NOTE

Stranding of blue button jelly *Porpita porpita* (Cnidaria: Hydrozoa) on the beaches of Visakhapatnam, India (Western Bay of Bengal)

Sujit K. Pattnayak[1], Krishnan Silambarasan[2, *], Annada Bhusan Kar[3], Pratyush Das[3] and G. V. A. Prasad[3]

[1]Fishery Survey of India, Kochi, India. [2]Fishery Survey of India, Chennai, India. [3]Fishery Survey of India, Visakhapatnam, India.
ORCID *Krishnan Silambarasan* https://orcid.org/0000-0001-5805-1562, *Annada Bhusan Kar* https://orcid.org/0000-0003-1431-6463

ABSTRACT. *Porpita porpita* occurs in the tropical and sub-tropical waters of the Pacific, Atlantic, and Indian Oceans, and the mass numbers of stranded colonies seem to be increasing. Although its presence in Indian waters is minimal, this is the first record ever made of *P. porpita* in Visakhapatnam coastal waters. The present study provided a detailed description of the species and its global distribution. Further, the perceived increase in gelatinous zooplankton blooms in the observed area indicates that jellyfish can negatively affect fisheries because they compete with zooplanktivorous fish, prey upon fish eggs and larvae, and indirectly compete with higher trophic levels by reducing the plankton available to planktivores. Conversely, jellyfishes also play a vital role in regulating global marine plankton food webs, spatio-temporal dynamics, and biomass, which is a role that has been generally neglected so far.

Key words: Jellyfish, Porpitidae, fisheries, gelatinous zooplankton, food web.

Arribazón de medusa azul *Porpita porpita* en las playas de Visakhapatnam, India (Bahía occidental de Bengala)

RESUMEN. *Porpita porpita* se encuentra en las aguas tropicales y subtropicales de los océanos Pacífico, Atlántico e Índico, y el número masivo de colonias varadas parece estar aumentando. Aunque su presencia en las aguas de la India es mínima, este es el primer registro de *P. porpita* en las aguas costeras de Visakhapatnam. El presente estudio proporcionó una descripción detallada de la especie y su distribución global. Además, el aumento percibido en las floraciones de zooplancton gelatinoso en el área observada, indica que las medusas pueden afectar negativamente a las pesquerías porque compiten con los peces zooplanctívoros, se alimentan de huevos y larvas de peces, e indirectamente compiten con niveles tróficos más altos al reducir el plancton disponible para los planctívoros. Por el contrario, las medusas también juegan un papel vital en la regulación de las redes alimentarias del plancton marino global, la dinámica espacio-temporal y la biomasa, un papel que generalmente se ha descuidado hasta ahora.

Palabras clave: Medusa, Porpitidae, pesquerías, zooplancton gelatinoso, trama trófica.

*Correspondence:
silambuplankton@hotmail.com

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Porpita porpita (Linnaeus, 1758), commonly known as 'blue button jelly', is a colony of Hydrozoa belonging to the Order Anthoathecata, Family Porpitidae, which includes three genera: *Porpema* Haeckel, 1888; *Velella* Lamarck, 1801 and *Porpita* Lamarck, 1801. It is an open ocean species found globally in tropical and sub-tropical waters of the Pacific, Atlantic, and Indian oceans (Zhang 1999; Kirkendale and Calder 2003; Bouillon et al. 2004;

Kubota and Tanase 2007; Fisner et al. 2008; Gravili et al. 2008; Calder 2010; Pandya et al. 2013; Gul and Gravili 2014). The species was first described by Linnaeus (1758) as *Medusa porpita.* Numerous nominal species of *Porpita* Lamarck, 1801, have been described over the years, but all are now synonymised for a single species, *P. porpita* (Calder 1988; Schuchert 2013). It is inhabiting the ocean surface although habitats of larvae and medusae may extend up to 200 m depth. This species is the dweller of the uppermost layer of the marine environment and is easily carried to shore by water currents and wind (Pandya et al. 2013).

The species *P. porpita* actively feeds on diverse zooplanktonic prey, including copepods, cladocerans, larval forms of small crustaceans and molluscs (Ganapati and Subba Rao 1959). In addition, *P. porpita* colonies and medusae host symbiotic zooxanthellae that may provide nutrition. It is predated by a diverse vertebrate predator and specially gastropods, mostly *Glaucus* spp. and *Janthina* spp. (Chowdhury et al. 2016; Lepoint et al. 2016; Phillips et al. 2017).

Porpita porpita is notable for forming huge rafts at sea and for massive beach strandings and aggregations that have been reported in various parts of the world's oceans (Chowdhury et al. 2016; Madkour et al. 2019; Mamish et al. 2019; Gurlek et al. 2020; Sahu et al. 2020; Boukhicha and Tilg-Zouari 2021). A total of 2,039 records from the Indian Ocean can be found in the Ocean Biogeographic Information System (OBIS) and the Global Biodiversity Information Facility (GBIF), of which 1,005 occurrences have been reported so far, though other records may be scattered throughout the literature and other biogeographic databases. This observation represents the blue button jelly *P. porpita* washed ashore at Bheemunipatnam beach, and it is the first record in Visakhapatnam coastal waters. In addition, the present study discussed a detailed description of the species, its distribution and the negative impact of fishers.

On March 16th, 2021, a cluster of twenty colonies of *P. porpita* were observed in Bheemunipatnam village, Visakhapatnam (Western Bay of Bengal). Out of twenty colonies, two *P. porpita* specimens were transported for laboratory analysis; later in the collection, specimens were examined visually and photographed. Specimens were preserved in a 4% formaldehyde solution for further anatomical studies. Anatomical details were observed with a dissection microscope and described following Ruppert et al. (2004) and Fox (2007). Specimens were stored in separate glass containers and deposited in the referral Museum of Fishery Survey of India, Visakhapatnam.

The animal is a round, bright blue colour, floating hydroid colony having a large, gas-filled flat disc with a prominent central pore and numerous minute pores radiating from the centre, no free-floating sail, a single mouth beneath the float and tentacles. The lower side of the disc has a small, central gastrozooid with a terminal mouth and is surrounded by many gonozooids, and dactylozooids extending towards the periphery (Figure 1).

The hydroid colony has a large, disc-shaped mantle and it floats on water's surface. Polyps and tentacles are finger-like projections that are submerged on the underside of the water. The upperside is slightly convex, without tubercles, and the central portion has a round elevation where a small central pore (stigmata) is present. Upper float and hanging polyps are present; there is a large central mass made up of mesoglea penetrated by tubular, gastrodermal extensions. The central region is hardened due to an internal chitinous float (pneumatophore) containing a series of concentric air chambers with pores on the upper side. The central part of the organ is covered by ectodermal tissue and filled with cnidoblasts, which are located between the upper and lower portion of the central mass. The cnidoblasts drift to tentacles and polyps, where they become stinging cells. The colony is divided into three sections: a large central gastrozooid, a median band of numerous gonozooids, and a peripheral band

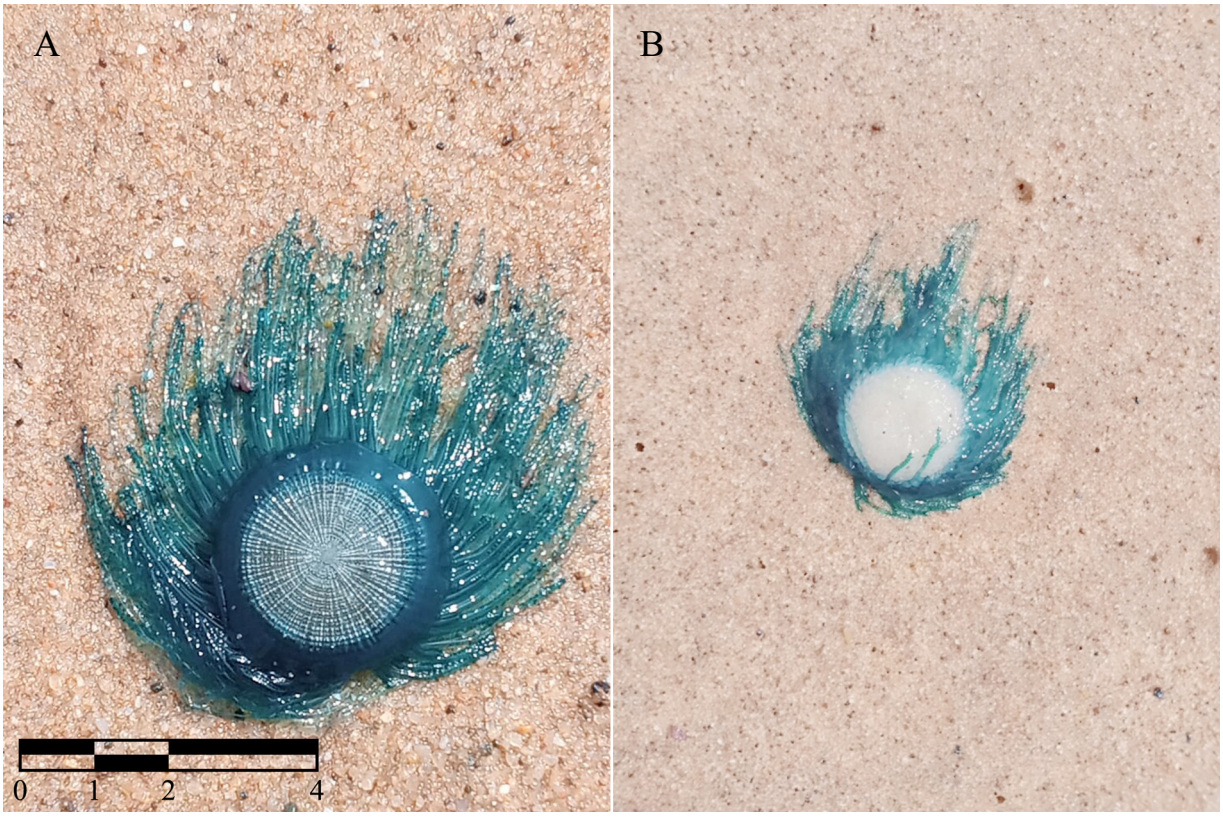

Figure 1. *Porpita porpita* stranding in Bheemunipatnam beach (A), stranded specimen on the beach (B) lower disc of the animal.

of dactylozooids. The central gastrozooid is circular, short, and broad with a terminal mouth and prominent nematocyst clusters. Gonozooid is a reproductive organ, and tentacles are absent. Instead of the tentacles, wart-like nematocyst clusters are developed in the medusae and are scattered over the body. Dactylozooids with three longitudinal rows and a distal whorl of four capitate tentacles are found on the floats oral surface and outer margin; the mouth absent. The mantle and dactylozooids are bright blue, while the central float region is silvery white due to the attached gas or basal tissues, which glow yellow to brown. In the Bay of Bengal, India, *P. porpita* occurs during the March-May period (Sahu et al. 2020), while in the Arabian sea in June-September (CMFRI 2010).

Porpita porpita was distributed throughout the tropical, sub-tropical, Indian, Pacific, Atlantic and Mediterranean seas (Moser 1925; Totton 1954; Brinckmann-Voss 1970; Daniel 1979; Bouillon 1984; Pages et al. 1992; Schuchert 1996; Bouillon et al. 2004; Gravili et al. 2008) (Figure 2).

Blue button jellies may cause a slight sting in humans since they contain bioactive compounds, which have antibacterial and antimicrobial effect (Fredrick and Ravichandran 2010). Its abundance and distribution in tropical and temperate waters and its importance as a predator and/or competitor of fish suggest that this species in Indian waters should be monitored. In fact, a mass occurrence and swarming are serious effects on fish stocks, which are already subject to high fish-

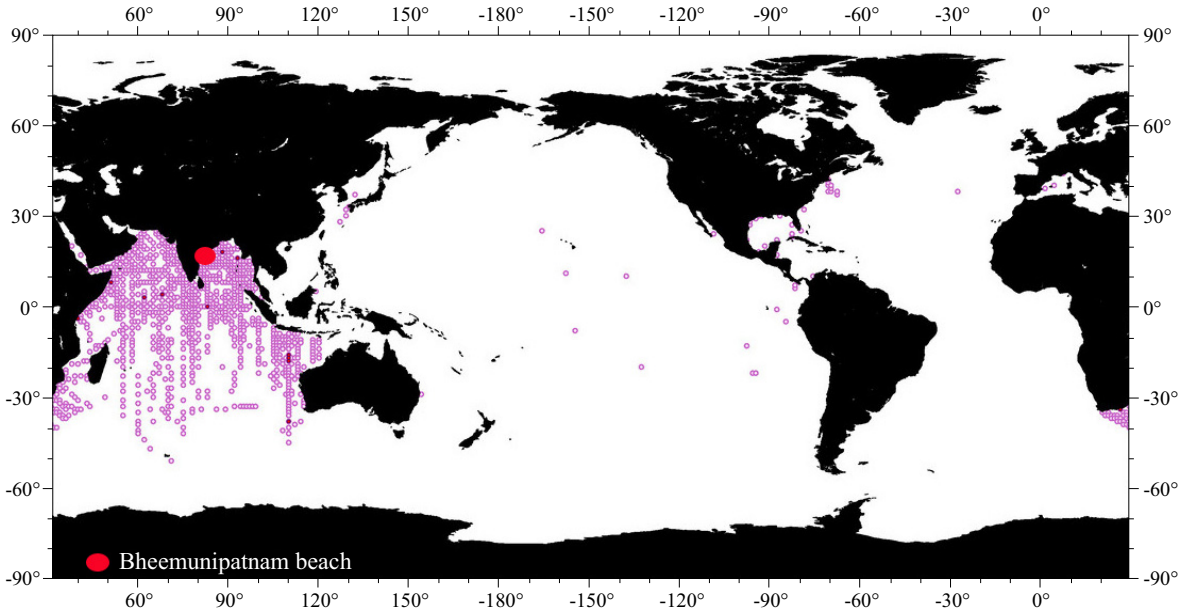

Figure 2. Global distribution of *Porpita porpita* (based on the data obtained from Copepedia, https://copepedia.org/?id=T4014367). The red dot indicates present location.

ing pressure by thousands of peoples who rely on the sea as their only source of livelihood (Davies et al. 2009). Many researchers reported that the aggregated swarm of *P. porpita*, in association with other species such as *Janathina*, *Physalia* and *Glaucus*, were found on the east coast of Guam in the Western Pacific (Kirkendale and Calder 2003). Also, in Veraval (Arabian sea) a large number of *P. porpita* appeared ashore during monsoon season (CMFRI 2010). Similarly, on the Odisha coast, Sahu and Panigrahy (2013) observed a swarming of jellyfish in the summer. The present study noticed *P. porpita* washed ashore in summer, which coincides with the findings of Sahu and Panigrahy (2013).

The distribution and abundance of gelatinous zooplankton are determined by physical parameters such as winds, water currents and tides; these supporting factors cause them to drift or swarm near to shore (Zavodnik 1987; Graham et al. 2003). Another possible reason for swarming is due to the availability of food. Predominant food items for *P. porpita* are calanoid copepods and crab megalopa larvae, as well as fish larvae, though the latter in lower quantities (Bieri 1970). It is highly likely that phytoplankton abundance and distribution during February and March will induce sufficient food for *P. porpita* and lead to large aggregations and swarming. The jellyfish blooms were mostly observed during the summer season (March-May), so it might be an optimal temperature for the species. In conclusion, the aggregation or swarming is a once-a-year event, which occurs on the summer season (March-May) on the Bay of Bengal.

Finally, it can be hypothesized that the beach stranding of *P. porpita* was due to physical and oceanographic parameters, i.e. wind (16 km h^{-1}), currents and tides. These factors might be a possible reason for offshore aggregation and swarming of the species. Furthermore, their occurrence was associated with higher water temperature (28.1 °C) and salinity (32.1) during the summer and monsoon seasons, which made Indian waters a favourable environment for the species aggregation or swarming.

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