

Small scale shrimp dragnets in Andhra Pradesh: Fishery performance and impact assessment

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Abstract

Small-scale shrimp dragnet (Royyala vala) fishery has emerged as a significant artisanal fishery targeting *Metapenaeus dobsoni* (Miers, 1878) in the nearshore waters of Andhra Pradesh. This study assessed dragnet operations across three coastal districts from June to August 2025 through structured fisher interviews, catch sampling, and biological studies to understand both fishery performance and ecological implications. Distinct regional patterns emerged, with Vizianagaram recording the highest catch per unit effort (CPUE, 0.08 t boat⁻¹ day⁻¹) during the south-west monsoon season, whereas year round operations of the Prakasam District yielded lower rates (0.04 t boat⁻¹ day⁻¹), indicating continuous exploitation pressure without seasonal recovery. Biological observations revealed growth parameters consistent with reported values for the species, including a growth exponent (b) of 2.9, indicating near isometric growth, and a mean condition factor (Fulton's K) of approximately 1.2. A substantial proportion of captured females were in advanced maturation or ripe stages at the time of capture, raising concerns that the sustained removal of pre-spawning individuals may affect future recruitment if the fishery is not managed. The bycatch of juvenile finfish and nontarget species, combined with benthic habitat disturbance from bottom-contact gear operations, may have adverse effects on the ecosystem. The declining CPUE trend from north to south, coupled with fisher reported declines in recent years, indicates emerging resource stress. Management interventions are needed, including mesh size regulations (minimum 16–18 mm codend mesh), seasonal closures aligned with spawning cycles, and spatial restrictions near nursery areas. Community based co-management is essential for compliance and long term viability. This first comprehensive assessment of the shrimp dragnet fishery of Andhra Pradesh revealed both its socioeconomic importance and the urgent need for balanced management to safeguard *M. dobsoni* resources as well as coastal ecosystems.

Introduction

Small-scale shrimp dragnets have recently emerged as an important fishing gear in the nearshore waters of Andhra Pradesh. Locally known as "Royyala vala" ('Royya' means shrimp in Telugu), these bag-like drag nets are operated by traditional fishers within two nautical miles of the shore, typically at depths of 5-9 m. The gear is analogous to the *Thallu madi* used by artisanal fishers in Palk Bay, Tamil Nadu. Fishing units consist of small wooden or fibre-reinforced plastic (FRP) boats (often 6-7 m, locally called "Theppa") fitted with

low-powered outboard or inboard engines (9-20 HP), reflecting the modest scale of this fishery. The gear is believed to have been introduced in the northern districts of Andhra Pradesh (Vizianagaram and Srikakulam) approximately a decade ago, likely adopted from the Palk Bay fishery of Tamil Nadu, and has since spread southwards into the Krishna and Prakasam districts. On the basis of fisher surveys, an estimated 30–60 active units operate across the study villages during the peak season, although exact fleet enumeration is not possible, as this gear category is not separately registered with the state

fisheries department. For many fishing households in the surveyed villages, dragnet operation during the monsoon season constitutes a primary or significant supplementary livelihood, particularly when offshore fishing is restricted by rough seas.

What started as a target fishery for larger penaeid species such as *Penaeus monodon* Fabricius, 1798 (tiger shrimp), and *Penaeus indicus* H. Milne Edwards, 1837 (Indian white shrimp) has now become a *Metapenaeus dobsoni* (Miers, 1878)-dominated fishery. The likely reasons for this shift are: *M. dobsoni* is more abundant in shallow nearshore zones (<10 m depth) during the south-west monsoon, coinciding with post-larval recruitment pulses, and intensified commercial trawling in deeper waters has reduced the nearshore availability of larger penaeid species. The approximate first-sale prices during the 2025 survey period were: *M. dobsoni* ₹150–250 kg⁻¹, *P. indicus* ₹300–500 kg⁻¹, and *P. monodon* ₹500–900 kg⁻¹ (fisher reported). The lower market value of *M. dobsoni* is offset by its small size.

M. dobsoni (flower tail or kadal shrimp) is commercially important and forms a significant part of coastal landings during certain seasons. As a short-lived, fast-growing species with high fecundity, *M. dobsoni* can sustain intensive exploitation to a certain extent (Chakraborty *et al.*, 2014). This species is a major component of penaeid shrimp landings, contributing to more than 50% of the catch in Kerala and supporting commercial fisheries throughout the Indian coast (George, 1963; Sukumaran *et al.*, 1993; Maheswarudu *et al.*, 2015). In Andhra Pradesh, marine penaeid shrimp landings are supported by 24 species, dominated by *Metapenaeus monoceros*, followed by *M. dobsoni*; together, they contribute to nearly half of the state's total marine penaeid shrimp landings (Maheswarudu *et al.*, 2015; Divipala *et al.*, 2019).

The rapid turnover and early maturity of *M. dobsoni*, while contributing to its resilience, could lead to sustainability issues if the fishery is not managed properly. Many dragnets use small mesh sizes (8–10 mm in cod-end), increasing the risk of indiscriminately capturing juvenile fish and shrimps. Similar small scale dragnets in other regions have been reported to predominantly retain juvenile shrimps; in Palk Bay, up to 90% of the shrimp caught by *Thallu madi* are juveniles (Rajkumar *et al.*, 2022). Furthermore, operating bottom contact gear in shallow coastal habitats may lead to high bycatch and damage benthic ecosystems (Behera *et al.*, 2021; Dineshbabu *et al.*, 2022a; Ghosh *et al.*, 2024). Studies from seagrass-rich Palk Bay have documented similar dragnets hauling significant quantities of seagrasses and other macrophytes along with target shrimps (Jeyabaskaran *et al.*, 2018; Rajkumar *et al.*, 2021; Thirumalaiselvan *et al.*, 2022a, b).

In the study area, other gear types that also target penaeid shrimp include stake nets (fixed bag nets), traditional shore seines, cast nets, and push nets (in estuarine areas). Commercial otter trawlers based on mechanised fishing also harvest penaeid shrimps in slightly deeper waters (>10 m). The small scale dragnet (*Royyala vala*) is distinctive in specifically targeting *M. dobsoni* in the nearshore zone (5–8 m), a niche not effectively covered by other gear operated by traditional fishers.

This study documents the *M. dobsoni* dragnet fishery in Andhra Pradesh, including gear characteristics, catch dynamics, seasonal

trends, and biological parameters of the target species, and compares these results with those of similar fisheries in India. These findings can inform the formulation of management measures to ensure the long term sustainability of this small scale fishery.

Materials and methods

Study area and fishery operations

Field observations and data collection were carried out from June–August 2025 in three coastal districts of Andhra Pradesh, where dragnet fishing is prevalent: Vizianagaram (north-eastern coast), Krishna (central coast), and Prakasam (south-central coast) (Fig. 1). Within these regions, the traditional fishing villages of Thippalavalasa and Chinthapalli (Vizianagaram), Yetipogaru, Pallipalem, Urigonditippa, and Chinna Gollapalem (Krishna) and Vadarevu (Prakasam) serve as major landing centers for the dragnet fishery. At each landing centre, three boats actively operating dragnets were identified, and their operators were interviewed via a structured questionnaire covering catch quantity, species composition, fishing season, boat and gear specifications, and fisher-reported trends. Total of 21 boat operator interviews were conducted across seven landing centres (three boats×seven centres). Gear specifications were physically measured wherever access was available.

Fishing is conducted from late spring through early winter in the north (monsoon and post-monsoon months) and nearly year round in the central-southern sector. Dragnets are operated from small motorised crafts (wooden or FRP boats, approximately 6–7 m LOA). Boats in the Vizianagaram District are powered by outboard motors (9–10 HP), whereas inboard engines (10–20 HP) are more common in the Krishna and Prakasam districts. Fishing trips are typically conducted in the morning (approximately 06:00–12:00 hrs), with boats operating in nearshore waters at depths of 5–8 m. When a productive shrimp patch is located over sandy-muddy grounds, information is shared among fishers, and multiple boats may operate in the same vicinity. CPUE is expressed as catch per active fishing day (*i.e.*, days on which the boat actually went to sea) and not per calendar day to account for weather related nonfishing days.

Gear description

The nearshore shrimp dragnet is essentially a scaled down otter trawl net customised for operation by small vessels. It consists of a conical net with wings, a body, and a codend, with a pair of wooden otter boards attached to spread the net horizontally during towing (Fig. 2). The net is locally fabricated from PP and HDPE webbing, whereas the miniature otter boards are procured separately, often from workshops in Visakhapatnam. Minor intersite variations were observed: in Vizianagaram, wings span approximately 5 m, and boats use outboard motors; in Krishna and Prakasam, wings extend up to 6 m, and inboard engines are used. The otter board dimensions and cod end mesh sizes were broadly consistent across all the sites.

Key gear specifications

Net dimensions: 9–10 m total length, comprising side wings (5–6 m each) and a tapering body ending in a cod end (5 m).

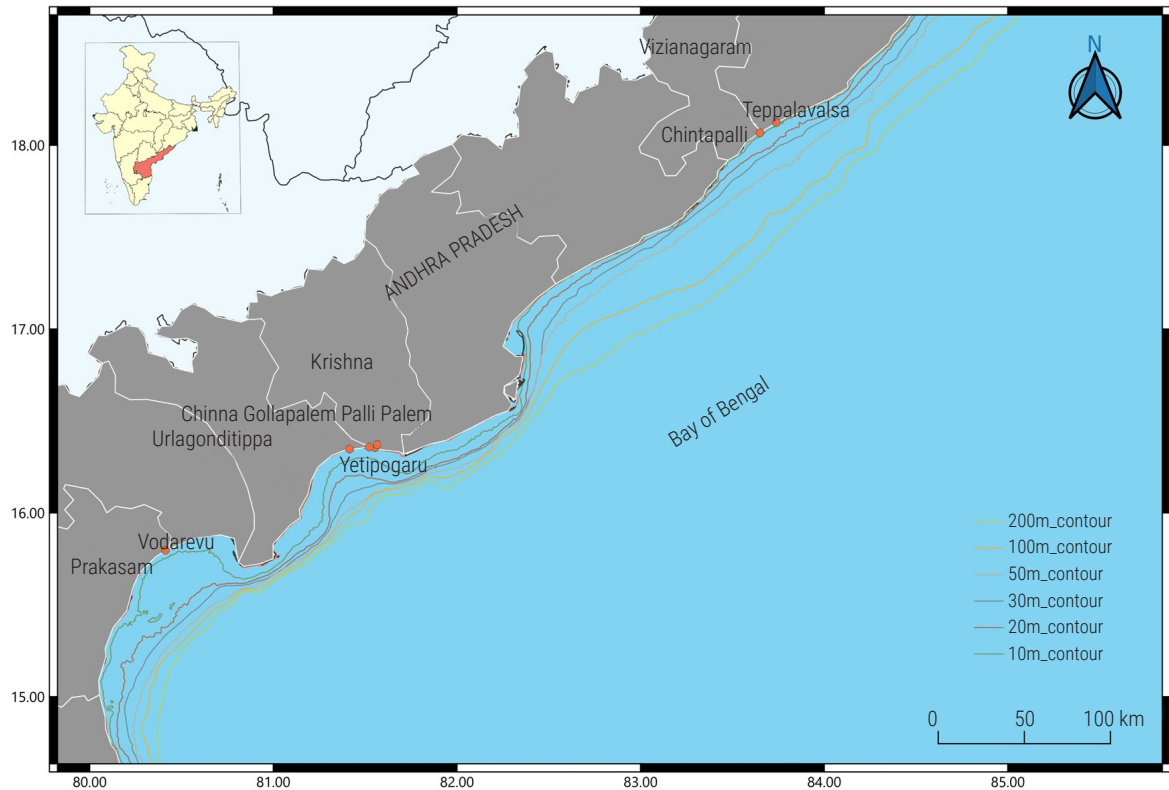


Fig. 1. Map of the study area showing the sampling sites in Andhra Pradesh

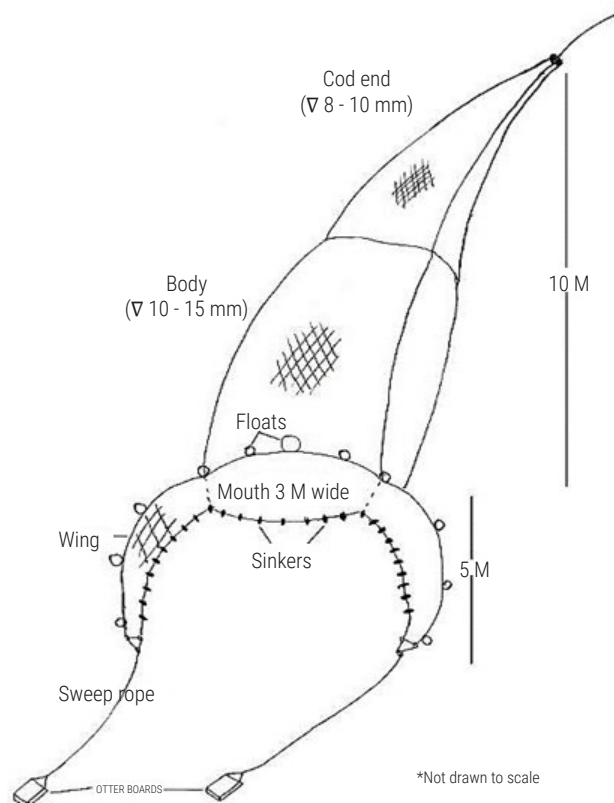


Fig. 2. Schematic (hand-drawn) diagram of a small-scale shrimp dragnet (Credit: Joe K. Kizhakudan)

Mesh size: Wings and square panel - 40–80 mm nylon netting; body - 10–12 mm high-density polyethylene (HDPE) mesh; cod end - 8–10 mm double-twine HDPE for strength.

Otter board: Two rectangular wooden boards (80 cm×45 cm×3.5 cm each) weighing approximately 20 kg each. Boards are attached via bridles (5 m sweep lines), and the net mouth is spread via hydrodynamic force.

Float and sinker arrangement: A float line with 8–10 small plastic floats on the headrope and a footrope weighted with 250–300 small lead sinkers maintained a vertical net opening of approximately 1.5–2 m during operation and ensured that the footrope contacted the seabed.

Net weight: approximately 10 kg (excluding the otter boards).

Data collection and analysis

Catch and effort data were collected through onsite inquiries with fishers. The CPUE was calculated as the average catch per boat per active fishing day ($t \text{ boat}^{-1} \text{ day}^{-1}$) for each district and each season. "Daily catch" represents the estimated total landings per day during the peak season in each district, derived from the total catch over the season divided by the number of active fishing days. The catch composition (proportions of target species and bycatch groups) was estimated from fisher reported data and onsite observations of landed catches. Although systematic quantitative bycatch weighing was not performed, the relative proportions by weight were estimated via interviews and landing observations, and these are presented as approximate percentages.

In addition to the catch data, biological sampling of *M. dobsoni* was conducted. Random subsamples of the shrimp catch were collected from each landing centre and examined for total length, body weight, sex, and maturity stage. The total length (rostrum tip to telson tip) was measured to the nearest 1 mm, and the body weight was measured to the nearest 0.1 g. Sex was determined by examining thelycum (females) or petasma (males). Females were classified into five maturity stages (Stage I: Immature, through Stage V: Ripe/spent) on the basis of gonadal development, following established protocols for penaeid shrimp (Dineshbabu *et al.*, 2023). Males were classified as immature or mature on the basis of the

development of their petasma. A total of 1,200 *M. dobsoni* samples were examined at all landing centres.

The data analysis involved descriptive statistics and interregional comparisons. The CPUE values were tabulated by district. The length–weight relationship was evaluated via least-squares regression on log-transformed data: $\log W = \log a + b \log L$. A one-sample t test was used to test whether b differed significantly from 3.0 (isometric growth). Fulton's condition factor ($K = W/L^3 \times 10^5$) was computed for each individual. Data management and descriptive statistics were performed using Microsoft Excel 2021, and regression analysis and significance testing were conducted using R (version 4.3.1; R Core Team, 2023). The significance level was set at $\alpha = 0.05$.

Results and discussion

Catch composition

The dragnet fishery primarily targets penaeid shrimp, with *M. dobsoni* being the most abundant species in the catch across all districts. Other recorded penaeid shrimp included *M. affinis*, *P. monodon*, and *P. indicus*, although these species occur at low proportions and show marked seasonal variability. In Vizianagaram, during the south-west monsoon, *M. dobsoni* accounted for approximately 85% of the total catch by weight, whereas finfish bycatch accounted for approximately 12–15%, and other shrimp (*M. affinis*, *P. monodon*, and *P. indicus*) accounted for the remaining 3–5%. In the Krishna and Prakasam districts, the dominance of *M. dobsoni* was slightly less pronounced, with finfish bycatch proportions reaching 18–22% during the post-monsoon months. Incidental captures of minor groups, including small Portunid and Xanthid crabs, caridean shrimps, small squids, cuttlefish, and bivalves, were also recorded but constituted <2% of the total catch by weight (Table 1).

The finfish bycatch was composed predominantly of small individuals, including anchovies (*Stolephorus* spp.), sardines (*Sardinella* spp.), juveniles of sciaenids (croakers), sillaginids (sand whittings), gerreids (silverbiddies), flatheads (*Platycephalus* spp.), tongue soles (*Cynoglossus* spp.), and ribbonfish (*Trichiurus* spp.). Most of this bycatch consists of low commercial value species or undersized individuals. Fishers typically retain a small fraction of high-value incidental catches (e.g., larger flatheads or crabs) and discard the rest at sea. The small mesh size (8–10 mm codend) is

Table 1. Approximate catch composition (% by weight) of small-scale shrimp dragnet landings by district and season in Andhra Pradesh (2025)

Catch Group/Species/Fishing season	Vizianagaram (Monsoon Jun – Oct)	Krishna (Postmonsoon Oct – Feb)	Prakasam (Year-round)
<i>M. dobsoni</i>	85	74	71
<i>M. affinis</i>	2	3	3
<i>P. monodon</i>	1	2	2
<i>P. indicus</i>	1	1	2
Small pelagics (anchovies <i>Stolephorus</i> spp., sardines <i>Sardinella</i> spp.)	5	8	9
Juvenile demersal fishes (sciaenids, sillaginids, gerreids, flatheads <i>Platycephalus</i> spp., tongue soles <i>Cynoglossus</i> spp., ribbonfish <i>Trichiurus</i> spp.)	5	10	11
Incidental catch (Portunid and Xanthid crabs, squids, cuttlefish, bivalves, empty bivalve shells, polychaete tubes, echinoderm fragments, and sediment clumps)	1	2	2
Total	100	100	100

Percentages are approximate and are based on fisher-reported catch estimates and landing centre observations from June to August 2025

the primary reason for the high finfish bycatch, as it does not allow the escape of small juvenile fishes.

The dominance of *M. dobsoni* and the low contribution of *M. monoceros* to dragnet catches warrants further investigation. *M. monoceros* is the leading commercial penaeid shrimp in Andhra Pradesh's overall landings, primarily from mechanised otter trawl fisheries operating in deeper waters (10-30 m). In the shallow nearshore zone (5-8 m) targeted by dragnets, *M. dobsoni* dominated due to its habitat preference and association with monsoon-driven coastal recruitment pulses. This habitat partitioning between the two species likely explains the disparity between dragnet catches and the broader state-level penaeid shrimp composition reported by Maheswarudu et al. (2015). The dominance of *M. dobsoni* in the dragnet fishery mirrors observations from commercial shrimp fisheries along the south-west coast of India (George et al., 1964), with contributions of 98.3 and 93.3% in purse seine catches at Mangalore and Malpe, respectively (Nair et al., 1982). The predominance of *M. dobsoni* during the monsoon season is likely linked to its life cycle dynamics and estuarine recruitment pulses coinciding with monsoon runoff. Earlier studies have shown that post-larval abundance serves as an index of fishing success in penaeid fisheries (George, 1963).

Catch rates (CPUE)

The catch and effort data revealed distinct regional differences in dragnet performance (Table 2, Fig. 3). The Vizianagaram

District recorded the highest mean CPUE at approximately $0.08 \pm 0.02 \text{ t boat}^{-1} \text{ day}^{-1}$, with values reaching $0.10 \text{ t boat}^{-1} \text{ day}^{-1}$ at the Chintapalli Landing Centre. The Krishna and Prakasam districts presented mean CPUE values of approximately $0.05 \pm 0.01 \text{ t boat}^{-1} \text{ day}^{-1}$ and $0.04 \pm 0.01 \text{ t boat}^{-1} \text{ day}^{-1}$, respectively. These estimates reflect the total landings of all species per craft per active fishing day. The intersite comparison uses catch per boat per day as a standardised measure; the difference in engine power between districts (9-10 HP in Vizianagaram vs. 10-20 HP in Krishna and Prakasam) is notable but is not expected to substantially affect CPUE since all crafts operate in similarly shallow, calm nearshore grounds at comparable towing speeds.

The higher CPUE in Vizianagaram suggests a localised abundance of *M. dobsoni*, possibly driven by favourable monsoon driven habitat conditions and stronger recruitment in the northern sector (Sukumaran et al., 1993; Lalitha Devi, 1988; Nandy et al., 2022). In contrast, the lower CPUEs in Krishna and Prakasam may indicate greater cumulative fishing pressure or a less favourable environmental regime for *M. dobsoni* during the sampling period. Despite continuous fishing over a longer season, Prakasam did not yield higher per-unit catches, implying either stock depletion or a more moderate resource base. Approximately 40–50 active dragnet boats have been reported to operate across the study area during the peak season, although not all boats operate every day; the actual fishing effort varies with the weather, market demand, and seasonal shrimp availability.

Table 2. Catch, effort, and CPUE of the shrimp dragnet fishery in three coastal districts of Andhra Pradesh

District	Fishing season (Active days)	No. of crafts	Daily average catch (t day ⁻¹)	Average CPUE (t boat ⁻¹ day ⁻¹)
Vizianagaram	Jun–Oct (~90 days)	50	~4.0	~0.08
Krishna	Oct–Feb (~150 days)	70	~3.5	~0.05
Prakasam	Year-round	70	~2.8	~0.04

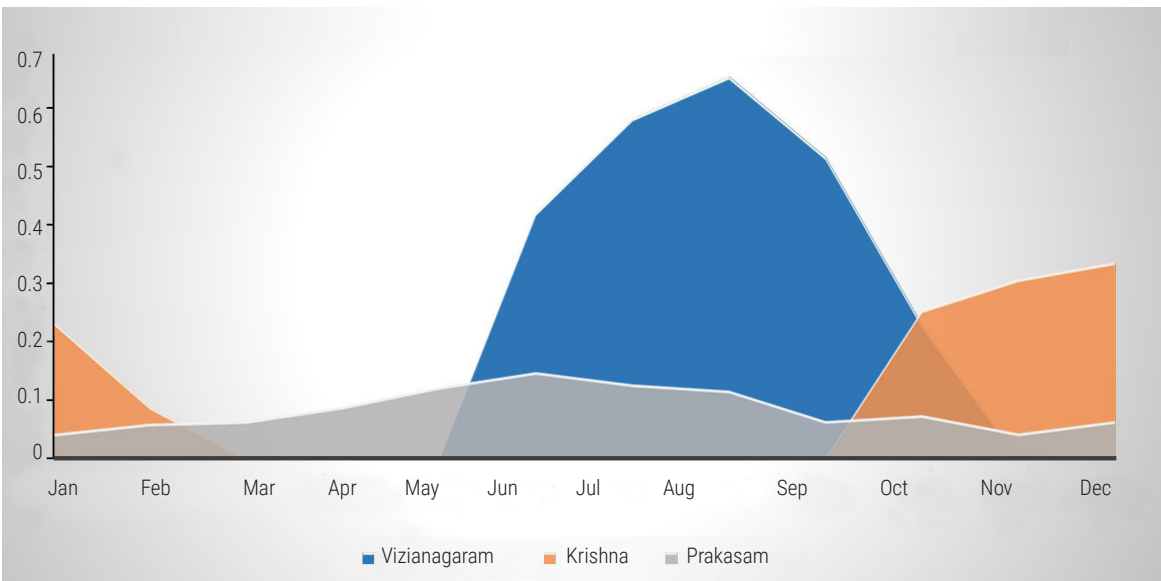


Fig 3. Small scale drag net CPUE of *M. dobsoni* in three coastal districts of Andhra Pradesh

Seasonal and spatial patterns

In Vizianagaram, fishing activity was concentrated within a shorter season spanning approximately June–October, coinciding with the south-west monsoon period. During this period, increased river discharge and coastal mixing likely enriched nearshore waters, increasing shrimp availability. Similar monsoon linked productivity has been reported in shrimp fisheries along the Mangalore coast (Sukumaran, 1985). As monsoon flows weakened by October–November, fishing activity declined or ceased, likely reflecting the seasonal migration of shrimp back into estuarine areas as salinity stabilised.

The Krishna District exhibited a longer fishing season, extending from approximately October to February, encompassing the post-monsoon and winter months. Although the CPUE values were lower than those in Vizianagaram, the catches were sustained over a longer period. This pattern may be associated with nutrient rich conditions persisting after the monsoon, reduced turbidity, and stable salinity regimes in the Krishna River Delta area. The mangrove associated wetlands of the Krishna delta provide nursery habitats that support shrimp recruitment (Satyanarayana *et al.*, 2002; Manisseri and Rao, 2000), although the extended fishing season and year-round exploitation by multiple gear types may offset this recruitment benefit, explaining the lower CPUE despite the productive estuarine environment.

The Prakasam District differed markedly in that fishing occurred year-round. However, the CPUE remained consistently lower than that of the other districts. Continuous exploitation without seasonal respite may dilute catch rates, as effort persists even during periods of low shrimp abundance. Unlike Vizianagaram, where a seasonal fishery allows stock recovery during the non-fishing period, Prakasam's stocks receive no such recovery window. This pattern raises concerns about sustained pressure on *M. dobsoni*, which is known to be sensitive to overexploitation, given its short lifespan (Sukumaran *et al.*, 1993). The apparent paradox, where year-round fishing yields a lower CPUE than a seasonal fishery does, is consistent with the depletion hypothesis: more fishing effort over the year does not translate to higher per-unit yields when stock recovery time is inadequate.

Size and biological characteristics of *M. dobsoni*

A total of 1,220 *M. dobsoni* individuals were measured across the study sites from June to August 2025. The total lengths ranged from 68 to 102 mm (mean 84.7 ± 7.5 mm). Females were significantly larger on average (mean 88.1 ± 6.8 mm) than males (mean 81.1 ± 7.1 mm), which is consistent with the typical sexual dimorphism reported for this species (Sukumaran *et al.*, 1993; Chakraborty *et al.*, 2014). The body weights ranged from 1.2 to 6.0 g (mean 3.33 ± 0.82 g). The length–frequency distribution (Fig. 4) was unimodal, with the highest frequency recorded in the 84–86 mm length class, indicating the dominance of a single size group in the catch during the sampling period. Most individuals measured between 80 and 94 mm, whereas shrimp less than 72 mm and greater than 100 mm in size were relatively rare. The observed size distribution is consistent with the reported maximum total length of 110–120 mm for *M. dobsoni* in Indian waters (Sukumaran *et al.*, 1993). The low proportion of larger individuals (>100 mm) indicates that only a small fraction of the population reaches near-maximum size before capture.

The overall male-to-female ratio was approximately 0.9:1 (males: 99, females: 107 in the *Thippalavalasa* subsample). This nearly equal sex ratio is consistent with earlier observations from the waters of Kerala (Chakraborty *et al.*, 2014). The monthly variation in the sex ratio could not be analysed in detail because of the limited temporal range of sampling (June–August 2025); a longer time series dataset is recommended to characterise the monthly and intersite variation. The maturity stage distribution of the females revealed that 49.5% were in Stage IV (late maturation) or Stage V (ripe/running) at the time of capture (Stage I: 0.9%; Stage II: 14.0%; Stage III: 35.5%; Stage IV: 33.6%; and Stage V: 15.9%). This high proportion of mature females in the catch indicates that the dragnet fishery intercepts a significant fraction of the female stock close to or at the spawning point. The observed maturity pattern is consistent with previous studies, which reported that the length at 50% maturity (L_{m50}) of female *M. dobsoni* ranged between 60 and 71 mm (Rao, 1968; Pillai and Thirimulu, 2013; Chakraborty *et al.*, 2014; Palomares and Pauly, 2024), indicating that most individuals in the present catch had likely attained sexual maturity before their capture. While *M. dobsoni* is a fast growing, short lived species capable of

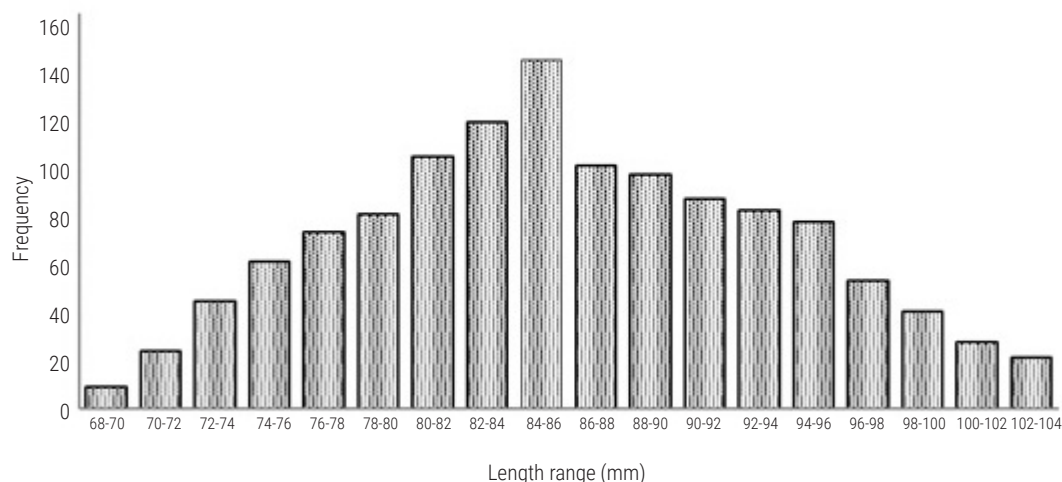


Fig. 4. Length–frequency distribution of *M. dobsoni* caught in small-scale shrimp dragnets

multiple spawning events per season (Chakraborty *et al.*, 2014), the sustained removal of mature females prior to spawning could adversely affect recruitment if the fishing pressure remains high. Therefore, continued monitoring of size and maturity composition across seasons is essential to evaluate the spawning stock status and support sustainable management of the fishery.

Length–weight relationship

The length–weight relationship for *M. dobsoni* pooled across both sexes was $\log W = 0.0065 + 2.9 \log L$ ($R^2 = 0.89$). The growth exponent b (2.9) was not significantly different from 3.0 (t test: $p > 0.05$), indicating near-isometric growth (Fig. 5). The intercept 'a' value and exponent b are consistent with values reported for *M. dobsoni* from Kerala ($b = 2.88$; Chakraborty *et al.*, 2014) and south-west Indian waters (Smita and Devaraj, 1990). Fulton's condition factor (K) averaged approximately 1.2 for both sexes, with no significant difference between males and females ($p > 0.05$). These values indicate good nutritional conditions and healthy growth of *M. dobsoni* in the fishing grounds during the study period.

CPUE trends and fishery sustainability

The observed spatial decline in CPUE from north (Vizianagaram) to south (Prakasam) may represent early signals of differential exploitation intensity along the coast. Fishers in the Krishna and Prakasam districts reported declining catches in recent years despite the use of similar gear, suggesting increasing pressure on shrimp stocks. The dominance of subadults (mean TL of 84.7 mm, well below the reported maximum of 110–120 mm) in catches, combined with the high proportion of mature females captured before spawning, is broadly consistent with exploitation patterns documented in intensively fished *M. dobsoni* populations elsewhere along the Indian coast (Smita and Devaraj, 1990; Sukumaran *et al.*, 1993). A formal stock assessment incorporating fishing effort, catch-at-length data, and population dynamic parameters is

needed to determine the exploitation status more definitively. In Vizianagaram, the relatively recent introduction of the dragnet fishery and its seasonal nature (June–October) likely allow shrimp stocks to recover during the non-fishing months, contributing to the higher CPUE observed. However, the continued expansion of dragnet efforts without regulation could lead to declining catch rates over time, as observed in other nearshore trawl fisheries in the region (Maheswarudu *et al.*, 2018; Dineshbabu *et al.*, 2022b).

Management and conservation considerations

Dragnet operations disturb benthic habitats and capture a wide range of non-target organisms by sweeping the seabed with a footrope and ground gear. Although a direct assessment of benthic fauna was beyond the scope of this survey, field observations consistently recorded the retrieval of benthic debris in hauls, including empty bivalve shells, polychaete tubes, echinoderm fragments, and sediment clumps. This is consistent with the well documented impacts of bottom-contact gear in shallow coastal habitats (Collie *et al.*, 2000; Hiddink *et al.*, 2017). Although no interactions with megafaunal organisms were recorded, the frequent removal of benthic organisms and disruption of sediment structure raise concerns about ecosystem impacts in the nearshore zone.

To ensure the sustainability of the *M. dobsoni* dragnet fishery in Andhra Pradesh, the following specific management interventions are recommended:

- ◆ Cod end mesh size regulation: A minimum stretched mesh size of 16–18 mm in the cod end is recommended. On the basis of the length-frequency data (mean TL 84.7 mm; L_{min} 68 mm) and published size at maturity estimates for *M. dobsoni* (Sukumaran *et al.*, 1993), this would allow the escape of a significant proportion of small subadults while retaining commercially sized individuals (>80 mm TL), which is consistent with recommendations from similar fisheries in Palk Bay (Rajkumar *et al.*, 2022) and Kerala waters (Thomas *et al.*, 2008).

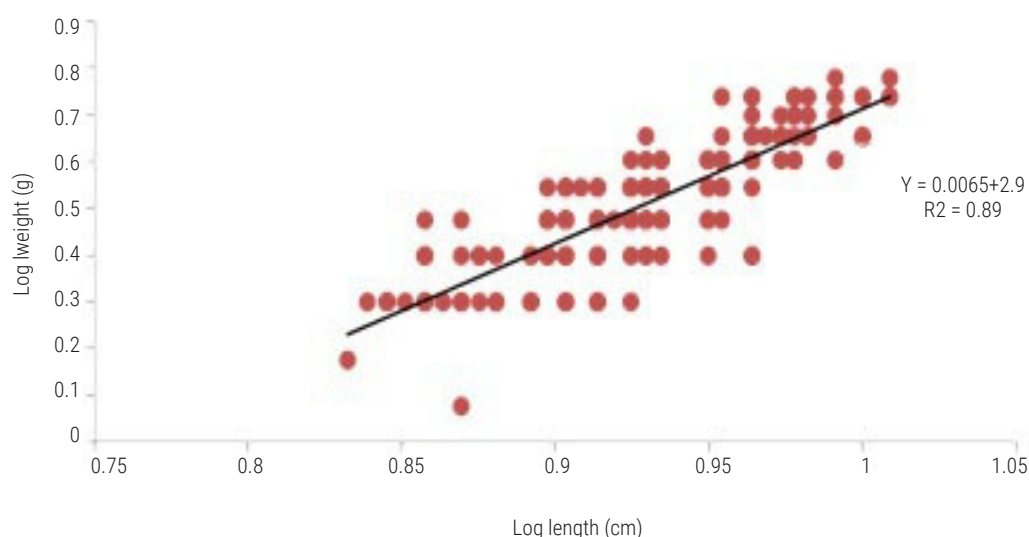


Fig. 5. Length–weight relationship of *M. dobsoni* caught in small scale shrimp dragnets

- ◆ Gear registration: Mandatory registration of dragnets with the state fisheries department as a precondition for a licensing arrangement, enabling fleet enumeration and effort monitoring.
- ◆ Community based co-management: Involving dragnet fishers in decision making through fisher organisations would improve compliance and long term management outcomes. Such approaches have demonstrated success in small scale fisheries across South Asia and South-east Asia.

This first comprehensive documentation of the small scale shrimp dragnet fishery in Andhra Pradesh provides baseline information on gear characteristics, catch rates, and *M. dobsoni* biology. This study revealed the socioeconomic importance of the fishery and identified key sustainability concerns. Future work should incorporate multiseason biological sampling for L_{m50} estimation, systematic bycatch quantification, fleet enumeration in collaboration with state fisheries authorities, and the integration of environmental data (sea surface temperature, chlorophyll-a, river discharge) to better understand the ecological drivers of shrimp abundance in the nearshore zone.

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