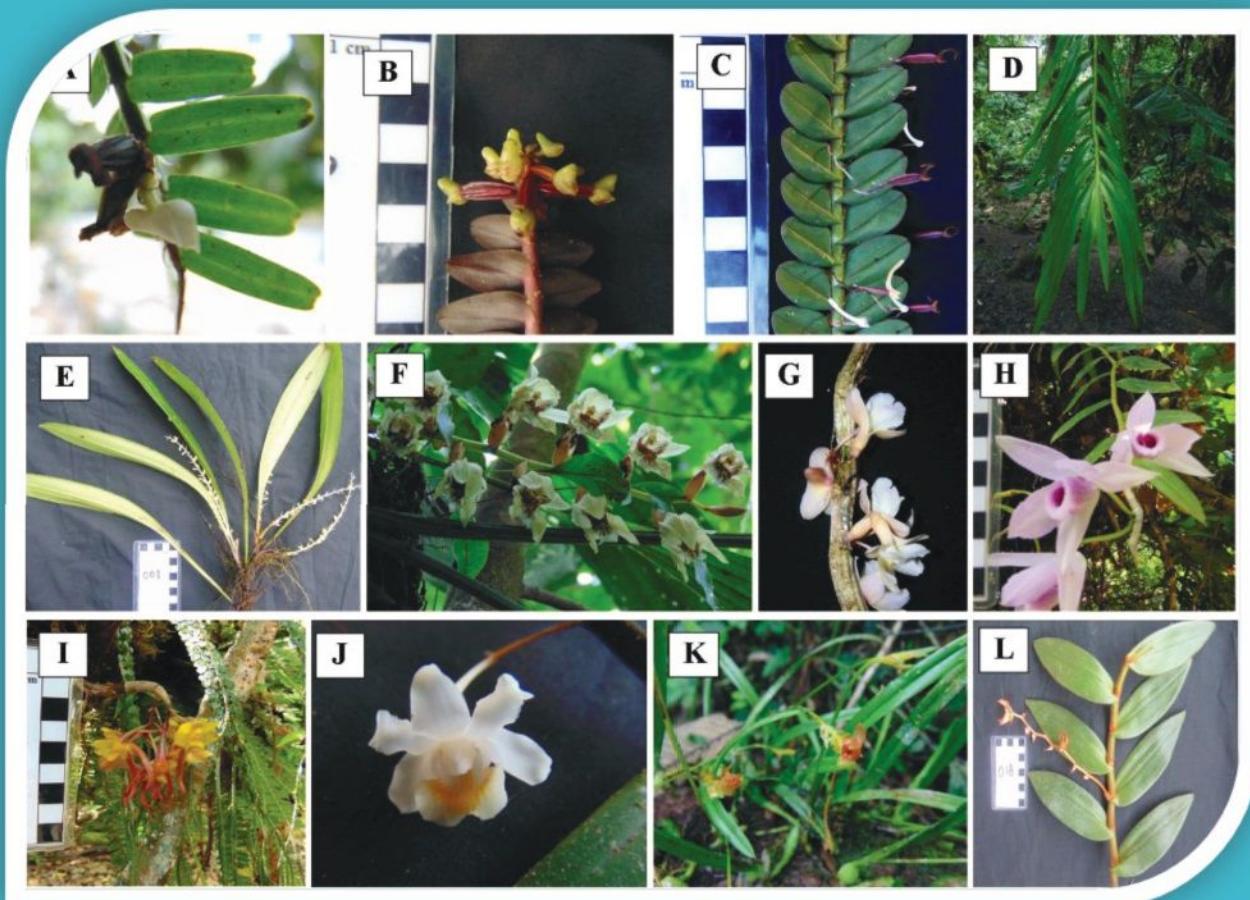


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Keterangan foto cover depan: Jenis anggrek epifit di kaki gunung Liangpran.

(Notes of cover picture): (The epiphytic orchids in the foothill of Mount Liangpran) sesuai dengan halaman 312 (as in page 312).



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THE DIVERSITY AND DISTRIBUTION OF TWO FAMILIES OF SUMATRAN LAND SNAIL (GASTROPODA: CAMAENIDAE AND CYCLOPHORIDAE)

[Keragaman dan Distribusi Dua Suku Keong Darat Sumatra
(Gastropoda: Camaenidae dan Cyclophoridae)]

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ABSTRACT

The diversity of land snail in Sumatra, Indonesia was firstly studied by Bock (1881), followed by some comprehensive studies by Degner (1928), Van Benthem Jutting (1959), and recently by Marwoto (2016). This research aimed to update the data on diversity and distribution of those two families, documenting new information on their distribution, make historical records of species occurrence, list species occurrence from inside and outside the conservation area. We collected primary data from 274 numbers of museum collections and secondary data from 29 literatures. In total, 58 species of Camaenidae and 66 species of Cyclophoridae were known from Sumatra. Fourteen land snail species, seven from family Camaenidae and seven from family Cyclophoridae, were added to the previous list of land snail species in Sumatra. There were 30 land snail species with new distribution ranges.

Key words: Camaenidae, Cyclophoridae, land snail, Sumatra.

ABSTRAK

Keragaman keong darat Sumatra pertama kali dipublikasikan oleh Bock (1881), disusul beberapa studi yang lebih komprehensif oleh Degner (1928), Van Benthem Jutting (1959), dan terbaru oleh Marwoto (2016). Tujuan dari penelitian ini adalah untuk memutakhirkan data keragaman dan distribusi kedua suku tersebut, mendokumentasikan informasi baru tentang distribusinya, membuat catatan sejarah tentang keberadaan spesies dari dalam dan luar kawasan konservasi. Dalam penelitian ini digunakan data primer dari 274 nomer koleksi spesimen museum dan data sekunder dari 29 pustaka berupa artikel dan buku. Penelitian ini berhasil menambahkan sebanyak 14 jenis keong darat yang dilaporkan dari Sumatra, tujuh jenis dari suku Camaenidae dan tujuh jenis dari suku Cyclophoridae. Terdapat 30 jenis keong darat dengan catatan baru persebarannya.

Kata kunci: Camaenidae, Cyclophoridae, keong darat, Sumatra.

INTRODUCTION

Sumatra is ranked as the fifth-largest island in the world with a total area of 475.000 km². It consists of ten administrative provinces (Laumonier, 1996; WWF Indonesia, 2010). Sumatra is surrounded by series of smaller satellite islands. Over 70% of the island areas have an annual rainfall of more than 2.500 mm/year (Whitten *et al.*, 1987). The area has seven or more consecutive wet months and up to three consecutive dry months in a year (Whitten *et al.*, 1987). With their relatively wet and humid climate, Sumatra offers a suitable habitat for land snails.

Land snails are the second most successful and diverse animal groups on land with an estimated 24.000 living species (Lydeard *et al.*, 2004). These animals are important to human, such as for food (Schneider *et al.*, 1998), as crop pests (Barker, 2002; Mujiono, 2010), vector of parasites (Djajasasmita,

1989), and also as bioindicator of environmental parameters (Uys *et al.*, 2010; Nurinsiyah *et al.*, 2016). In nature, land snails also play an important role as predator (Meyer and Cowie, 2010), prey (Barker, 2016), and decomposer (Mason, 1970; Wolters, 1997).

The inventory of land snails in Sumatra is well documented. The studies of land snails from Sumatran region have a long history. In 1881, Carl Bock published the list of Sumatran snails. It consists of 19 species of land snails and 14 species of freshwater snails, mainly collected from Padang, West Sumatra. Numerous references on Sumatran molluscs have been published. Some authors summarized their previous work by published a checklist (Degner, 1928; Van Benthem Jutting, 1959). Marwoto (2016) completed their studies and listed 25 families and 280 species of land snails in Sumatra. Two most diverse families of Sumatran

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land snail are Cyclophoridae (45 species) and Camaenidae (37 species). The two families contribute 82 species or 30% of all known land snail species in Sumatra (Marwoto, 2016).

Museum Zoology Bogor (MZB) of Research Center for Biology, Indonesian Institute of Sciences (LIPI) was established in 1894 and deposited more than three million collections of animal specimens mainly from Indonesia including Sumatra. There are 19.781 catalog number of molluscs collections.

Despite the inventory is well documented, however, taxonomic status on Sumatran land snail diversity is still confusing. Updated data is required to give precise information on Sumatran land snail. This paper aims to update and validate the data of nomenclature and species composition of two Sumatran land snail families as well as documenting new information on their distribution within ten administrative provinces based on museum specimens and published references. The historical records of species occurrence from inside and outside of the conservation area also will be discussed.

MATERIALS AND METHODS

The checklist and distribution data of land snail species from Sumatra were constructed based on museum collections from the Museum Zoologicum Bogoriense (LIPI, Indonesia) and literature studies. All species from two families i.e. Cyclophoridae and Camaenidae in the collection of MZB recorded from Sumatra, were examined. The study examined 274 registered numbers of land snail specimens collected from 1921-2017. The secondary data were obtained from the 29 references of land snail species from Sumatra. The species distribution data were listed into two categories i.e. new record (NR) and extended distribution (ED). New record (NR) defines the occurrence of a species that never been reported in a province or in an island. Meanwhile, extended distribution (ED) is the occurrence of a species that never been reported in a regency within a province. Data of species distribution which mentioned from the literatures were considered as old record.

We made a historical records of occurrence from each species based on the primary and secondary data. The occurrences of species within a

regency in each province then were identified whether they are located inside or outside the protected areas (National Parks, Wildlife Sanctuaries, and Nature Reserves).

RESULTS

A total of 124 species of land snails in Sumatra were identified. In this study, of 58 species of Camaenidae and 66 species of Cyclophoridae, were found respectively (Table 1 and Table 2). Twenty-seven species (46%) of Camaenidae and thirty-eight species (57%) of Cyclophoridae were recorded based on the collections in MZB, whereas 56 species (96%) of Camaenidae and 63 species (95%) of Cyclophoridae were recorded from references. In total, six genera of Camaenidae were recorded in Sumatra. West Sumatra province has the highest species richness (23 species and 5 genera). Meanwhile, the least species were recorded from Riau and Riau Islands provinces (1 genus and 1 species). Eleven genera, consist of 66 species of Cyclophoridae were compiled. North Sumatra province has the highest species richness of Cyclophoridae (32 species and 10 genera). Meanwhile, Riau and Riau Islands provinces were the least-species found (2 genera and 2 species) (Table 1).

Results showed that species richness of Camaenidae and Cyclophoridae in Sumatra was varied among provinces (Table 3). Ten provinces in Sumatra were classified into three groups based on their species diversity. It will be useful information for conducting future studies. provinces with medium or low diversity are needed to be explored more intensively. The first group (provinces with more than 40 species) consist of West Sumatra (50 species), North Sumatra (48 species), and Aceh (41 species). The second group (provinces with 21-40 species) consist of Lampung (37 species), Bengkulu (32 species), and South Sumatra (22 species). The third group (provinces with less than 21 species) consist of Jambi (17 species), Bangka Belitung (eight species), Riau and Riau Islands (each three species). Bangka Belitung and Riau Islands are small islands are separated by sea from the mainland of Sumatra.

Table 1. Camaenidae land snail species from Sumatra. References sorted alphabetically: 1: Bock (1881), 2: Bullen (1906a), 3: Bullen (1906b), 4: Degner (1928), 5: Dharma (1993), 6: Dharma (2005), 7: Dharma (2007), 8: Djajasasmita (1982), 9: Djajasasmita (1988), 10: Gergely (2015), 11: Henderson (1898), 12: Heryanto (2013), 13: Heryanto (2017), 14: Laidlaw (1954), 15: Laidlaw (1957), 16: Laidlaw and Solem (1961), 17: Maassen (2006) 18: Marwoto (2016), 19: Paravicini (1935), 20: Rensch (1933), 21: Rensch (1934), 22: Smith and Djajasasmita (1988), 23: Van Benthem Jutting (1934), 24: Van Benthem Jutting (1935a), 25: Van Benthem Jutting (1935b), 26: Van Benthem Jutting (1937), 27: Van Benthem Jutting (1959), 28: Van Der Meer Mohr (1926), 29: Van Der Meer Mohr (1930), MZB: collections of Museum Zoology Bogor. Provinces: Ac: Aceh, NS: North Sumatra, WS: West Sumatra, Ru: Riau, RI: Riau Islands, Ja: Jambi, Be: Bengkulu, SS: South Sumatra, BB: Bangka Belitung, La: Lampung.

No	Species (jenis)	Ac	NS	WS	Ru	RI	Ja	Be	SS	BB	La	References (pustaka)
1	<i>Amphidromus adamsi</i>				+							1, 4
2	<i>Amphidromus ameliae</i>				+							MZB, 7, 18
3	<i>Amphidromus banksi</i>										+	22
4	<i>Amphidromus bulowi</i>				+							4, 16, 18, 27
	<i>Amphidromus djajasasmittai</i>											
5									+		+	MZB, 5, 6, 18
6	<i>Amphidromus elviae</i>							+				MZB, 7, 18
7	<i>Amphidromus elvinae</i>				+			+				MZB, 7, 18
	<i>Amphidromus enganoensis</i>											MZB, 6, 11, 13, 16, 18, 26, 27
8								+				
9	<i>Amphidromus fruhstorferi</i>							+				6, 14, 16, 26, 27
	<i>Amphidromus enganoensis sykesi</i>				+			+				16, 26, 27
10												6, 16, 18, 20, 25, 27
11	<i>Amphidromus ilsa</i>	+	+									MZB, 6, 16,
12	<i>Amphidromus inversus</i>							+	+	+	+	18, 27
	<i>Amphidromus inversus andamanensis</i>											
13										+		MZB, 16
14	<i>Amphidromus javanicus</i>							+				MZB
15	<i>Amphidromus minutus</i>										+	MZB, 8
16	<i>Amphidromus niasensis</i>			+								6, 18, 27
17	<i>Amphidromus palaceus</i>								+			MZB, 4, 6, 16, 18, 27
	<i>Amphidromus palaceus lemongensis</i>							+	+			
18												MZB, 7, 18
	<i>Amphidromus palaceus taloensis</i>							+				
19												MZB, 7, 18
	<i>Amphidromus palaceus tanggamusensis</i>										+	
20												MZB, 7, 18
21	<i>Amphidromus perversus</i>	+					+	+	+			16, 18, 27
22	<i>Amphidromus porcellanus</i>			+						+	+	MZB, 4, 6, 16, 18, 22
23	<i>Amphidromus puspae</i>							+				MZB, 5, 6, 18
24	<i>Amphidromus ristiae</i>							+	+			MZB, 7, 18

25	<i>Amphidromus sekincauensis</i>										+ MZB, 7, 18, 4, 6, 16, 18, 21, 27	
26	<i>Amphidromus semifrenatus</i>	+	+									
27	<i>Amphidromus sowerby</i>		+								23, 24, 27	
28	<i>Amphidromus sumatranaus</i>	+	+	+	+			+	+		MZB, 4, 6, 16, 18, 27	
29	<i>Amphidromus sumatranaus jacobsoni</i>	+									MZB, 6, 14, 15, 16, 18, 27	
30	<i>Amphidromus sumatranaus singalangensis</i>			+							16, 18, 27	
31	<i>Amphidromus webbi</i>		+	+							6, 16, 27	
32	<i>Amphidromus webbi babiensis</i>		+								MZB, 14, 15, 16, 27	
33	<i>Amphidromus webbi simalurensis</i>		+								MZB, 6, 14, 15, 16, 27	
34	<i>Chloritis breviseta</i>							+			4	
35	<i>Chloritis crassula</i>	+	+								18, 19, 23, 25, 27, 28, 29	
36	<i>Chloritis pandjangensis</i>			+							18, 27	
37	<i>Chloritis rufofasciata</i>			+							4	
38	<i>Chloritis sykesi</i>			+				+			4, 18, 27	
39	<i>Chloritis tabularis</i>		+	+							3, 4, 6, 18, 27	
40	<i>Chloritis tomentosa</i>			+							1, 4, 18, 27	
41	<i>Ganesella acris</i>	+	+				+				4, 6, 18, 21, 27	
42	<i>Ganesella bantamensis</i>									+	MZB	
43	<i>Genesella bottgeri</i>			+							4	
44	<i>Ganesella conulus</i>			+				+			3, 4, 19	
45	<i>Landouria ciliocincta</i>		+	+							MZB, 12, 27	
46	<i>Landouria costulata</i>		+	+							+	MZB, 27
47	<i>Landouria mentawaiensis</i>			+								4, 27
48	<i>Landouria monticola</i>										+	MZB, 12
49	<i>Landouria rotatoria</i>		+	+							+	MZB, 12, 22, 23, 27
50	<i>Landouria sumatrana</i>		+	+			+	+	+		+	1, 4, 19, 27
51	<i>Landouria winteriana</i>		+	+			+		+		+	MZB, 4, 12, 27
52	<i>Planispira aldrichi</i>							+				11, 26, 27
53	<i>Planispira gabata atjehensis</i>	+										18, 21, 27
54	<i>Planispira gabata smithi</i>	+		+								4, 18, 27
55	<i>Planispira quadrivolvis</i>	+						+	+			4, 6, 15, 18, 21, 27
56	<i>Pseudopartula arborascens</i>									+		22
57	<i>Pseudopartula dohertyi</i>									+		4, 18, 27
58	<i>Pseudopartula galericulum gedeana</i>									+		18, 27
		10	16	23	1	1	6	16	11	3	20	

Table 2. Cyclophoridae land snail species from Sumatra. The list of References and provinces referring to Table 1.

No	Species (jenis)	Ac	NS	WS	Ru	RI	Ja	Be	SS	BB	La	References (pustaka)
1	<i>Alycaeus crenilabris laevis</i>		+									27
	<i>Alycaeus crenilabris</i>											
2	<i>latecostatus</i>						+					18, 27
3	<i>Alycaeus liratulus</i>			+								18, 27
												MZB, 18, 27
4	<i>Alycaeus praetextus</i>	+			+							27
	<i>Alycaeus reinhardtii</i>											
5	<i>sabangensis</i>	+										20, 25, 27
6	<i>Alycaeus sumatranaus</i>	+	+									4, 18, 27
7	<i>Alycaeus wilhelminaiae</i>	+										17
8	<i>Chamalycaeus crassicollis</i>		+									18, 27
9	<i>Chamalycaeus fruhstorferi</i>		+									27, 29
10	<i>Chamalycaeus longituba</i>	+	+	+				+	+			MZB, 4, 6, 18, 19, 27
11	<i>Crossopoma albersi</i>	+	+	+								MZB, 18, 21, 27
12	<i>Crossopoma bathyrhaphes</i>								+		+	19, 27
	<i>Crossopoma cornuvenatorium</i>	+		+				+				MZB, 6, 18
13												MZB, 11, 13, 26, 27
14	<i>Crossopoma enganoense</i>							+				MZB, 6, 20, 25
15	<i>Crossopoma inflatum</i>	+										MZB, 6, 18, 27
16	<i>Crossopoma nieli</i>		+									MZB, 1, 2, 4, 18, 19, 27
17	<i>Crossopoma planorbulum</i>	+	+	+				+	+	+		MZB
18	<i>Crossopoma sp</i>				+							
19	<i>Crossopoma spiroliratus</i>	+										MZB, 9, 18
	<i>Cyclohelix crocata</i>											MZB, 6, 15, 27
20	<i>jacobsoni</i>	+										MZB, 6, 23, 24, 27
21	<i>Cyclohelix kibleri</i>		+									
22	<i>Cyclohelix kibleri babiensis</i>	+										15, 27
	<i>Cyclohelix kibleri simalurensis</i>											MZB, 15, 27
23												
24	<i>Cyclohelix nicobarica</i>	+										6, 15, 27
25	<i>Cyclophorus courbeti</i>		+									18, 27
26	<i>Cyclophorus egregius</i>	+	+									4, 6, 18, 21, 27
												MZB, 1, 2, 4, 6, 18, 19, 27
27	<i>Cyclophorus eximius</i>	+	+	+				+	+	+		21, 27
	<i>Cyclophorus eximius rouyeri</i>				+							2, 4, 27
28												
29	<i>Cyclophorus hebereri</i>	+										20, 25, 27
30	<i>Cyclophorus ouwensianus</i>	+	+									18, 21, 27
												MZB, 4, 18, 27
31	<i>Cyclophorus perdix</i>	+	+	+			+	+		+	+	19, 27
	<i>Cyclophorus perdix aquilus</i>											6
32												
33	<i>Cyclophorus perdix bankanus</i>									+		27
												MZB, 6, 15, 27
34	<i>Cyclophorus schepmani</i>	+										18, 27
35	<i>Cyclophorus taeniatus</i>		+									

36	<i>Cyclophorus tuba</i>	+	+	+	+	+	+	+	+	+	MZB, 1, 4, 6, 18, 19, 21, 27	
37	<i>Cyclophorus tuba plicifera</i>	+	+	+		+	+	+	+	+	MZB, 2, 4, 27	
38	<i>Cyclotus bialatus</i>		+								27	
39	<i>Cyclotus corniculum</i>			+		+			+	+	MZB, 13, 18, 27	
40	<i>Cyclotus discoideus</i>			+	+				+	+	MZB, 4, 18, 19, 27	
41	<i>Cyclotus discriminendus</i>	+		+		+	+				MZB, 6, 18, 21	
42	<i>Cyclotus niasensis</i>		+								23, 27	
43	<i>Cyclotus politus</i>				+						MZB	
44	<i>Cyclotus rostellatus</i>		+					+	+	+	4, 6, 18, 19, 27	
45	<i>Cyclotus simplicissimus</i>	+									20, 25, 27	
46	<i>Cyclotus sumatranaus</i>		+	+		+	+	+	+	+	MZB, 4, 6, 18, 19, 21, 27	
47	<i>Japonia ciliferum</i>			+			+				MZB, 11, 13, 18, 26, 27	
48	<i>Japonia ciliocinctum</i>	+					+		+	+	MZB, 18, 19, 27	
49	<i>Japonia garreli</i>		+	+		+	+				MZB, 4, 18, 27	
50	<i>Japonia grandipilum</i>					+			+	+	MZB, 18, 27	
51	<i>Japonia marangense</i>		+								MZB, 12, 18	
52	<i>Japonia mundum</i>	+	+								MZB, 18, 27	
53	<i>Japonia obliquistriatum</i>			+							MZB, 18, 27	
54	<i>Japonia townsendi</i>	+	+						+		18, 27	
55	<i>Leptopoma altum</i>	+									18, 20, 25	
56	<i>Leptopoma bodjoense</i>		+								MZB, 27	
57	<i>Leptopoma bodjoense</i> <i>mentawaiense</i>			+							MZB, 4	
58	<i>Leptopoma fultoni</i>			+	+			+	+	+	3, 4, 6, 18, 27	
59	<i>Leptopoma niasense</i>	+	+	+							MZB, 6, 15, 23, 27	
60	<i>Leptopoma perlucidum</i>	+	+			+			+	+	MZB, 18, 26, 27	
61	<i>Leptopoma sericatum</i>		+			+					MZB	
62	<i>Leptopoma vitreum</i>		+			+			+	+	MZB, 11, 18, 19	
63	<i>Pincerna yansenii</i>			+							10	
64	<i>Schistoloma sumatranum</i>	+	+	+			+				MZB, 2, 4, 18, 19, 27	
65	<i>Schistoloma sectilabrum</i>				+						1, 4, 27	
66	<i>Theobaldius dautzenbergi</i>	+	+								MZB, 6, 15, 18, 23, 24, 27	

Records of Sumatran land snails species were mainly started from 1881 when Carl Bock published his study in Padang West Sumatra. After that, the inventories were continued by Bullen (1906) and Degner (1928). Data of museum specimens were started from 1931 consist of six Cyclophorid species. After this periods, the inventories were still continued by some authors, such as the collection done by museum staffs (Table 4 and 5).

There are ninety-seven conservation areas in Sumatra Island, consist of ten National Parks, 23 Wildlife Sanctuaries, and 64 Nature Reserves. This study covers 95 regencies in ten provinces. Only 35 (37%) of them located at inside the conservation areas and 60 (63%) located at outside the conservation areas. The species composition in ten regencies varied (Table 6).

Table 3. The diversity of land snail in ten provinces in Sumatra data are sorted from most to less diverse, summarized from the primary and secondary sources (*keragaman keong darat dari 10 provinsi diurutkan dari banyak ke sedikit, dirangkum dari sumber primer dan sekunder*).

No	Group (grup)	Province (provinsi)	Ref	Ft	Camaenidae		Cyclophoridae		Two families (dua suku)	
					Gen	Sp	Gen	Sp	Gen	Sp
1	First	West Sumatra	13	11	5	23	9	27	14	50
2	First	North Sumatra	13	6	4	16	10	32	14	48
3	First	Aceh	10	10	3	10	10	31	13	41
4	Second	Lampung	13	25	4	20	5	17	9	37
5	Second	Bengkulu	11	12	5	16	6	16	11	32
6	Second	South Sumatra	7	4	4	11	6	11	10	22
7	Third	Jambi	8	7	3	6	6	11	9	17
8	Third	Bangka Belitung	4	1	1	3	3	5	4	8
9	Third	Riau	5	1	1	1	2	2	3	3
10	Third	Riau Islands	4	1	1	1	2	2	3	3

Notes (*keterangan*): Ref: number of literatures dealing with each province (*jumlah pustaka berkaitan dengan tiap provinsi*), Ft: frequency of field trip to collect specimens (*frekuensi perjalanan lapang untuk mengumpulkan spesimen*), Gen: genus (*marga*), Sp: species (*jenis*).

New Record (NR) and Extended Distribution (ED) of nine species of Camaenidae

Amphidromus enganoensis. Previous record was only known from Enggano island, Bengkulu (Dharma, 2005; Henderson, 1898; Heryanto, 2017; Laidlaw and Solem, 1961; Marwoto, 2016, Van Benthem Jutting, 1937, 1959). This study showed the species also was found in Dua Island, east side of Enggano island (MZB.Gst.9693: NR).

Amphidromus inversus. Previous records were known from Lampung (Bandar Lampung, Lampung Timur), South Sumatra, and Bangka Belitung (Dharma, 2005; Laidlaw and Solem, 1961; Marwoto, 2016; Van Benthem Jutting, 1959). This study showed that the species also was found in Bengkulu (MZB.Gst.13962; 6640 Bengkulu Selatan: NR). Within Lampung, it also was found in Sebesi Island (MZB.Gst.5140: NR) and Sertung Island (MZB.Gst.9625: NR).

Amphidromus palaceus. Previous records were known from Lampung (Lampung Barat, Tanggamus) and South Sumatra (Degner, 1928; Dharma, 2005; Laidlaw and Solem, 1961; Marwoto, 2016; Van Benthem Jutting, 1959). This study showed that the species also was found in Bengkulu (MZB.Gst.9673 Rejang Lebong: NR). Within Lampung, it also was found in Pesisir Barat (MZB.Gst.9148; 9363; 9638; 16654; 21575: ED).

Amphidromus porcellanus. Previous records were known from Lampung (Krakatau Islands), Bangka Belitung, and North Sumatra (Degner, 1928; Dharma, 2005; Laidlaw and Solem, 1961, Marwoto, 2016, Smith and Djajasasmita, 1988). This study showed that the species also was found in Lampung Timur (MZB.Gst.7230: NR) and Tanggamus (MZB.Gst.9633: NR).

Landouria ciliocincta. Previous records were known from Lampung (Pesawaran), West Sumatra, and North Sumatra (Heryanto, 2013; Van Benthem Jutting, 1959). Within Lampung, it also was found in Lampung Timur (MZB.Gst.9899: ED).

Landouria costulata. Previous records were known from West Sumatra and North Sumatra (Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung (MZB.Gst.6659 Lampung Timur: NR).

Landouria rotatoria. Previous records were known from West Sumatra and North Sumatra (Heryanto, 2013; Smith and Djajasasmita, 1988; Van Benthem Jutting, 1934, Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung (MZB.Gst.9800 Lampung Timur, MZB.Gst.16627 Pesawaran, and MZB.Gst.7299 Pringsewu : NR).

Landouria sumatrana. Previous records were known from Lampung (Bandar Lampung,

Table 4. Inventories of Sumatran Camaenidae land snails (*inventarisasi keong darat Camaenidae dari Sumatera*).

Periode (rentang waktu)	References (pustaka)	Σ sp	Nsp	Tsp
1881-1890	Bock 1881	2	0	
1901-1910	Bullen 1906	3	3	5
1921-1930	Degner 1928	19	16	21
1931-1940	Rensch 1934	7	4	25
1951-1960	Van Benthem Jutting 1959	30	16	41
1961-1970	Laidlaw 1961	1	1	42
1971-1980	MZB	11	2	44
1981-1990	MZB	7	4	48
1991-2000	MZB	8	6	54
2001-2010	MZB	6	3	57
2011-2019	MZB	8	1	58

Notes (keterangan): Σ sp: number of species listed in the publication or museum specimen (*jumlah jenis terdaftar dalam publikasi atau spesimen musium*), Nsp: number of species not listed from previous publication or museum specimen (*jumlah jenis tak terdaftar dalam publikasi terdahulu atau spesimen musium*), Tsp: total of all known species (*total dari semua jenis yang dikenal*).

Table 5. Inventories of Sumatran Cyclophorid land snails. (*inventarisasi keong darat Cyclophoridae dari Sumatera*).

Periode (rentang waktu)	References (pustaka)	Σ sp	Nsp	Tsp
1881-1890	Bock, 1881	4	0	
1901-1910	Bullen, 1906	6	4	8
1921-1930	Degner, 1928	19	12	20
1931-1940	MZB (1931)	6	3	23
	Rensch, 1934	14	3	26
	Paravicini, 1935	12	0	26
1951-1960	Laidlaw, 1957	5	4	30
	Van Benthem Jutting, 1959	55	10	40
1971-1980	MZB	11	1	41
1981-1990	MZB	20	6	63
1991-2000	MZB	10	1	64
2001-2010	MZB	2	0	64
2011-2019	MZB	13	0	64
	Maassen, 2006	1	1	65
	Gergely, 2015	1	1	66

Notes (keterangan): Σ sp: number of species listed in the publication or museum specimen (*jumlah jenis terdaftar dalam publikasi atau spesimen musium*), Nsp: number of species not listed from previous publication or museum specimen (*jumlah jenis tak terdaftar dalam publikasi terdahulu atau spesimen musium*), Tsp: total of all known species (*total dari semua jenis yang dikenal*).

Tanggamus), South Sumatra, Bengkulu, Jambi, West Sumatra, and North Sumatra (Bock, 1881; Degner, 1928; Paravicini, 1935; Van Benthem Jutting, 1959). Within Lampung, it also was found in Lampung Timur (MZB.Gst.21573: ED).

Landouria winteriana. Previous records were known from Lampung (Lampung Timur, Pesawaran), South Sumatra, West Sumatra, and North Sumatra (Degner, 1928; Heryanto, 2013;

Van Benthem Jutting, 1959). This study showed that the species also was found in Jambi (MZB.Gst.9859 Kerinci: NR). Within Lampung, it also found in Tanggamus (MZB.Gst.9959: ED).

New Record (NR) and Extended Distribution (ED) of twenty-one species of Cyclophoridae

Alycaeus praetextus. Previous record was only known from West Sumatra (Marwoto, 2016; Van

Table 6. Species composition of Sumatran land snails based on regencies, located inside or outside the conservation areas. (*komposisi jenis keong darat Sumatera berdasarkan kabupaten, terletak di dalam atau di luar daerah konservasi*).

Province (provinsi)	Regency (kabupaten)			Camaenidae			Cyclophoridae			Camaenidae and Cyclophoridae		
	T	IC	OC	Tr	IC	OC	Tr	IC	OC	Tr	IC	OC
West Sumatra	17	10	7	33	22	11	71	52	19	104	74	30
North Sumatra	18	7	11	35	20	15	76	33	43	111	53	58
Aceh	16	5	11	13	0	13	57	15	42	70	15	55
Lampung	13	4	9	31	19	12	38	20	18	69	39	30
Bengkulu	11	4	7	24	3	21	25	7	18	49	10	39
South Sumatra	9	2	7	13	3	10	19	4	15	32	7	25
Jambi	5	3	2	5	4	1	13	11	2	18	15	3
Bangka Belitung	2	0	2	3	0	3	4	0	4	7	0	7
Riau	2	0	2	1	0	1	2	0	2	3	0	3
Riau Islands	2	0	2	1	0	1	2	0	2	3	0	3
Total	95	35	60	159	71	88	307	142	165	466	213	253

Note (keterangan): T: total (*semua*), Tr: total records (*semua rekaman*), IC: inside conservation area (*dalam daerah konservasi*), OC: outside conservation area (*luar daerah konservasi*).

Bentham Jutting, 1959). This study showed that the species also was found in Aceh (MZB.Gst.19798 Aceh Besar: NR).

Chamalycaeus longituba. Previous records were known from Bengkulu, West Sumatra and North Sumatra (Degner, 1928; Dharmo, 2005; Marwoto, 2016; Paravicini, 1935; Van Bentham Jutting, 1959). This study showed that the species also found in Aceh (MZB.Gst.8874 Aceh Tenggara: NR).

Crossopoma albersi. Previous record were known from West Sumatra (Padang), North Sumatra, and Aceh (Marwoto, 2016; Rensch, 1934; Van Bentham Jutting, 1959). Within West Sumatra, it also was found in Siberut Island (MZB.Gst.9959: ED).

Crossopoma bathyrhaphes. Previous record was only known from Lampung (Bandar Lampung, Lampung Timur, and Pesisir Barat). This study showed that the species also was found in South Sumatra (MZB.Gst.17054 OKU Selatan: NR). Within Lampung, now it also was found in Tanggamus (MZB.Gst.21568: ED) and Way Kanan (MZB.Gst.9704: ED).

Crossopoma inflatum. Previous record was only known from Weh Island, Aceh (a small island on the north side of Sumatra) (Dharmo, 2005; Rensch, 1933; Van Bentham Jutting, 1935b). This study showed that the species also was found in

Aceh Selatan (MZB.Gst.951: NR).

Crossopoma nieli. Previous record was only known from North Sumatra (Asahan, Karo, and Simalungun) (Dharma, 2005; Marwoto, 2016; Van Bentham Jutting, 1959). This study showed that the species also found in Langkat (MZB.Gst.10181: ED).

Crossopoma planorbulum. Previous record were known from Lampung, South Sumatra, Bengkulu, Jambi, West Sumatra, North Sumatra (Asahan, Batu Island, and Deli Serdang), and Aceh (Bock, 1881; Bullen, 1906a; Degner, 1928; Marwoto, 2016; Paravicini, 1935; Van Bentham Jutting, 1959). Within North Sumatra, now it also was found in Langkat (MZB.Gst.21574: ED).

Cyclophorus eximius. Previous records were known from Lampung (Tanggamus), South Sumatra, Bengkulu (Bengkulu Utara, Kepahiang, Rejang Lebong), Jambi, West Sumatra (Agam, Dharmasraya, Lima Puluh Kota, Padang, Padang Panjang, Pasaman, Pasaman Barat, Sijunjung, Solok, Solok Selatan, Tanah Datar), North Sumatra, and Aceh (Aceh Tengah) (Bock, 1881; Bullen, 1906a; Degner, 1928; Dharmo, 2005; Marwoto, 2016; Paravicini, 1935; Rensch, 1934; Van Bentham Jutting, 1959). This study showed that the species also was found in Lampung Barat (MZB.Gst.12681; 12682; 13174; 16926: ED), Bengkulu Tengah (MZB.Gst.16933 : ED) and

Seluma (MZB.Gst.16949: ED), Siberut Island (MZB.Gst.12678: NR), and Aceh Besar (MZB.Gst.16929; 16931; 16934: ED).

Cyclophorus perdix. Previous records were known from Lampung (Pesisir Barat, Tanggamus), South Sumatra, Bangka Belitung, West Sumatra, North (Asahan, Deli Serdang, Karo, Toba Samosir), and Aceh (Aceh Selatan, Bener Meriah, Pidie) (Degner, 1928; Marwoto, 2016; Paravicini, 1935; Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung Timur (MZB.Gst.7186: ED), Jambi (MZB.Gst.9019 Merangin: NR), Riau Islands (NR: MZB.Gst.16360 Natuna Island, MZB.Gst.8994 Bintan Island), Tapanuli Utara (MZB.Gst.12613: ED), and Aceh Besar (MZB.Gst.9028; 9029; 16985 : ED).

Cyclophorus tuba. Previous records were known from Lampung (Bandar Lampung, Lampung Timur), Bengkulu (Kepahiang, Rejang Lebong), South Sumatra (Banyuasin, Muara Enim, Pagar Alam, Palembang), Jambi, West Sumatra (Agam, Mentawai Islands, Padang, Payakumbuh, Solok, Solok Selatan), North Sumatra (Asahan, Deli Serdang, Humbang Hasundutan, Karo, Labuhanbatu Utara, Langkat, Medan, Pematang Siantar, Serdang Bedagai, Tebing Tinggi), and Aceh (Aceh Tengah, Aceh Timur, Aceh Utara, Bener Meriah, Gayo Lues, Langsa, Lhokseumawe) (Bock, 1881; Degner, 1928; Dharma, 2005; Marwoto, 2016; Paravicini, 1935; Rensch, 1934; Van Benthem Jutting, 1959). This study showed that the species also was found in Tanggamus (MZB.Gst.12621: ED), Bengkulu Tengah (MZB.Gst.16947: ED), OKU Selatan (MZB.Gst.12620; 12623: ED), Pasaman (MZB.Gst.10084; 12622; 16968: ED), Siberut Island (MZB.Gst.12612: NR), Riau (MZB.Gst.16945 Kampar: NR), Tapanuli Utara (MZB.Gst.12624: ED), Aceh Tenggara (MZB.Gst. 8375; 8383; 8781; 16944; 16946; 16948; 16962; 16963; 16967: ED), Mt.Leuser (MZB.Gst.16964: ED), and Aceh Selatan (MZB.Gst.16966 : ED).

Cyclotus corniculum. Previous records were known from Bangka Belitung and Bengkulu (Heryanto, 2017; Marwoto, 2016; Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung (MZB.Gst.6651

Lampung Timur: NR), West Sumatra (MZB.Gst.17057; 21572 Pasaman: NR), and Aceh (MZB.Gst.19796 Aceh Besar: NR).

Cyclotus discoideus. Previous records were known from Lampung, West Sumatra (Agam), and North Sumatra (Degner, 1928; Marwoto, 2016; Paravicini, 1935; Van Benthem Jutting, 1959). Within West Sumatra, now it also was found in Pasaman (MZB.Gst. 9698: ED).

Cyclotus discriminendus. Previous record was only known from Jambi (Dharma, 2005; Marwoto, 2016; Rensch, 1934). This study showed that the species also was found in Bengkulu (MZB.Gst.17045 Lebong, MZB.Gst.10141 Rejang Lebong: NR), West Sumatra (MZB.Gst.9198; 16986; 17042; 17043; 17046; 17047; 170551 Pasaman: NR), and Aceh (MZB.Gst.9156 Aceh Utara: NR). Within Jambi, now it also was found in Tebo (MZB.Gst.17044: ED).

Cyclotus sumatranaus. Previous records were only known from Bengkulu (Kepahiang), Jambi, West Sumatra (Padang), and North Sumatra (Degner, 1928; Dharma, 2005; Marwoto, 2016; Paravicini, 1935; Rensch, 1934; Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung (MZB.Gst.7181 Lampung Timur, MZB.Gst.17050 Pesisir Barat: NR). Within Bengkulu and West Sumatra, now it also was found in Rejang Lebong (MZB.Gst.9867: ED) and Agam (MZB.Gst.17049: ED).

Japonia ciliocinctum. Previous record was only known from Lampung (Bandar Lampung, Lampung Selatan, Pesawaran, Tanggamus) (Marwoto, 2016; Paravicini, 1935; Van Benthem Jutting, 1959). This study showed that the species also was found in Aceh (MZB.Gst.8875 Aceh Tenggara: NR) and Bengkulu (MZB.Gst.18247 Enggano Island: NR). Within Lampung, now it also was found in Lampung Timur (MZB.Gst.21560: ED).

Japonia grandipilum. Previous record was only known from Jambi (Kerinci) (Marwoto, 2016; Van Benthem Jutting, 1959). This study showed that the species also was found in Lampung (MZB.Gst.6668; 7185 Lampung Tengah: NR).

Japonia mundum. Previous record was only known from North Sumatra (Marwoto, 2016; Van

Bentham Jutting, 1959). This study showed that the species also was found in Aceh (MZB.Gst:9886 Aceh Tenggara: NR).

Japonia obliquistriatum. Previous record was only known from Lampung (Heryanto, 2013; Marwoto, 2016). This study showed that the species also was found in West Sumatra (MZB.Gst.21561 Pasaman: NR).

Leptopoma perlucidum. Previous records were known from Bangka Belitung, Bengkulu, and West Sumatra (Lima Pulu Kota) (Marwoto, 2016, Van Bentham Jutting, 1937; 1959). This study showed that the species also was found in Lampung (MZB.Gst.21562; 21563; 21564 Lampung Timur: NR), North Sumatra (MZB.Gst.8598 Batu Bara: NR), and Siberut Island, West Sumatra (MZB.Gst.12614: NR).

Leptopoma vitreum. Previous record was only known from West Sumatra (Henderson, 1898; Marwoto, 2016; Paravicini, 1935). This study showed that the species also was found in Bengkulu (MZB.Gst.18405 Enggano Island: NR).

Schistoloma sumatrana. Previous records were known from Jambi, West Sumatra (Agam, Lima Puluh Kota, Padang, Pasaman Barat, Tanah Datar), and North Sumatra (Bullen, 1906a; Degner, 1928; Marwoto, 2016; Paravicini, 1935; Van Bentham Jutting, 1959). This study showed that the species also was found in Aceh (MZB.Gst.8390 Aceh Tenggara: NR). Within West Sumatra, now it also was found in and Pasaman (MZB.Gst.9298: ED).

DISCUSSION

Previously, the number of species of Camaenidae and Cyclophoridae have been reported, i.e., 22 species and 26 species (Degner, 1928), 22 species and 40 species (Van Bentham Jutting, 1959), and 37 species and 45 species (Marwoto, 2016), respectively.

Cyclophorus taeniatus (Pfeiffer, 1854) and *Landouria sumatrana* (Martens, 1864) were the oldest Cyclophoridae and Camaenidae land snail described from Sumatra. The two oldest MZB museum specimens were *Amphidromus porcellanus* (Camaenidae MZB.Gst.1028, Sebesi Island, Lampung, collected in 1921) and

Leptopoma bodjoense mentawaiense (Cyclophoridae MZB.Gst.641, Mantawai Islands, West Sumatra, collected in 1924). The latter species was described by Degner in 1928, and it means that the specimen had already deposited in the MZB museum four years before the specimen described.

Based on the examination of museum specimens and literatures about diversity and distribution of Sumatran land snail, fourteen species were not listed in previous checklists, Degner, 1928, Van Bentham Jutting, 1959; Marwoto, 2016 (Figure 1).

The similarity of species composition of Camaenid and Cyclophorid between van Bentem Jutting (1959) and Marwoto (2016) is higher compared to Degner (1928). It may be caused by the number of newly described species between 1928-1959 is higher than between 1959-2016, it will affect the similarity of species composition. We found fourteen species that never been reported from Sumatra previously (additional species record) consist of seven Camaenid species and seven Cyclophorid species. Based on data of museum specimens and data from literatures, 36 new records and 30 extended distributions were found (Table 1 and 2).

We found seven additional species record from Camaenidae, six species of them were deposited in MZB: *Pseudopartula arborascens* was reported from Sertung Island (Krakatau Islands group, Lampung) (Smith and Djajasasmita, 1988), *Amphidromus banksi* was collected from Krakatau Islands (MZB.Gst.9254) and Sebesi Island, Lampung (MZB.Gst.5136). Smith and Djajasasmita (1988) stated that this species was only found in Sertung Island. The type locality of this species was in Panaitan Island, Banten (Butot, 1955). *Amphidromus inversus andamanensis* (MZB.Gst.9362) was collected from Belitung Timur, Bangka Belitung. Laidlaw and Solem (1961) stated this species was found in Belitung and its satellite islands. *Amphidromus minutus* (MZB.Gst.8234) was described from Lampung Timur, Lampung (Djajasasmita, 1982). *Amphidromus javanicus* (MZB.Gst.9668) was collected from Batang Hari, Jambi. *Ganesella*

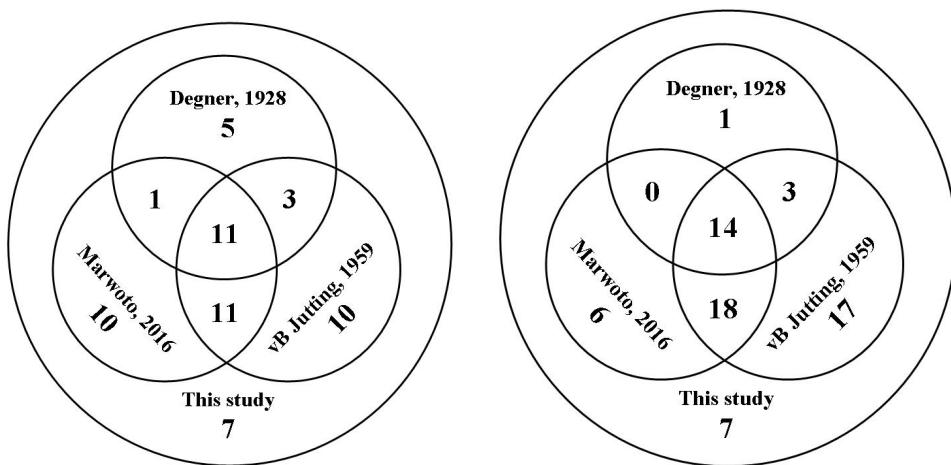


Figure 1. Similarity of species composition between three main literatures and this study (left: Camaenidae, right: Cyclophoridae) (*kesamaan komposisi jenis antara tiga pustaka utama dan penelitian ini (kiri: Camaenidae, kanan: Cyclophoridae)*).

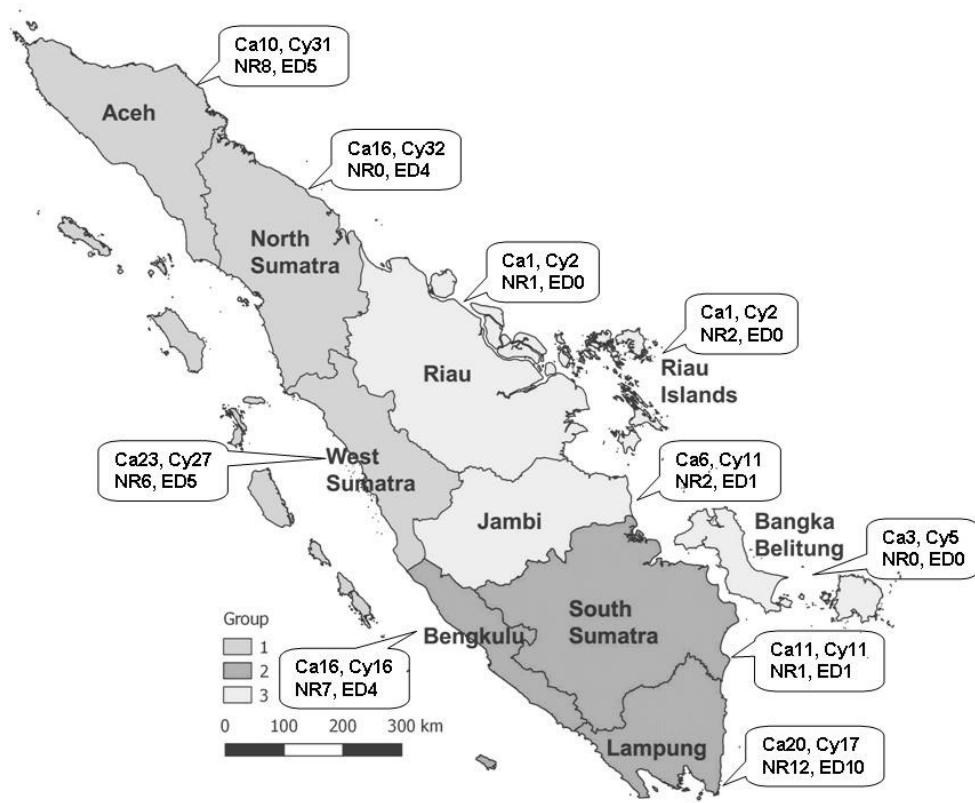


Figure 2. Summary of the diversity of land snail with their New Record and Extended Distribution in each province. Ca : Camaenidae, Cy : Cyclophoridae (*rangkuman dari keragaman keong darat dengan catatan baru dan perluasan distribusi pada setiap provinsi. Ca: Camaenidae, Cy : Cyclophoridae*). Source (*sumber*): private document (*dokumen pribadi*).

bantamensis (MZB.Gst.6653) was collected from Lampung Timur, Lampung. *Landouria monticola* (MZB.Gst.16624) was collected and recorded from Pesawaran, Lampung (Heryanto, 2013). Van Benthem Jutting (1950) stated that these last three species only occurred in Java.

Additional species record also was found from seven species of Cyclophoridae, four species of them were deposited in MZB. *Alycaeus wilhelmina* was described from Aceh Besar, Aceh (Maassen, 2006). *Cyclophorus perdix aquilus* was recorded from Bangka Island (Dharma, 2005) and *Pincerna yanseni* was described from Solok Selatan, West Sumatra (Gergely, 2015). *Crossopoma inflatum* (MZB.Gst.951) was collected from Aceh Selatan, Aceh. Van Benthem Jutting (1935ab) stated that this species was only occurred in Weh Island, Aceh. *Crossopoma* sp. (MZB.Gst.21567) was collected from Siberut Island, West Sumatra (small island on the west coast of West Sumatra). The shell's morphology of this specimen is different compared to previously known species from Sumatra by having a prominent spiral ribs around the body whorl. *Cyclotus politus* (MZB.Gst.19000) was collected from Bintan Island, Riau Islands. Rensch (1931) stated that this species was only found in Lesser Sunda islands. *Leptopoma sericatum* was collected from Pasaman, West Sumatra (MZB.Gst.21565) and Lebong, Bengkulu (MZB.Gst.21566). Vermeulen (1999) stated that this species only occurred in Borneo.

CONCLUSION

This study summarized the species composition of two most diverse land snail families of Sumatra, i.e., Camaenidae and Cyclophoridae. Overall, 124 species in family Camaenidae and Cyclophoridae were listed and 65 species of them were deposited in MZB. We added 14 species of Camaenidae and Cyclophoridae that have not been listed in previous literatures. Thirty six new records and 30 extended distributions of Camaenid and Cyclophorid species were documented from this study. The records of species found in inside the conservation areas were lower than from outside the conservation areas in Sumatra.

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Pedoman Penulisan Naskah Berita Biologi

Berita Biologi adalah jurnal yang menerbitkan artikel kemajuan penelitian di bidang biologi dan ilmu-ilmu terkait di Indonesia. Berita Biologi memuat karya tulis ilmiah asli berupa makalah hasil penelitian, komunikasi pendek dan tinjauan kembali yang belum pernah diterbitkan atau tidak sedang dikirim ke media lain. Masalah yang diliput harus menampilkan aspek atau informasi baru.

Tipe naskah

1. Makalah lengkap hasil penelitian (*original paper*)

Naskah merupakan hasil penelitian sendiri yang mengangkat topik yang *up to date*. Tidak lebih dari 15 halaman termasuk tabel dan gambar. Pencantuman lampiran seperlunya, namun redaksi berhak mengurangi atau meniadakan lampiran.

2. Komunikasi pendek (*short communication*)

Komunikasi pendek merupakan makalah hasil penelitian yang ingin dipublikasikan secara cepat karena hasil temuan yang menarik, spesifik dan atau baru, agar dapat segera diketahui oleh umum. Hasil dan pembahasan dapat digabung.

3. Tinjauan kembali (*review*)

Tinjauan kembali merupakan rangkuman tinjauan ilmiah yang sistematis-kritis secara ringkas namun mendalam terhadap topik penelitian tertentu. Hal yang ditinjau meliputi segala sesuatu yang relevan terhadap topik tinjauan yang memberikan gambaran '*state of the art*', meliputi temuan awal, kemajuan hingga issue terkini, termasuk perdebatan dan kesenjangan yang ada dalam topik yang dibahas. Tinjauan ulang ini harus merangkum minimal 30 artikel.

Struktur naskah

1. Bahasa

Bahasa yang digunakan adalah Bahasa Indonesia atau Inggris yang baik dan benar.

2. Judul

Judul diberikan dalam bahasa Indonesia dan Inggris. Judul ditulis dalam huruf tegak kecuali untuk nama ilmiah yang menggunakan bahasa latin, Judul harus singkat, jelas dan mencerminkan isi naskah dengan diikuti oleh nama serta alamat surat menyurat penulis dan alamat email. Nama penulis untuk korespondensi diberi tanda amplop cetak atas (*superscript*). Jika penulis lebih dari satu orang bagi pejabat fungsional penelitian, pengembangan agar menentukan status sebagai kontributor utama melalui penandaan simbol dan keterangan sebagai kontributor utama dicatatkan kaki di halaman pertama artikel.

3. Abstrak

Abstrak dibuat dalam dua bahasa, bahasa Indonesia dan Inggris. Abstrak memuat secara singkat tentang latar belakang, tujuan, metode, hasil yang signifikan, kesimpulan dan implikasi hasil penelitian. Abstrak berisi maksimum 200 kata, spasi tunggal. Di bawah abstrak dicantumkan kata kunci yang terdiri atas maksimum enam kata, dimana kata pertama adalah yang terpenting. Abstrak dalam Bahasa Inggris merupakan terjemahan dari Bahasa Indonesia. Editor berhak untuk mengedit abstrak demi alasan kejelasan isi abstrak.

4. Pendahuluan

Pendahuluan berisi latar belakang, permasalahan dan tujuan penelitian. Perlu disebutkan juga studi terdahulu yang pernah dilakukan terkait dengan penelitian yang dilakukan.

5. Bahan dan cara kerja

Bahan dan cara kerja berisi informasi mengenai metode yang digunakan dalam penelitian. Pada bagian ini boleh dibuat sub-judul yang sesuai dengan tahapan penelitian. Metoda harus dipaparkan dengan jelas sesuai dengan standar topik penelitian dan dapat diulang oleh peneliti lain. Apabila metoda yang digunakan adalah metoda yang sudah baku cukup ditulis sitasinya dan apabila ada modifikasi maka harus dituliskan dengan jelas bagian mana dan hal apa yang dimodifikasi.

6. Hasil

Hasil memuat data ataupun informasi utama yang diperoleh berdasarkan metoda yang digunakan. Apabila ingin mengacu pada suatu tabel/ grafik/diagram atau gambar, maka hasil yang terdapat pada bagian tersebut dapat diuraikan dengan jelas dengan tidak menggunakan kalimat 'Lihat Tabel 1'. Apabila menggunakan nilai rata-rata maka harus menyertakan pula standar deviasinya.

7. Pembahasan

Pembahasan bukan merupakan pengulangan dari hasil. Pembahasan mengungkap alasan didapatkannya hasil dan arti atau makna dari hasil yang didapat tersebut. Bila memungkinkan, hasil penelitian ini dapat dibandingkan dengan studi terdahulu.

8. Kesimpulan

Kesimpulan berisi infomasi yang menyimpulkan hasil penelitian, sesuai dengan tujuan penelitian, implikasi dari hasil penelitian dan penelitian berikutnya yang bisa dilakukan.

9. Ucapan terima kasih

Bagian ini berisi ucapan terima kasih kepada suatu instansi jika penelitian ini didanai atau didukungan oleh instansi tersebut, ataupun kepada pihak yang membantu langsung penelitian atau penulisan artikel ini.

10. Daftar pustaka

Tidak diperkenankan untuk mensitis artikel yang tidak melalui proses *peer review*. Apabila harus menyitir dari "laporan" atau "komunikasi personal" dituliskan '*unpublished*' dan tidak perlu ditampilkan di daftar pustaka. Daftar pustaka harus berisi informasi yang *up to date* yang sebagian besar berasal dari *original papers* dan penulisan terbitan berkala ilmiah (nama jurnal) tidak disingkat.

Format naskah

1. Naskah diketik dengan menggunakan program Microsoft Word, huruf New Times Roman ukuran 12, spasi ganda kecuali Abstrak spasi tunggal. Batas kiri-kanan atas-bawah masing-masing 2,5 cm. Maksimum isi naskah 15 halaman termasuk ilustrasi dan tabel.

2. Penulisan bilangan pecahan dengan koma mengikuti bahasa yang ditulis menggunakan dua angka desimal di belakang koma. Apabila menggunakan Bahasa Indonesia, angka desimal ditulis dengan menggunakan koma (,) dan ditulis dengan menggunakan titik (.) bila menggunakan bahasa Inggris. Contoh: Panjang buku adalah 2,5 cm. Length of the book is 2.5 cm. Penulisan angka 1-9 ditulis dalam kata kecuali bila bilangan satuan ukur, sedangkan angka 10 dan seterusnya ditulis dengan angka. Contoh lima orang siswa, panjang buku 5 cm.

3. Penulisan satuan mengikuti aturan *international system of units*.

4. Nama takson dan kategori taksonomi ditulis dengan merujuk kepada aturan standar yang diajui. Untuk tumbuhan menggunakan *International Code of Botanical Nomenclature* (ICBN), untuk hewan menggunakan *International Code of Zoological Nomenclature* (ICZN), untuk jamur *International Code of Nomenclature for Algae, Fungi and Plant* (ICAFP), *International Code of Nomenclature of Bacteria* (ICNB), dan untuk organisme yang lain merujuk pada kesepakatan Internasional. Penulisan nama takson lengkap dengan nama author hanya dilakukan pada bagian deskripsi takson, misalnya pada naskah taksonomi. Penulisan nama takson untuk bidang lainnya tidak perlu menggunakan nama author.

5. Tata nama di bidang genetika dan kimia merujuk kepada aturan baku terbaru yang berlaku.

6. Untuk range angka menggunakan en dash (-), contohnya pp.1565–1569, jumlah anakan berkisar 7–8 ekor. Untuk penggabungan kata menggunakan hyphen (-), contohnya: masing-masing.

7. Ilustrasi dapat berupa foto (hitam putih atau berwarna) atau gambar tangan (*line drawing*).

8. Tabel

Tabel diberi judul yang singkat dan jelas, spasi tunggal dalam bahasa Indonesia dan Inggris, sehingga Tabel dapat berdiri sendiri. Tabel diberi nomor urut sesuai dengan keterangan dalam teks. Keterangan Tabel diletakkan di bawah Tabel. Tabel tidak dibuat tertutup dengan garis vertikal, hanya menggunakan garis horizontal yang memisahkan judul dan batas bawah.

8. Gambar
Gambar bisa berupa foto, grafik, diagram dan peta. Judul gambar ditulis secara singkat dan jelas, spasi tunggal. Keterangan yang menyertai gambar harus dapat berdiri sendiri, ditulis dalam bahasa Indonesia dan Inggris. Gambar dikirim dalam bentuk .jpeg dengan resolusi minimal 300 dpi, untuk *line drawing* minimal 600dpi.
9. Daftar Pustaka
Situs dalam naskah adalah nama penulis dan tahun. Bila penulis lebih dari satu menggunakan kata ‘dan’ atau *et al.* Contoh: (Kramer, 1983), (Hamzah dan Yusuf, 1995), (Premachandra *et al.*, 1992). Bila naskah ditulis dalam bahasa Inggris yang menggunakan sitasi 2 orang penulis maka digunakan kata ‘and’. Contoh: (Hamzah and Yusuf, 1995). Jika sitasi beruntun maka dimulai dari tahun yang paling tua, jika tahun sama maka dari nama penulis sesuai urutan abjad. Contoh: (Anderson, 2000; Agusta *et al.*, 2005; Danar, 2005). Penulisan daftar pustaka, sebagai berikut:
 - a. **Jurnal**
Nama jurnal ditulis lengkap.
Agusta, A., Maehara, S., Ōhashi, K., Simanjuntak, P. and Shibuya, H., 2005. Stereoselective oxidation at C-4 of flavans by the endophytic fungus *Diaporthe* sp. isolated from a tea plant. *Chemical and Pharmaceutical Bulletin*, 53(12), pp.1565–1569.
 - b. **Buku**
Anderson, R.C. 2000. *Nematode Parasites of Vertebrates, Their Development and Transmission*. 2nd ed. CABI Publishing. New York. pp. 650.
 - c. **Prosiding atau hasil Simposium/Seminar/Lokakarya.**
Kurata, H., El-Samad, H., Yi, T.M., Khammash, M. and Doyle, J., 2001. Feedback Regulation of the Heat Shock Response in *Escherichia coli*. *Proceedings of the 40th IEEE Conference on Decision and Control*. Orlando, USA pp. 837–842.
 - d. **Makalah sebagai bagian dari buku**
Sausan, D., 2014. Keanekaragaman Jamur di Hutan Kabungolor, Tau Lumbis Kabupaten Nunukan, Kalimantan Utara. Dalam: Irham, M. & Dewi, K. eds. *Keanekaragaman Hayati di Beranda Negeri*. pp. 47–58. PT. Eaststar Adhi Citra. Jakarta.
 - e. **Thesis, skripsi dan disertasi**
Sundari, S., 2012. Soil Respiration and Dissolved Organic Carbon Efflux in Tropical Peatlands. *Dissertation*. Graduate School of Agriculture. Hokkaido University. Sapporo. Japan.
 - f. **Artikel online.**
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Himman, L.M., 2002. A Moral Change: Business Ethics After Enron. San Diego University Publication. <http://ethics.sandiego.edu/LMH/oped/Enron/index.asp>. (accessed 27 Januari 2008) bila naskah ditulis dalam bahasa inggris atau (diakses 27 Januari 2008) bila naskah ditulis dalam bahasa indonesia

Formulir persetujuan hak alih terbit dan keaslian naskah

Setiap penulis yang mengajukan naskahnya ke redaksi Berita Biologi akan diminta untuk menandatangani lembar persetujuan yang berisi hak alih terbit naskah termasuk hak untuk memperbaiknya artikel dalam berbagai bentuk kepada penerbit Berita Biologi. Sedangkan penulis tetap berhak untuk menyebarkan edisi cetak dan elektronik untuk kepentingan penelitian dan pendidikan. Formulir itu juga berisi pernyataan keaslian naskah yang menyebutkan bahwa naskah adalah hasil penelitian asli, belum pernah dan tidak sedang diterbitkan di tempat lain serta bebas dari konflik kepentingan.

Penelitian yang melibatkan hewan

Setiap naskah yang penelitiannya melibatkan hewan (terutama mamalia) sebagai obyek percobaan/penelitian, wajib menyertakan '*ethical clearance approval*' terkait animal welfare yang dikeluarkan oleh badan atau pihak berwenang.

Lembar ilustrasi sampul

Gambar ilustrasi yang terdapat di sampul jurnal Berita Biologi berasal dari salah satu naskah yang dipublikasi pada edisi tersebut. Oleh karena itu, setiap naskah yang ada ilustrasinya diharapkan dapat mengirimkan ilustrasi atau foto dengan kualitas gambar yang baik dengan disertai keterangan singkat ilustrasi atau foto dan nama pembuat ilustrasi atau pembuat foto.

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