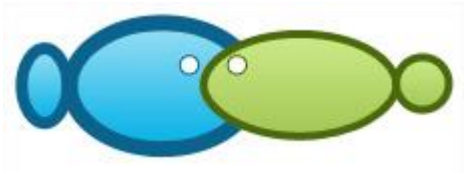

Contemporary records of sea urchin *Tripneustes gratilla* (Echinodermata: Echinoidea) in Timor Island, Indonesia

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Abstract. This study was conducted to determine the distribution of sea urchin *Tripneustes gratilla* in several locations on the island of Timor, Indonesia, from 10 April to 19 June 2018, using a random sampling method and description based on habitat and distribution. The results showed that *T. gratilla* was more found in coastal areas with sandy muddy substrate, overgrown with seagrass beds and with salinity between 30-45$^0/_{00}$. Samples had an average diameter from 60 to 80 mm, with a height of 50-60 mm and a weight of 5-7 grams.
Key Words: distribution, East Nusa Tenggara, marine fish, seagrass.

Introduction. The *Tripneustes gratilla* (Linneaus 1758) sea urchin lives in shallow sea areas widespread in the tropical Indo-Pacific and Indian Oceans (Chen & Chang 1981; Shokita et al 1991; Lison de Loma et al 2002; Lessios et al 2003; Juinio-Meñes et al 2008; Kasim 2009). This species is found in seagrass habitats (Regalado et al 2010; Lyimo et al 2011; Toha et al 2012), coral reefs (Shigei 1970; Lyimo et al 2011) and sands with coral rubble (Shimabukuro 1991), in temperatures ranging from 30 to 31°C, 30-32$^0/_{00}$ salinity and 7.3-8 pH (Toha et al 2012). Sea urchins are omnivores, but prefer a mostly vegetal diet. They can eat seagrass, algae, periphyton, crustaceans and mollusks (Ogden et al 1989; Hattori et al 1985; Vaïtilingon et al 2003; Stimson et al 2007; Eklöf et al 2008; Lyimo et al 2011; Cyrus et al 2015).

Sea urchins have important economic value (Toha 2006; Toha et al 2013), especially as a highly nutritious food and export commodity. Furthermore, sea urchins have ecological importance for the seas (Toha 2006; Toha et al 2013), with the potential to be a biological control agent (Stimson et al 2007). Sea urchins also contain bioactive substances of medicinal importance (Takei et al 1991; Nakagawa et al 2003; Li et al 2010; Bragadesaran et al 2013), with antimicrobial activity (Abubakar et al 2012; Akerina et al 2015; Sidiqi et al 2019).

Learning the distribution of the sea urchin *T. gratilla* is important for contemporary records and for determining the range expansion of a species. The records of the existence of *T. gratilla* in Indonesia are in the Arafura Sea (Clark 1946), Balekambang, Southern Malang (Sumitro et al 1992), Nusa Dua Bali (Darsono & Sukarno 1993), Kapoposan Islands, Banda Neira (Andamari et al 1994), Spermonde Islands, Southern Sulawesi (Tuwo 1995), Tamedan in Southeast Maluku (Radjab 1997), Osi Islands in Western Seram Northern Maluku (Syam et al 2002), Morotai Beach in Northern Halmahera (Yusron 2006), Buton in South East Sulawesi (Kasim 2009), Papua region (Toha & Zain 2003; Radjab 2004; Toha & Fadli 2008; Toha et al 2012; Toha et al 2015) and Ambon (Silahooy et al 2013). No record about the existence of *T. gratilla* on Timor Island was found. This study aims to report the existence of this sea urchin in Timor Island, East Nusa Tenggara (NTT), Indonesia.

Material and Method

Sampling and description of the study sites. A random sampling survey of the sea urchin was conducted in the Nunkurus beach, Oebelo beach, Oesapa beach, Pasir Panjang beach, Bolok beach, Batubao beach, Oetma Nunu beach, Tablolong beach and Salupu beach (Figure 1). All sampling sites are located in Timor Island, East Nusa Tenggara (NTT), Indonesia. Specimens were obtained during fieldwork carried out from 10 April to 19 June 2018. Specimens were collected using cast-nets and traditional fish traps.

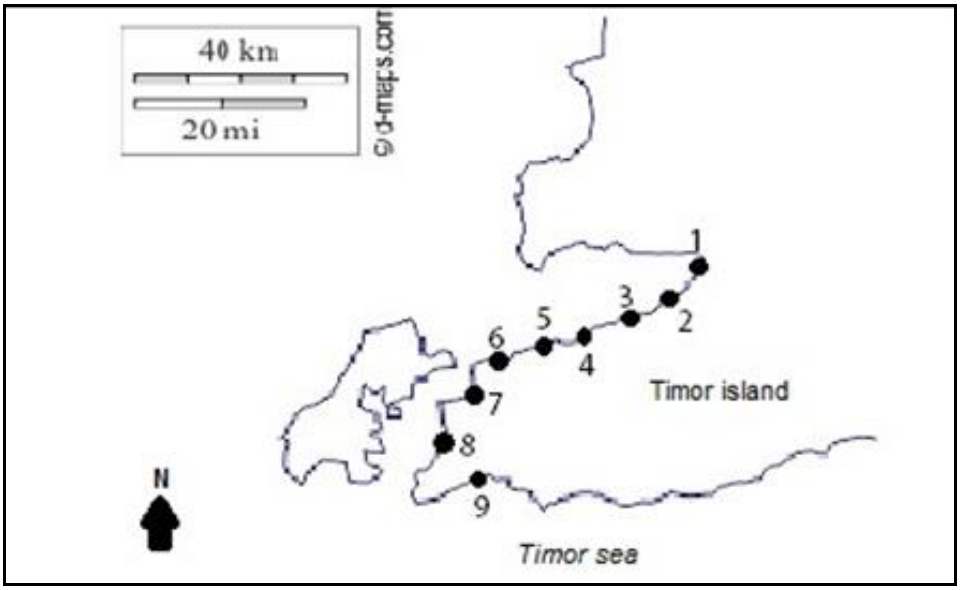

Figure 1. Contemporary distribution records of *Tripneustes gratilla* in Timor Island.

Sea urchin identification and salinity measurement. To ensure the validity of the species, the analysis of the morphological features of *T. gratilla* was carried out based on Toha et al (2015) and Toha et al (2017). Salinity measurement was conducted using a refractometer.

Results and Discussion

Specimen collection. The 80 live specimens of *T. gratilla* had a diameter between 60 and 80 mm, a height between 50-60 mm and weights between 5-7 g (Figure 2). Two specimens were preserved in 96% alcohol solution and deposited at the Zoology Laboratory, Generasi Biologi Indonesia Foundation, Gresik, Indonesia (GBI0047). The remaining 78 were kept as livestock at the Fish Reproduction Laboratory, Brawijaya University, Malang Indonesia. The live individuals were transported in plastic containers with oxygen.

Identification. Several specimens collected on Timor Island were identified as *T. gratilla* (Figure 2). Detailed morphological characters are as follows: round-shaped; its body (termed corona or test) is divided into an aboral and oral surface; body surface has colorful short spines and tube feet; surfaces are separated by the ambitus (horizontal circle with a large diameter); each surface is ended with a circular opening covered by flat structures; the body is enclosed within a structure where the species conduct its activities; gonads are in the body. *T. gratilla* body diameter and height are influenced by age and maturity. Specimens from Timor Island had a diameter between 60 to 80 mm, while Toha et al (2012) recorded different sizes in the area around Papua, in Manokwari (56.97-77.92 mm), Saubeba (76-90.37 mm), Wasior (62.1-93.46 mm), Biak (50-87.5 mm) and Serui (58-77 mm).

Figure 2. *Tripneustes gratilla* sea urchins captured in Timor Island.

Distribution. As for the distribution of *T. gratilla,* the species was found in Timor Island (Figure 3). During sampling, 80 specimens were obtained from seagrass areas, whereas in mangrove areas, no specimens of *T. gratilla* were found. This is in accordance with Shigei (1970), Aziz (1983), Shimabukuro (1991), Regalado et al (2010), Lyimo et al (2011), and Toha et al (2012), who stated that sea urchins are found in seagrass, coral reefs and sandy habitats with coral remains (Table 1).

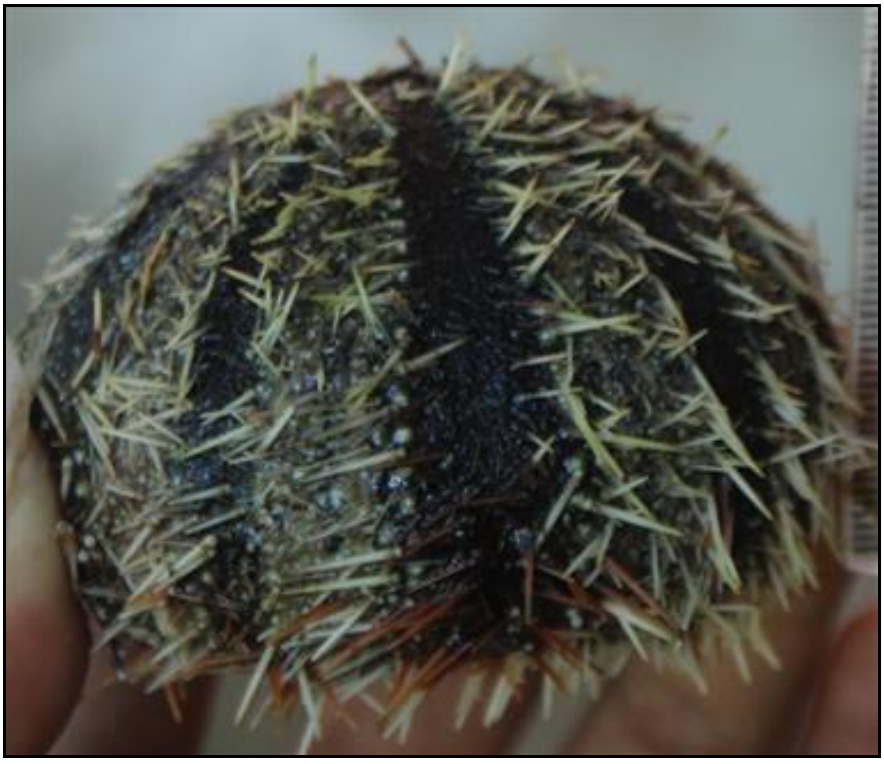

Figure 3. Specimen of *Tripneustes gratilla* from Timor Island.

Table 1

Location of *Tripneustes gratilla* in Timor Island

No	*Location*	*Area*	*Number*	*Coordinate*	*Salinity ($^0/_{00}$)*
1	Nunkurus beach	Mangrove	-	10°03'00"S; 123°46'09"E	15-20
2	Oebelo beach	Mangrove	-	10°05'09"S; 123°44'51"E	15-20
3	Oesapa beach	Mangrove	-	10°08'39"S; 123°38'03"E	15-25
4	Pasir Panjang beach	Seagrass	15	10°15'05"S; 123°60'28"E	30-40
5	Bolok beach	Seagrass	30	10°13'13"S; 123°30'46"E	30-45
6	Batubao beach	Mangrove	-	10°17'51"S; 123°29'12"E	15-20
7	Oetma Nunu beach	Mangrove	-	10°16'42"S; 123°29'52"E	15-20
8	Tablolong beach	Seagrass	35	10°18'24"S; 123°28'51"E	30-45
9	Salupu beach	Mangrove	-	10°20'56" S; 123°29'42"E	15-20

The distribution of *T. gratilla* in seagrass areas could be due to several factors, one of which is the substrate. In seagrass areas, with a sandy substrate, the species can live well, but in mangrove areas with muddy habitats, *T. gratilla* was not found. Seagrass areas also provide food for *T. gratilla* such as algae, periphyton, crustaceans, and mollusks. According to Shimabukuro (1991), the initial life stages of *T. gratilla* consume diatoms, while larger individuals eat macroalgae (seaweeds, *Sargassum* spp., and microflora). This is the reason why *T. gratilla* sea urchins from Timor Island, NTT, are more commonly found in areas with beaches, with sandy muddy substrate and overgrown by seagrass beds.

In addition to the substrate, one of the physical factors of water quality is salinity, which determines the spread of marine biota. In the coastal sea, salinity is usually more variable when compared to the open sea or deep sea. The coastal sea of the Timor Island is affected by the presence of mangrove forests and has a salinity of about 15-20$^0/_{00}$, while, in the seagrass beds areas, the salinity is between 30-45$^0/_{00}$. Sea urchins are intolerant to low salinities and cannot survive in estuaries because of freshwater influences. Sea urchins are classified as stenohalin animals and salinity fluctuations can have different effects on the growth and survival of larvae and juveniles (Drouin et al 1985). This is thought to be the reason why the spread of sea urchins is predominant in the areas with high salinity, between 30-45$^{00}/_{00}$, a fact confirmed by Toha et al (2012), who found sea urchins in Teluk Cendrawasih, where the salinity is between 30-32$^0/_{00}$ salinity.

Conclusions. The distribution of the sea urchin *T. gratilla* in several locations of Timor Island, East Nusa Tenggara (NTT), Indonesia, was recorded. The salinity of the habitat ranged from 30 to 45$^0/_{00}$ and specimens were found in sandy muddy substrate, with seagrass beds. The diameter of the specimens was between 60-80 mm, with a height between 50-60 mm and a weight of 5 to 7 g.

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