

New distribution record of *Elysia leucolegnote* (Jensen, 1990) (Sacoglossa Plakobranchidae) in mangrove ecosystem of Biak Numfor, Papua - Indonesia

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ABSTRACT

Elysia leucolegnote (Jensen, 1990) (Sacoglossa Plakobranchidae) was firstly found in Hong Kong and described in 1989. Furthermore, in the past decade, the mangrove leaf-slug, *E. leucolegnote*, has been found outside Hong Kong, for example in Thailand, India, and Australia, but it is here reported for the first time in Indonesia. Details on the distribution, habitat and external morphology of *E. leucolegnote* in Biak Numfor, Papua, Indonesia, are here described. This species is found in mangrove ecosystems and has a similar morphological external character with previously reported which are distributed worldwide from East, South and South-east Asia to Australia. The IUCN redlist category is discussed in this paper.

KEY WORDS

Distribution; Gastropoda; Eastern Indonesia; Leaf-slug; Mangrove ecosystem.

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INTRODUCTION

The order Sacoglossa inhabits brackish and marine waters worldwide (Jensen, 2007; Yonow, 2008). The Indo-Polynesian region is an area that has a high number of species and distribution of Sacoglossa, but few areas have been extensively sampled (Jensen, 2007). Furthermore, the genus *Elysia* Risso, 1818 (Plakobranchidae) of the Sacoglossa order in the Indo-Pacific region have 65 species (Jensen, 1992). To the family Plakobranchidae belongs generally small species of heterobranch sea slugs (for-

merly known as Opisthobranchia); it is also the largest family of Sacoglossa (Yonow, 2008).

In general, all sacoglossans, including the genus *Elysia*, are herbivores (Jensen, 1997) with algae as a food source (Jensen, 1993; 1994). They are usually less than 1 cm in size (Swennen, 2011; Bourke et al., 2016) and only a few species occur in the mangrove ecosystem (Jensen, 1996; Swennen, 2011; Bourke et al., 2016). Their external morphology includes a slender head, dorsal rhinophores, eyes, wing-like parapodia, anus located behind the rhinophores, and oral tentacles are absent (Jensen,

1992; Jensen, 1996). Many species have symbiotic algal chloroplasts (Jensen, 1997; Wägele & Johnsen, 2001). Their body coloration varies according to their food sources (Jesus et al., 2010; Costa et al., 2012). *Elysia leucolegnote* (Jensen, 1990) has been found in the last 2 decades but appears to have a patchy distribution (Swennen, 2011). The genus *Elysia* has not been reported in Indonesia before, furthermore the aim of this study is to report on the external morphology, distribution, habitat for the first time in Indonesia and IUCN red list categories of *E. leucolegnote*.

MATERIALS AND METHODS

The study was conducted in the Biak Barat mangrove ecosystem (1°0'33,715" N and 135°48'54.83" E), Biak Numfor District, Papua, Indonesia in August 2015 (Fig. 1). The mangrove trees found at the study site were *Avicennia* sp., *Bruguiera* sp., *Rhizophora* sp., and *Sonneratia* sp. The sampling was conducted with a survey around the mangrove root. The specimens found were 3 individuals, furthermore photographed in situ and image J was used to measure the external morphology (Figs. 2–5). The identification of *E. leucolegnote* was according to Swennen (2011).

RESULTS AND DISCUSSION

The specimens of *E. leucolegnote* had a total length of 0.6 cm to 1.8 cm (n=3), the average length of rhinophores was 0.03 cm, a white triangle in the

head extending to the rhinophores (Fig. 2), yellowish green on the head and body, white bands along the parapodia both sides and colored spots (Fig. 3) of varying sizes. One specimen of *E. leucolegnote* was missing one rhinophore and some had damage of the edges of the parapodia (Fig. 4). Specimens of *E. leucolegnote* were found at depths of 5 to 7 cm (Fig. 5), located among the *Rhizophora* sp. Roots with 100% water clearness and mud substrate (Fig. 2). Based on IUCN red categories, species of *E. leucolegnote* is data deficient.

The specimens of *E. leucolegnote* found in this study is longer compared to most previous studies in which specimens were more than 1 cm, but had similar characteristics, namely rhinophores and a white triangle on the head, yellowish green color on the head and body, white bands along the parapodia both sides (Jensen, 1990; Swennen, 2011; Sreeraj et al., 2012; Bourke et al., 2016). Mostly of species from the genus *Elysia* have bands on parapodia and colored spots of varying sizes on the body (Jensen, 1992). Specimens with damage in the parapodia of *E. leucolegnote* were also found in this study. The damage consisted of smaller or larger parts missing, or some had a hole in parapodia, which may have caused by crab or bird and will heal totally after feeding (Swennen, 2011).

Previous studies showed that *E. leucolegnote* were found in the mangrove ecosystem (Jensen, 1990; Swennen, 2011; Bourke et al., 2016) with clear waters, under mangrove roots and mud substrate (Swennen, 2011; Bourke et al., 2016). Furthermore, *E. leucolegnote* can be found at low tide, anaerobic water conditions with white colonies and borders of sulphur bacteria (Swennen, 2011). This species was often found solitary in the mangrove ecosystem substrate. According to Swennen (2011), at the lowest tide, *E. leucolegnote* will aggregate in small ponds containing water.

Elysia leucolegnote was originally found initially in Hong Kong (Jensen, 1990), then in Thailand and Singapore (Swennen, 2011), Andaman Island, India (Sreeraj et al., 2012), Australia (Bourke et al., 2016), and Indonesia (present study) (Fig. 6). The distribution of *E. leucolegnote* now includes the tropics of West Pacific and East Indian Ocean, as well as eastern Indonesia and northern Australia. Swennen (2011) predicted that *E. leucolegnote* would be distributed worldwide from East, South and Southeast Asia to Australia (Fig. 6).

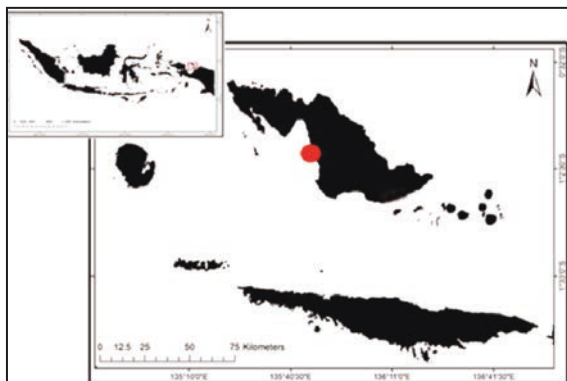
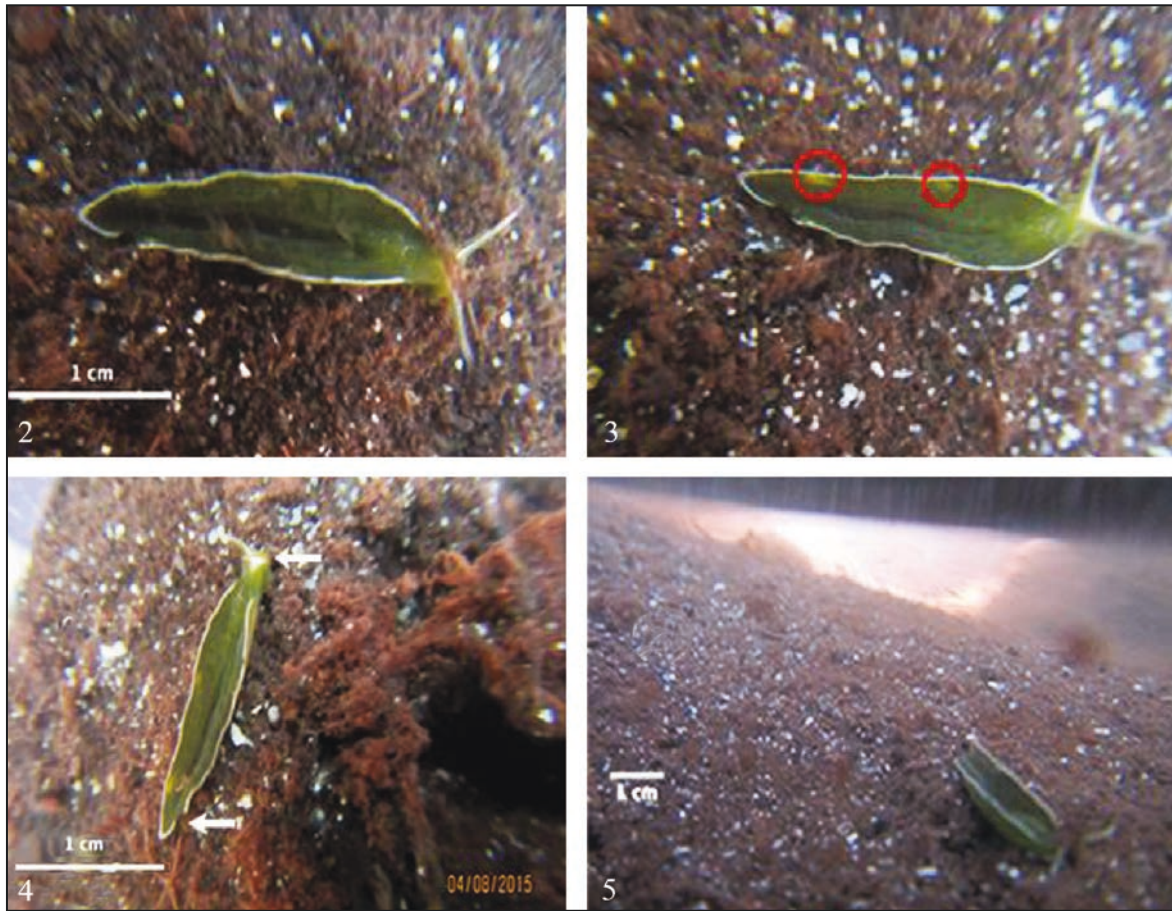


Figure 1. Map showing the study site (red circle).



Figures 2–5. External character morphology and habitat of *E. leucolegnote* found in a mangrove ecosystem of Biak Numfor District, Papua, Indonesia.

The morphology, adaptation and evolution genus of *Elysia* has been known by previous studies (Jensen, 1990; 1992; 1993; 1994; 1996; 1997) but data on distribution are lacking, as in IUCN red list category this species is data deficient (IUCN, 2012). This category indicates that more information is needed about the distribution and abundance of this species and habitat, especially in Indonesia. Furthermore, the habitat of *E. leucolegnote* can be commonly found in mangrove ecosystems (Swennen, 2011; Bourke et al., 2016) and Indonesia is a country that has the largest distribution of mangrove ecosystems in the world (Polidoro et al., 2010). Since mangrove ecosystems have declined in decades due to over-exploitation (Polidoro et al., 2010), the impact will directly decline the number of *E. leucolegnote* in nature. Therefore, in order to prevent the extinc-

tion of this species in nature, we need to protect the mangrove ecosystem.

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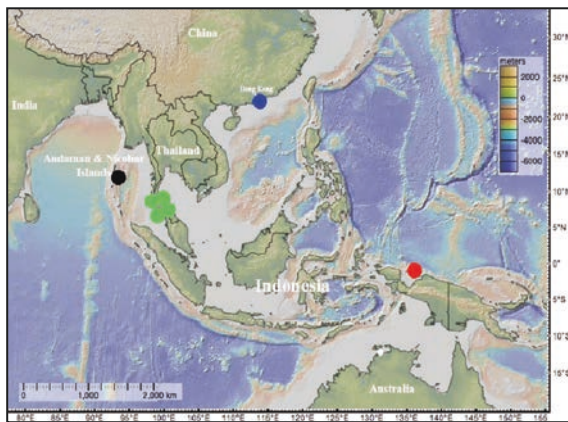


Figure 6. Map showing distribution of *Elysia leucolegnote* (blue, black, green, and white circles from Jensen (1990), Sreeraj et al. (2012), Swennen (2011), Bourke et al. (2016), respectively, and red for this study).

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