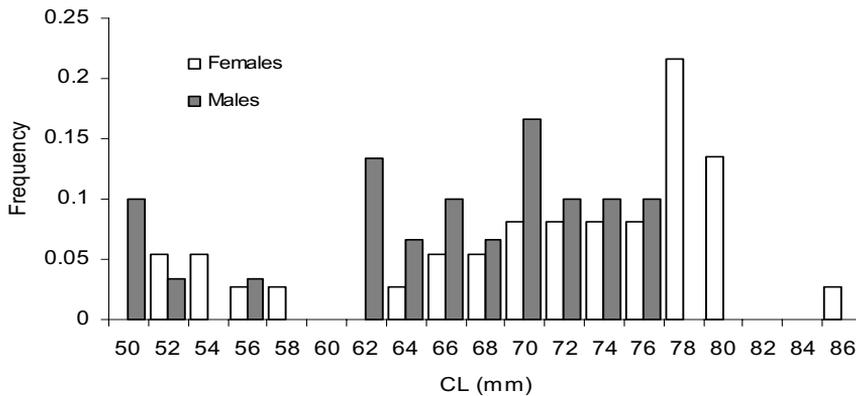


Figure 2. Size frequency distribution (CL, mm) of male and female *P. sewelli* caught in Oman in 2007.

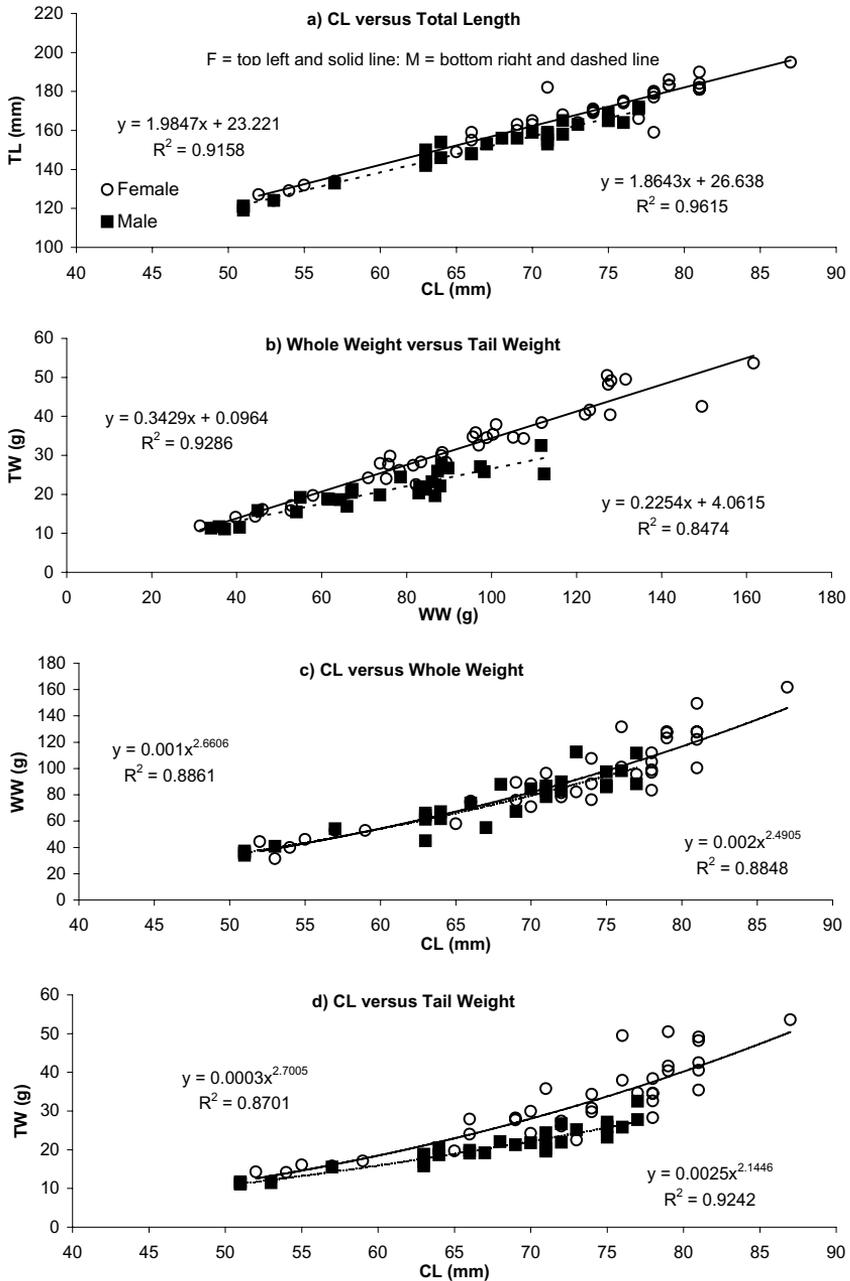


Figure 3. Regressions of (a) CL versus TL, (b) WW versus TW, (c) CL versus WW, and (d) CL versus TW of 37 female and 30 male *P. sewelli*. The equations and R^2 are shown.

A total of 67 lobsters, 37 females and 30 males (a ratio of 1:0.81) (6.4 kg), were collected from the trawl made on 8th December. The size of specimens ranged from 51 – 87 mm CL (119–195 mm TL), with an average of 69.7 ± 8.8 (S.D.) mm CL (159.6 ± 18.7 mm TL) (Table 2). The average CL of females (71.9 ± 9.0 mm) was larger than that of males (66.8 ± 7.8 mm), and 38% of females were larger than the maximum size of 77 mm CL measured for males (Fig. 2). This result is consistent with that of Sanders (1981) from Yemen, where females grew to a “considerably larger length than males”. The largest length class from Somalia was 215 mm TL (Johnsen, 1986) and in Yemen the largest individual measured was 205 mm TL (Sanders, 1981).

The size frequency distribution suggests two modes, at 54 mm and 72 mm CL respectively (Fig. 2), very similar to modes at 52.8 mm and 72.4 mm CL reported by Sanders (1981) for a sample taken in December 1972 (the same month as in the present study) in Yemen. The latter author suggested that the smaller lobsters (recruits) moved into the fishery in autumn, and that the larger lobsters (post-recruits) consist of cohorts recruited in the spring of the same year, and earlier.

The linear regressions of CL versus TL for males and females respectively fitted the data well, with high coefficients of variation ($r^2 > 0.91$; Fig. 3a). For sexes combined, the equation was $TL = 2.0238 \times CL + 18.352$ ($r^2 = 0.93$), and this equation was used above to convert data from Yemen (given in TL in Sanders, 1981) to CL for comparisons with the present data from Oman. The linear regressions of WW versus TW fitted the data well ($r^2 = 0.85$ for males and 0.93 for females; Fig. 3b), showing that the TW proportion of females increase faster than that of males as lobsters increase in WW. This is a common occurrence in many lobster species (Groeneveld, 1996).

Regressions of CL versus WW and CL versus TW are useful for raising the length composition of biological subsamples to reflect that of total catches in biomass calculations. The non-linear regressions of CL versus WW are shown for males ($r^2 = 0.89$) and females ($r^2 = 0.88$) in Fig. 3c. Similar regressions of CL versus TW are shown for males ($r^2 = 0.87$) and females ($r^2 = 0.92$) in Fig. 3d, and the latter regressions confirm that the TW of females becomes progressively heavier than that of males as CL increases.

Three females were soft-shelled (8%), indicating that they had recently moulted, but none of the males were soft. Based on the visual examination of 36

excised female gonads, 8.3% were immature (ave. CL = 53 mm), 13.8% were developing (75.6 mm), 55.5% were maturing (73.7 mm) and 22.2% were ripe (72.6 mm). Seven females (19%) carried external eggs, and this percentage was much lower than the 76.5%–92.3% found in December 1975 in Yemen (Sanders, 1981). Given that only a December sample existed from Oman, no further inferences could be made on reproductive seasonality.

The smallest egg-bearing female had a CL of 74 mm, and the L_{50} estimated from the logistic curve, based on gonad stages, was 54 mm. Sanders (1981) reported a smallest egg-bearing female of 57 mm CL. The lower value obtained from the Oman sample is based on a very small sample size in the smallest size classes, and is likely an underestimate.

The range extension shown for *P. sewelli* into the waters of Oman is perhaps not surprising, given that it inhabits the continental slope of the Arabian Sea off Yemen, and that a similar deeper-water environment extends northeastwards to Ras al Hadd. Possibly, its presence off southern Oman remained unknown because the steep and often rocky continental slope between the Yemen/Oman border and Mirbat is not exploited by trawlers. The potential commercial value of *P. sewelli* off Oman should be further investigated through experimental fishing.

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