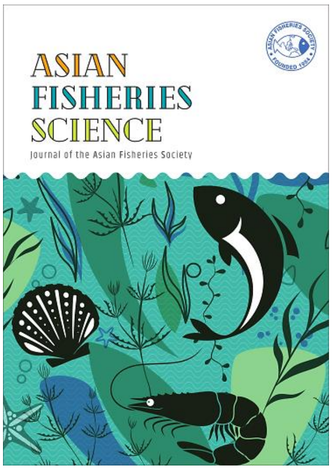

Deep-Water Japanese Blunthorn Lobster *Palinustus waguensis* Kubo, 1963: First Estimates of Life History Parameters From the Southwest Coast of India

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Abstract

Palinustus waguensis Kubo, 1963, is the deep-sea Japanese blunthorn lobster belonging to the Family Palinuridae. It is a species that has been rarely reported, living in rocky habitats on deep-reef slopes at a depth of 100–250 m. An estimated catch of 100 kg of *P. waguensis* consisting of 113 males, 54 females, and 23 berried lobsters were collected during the first fortnight of January 2019 from the multi-day shrimp trawls operating off Sakthikulangara, Kerala, India. The mean total length was recorded as 112.3 mm in males, 102.6 mm in females. The parameters of the length-weight relationship were estimated as, a = 0.041, b = 2.84 for males and a = 0.05, b = 2.86 for females, which were not significantly different ($P > 0.05$, $r^2 > 0.90$) between the males and females. The relative condition factor (K) in the males and females of *P. waguensis* ranged from 2.07–4.96 and 1.87–3.86, respectively, attributing to the better feeding efficiency in males. Food and feeding analysis revealed the dietary content as fish (53 %), crab (23.5 %), shrimp (7.8 %), digested matter (11.6 %), and foraminifera (4 %). Feeding intensity analysis about the fullness of the stomach showed the specimens bearing full stomachs (11.3 %), three-fourth full (9.9 %). Length at 50 % maturity (Lm_{50}) was 96.9 mm. Gonado-somatic index (GSI) ranged from 3.39 to 8.13. The present study forms the first report on the biology of the deep-water Japanese blunthorn lobster, *P. waguensis* from India.

Keywords: length weight relationship, berried, gut contents, fecundity

Introduction

Palinustus waguensis Kubo, 1963 is a species of deep-sea lobster commonly known as blunthorn lobster, which belongs to the Family Palinuridae, a group of spiny lobsters. It is found in the rocky habitats and reef slopes at 100–200 m depths with edible and ornamental value (Chan and Yu, 1995). The deep-sea Japanese blunthorn lobster has a wide distribution in the Indo-West Pacific region and was recorded from Japan, Taiwan, and the Indian waters. The specimens obtained in the present study agree well with the description given by Holthuis (1991) for *P. waguensis* and the description by Chan and Yu (1995). Earlier reports on *P. waguensis* from Indian waters included the taxonomic description of the species from Kasimedu, Chennai, and Cuddalore (Pillai and Thirumulu, 2006; Kizhakudanet al., 2012) and its molecular characterisation was reported from the Kerala coast (Chakraborty et al., 2016). Notably, there was only one report on the length-weight relationship (LWR) of *P. waguensis* (Kizhakudan and Thirumulu, 2006) from the southeast coast of India. Sekiguchi and Okubo (1986) studied 15 specimens from the Kii Peninsula. But a slightly larger number comprising 42 specimens obtained from the large trawls operated at a depth range of 300-450 m off Pondicherry to Nagapattinam was reported by Kizhakudan and Thirumulu (2006), highlighting the results of LWR in *P. waguensis*.

For the adequate management of any resource, studies on LWR and condition factor (K) are vital tools (King, 2007; Ndomeet al., 2012). The importance of the length-weight relationship is apparent in estimating the average weight at a given length group (Beyer, 1987), and in assessing the relative well-being of a fish population (Bolger and Connoly, 1989), as well as for comparisons between the regions about their histories of a specific species (Wootton, 1990). In general, food and feeding studies provide information on the food preferences of a particular species and the knowledge gained from it can be further extrapolated to improve the harvest from aquaculture systems in captivity. Studies on the size at first sexual maturity (Lm_{50}) can be used to fix the minimum legal size (MLS) for the capture for any species (Mohamed et al., 2014), and the information on the condition factor of a species can indicate its reproductive potential.

Although detailed studies have been carried out in inshore lobsters (Phillips, 2006; Thangarajan and Radhakrishnan, 2017), no information is available on the biological aspects of *P. waguensis* because of its rare capture (Chakraborty et al., 2016). Therefore, the present study forms the first report on the biology of a Japanese blunthorn lobster, *P. waguensis* describing the LWR, condition factor, food and feeding, maturity and fecundity from the Sakthikulangara fisheries harbour along the southwest coast of India.

Materials and Methods

Sampling

An unusual landing of 100 kg of *P. waguensis* consisting of 113 males, 54 females, and 23 berried lobsters were collected on 15 January 2019 from the multi-day shrimp trawls (cod-end mesh size of 24–30 mm) operating at Sakthikulangara (9°24′N 75°38′E) off Kollam, Kerala coast, India. In general, *P. waguensis* was landed sparsely in the commercial deep-sea shrimp trawls, but this study reports the bulk landings of this rarely captured lobster species.

The specimens were identified based on the distinguishing characteristics provided by Holthuis (1991) for *P. waguensis*. The specimens were sorted (Fig. 1A), sex was distinguished by the presence of gonopores on coxopodite at the base of the third pair of pereiopods in females (Fig. 1B), while in the fifth pair in males (Fig. 1C) (Meglitsch, 1967). The total length (TL), carapace length (CL), and carapace width (CW) of the specimens were measured using digital callipers to the nearest 0.1 mm. Total length was measured as the distance between the notch on carapace to posterior margin of telson. Likewise, CL was calculated as the distance between the notch and posterior margin of carapace, and CW was measured as maximum distance on the carapace. Wet body weight (BW) was measured (0.1 g accuracy) using a weighing balance (ME203E, Mettler Toledo, Switzerland).

Length-weight relationship analysis

The relationships between the total length and weight (TLR), carapace length and weight (CLR), and carapace width and weight (CWR) were estimated separately for the male, female, and berried lobsters. The total length and weight, CLR, and CWR were estimated separately, based on the allometric growth equation (Bagenal, 1978) as follows:

$W = aL^b$, where W is the weight (g), L is the length (CL/TL/CW) in mm, and a and b are the constants.

The confidence interval of 95 % was estimated for the "b" value, and Student's t-test determines the growth as isometric (H0: b = 3) or allometric (H0: b >/<3) in *P. waguensis* at a significance level of $P < 0.05$ (Zar, 1996).

Sex ratio

The sex ratio was statistically tested through Chi-square analysis (Snedecor and Cochran, 1967) for variances from the hypothetical ratio of 1:1.

Maturity stages

The size at functional or physical maturity was assessed from the frequency distribution of males (Fig. 1D) and females (Fig. 1E) for specialised structures, which ensure the mating and propagative capabilities of the animals, namely, decalcified windows on the ventral side, well developed setal brush on the dactylii of the fifth pair of walking legs and ovigerous condition in females and penile process in males. The male reproductive system located in the cephalo-thoracic region consists of paired testis and vas deferens. Each vas deferens extends from the mid-region of the testis to the gonopore, located at the base of the fifth walking leg. The two distinct regions of the vas deferens - the proximal region is highly coiled while the distal is thick, opaque and opens out to the gonopore. The male gonopore was visible in juveniles in the form of a tiny inconspicuous spot on the coxa of the fifth pair of pereiopods ventrally.

The gonopore had developed into a penile process with a hairy tip in older males. As described by Rachel (2002), the females were classified into five stages based on the development of setal brush:small setae (SS, immature-stage I), medium setae (MS, primary vitellogenic-stage II), large setae (LS, secondary vitellogenic-stage III) as seen in Figure 1F, berried (B-eggs on the pleopods-stage IV), and spent (flaccid ovary, shedded eggs – stage V).

Based on the colour of the berry, the stages were further classified into berried orange (BBO) in Figure 1G; and berried black (BB) in Figure 1H with eggs bearing an eyespot with a wide sternum (Fig. 1I) whereas some specimens recorded hatched eggs, showing phyllosoma larvae (Fig. 1J). The males were categorised into two types, namely immature and mature with the development of the penile process (Fig. 1K).

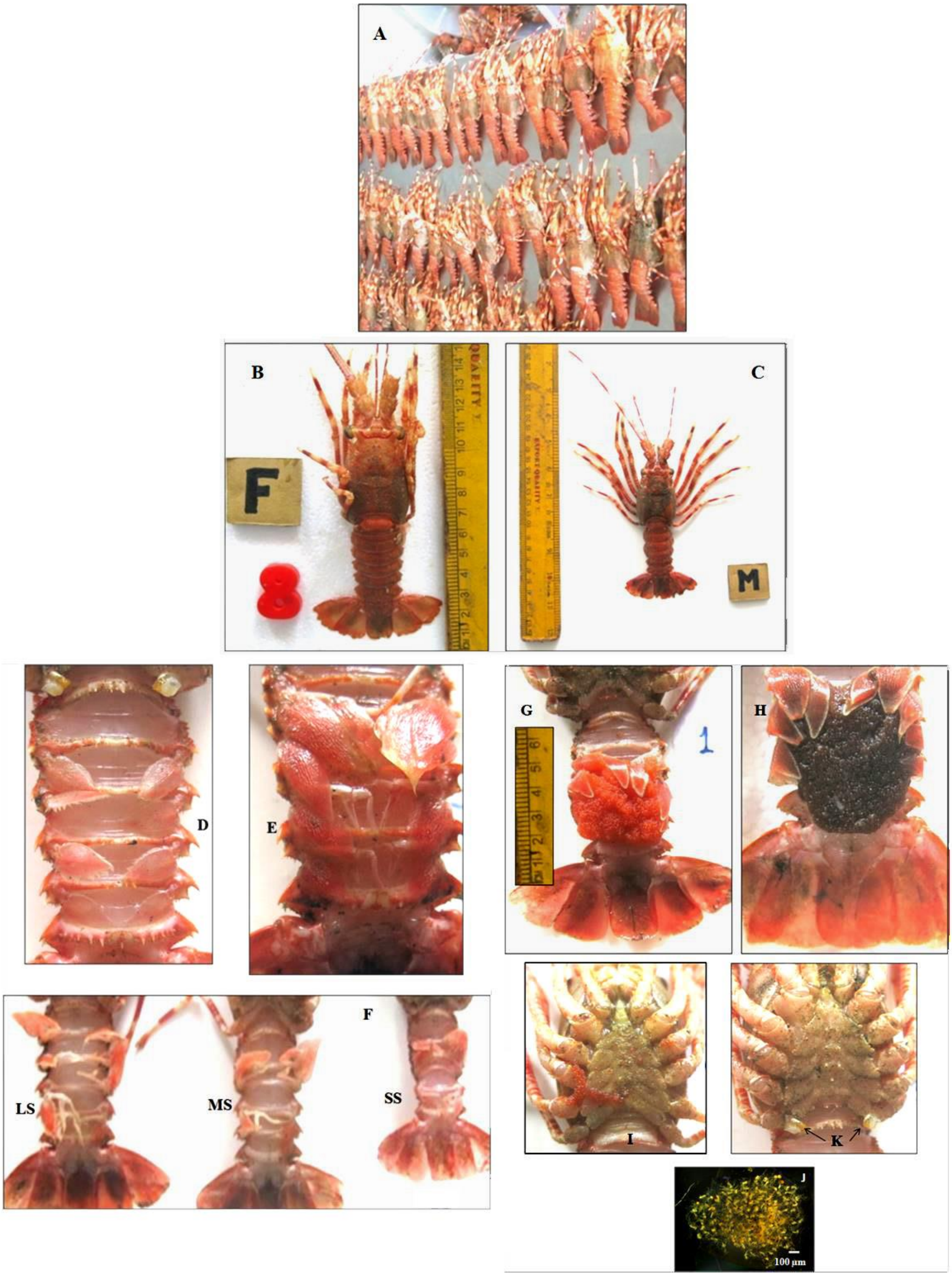

Fig. 1. A: *Palinustus waguensis* sorted in laboratory; B: Male; C: Female. D: Male with uniramous pleopods; E: Female with biramous pleopods; F: Female specimens with large (LS), medium (MS) and small setae (SS) on pleopods. G: Berried female with orange coloured eggs; H: Berried female with black coloured eggs; I: Female sternum; J: Egg hatchlings; K: Penile process in male sternum.

Size at maturity

The size at which 50 % of females are physically able to mate, spawn and carry eggs (functional maturity) was estimated by plotting total length (TL) against the proportion of females with ovigerous setae. The usual practice of estimating size at maturity is to regress per cent mature against TL and to fit a logistic curve to predict the size class in which 50 % of the population is mature (King, 1995). The size at first maturity (Lm_{50}) was determined by plotting the percentage of mature specimens against the TL by using the logistic function as follows:

$$P = 1/(1+\exp[-r(L - Lm)])$$

where P is the proportion of mature females, r represents the slope of the curve, Lm denotes mean length at maturity, and L indicates the total length class.

Food and feeding

The stomachs of the investigated specimens were carefully removed and food contents were studied in detail to understand the food and feeding habits of *P. waguensis*. Stomach fullness was visually classified into five categories, namely full, three-fourth, half, one-fourth, trace, and empty, based on the distension of the stomach, which was attributable to the presence or absence of food. The average feeding intensity was evaluated by the percentage of occurrence of food items (Hynes, 1950).

Condition factor

The relative condition factor (K) was estimated for the males, females, and berried females. Fulton's condition factor was assessed using the following formula: $K = W \times 100\ L^{-3}$ (Fulton, 1902), where K is the condition factor, W denotes weight (g), and L signifies the total length (mm).

Sexual maturity was visually observed and recorded in female lobsters for the presence of i) Eggs on the pleopods: berried females, ii) fresh or remnants of spermatophore mass: When male lobsters mate with females, a white patch (sperm packet) will be deposited on the sternum of female, iii) posterior "window" on sternal plate: Female lobsters can be considered sexually mature when they have attained physiological (gonadal) maturity, i.e. physically capable of mating, oviposition and brooding eggs (functional maturity), for which they develop certain specialised morphological features such as well - developed pleopodal (ovigerous) setae, cement glands and decalcified zones ('window') on the sternal plates. The texture, colour, and weight of the ovary to the nearest 0.01 g were noted, and the GSI of the lobsters was calculated as follows: GSI = WG/W × 100, where WG is the gonad weight and W denotes the total weight of the lobster.

Estimation of fecundity

For estimating fecundity, eggs attached to the pleopods of the female specimens (n = 23; TL: 86–122 mm; CL: 31–42 mm) were carefully separated, and the wet weight of the berry was recorded. A sub-sample (1 g) of the berry was pre-weighed, and the number of eggs present in the sub-sample was counted to determine the absolute fecundity. Relative fecundity was calculated as the number of eggs attached to the abdomen in a female divided by the total weight of the female lobster (Groeneveld et al., 2005). The relationship between fecundity and carapace length was calculated using the formula: fecundity (F) = log Y (fecundity) = a + b log × (total length/carapace length).

Results

Length-weight relationship and sex ratio

Total length, carapace length, and carapace width ranges in males, females, berried females, and their respective mean values along with their standard deviations (SD) are shown in Table 1. The results of the length-weight relationships for TL-weight, CL-weight, and CW-weight revealed negative allometry in the growth pattern of males, females, and berried females. Significant ($P < 0.05$) "b" values of <3 in all samples with coefficient of regression (r^2) of >0.8 attributed to higher correlation between respective length and weight variables (Table 1).

Length frequency analysis demonstrated the dominance of males, exhibiting a modal length of 125 mm for total length in males and 100–105 mm in females (Fig. 2A), whereas the modal length could coincide at 40 mm in either sex for CL (Fig. 2B). According to Chi-square analysis, males significantly (5 %) dominated and outnumbered the females in the catch with an overall sex ratio of 1:0.68.

Size at maturity (Lm_{50})

A total of 77 female specimens collected during the period were examined to assess the size at first maturity. Gonadal development and sexual maturity commenced from a TL of 86 mm. The size of the smallest berried female was 86 mm for TL (CL: 32 mm), and the estimated size at first maturity for *P. waguensis* was 96 mm for TL (CL: 27 mm) (Fig. 3A).

The TL of the berried female with an orange red berry was >86 mm, while that of the female with a berried black egg was >100 mm. The percentage of females with an orange-coloured berry (BBO, 33.7 %) was higher than that of those with berried black eggs (BB, 2.6 %) (Fig. 3B).

Fecundity and gonadosomatic index

Absolute fecundity ranged from 10088 to 65138 (mean ± SD; 20635 ± 12503) ova, while relative fecundity varied from 425 to 876 (mean: 540) ova.g^{-1} body weight. The smallest berried female had a total length of 86 mm (CL: 32 mm; wt: 23.7 g), while the largest specimen with a black berry (4.355 g) had a

Table 1. Descriptive statistics and length-weight relationship (LWR) of *Palinustus waguensis* collected from the Sakthikulangara (9°24′N 75°38′E) of the southwest coast of India.

		Total length (mm)		Weight (g)							
Sex	Sample size	Min	Max	Min	Max	a	95 % of TL a	TL mean ± SD	b	95 % of TL b	r^2
M	113	81	154	15.3	75.7	0.04	3.627 - 2.783	112.3 ± 25.2	2.84	2.670 - 3.020	0.903
F	54	86	131	20.0	67.3	0.05	3.518 - 2.500	102.6 ± 22.6	2.86	2.607 - 3.045	0.900
B	23	86	122	23.7	64.6	0.04	4.804 - 1.631	103.5 ± 18.1	2.93	2.246 - 3.605	0.801
P	190	81	154	15.3	75.7	0.22	2.132 - 0.946	106.2 ± 21.9	2.17	1.922 - 2.421	0.601

		Carapace length (mm)		Weight (g)							
Sex	Sample size	Min	Max	Min	Max	a	95 % of TL a	CL mean ± SD	b	95 % of TL b	r^2
M	113	28	62	15.3	75.7	2.25	0.502 - 1.122	38.8 ± 17.1	2.114	1.885 - 2.343	0.750
F	54	30	46	20.0	67.3	1.43	0.056 - 0.656	36.2 ± 11.5	2.488	2.256 - 2.720	0.860
B	23	31	42	23.7	64.6	1.54	2.700 - 2.211	36.3 ± 5.20	2.454	0.343 - 1.202	0.800
P	190	28	62	15.3	75.7	1.43	0.164 - 0.551	39.2 ± 11.2	2.476	2.329 - 2.624	0.850

		Carapace width (mm)		Weight (g)							
Sex	Sample size	Min	Max	Min	Max	a	95% of TL a	CW mean ± SD	b	95 % of TL b	r^2
M	113	22	42	15.3	75.7	2.89	3.627 - 2.783	31.8 ± 10.2	2.84	2.670 - 3.020	0.903
F	54	25	37	20.0	67.3	3.39	2.940 - 4.014	29.7 ± 5.60	0.06	0.447 - 0.550	0.010
B	23	25	32	23.7	64.6	3.94	0.908 - 1.885	29.1 ± 5.10	2.09	1.652 - 2.530	0.850
P	190	22	42	15.3	75.7	5.61	1.490 - 1.980	30.2 ± 6.90	1.61	1.898 - 1.458	0.550

M: Male; F: Female; B: Berried; P: Pooled.

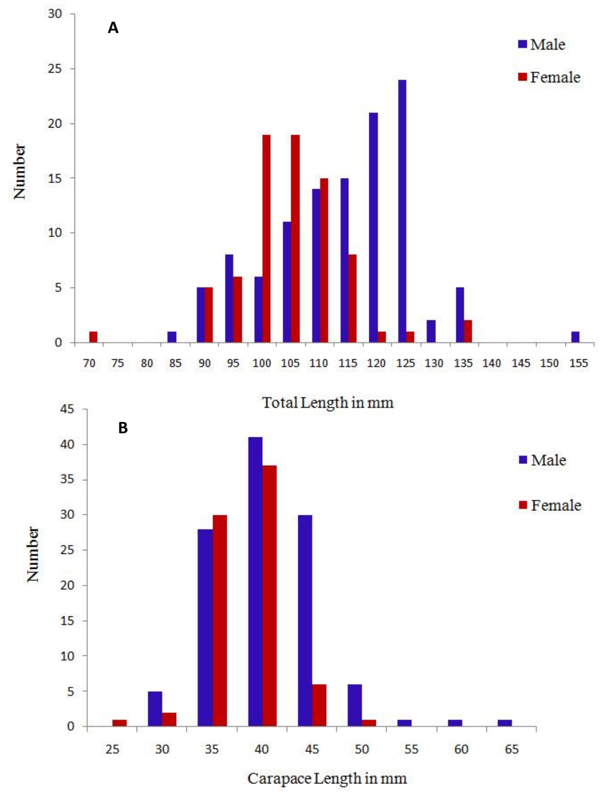

Fig. 2. A: Length frequency in male and female of *Palinustus waguensis* using total length; B: Length frequency in male and female using carapace length.

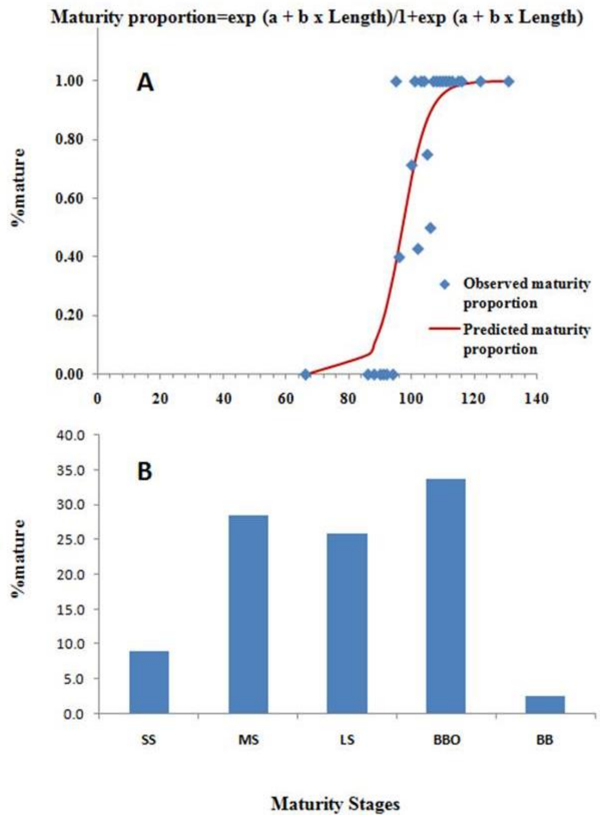

Fig. 3. A: Size at first maturity in female using total length; B: Percentage of mature females in relation to the size of the setae. (SS: Small setae; MS: Medium setae; LS: Large setae; BBO: Berried orange; BB: Berried black).

bodyweight of approximately 64.6 g (TL: 122 mm; CL: 42 mm). The size of the ova varied from 0.9 to 1.2 mm in diameter, and GSI ranged from 3.39 to 8.13. Fecundity increased proportionately with an increase in the length of the specimen (TL/CL), although some irregularities were apparent in higher size ranges.

Food and feeding

Feeding habits indicated that *P. waguensis* forage mainly on fin-fishes, crustaceans, and foraminiferans. Feeding intensity showed specimens with full stomachs (11.3 %), and three-fourth full (9.9 %), half-full (11.2 %), one-fourth full (14.2 %), trace (30.5 %), and empty (22.9 %) (Fig. 4A) guts. Fish remains formed the dominant prey item, contributing to 53 % of the diet consumed by females, while crustacean remains (78.4 %) were dominant in males (Fig. 4B).

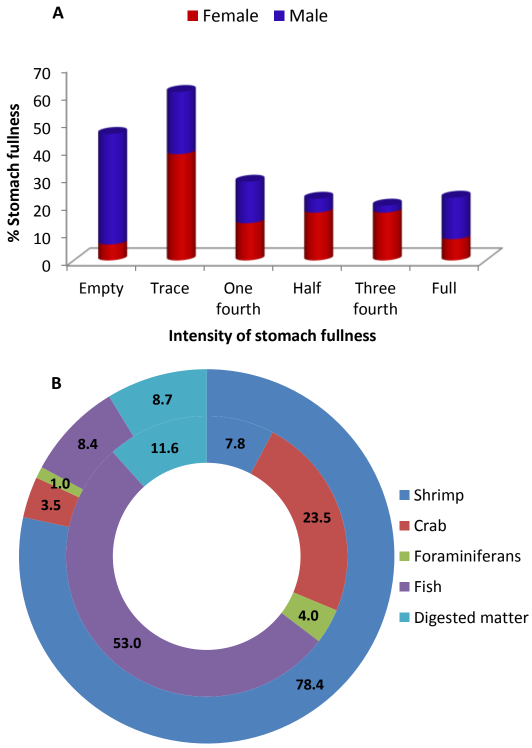

Fig. 4. Stomach fullness in males and females of *Palinustus waguensis* showing percentage of food items; A: Male: inner circle; B: Female: outer circle.

Fish remains were mainly found to constitute bones, scales, and fisheye lens (Figs. 5A, B). Crustacean remains were dominated by shrimp flesh, antennae, pincers, crab, and chelate leg pieces (Figs. 5C, D, E, F). Digested matter and foraminiferans (Figs. 5G, H) were the dominant food item/remnants in the samples.

Condition factor

Results of Fulton's condition factor (K) were analysed for the males, females, and ovigerous females of *P.*

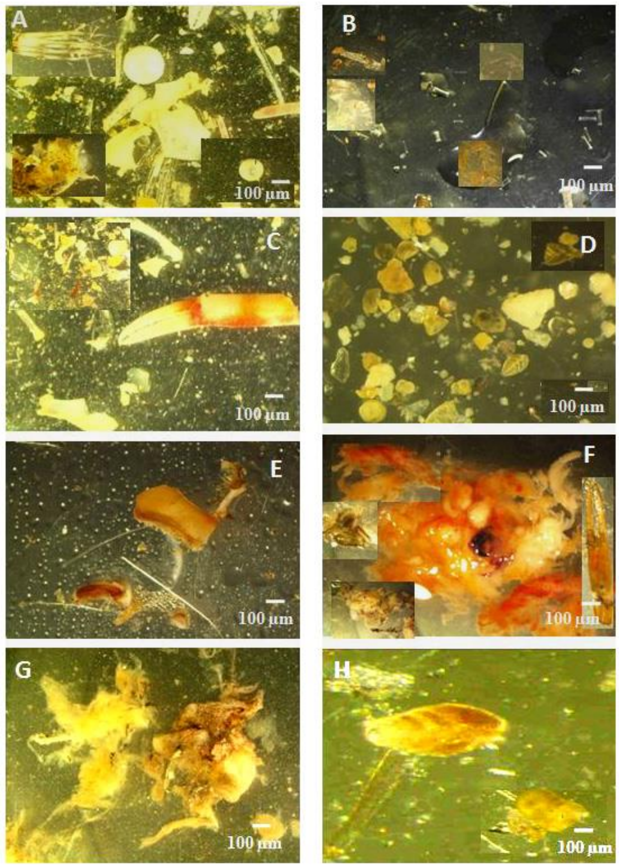

Fig. 5. Female: A: Fish remains: bone, eye lens, scales, fin rays, flesh; B: Fish remains; C: Crab remains; D: Foraminiferans and sand particles; Male: E: Crab remains; F: Shrimp remains; G: Fish remains; H: Foraminiferans.

waguensis and revealed that the lobsters exhibited a condition factor value of >2.0. The K value ranges in males, females, and berried females were 2.07–4.96 (mean ± SD; 3.29 ± 0.41), 1.87–3.86 (2.81 ± 0.32), and 2.54–3.55 (2.87 ± 0.22), respectively. The highest "K" values were recorded in males, followed by females and berried lobsters. The K analysis recognised lesser variation from the mean in the case of berried females, followed by females and males.

Discussion

The present study is the first contribution to the biology of a seldom captured deep-water lobster, *P. waguensis*. This study investigated 113 male and 77 female lobsters caught from the trawls operated off Kollam, Sakthikulangara, along the southwest coast of India. The study complements previous works on taxonomic records from the waters off Honshu Island, Japan (Kubo, 1963) and India (Pillai and Thirumilu, 2006; Kizhakudan et al., 2012; Purushottama and Saravanan, 2014; Chakraborty et al., 2016).

In the present study, the total length of the lobsters ranged from 81 to 154 mm, which was greater than the earlier observations from the same region (Chakraborty et al., 2016), and marginally higher than that reported from other regions along the Indian coast (Purushottama and Saravanan, 2014; Pillai and

Thirumilu, 2006) and Oman waters (Al-Kharusi et al., 2019). The male specimens were bigger than the female specimens, and this difference in size was considered a general characteristic of spiny lobsters (Morgan, 1980; Fourzan and Alvarez, 2003). This difference could be explained because ovarian maturation and breeding could suppress growth and prolong the intermoult period, especially in repetitive breeding species that do not necessarily moult between the broods (Quackenbush, 1994).

The values of the exponent "b" could provide information on the growth of aquatic animals. Notably, where b was equated to 3, an increase in weight was assumed to be isometric, whereas if b is other than 3, an increase in weight was termed as allometric (positive if $b > 3$, negative if $b < 3$). These parameters (a, b) are essential in stock assessment studies (Can et al., 2002; Moutopoulos and Stergiou, 2002). In the current study, representing LWR using TL, CL, and CW resulted in "b" values of <3, which ascertained that the growth was negatively allometric in *P. waguensis*. The present study results are contradictory to those of the reports of Kizhakudan and Thirumulu (2006) on *P. waguensis* and those of the reports on other deep-sea spiny lobsters (Nahdi et al., 2008). The variation of "b" values was determined primarily by the shape and fatness of the species. Different factors, *viz.*, seasons, sex, time of the year, and stages of maturity, were also proven to be responsible for the variation in the length-weight relationship parameters.

In the present study, the sex ratio was in favour of males, which agrees with the reports of Kizhakudan and Thirumulu (2006). These results could recognise the differential growth rate and mortality (Siegel et al., 2008; Tiews, 1954), particularly natural mortality between males and females, thus potentially contributing to the unequal sex ratio (Wenner, 1972). Three basic indicators of maturity that can be assessed by one or more criteria: (i) morphological maturity, detected by development of external body parts representing secondary sexual characters; (ii) physiological maturity, reflected in the development of gonads and accessory glands; and (iii) functional maturity, revealed by internal or external features of behaviour indicating past or current breeding activity (McQuinn, 1989).

The functional maturity has been estimated by several methods, including the presence of fresh or remains of spermatophore on female sternum and eggs on pleopods. The development of decalcified 'windows' on the female sternum (George, 2005) has also been used to estimate the size at sexual maturity in the lobster genus *Panulirus* (Lindberg, 1955; Vega-Velazquez, 2003). The size at physiological maturity is estimated from the percentage of females with maturing, mature and spent-recovery ovary, based on macroscopic examination of structure, weight and colour of the ovary. In the present study, the size at first maturity (Lm_{50}) was calculated as 96 mm of TL in *P. waguensis*, derived by a functional relationship between the estimated proportion of mature specimens and length of the species.

Though no information on the Lm_{50} value is available on any species in this genus, few studies have been done on the other deep-sea lobsters *viz.*, *Puerulus sewelli* Ramadan, 1938 (Kathirvel et al., 1989) from India, *Metanephrops binghami* (Boone, 1927) from the Colombian Caribbean (Cusba et al., 2017). The size at sexual maturity might be affected by several biotic and abiotic environmental variables, such as temperature (Chittleborough, 1975), food availability (Kanciruk, 1980), shelter (Polovina, 1989), population density (DeMartini et al., 2003), and age (Fielder, 1964).

The present study recognises that the deep-sea lobster *P. waguensis* feeds on a diversified diet available in the Arabian Sea. This diverse diet consists mostly of benthic community creatures of two categories: a) endobenthic invertebrates, which could be found partially or fully buried in the soil (foraminifera), and b) epibenthic invertebrates, which reside on the surface of the substratum (decapods and fish).

In the present study, fish formed the dominant prey for male lobsters, while crustaceans were the dominant prey for female lobsters along with foraminiferans. These findings were consistent with those of Fourzan et al. (2003), who reported that Palinurid lobsters feed on crustaceans, gastropods, and fish remains, whereas Kizhakudan et al. (2012) reported that *P. waguensis* feed specifically on wedge clam. The presence of foraminifera in the diet of blunthorn lobsters signifies their deep-water habitat as that of deep-sea shrimps. In general, foraminiferans are reported to be the major component of the diet (Cartes and Abello, 1992) of deep-sea lobsters *Polychelis typhlops* Heller, 1862 and *Linuparus trigonus* (von Siebold, 1824) (Wassenberg and Hill, 1989). In recent years, foraminiferans have been reported to be the dominant members of benthic communities in both shallow and deep-sea environments (Moodley et al., 1998), thus indicating their important role in the carbon cycle (Linke et al., 1995).

The K values obtained for *P. waguensis* ranged from 1.87 to 4.96, demonstrating that the lobsters were healthy (Bennet, 1971). Condition factor (K) explains the interaction between biotic and abiotic factors in the physiological state of the reproductive cycle of the organism (Narejo et al., 2002). It could help observe the feeding rhythms, physiochemical factors of the environment, age, and physiological state of fish (Dar et al., 2012).

Studies involving population dynamics of shellfish have reported that favourable environmental conditions have greater K values, whereas unfavourable conditions have lower K values (Blackwell et al., 2000). The males showed higher feeding intensities than the females due to increased growth rates, a general characteristic of spiny lobsters (Morgan, 1980). Berried females showed comparatively lower feeding intensities, which could be attributed to the inability of ovigerous decapods to moult until the eggs are hatched and led to a reduced stimulus for feeding (Hartnoll, 1985). Immature females, feeding intensity was higher, which could be explained by the highest metabolic demand at the beginning of oogenesis (Maynou and Cartes, 1998; Kapiriset al., 2010).

Fecundity is generally defined as the egg-laying capacity of a fish. Relative fecundity is the number of eggs per gram of bodyweight of the specimen, and absolute fecundity is defined as the total number of eggs that are likely to be spawned in one season. Successful management of the lobster fishery, including aquaculture, predominantly relies on the accurate estimation of fecundity to understand the recovery ability of any aquatic species (Nikolskii, 1969; Tracey et al., 2007). Fecundity and its relationship with the size of the specimen could help in estimating the potential egg output (Chondar, 1977), the potential number of offspring in a season, and reproductive capacity of aquatic stocks (Qasim and Qayyum, 1963).

Conclusion

The length-weight relationship revealed an insignificant difference between the males and females. Feeding efficiency was better in males with fish, foraminifera, crab, shrimp as the major dietary contents. Biological research forms the basis for understanding the lifecycle of any species that has the potential to be a new resource. The present study could be considered as the first report on the biological aspects, such as length-weight relationship, sex ratio, length at first maturity, food and feeding, as well as fecundity, of the rare deep-sea blunthorn lobster *Palinustus waguensis* caught in the trawls operated off Kollam, Sakthikulangara along the southwest coast of India. The information on Lm_{50} could be extrapolated to ascertain the minimum legal size (MLS) for *P. waguensis.* It is important to note that the captured studied species or berried lobsters of lengths below the MLS could be released back to the sea. The information obtained in the present study would help comprehend the biology of this deep-sea species and its role in the ecosystem and adopt rational conservation measures.

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Conflict of interest: The authors declare that they have no conflict of interest.

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