Isis hippuris in Bone Bay South Sulawesi: bio-ecological study, status and conservation challenges

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Isis hippuris in Bone Bay South Sulawesi: bio-ecological study, status and conservation challenges

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ABSTRACT

Marine bamboo Isis hippuris is known for source of cytotoxic polyoxygenated steroids with apparent anti-cancer functions, as also containing a substance which hinders proteinproductionof viruses, use against cancer & AIDS. This group has been harvested extensively in Bone far few years which mainly shifts to Spermonde approximately for exporting. The study on bioecology aspect of Isis hippuris was conducted from October –November 2008 in Bone Bay, District of Sinjay and coastal area of Bone Regency South Sulawesi Indonesia. Bioecological observation using belt transect method at two different depths was applied at coral reefs in both areas. Additional information on the utilization of this group was collected through interview with fishermen and related stakeholders. The study indicates, based on colony size, exploitation level was considered moderate at four locations, while three locations show high level of exploitation. Locations that far from mainland and would be less in control by authority such as Taka Laburango, Pangampi and Limpoge were targeted by local fishermen as fishermen from Makassar. Furthermore, level of utilization of I. hippuris in both observation areas is various. Generally, fishermen could harvest up to 1 tones of Isis daily, which is left 50-70% dry weight after cleaning and drying processes. As legal aspects not included in CITES, no protection status in Indonesia. In fact, several tons of this group was confiscated in Bone in 2006, and a preventive ban on collection have issued by Bone's authority. However, collection of I. hippuris exists. It is known that this fauna has slow growth rate of 0.7 - 2.4 mm/month, respectively. Therefore, an over exploitation of this group would threaten natural population. As new law on coastal and small islands management requires permission for resources use which has to be derived from a resource management plan based on scientific evidence, possibility for moratorium is discussed in this paper.

Keywords: coral, Bone, conservation

INTRODUCTION

Bone bay water is enclosed system, even though it border with Makassar straits and Flores seas, the bay is quite unique. Marine resources in this area have been utilized for many decades. Unfortunately, unfriendly fishing method and un-control benthic harvesting has resulted in habitat degradation. In 2006, almost 75 % coral reefs in Bone district were severed damaged, 80% occured in Bone administratice area and 60% at Sinjay area [1].

Marine bamboo is one of marine resources in this area known as akar bahar (*Isis hipuris*) belongs to soft coral [1,3,4,5]. Sistematically of this group as follows: Kingdom: Animalia, Phylum: Cnidaria, Class: Anthozoa, Subclass: Alcyonaria (Octocorallia), Ordo: Alcyonacea, Subordo: Holaxonia, Family: Isididae , Genus: *Isis*, Spesies: *Isis hippuris* Linnaeus, 1758, with *Common name*: Gorgonia [5]. This group, as no protection law inplies, has been a targeted by fishermen in these area due to its economical value. Isis can be found in almost all coral reef area in Bone bay from Sinjai waters to coast of Palopo.

Due to intensive level of explotation, goverment of Bone has prohibited harvesting of marine bamboo in it area. This step is believed can protect this resources from being extinct. However study on explotation level as bio-ecological aspect is still needed to support government policy.

The aims of this study are (1) to explore *Isis hipuris* level and ways of exploitation at Bone Bay (Bone and Sinjay Regency); (2) to identify trade network and economical aspects of *Isis Hipuris*. The result of this study is expected to support local government policy in preventing further over exploitation of this group as also reference to government for law enforcement in order to maximize sustainable use of this resource.

MATERIALS AND METHOD

The study was conducted from October to November 2008 at Bone bay covering two regency that of Sinjay and coast of Bone. Ecological survey was conducted using transect belt method [6] 50 m long combination plot 2.5 m^2, with total area of 250 m^2. In field observation, researcher dived along with fishermen in which direct observation could be done. Deep interview was also applied in order to obtain socio-economical data from fishermen and other stakeholders.

Data analysis

Density (D) of marine bamboo was analyzed using formula:

$$D = \frac{\sum \text{individual}}{\text{Transect area}}$$

Descriptive analysis is used to explain *Isis* trading network from local fishermen, middle man until exporter at Makassar.

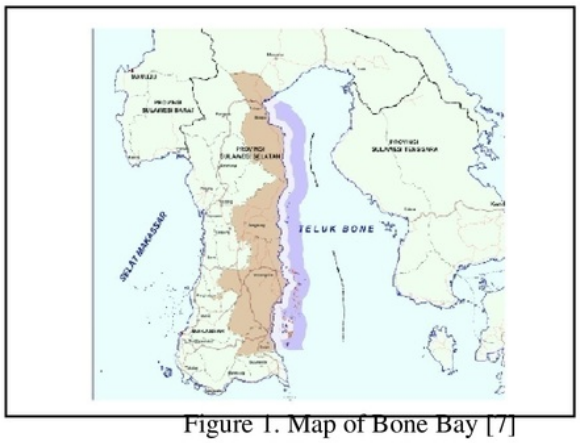


Figure 1. Map of Bone Bay [7]

RESULT AND DISCUSSION

Bone bay waters

Bone bay water cover is of 31.837,077 km^2 with coast line of 1128,84397 km, this area is considered different to Makassar Strait and Flores Sea. High rain fall (> 200 mm) usually occurs during May. Schimidt and Fergusson, 1951 *In* [8] reported average humidity in this area between 71 – 88 % (average 82,6 %) and temperature between 24 – 29 ^{o}C (average 27,87 ^{o}C), average monthly evaporation between 3,0 – 4,5 mm (average 3,86 mm).

Reefs conditions at Bone Bay

Coral reefs at Sinjay district is widely distributed around Sembilan archipelago. Admistratively, Sembilan archipelago belongs to District of Sembilan archipelago. This area merged from North Sinjay, Sinjay Regency. This archipelago consists of nine islands as follows: Kambuno, Liang-liang, Burung Loe, Kodingare, Batang Lampe, Kanalo Satu, Kanalo Dua, Katindoang and Larea-rea islands. The latest is inhabitants. Sembilan archipelago is recognised as yang volcano with average altitude of 70 – 200 m, except for Burung Loe with altitude of 400 m above sea level. Formerly, these islands were meant to be marine tourist destination however, the tourism business grows very slowly.

In this region, fringing reef and reef flat is widely distributed at eastern side of Liang-liang, Kodingare and Batang Lampe islands. Citra satellite shows that 23 spots patch reef) are found in administrative area of Sinjai District. In addition, more Than 60 patch reefs are found at Bone District waters. These reefs have been utilized by local inhabitants [7].

Figure 2. *Isis hipuris* from Bone bay waters (doc. Syafiudin Yusuf)

Density and partial horizontal distribution of marine bamboo

The results indicates that number of *Isis hippuris* [9] colony found in Sembilan archipelago is less than 10, the lowest ones was located on station 2 (P. Burung Loe) and station 4 (P. Batang lampe) (Table 1). This proves that over explotation of this resources already happened. This situation is also influenced by big flood in 2006 which resulted in very low water transparancy. At middle patch reef number of ind./transect ranges 31 – 89, and 15-137 at outher patch reef. As also seen from Table 1, number of ind. in Taka Pangampi and Taka Limpoge 2 are significantly lower compared to other takas at midle and outher patch reefs.

Table 1. Spatial distribution of *Isis hipuris* at Bone Bay

Sembilan Island reefs

Sta.	Location	Coordinate		N = no (Ind./ transect)
1	P. Liangliang	S 05° 06' 136"	E 120° 24' 240"	8
2	P. Burung Loe	-	-	3
3	Taka Batang Lampe	S 05° 03' 240"	E 120° 24' 170"	7
4	P. Batang Lampe	S 05° 02' 580"	E 120° 24' 430"	3
5	P.Kanalo I	S 05° 02' 462"	E 120° 23' 522"	7
6	P. Kanalo II	S 05° 02' 452"	E 120° 23' 344"	4

Middle Patch reef

Sta.	Location	Coordinate		N = no (Ind./ transect)
7	Taka Marempu 1	05° 02' 002"	120° 20' 304"	31
8	Taka Marempu 2	04° 00' 482"	120° 23' 347"	89
9	Taka Laburango 1	05° 00' 257"	120° 30' 318"	31
10	Taka Laburango 2	05° 00' 170"	120° 31' 090"	88
11	Taka Bungin Pare'e 1	04° 59' 133"	120° 29' 127"	61
12	Taka Bungin Pare'e 2	04° 59' 507"	120° 28' 352"	86

Outher Patch reef

Sta.	Location	Coordinate		N = no (Ind./ transect)
13	Taka Pangampi 1	05° 05' 564"	120° 35' 086"	137
14	Taka Pangampi 2	05° 05' 233"	120° 36' 142"	15
15	Taka Limpoge 1	05° 06' 125"	120° 38' 140"	128
16	Taka Limpoge 2	05° 07' 125"	120° 38' 140"	27
17	Taka Laborango 1	05° 00' 312"	120° 30' 508"	57
18	Taka Laborango 2	05° 00' 160"	120° 30' 263"	28

Density and vertical distribution of marine bamboo

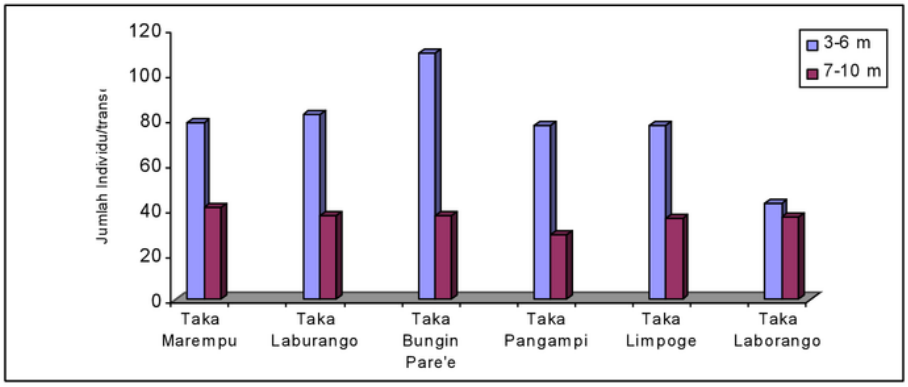
Density and vertical distribution of marine bamboo at different depth is shown in Figure 3. Isis is having simbiont unicellular dinoflagellata zooxanthella; therefore its vertical distribution

depends on light penetration and in this study, is found at all coral reef habitats. It is obvious from Figure 3 that density of Isis is found higher at 3-6 m depth compared to 7-10 m depth.

The highest occurs at 3-6 m depth in Taka Bungin Pare'e with average density 110 ind/m^2. On the other hand the highest density for deeper water is found at Taka Marempu with average density of 41 ind/m^2.

Isis is found at 1-3 m in Sumbawa waters, especially at Sape Bay with density of 3-5 m^2 (pers comm. 2008). Density of Isis is higher at Sape Bay Bima compared to Bone bay (this study). While, Isis in conservation are of Wakatobi area SE Sulawesi is about 30 ind/10m^2, growth on coral reefs at 1-2 m depth. Due to topography of this area which is drop off, this group is not found at more than 2 m depth.

Figure 3. Density of marine bamboo at 3-6 m and 7-10 m depth at six patch reefs (Taka)



Colony size as indicator of exploitation level

Isis grows symmetrically, meaning that length and width are growing at same time. Generally, Isis colony can grow up to 62 – 100 cm in diameter. In this study, we only recorded length and size for 10 patch reefs (station 7 – 18) and data is given in Table 2.

Table 2. Size of *Isis hipuris* (length and width) as indicator of exploitation level *

No	Location/Station	Size (Average ± SD)		∑ Sample	Explotation level
		Length/Heigh (cm)	Width (cm)		
9	Taka Laburango 1	38.36 ± 14.84	27.7 ± 18.38	47	Less
10	Taka Laburango 2	29.11 ± 11.51	20.02 ± 10.35	45	Moderate
11	Taka Laburango 3	23.03 ± 9.58	18.11 ± 8.82	28	High
12	Taka Bungin Pare'e 1	30.07 ± 10.67	24.6 ± 13.10	40	Moderate
13	Taka Bungin Pare'e 2	29.91 ± 13.03	22.97 ± 17.04	34	Moderate
13	Taka Marempu	31.88± 15.07	24.84 ± 21.30	32	Moderate
14	Taka Pangampi 1	28.38 ± 10.65	19.69 ± 10.71	45	Moderate
15	Taka Pangampi 2	15.58 ± 5.82	8.5 ± 3.53	12	High
16	Taka Limpoge 1	24.47 ± 10.03	16.96 ± 9.14	45	High
17	Taka Limpoge 2	22.59 ± 7.32	14.59 ± 6.20	27	High

* Data for station 1-8 not available

We observed diameter of Isis branch range 3 – 130 cm. An average bigger size was fount at Taka Laborango (38.36 ± 14.84 cm high and width 27.7 ± 18.38 cm) At some locations such as Taka Laburango 2, Bungin Pare'e 1 &2, Marempu, and Taka Pangampi 1, an average high was 28 – 31 cm, and width ranges 19 – 24 cm, respectively. Taka Laburango, Pangampi dan Limpoge are located far off coast line, hence less control by authority (water police and PPNS from DKP) . Therefore, these ares are targeted by fishermen from Bone, Sinjay, and even from Makassar.

The relationship between length and width of Isis is described in Table 3. As shown in the Table, length is possitively correlated to width of Isis.

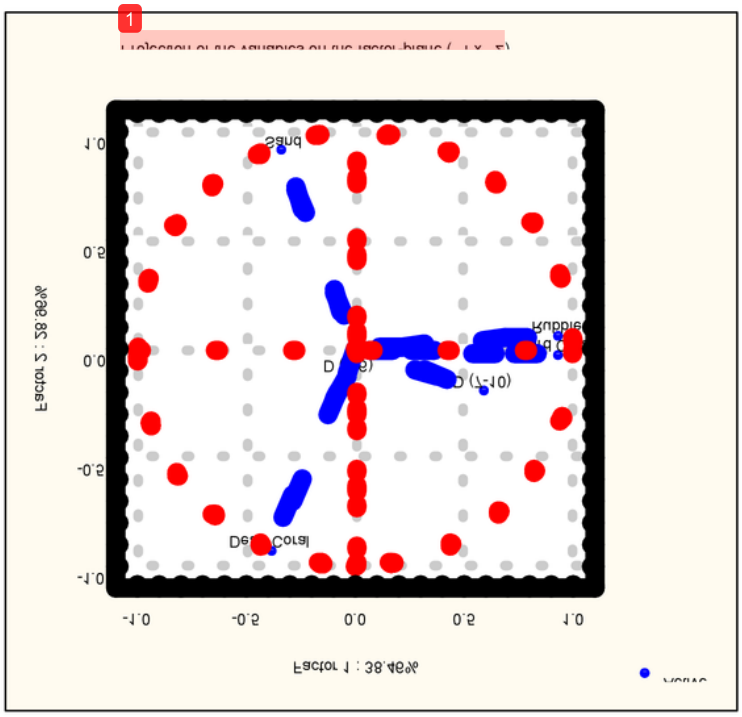
Table 3. Relationship between length/heigh (X) and width (Y) of Isis from 10 locations*

No	Station	Regression	R
9	Taka Laburango 1	Y = 1.0295 X – 12.558	0.0717
10	Taka Laburango 2	Y = 0.9788 X – 5.4487	0.6355
11	Taka Laburango 3	Y = 1.326 X – 10.906	0.7498
12	Taka Bungin Pare'e 1	Y = 1.3287 X – 17.51	0.8838
13	Taka Bungin Pare'e 2	Y = 0.8208 X – 3.6037	0.6664
14	Taka Marempu	Y = 0.4813 X + 0.9991	0.6307
15	Taka Pengampi 1	Y = 0.7132 X – 0.4934	0.6126
16	Taka Pangampi 2	Y = 06364 X + 0.2139	0.5646
17	Taka Limpoge 1	Y = 0.6988 X – 0.3195	0.6039
18	Taka Limpoge 2	Y = 0.8184 X – 0.7463	0.7905

*Data for station 1-8 not available

Relationship between Isis densities with type of habitat

Figure 4. The relationship between Isis with type habitat



The relation ship between Isis density and environmental type of habitat is described in Figure 4. As shown by correspondence analysis graph Isis tends to abundant at 3-5 m depth as located on the central of main axis (Figure 3). This indicates that there is no dominant environmental factor applies. Habitat 7-10 m is more dominated by rubble and live hard coral. Hence, sand and rubble habitats are less affecting Isis existence.

Utilization, harvesting and post-harvesting of Isis

Fishermen from Sembilan archipelago call *Isis hipuris* as '*lappa-lappa'*. They started utilizing this group since trepang (low cucumber) is rare in the area. Since 2006, *lappa-lappa* had been exploted by fishermen from Sembilan archipelago, Bone and Makassar. Some fishermen admitted that they recently started to harvest marine bamboo. When east moonsoon comes, they are fishing trepang. High level of explotation is supported by fact that market for this group is clear and this group is easily found in Bone bay. The result from deep interview also reveals that frequency of harvesting is differ amongst fishermen. Some fishermen only operate twice a week, but some can collect daily.

Isis is usually harvested by removing all collony with substrat or by cutting basal isis with knife or *parang*. Post harvesting process is quite simple. Marine bamboo then soaked in salt water for weeks to remove soft part of the body. Hard part of body (skeleton) will be cutted intro pieces then are kept in container before being sold.

Socioeconomical aspect

Isis is sold in fresh or dry form, and its price various from one place to another. For example, fishermen in Batang Lampe island is selling Isis Rp. 1500/kg wet weight (ww) and Rp. 4000/kg dry weight (dw). While, Isis cost Rp. 2000/kg ww and Rp. 4500/kg dw in Kanalo (I) island. These prices only apply in Sembilan archipelago, this can reach Rp. 7.000/kg dw in Makassar [10]. Generally, local fishermen are selling Isis to a middle men before it is sold to exporter in Makassar.

We found that not all fishermen in Sembilan archipelago fishing Isis, i.e. majority of inhabitant in Burung Loe island is fishing on jackfish. Isis hunting is obviously practised in Kanalo I, Batang Lampe and kambuno islans. Half of total fishermen in Kanalo island are fishing on Isis. Post harvesting activity involve women and children as cleaner with salary of Rp. 250-500/kg.

Production

According to fishermen from Kanalo island (Sinjay), one boat that consist of 5-5 fishermen can produce 1 tonnes wet weight marine bamboo each trip. These will left over 50-70% dry weight after post harvesting process. While fishermen from Batang lampe island (Bone district) can harvest up to 700 kg ww each trip. This differences may due to fact that density/areas depends on location.

Conflict and moratorium issue

Generally, fishermen aware that they know that harvesting Isis is prohibitet by law, however the consequences of law enforcement is unclear to them. According to Dept Fishery and marine Affairs Sinjay, prohibition for harvesting Isis in Sinjay Regency is based on Bupati Decree No. 660/943/SET. Harvesting of marine bamboo was temporary stopped when the decree was accounced, however explotation of Isis is still continuing. Eventhough, social approach have been done through different ways including advocacy and religous leadres. Therefore, more action is needed in irder to prevent more lost of these resources.

CONCLUSION

1. Over explotation of marine bamboo *Isis hipuris has happend* in Bone bay waters.
2. Marine bamboo shown unevenly distribution at Bone bay waters.
3. Eventhough providing jobs, exploitation of marine bamboo in bigger scale threaten natural population.
4. Trading marine bamboo is mainly for exporting.

RECOMENDATION

1. Implementation of law inforcemen is needed to prevent most lost in natural population.
2. Tranplantation or vegetative reproduction may be an option to support restocking on exploited areas
3. Holistic study on Isis in other areas of Indonesia is need to know the present status of this potential resources

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