JELLYFISH STING : AN INDONESIAN CASE REPORT

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Abstract

Jellyfish sting cases are reported between the years 2005 to 2009 from Indonesian waters. Three fatal cases occurred in Jebus and Situbondo in 2008 which predicted to be caused by *Chrysaora quinquecirrha* and *Physalia physalis*. Another species, *Physalia utriculus* is causing no fatality. Seasonality, treatment of the injury and prevention from the sting also discussed.

Key words : jellyfish sting, Indonesia

Introduction

Jellyfish is belong to the *Phylum Cnidaria* (in the past also known as *Coelenterata*), a group of invertebrate animals with gelatinous body that look very similar to jelly, from here they get their name. Their body contains 95% of water. There are four classes of *Cnidarians* : *Anthozoa* (antho : flower), which includes true corals, anemones and sea pens; *Cubozoa* (cubo : box), the amazing box jellies with complex eyes and potent toxins; *Hydrozoa* (hydro : water), the most diverse group with siphonophores, hydroids, fire corals and many medusae and *Scyphozoa* (scypho ; umbrella), the true jellyfish. Only *Anthozoa* is benthic sessile, the others are planktonic. Some species are stinging and can causing a severe pain, even die for human.

During several last years, jellyfish were studied more extensively in elsewhere, especially on the impact of climate change on the lifecycle and distribution of this animal. At present, the climate change is occur in almost every country in the world, making the temperature increase and the sea surface become warmer than before. One example from Scottish ocean, long term investigation (1998 to 2005) have shown an increase of sea surface temperature 0.2-0.6oC per decade over the last 25 years (Hughes, 2006). Further more, increasing the sea surface temperature is predicted to be a cause for increasing population number of gelatinous zooplankton, such jellyfish (Uye, 2008; Purcell, 2005; Mills, 2001; Graham *et al.*, 2001; Brodeur *et al.*, 1999). Warmer sea water may lead to higher scyphistoma asexual reproduction and birth rates of medusae (Uye, 2008).

As planktonic animal, the distribution and dispersal of jellyfish is strongly affected by the wind, waves and currents rather than their swimming movement. Dry season always associated with high waves, strong wind and currents in coastal zone. This will bring planktonic animal, such jellyfish, closer to the beach and raising possibility of contact with human (tourist) who have fun during dry season. In Indonesia, dry season occur between April to October. This paper will deal with some cases of accident by planktonic jellyfish sting occur in Indonesia which reported by local media, diversity of stinging planktonic jellyfish, treatment and prevention of planktonic jellyfish sting.

Material and Methods

The information gained from the local newspaper and internet using keywords : Ubur-ubur/jellyfish, sengat/sting and Indonesia. After that summarized in Table 1.

Result

According to the information from local newspaper and website, at least 13 cases of accident by jellyfish sting were reported from 2005 to 2009, 11 of them occur in Java, 1 from Bali and 1 from Bangka. Three fatal cases which causing the victims die were reported during June to October 2008, two cases occur in Situbondo, the other occurs in Jebus (see Table 1. for details).

Information from the Table 1 showed that the accidents occur between June to October when it's in dry season, number of victim varied from single person to hundreds, the impact of jellyfish sting also varied from only felt itchy and burnt on skin into death, three species were suspected as a cause of this accident *Chrysaora quinquecirrha* and *Physalia* spp. Judging from the description of animal by local people and the effect caused by sting, it is refers to *Physalia utriculus* and *Physalia physalis*.

Two cases which occur in Situbondo were reported in June and July 2008. both cases causing the victim die (Junaidi, 19 years and Firdaus, 10 years old), both victims were stung when they swim near the

beach. Their body, back, stomach and feet are getting reddish. When they evacuated, their body cramping continously, a foam like liquid comes out from their mouth. Finally, they die during the evacuation into the local health facility (Radar Banyuwangi, 05/06/2008 and 05/07/2008). Another case which occur in Jebus also reported in October 2008 causing the victim dies (Jaka, 4 years old). He was playing in the beach with his old brother when suddenly stung by jellyfish on his feet. Soon, he getting unconscious, his left tight and genital are getting reddish. By the time running, they change into bluish. He also dies during the evacuation

Table 1. Record of 13 Cases of accident by jellyfish sting sorted by date

Date	Location	No. of victims	Fatality	Species	References
27/07/2005	Sanur Beach, Bali	-	-	*Physalia utriculus*	Bangka Pos 07/10/2008
08/07/2007	Depok Beach, Bantul	2 in 2009, 50 in 2004	Stomach ache	*Physalia utriculus*	Werdiono, 2007
20/07/2007	Teleng Ria beach, Pacitan	Tens	Severe cold, asphyxia	-	Adi, 2007
12/08/2007	Parangtritis beach, Bantul	Tens	Itchy and burnt on skin	*Physalia utriculus*	Utantoro, 2007
05/06/2008	Mlandingan, Situbondo	1	19 years old boy die	*Physalia utriculus*	Radar Banyuwangi 05/06/2008
04/07/2008	Banyuputih, Situbondo	1	10 years old boy die	*Physalia utriculus*	Radar Banyuwangi 05/07/2008
05/10/2008	Bembang beach, Jebus	1	4 years old boy die	*Chrysaora quinquecirrha*	Bangka Pos 07/10/2008
19/07/2009	Parangtritis and Samas beach, Bantul	Tens	Severe pain, unconcscious	*Physalia utriculus*	Waskita, 2009
22/09/2009	Parangtritis beach, Bantul	Hundreds	Severe pain, unconcscious	*Physalia utriculus*	Heru, 2009
22/09/2009	Widrapayung beach, Cilacap	Tens	Severe cold, choke	*Physalia utriculus*	Republika 24/09/2009
23/09/2009	Glagah Indah and Trisik beach, Kulonprogo	Tens	Asphyxia, unconscious	*Chrysaora quinquecirrha*	Kuntadi, 2009
26/09/2009	Kukup beach, Gunung Kidul	64	-	-	Wulan, 2009
02/10/2009	Pangandaran beach, Ciamis	1	Almost unconscious	-	Pikiran Rakyat 03/10/2009

into the local health facility. Fortunately, his brother survive (Bangka Pos, 07/10/2008).

Several cases from foreign countries also reported. At least 3 deaths have occurred due to *Physalia* species since 1989 in USA (Daubert, 2008; Burnett & Gable, 1989; Stein et al., 1989). About 500 cases of *Physalia* species sting also reported from Western and Southern Australia with several fatalities in Western hemisphere (Goggin *et al.*, 2004). In the tropics, most cases occurred in summer months, while in Australia common in many months in the year (Fenner, 1997). Over 100 people were stung by Chrysaora quinquecirrha at Yorktown Beach, Virginia-USA on July 4, 2009 which it also in summer month. No fatalities reported (Cawley, 2009).

At least 30 species of stinging planktonic jellyfish are known as well as the grade of injury and geographical distribution (see Table 2. for details).

Three species of jellyfish which reported as a cause of accident in Indonesia also listed in the table.

The classification of both species are as follow (Boullion *et al.*, 2006; Arai, 1997) :

Class : *Hydrozoa Scyphozoa*
Order : *Cystonecta Semaeostomeae*
Family : *Physaliidae Pelagiidae*
Genus : *Physalia Chrysaora*
Species : *Physalia utriculus, Physalia physalis, Chrysaora quinquecirrha*

Physalia utriculus : Siphonophores with a relatively large asymetric horizontal pneumatophore, purplish blue in color, up to 10-15 cm in length, top of the pneumatophore formed by an erectile "sail" running diagonally, cornidia attached to one side of the float, a single large deep blue fishing tentacle hangs beneath the bell, this is retractile and curled up to a few centimetres or extended 10 metres in length. It surrounded by a number of smaller and shorter, fine pale-blue tentacles (Goggin *et al.*, 2004, Bouillon *et al.*, 2004) (see Figure 1.A for details).

Physalia physalis : Siphonophores with a relatively large asymetric horizontal pneumatophore, purplish blue in color, up to 30 cm in length.

Table 2. List of stinging jellyfish, grade of injury and geographical distribution

Class/species	Grade	Distribution					References
		NA	SP	NP	SP	IO	
CUBOZOA							
Carybdea rastoni (jimble stinger)	1	+	+	+	+	+	Kramp, 1961; Marsh & Smith, 1986; Burke, 2002
Carybdea marsupialis	1	+				+	Halstead, 1971; Kramp, 1961
Carybdea alata	1	+	+	+	+	+	Halstead, 1971; Kramp, 1961; Burke, 2002
Carybdea xaymacana	1			+		+	Goggin et al., 2004
Carybdea sivickisi	1			+		+	Goggin et al., 2004
Carukia barnesi (irukandji)	2				+	+	Marsh & Smith, 1986
Chironex fleckeri (sea warsp)	1				+	+	Marsh & Smith, 1986; Burke, 2002
Chiropsalmus quadrigatus	2				+	+	Marsh & Smith, 1986; Burke, 2002
Tamoya gargantuan	1				+	+	Marsh & Smith, 1986
Chiropdesis buitendijki	1			+	+	+	Burke, 2002

Class/species	Grade	Distribution					References
		NA	SP	NP	SP	IO	
HYDROZOA							
Leuckartiara gardiner (little red stinger)	3					+	Marsh & Smith, 1986
Olindias singularis	2				+	+	Kramp 1961; Marsh & Smith, 1986
Physalia physalis (Portuguese man of war)	1	+	+	+	+	+	Marsh & Smith, 1986; Woodcock, 1997
Physalia utriculus (blue bottle)	2				+	+	Goggin et al., 2004
Olindiodes formosa	3			+			Halstead, 1971; Kramp, 1961
Algaophenia cupressina	3			+		+	Halstead, 1971
Lytocarpus philipinus	3		+		+	+	Halstead, 1971
Gonionemus vertens	1	+	+	+	+	+	Fenner, 1998
Velella velella	2	+	+		+		Burke, 2002; Bouillon et al., 2004
SCYPHOZOA							
Catostylus mosaicus (mosaic sea jelly)	3			+	+	+	Halstead, 1971
Cyanea capillata (hairy stinger)	2	+	+	+	+	+	Halstead, 1971; Marsh & Smith, 1986; Burke, 2002
Cyanea mjobergi (hairy stinger)	2					+	Marsh & Smith, 1986
Chrysaora quinquecirrha (sea nettle)	2	+			+	+	Halstead, 1971; Marsh & Smith, 1986; Burke, 2002
Pelagia noctiluca (mauve stinger)	2	+	+	+	+	+	Halstead, 1971; Marsh & Smith, 1986; Burke, 2002
Phyllorhiza punctata (spotted jellyfish)	2			+		+	Marsh & Smith, 1986
Pseudorhiza haeckeli (net patterned jellyfish)	2					+	Marsh & Smith, 1986
Chrysaora hysoscella (sea nettle)	2	+					Burke, 2002
Chrysaora lactea (sea nettle)	2		+		+		Burke, 2002

Class/species	Grade	Distribution					References
		NA	SP	NP	SP	IO	
Stomolophus nomurai	1			+			Burke, 2002
Sanderia malaynensis	2			+			Burke, 2002

Remarks : *Grade : 1)Deadly, 2)Mild, 3)Harmless;
*Distribution : NA(North Atlantic), SA(South Atlantic), NP(North Pacific), SP (South Pacific), IO (Indian Ocean)

Pneumatophore enantiomorphic, two forms, each the mirror image of the other, top of the pneumatophore formed by an erectile "sail" running diagonally. There are many (up to 7-8) retractile large fishing tentacle, may reach extended length of 30 meters. It surrounded by a number of smaller and shorter, fine pale-blue tentacles (Goggin *et al.*, 2004, Bouillon *et al.*, 2004) (see Figure 1.B for details).

Chrysaora quinquecirrha : Semaeostomeae in which the central stomach gives rise to completely separated, unbranched radiating pouches, without a ring canal. Umbrella up to 25 cm wide, marginal lappets semicircular or tongue-shaped the lappet-clefts of primary and secondary tentacles deep, the tertiary were shallow notches. In each octant three large tentacles and usually two or sometimes four smaller ones issuing from subumbrella side of the rhopalar lappets tentacles arise from the umbrella margin between the clefts of lappets, oral arm long, pointed, much folded. Colour very variable, usually rather pale, yellowish or pink, sometimes in radiating stripes (Kramp,1961) (see Figure 1.C for details).

Jellyfish can be subdivided into three main group, based on the symptoms they caused : those causing human fatalities, those causing severe envenomation with systemic effects and those causing nuisance stings (Fenner, 1998). A jellyfish tentacle contains huge numbers of stinging cells arranged in

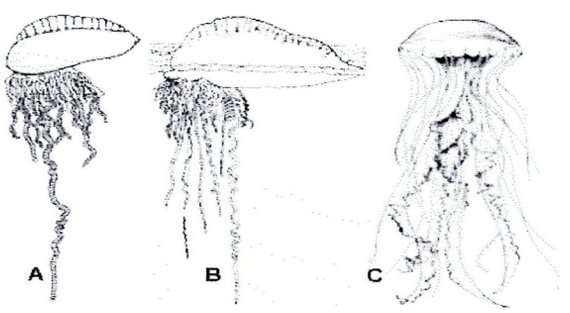

Figure 1. Three stinging jellyfish which reported for causing several accidents. A) Physalia utriculus (source: Waikiki Aquarium Education Department, 2009); B) Physalia physalis (source : Bouillon et al., 2004); C) Chrysaora quinquecirrha (source : Calder, 2008)

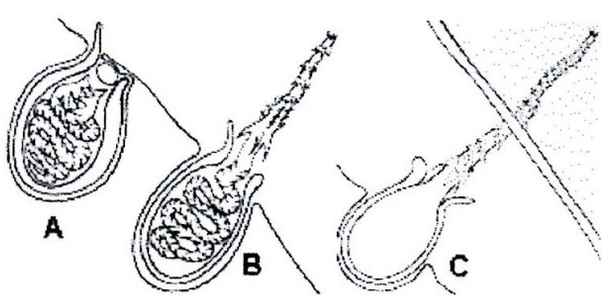

Figure 2. A) Non active nematocysts, B) Active nematocysts; C) Barbed threads passing through skin tissue

clusters called “batteries”. Activated by touch or chemical cues, the nematocysts in the stinging cells fire. Barbed threads deliver toxin that may affect the victim's muscles, nerves and other tissues (Waikiki Aquarium Education Department, 2009) (see Figure 2. for details).

During discharge, many nematocysts inject venom, including inert fluids, salts and toxins, some materials having a known negative influence on biological systems. Injury may occur directly by action of the toxins or indirectly by involvement of immune reactions. Most toxins are proteinaceous molecules, many of which target plasma membranes (Arai, 1997). Jellyfish toxin can be classified according to their works : neurotoxic which attacks nerves, cardiotoxic which attacks the heart; dermatonecrotic which destroy skin; cytotoxic which destroy body cells and haemolytic which destroy blood cells (Goggin *et al.*, 2004; Arai, 1997).

Victims due the sting of Chrysaora quinquecirrha are reported from Glagah and Jebus. A woman who have been stung in Glagah said that her feet felt burning and tender from the wound caused by jellyfish sting. Two other victims suffered from asphyxia and getting unconscious. However, after having medical treatment, both are recover from unconscious and healing (Kuntadi, 2009). A four years old child from Jebus who stung by this species on his feet and genital suddenly getting unconscious. His feet and genital are getting reddish which soon change into bluish. These symptoms are believed to be caused by jellyfish sting as said by local doctor. Even having medical treatment, this child cannot survive (Bangka Pos, 07 October 2008). Toxin of Chrysaora quinquecirrha work as haemolytic, dermatonecrotic and cytotoxic agent (Balamurugan *et al*., 2009). General symptoms are sudden burning, as pain spreads leading to muscle cramps and excruiating pains across the lower back after 15 minutes so that patients being hysterical. Restlessness, weakness and mental deperession may follow a severe sting. Constriction of the throat and chest with constant coughing and a profuse discharge from the noose and eyes may occur. Nausea and vomiting can occur. The sting is followed by grossly raised red weels, which swell, weep like eczema and blister, taking two or three weeks to heal (Marsh & Smith, 1986). Some of these symptoms are occur to the victims reported above. The child dies probably because of his immunity system is not develop yet compare to older victims from Glagah, so the toxin's effect are much powerful. However, there is no report of medical treatment applied for them.

Burnett *et al* (1983) reported that baking soda (Sodium bicarbonate/$NaHCO_3$) was an effective nematocyst inhibitor for Chrysaora quinquecirrha. Paramedics in Yorktown Beach mix them with Acetic acid (CH_3COOH) in sterile water for curing the victims (Cawley, 2009). It is not recommended to use vinegar because it might precipitate nematocyst firing (Little, 2008).

Meanwhile the victims due the sting of Physalia utriculus are reported from six places (Sanur, Depok, Teleng Ria, Parangtritis, Samas and Widarapayung) with no fatalities occurred, the victims due the sting of Physalia physalis are reported from two places (Mlandingan and Banyuputih) which both are fatal. Firdaus (10 years) and Junaidi (19 years) are swimming in the beach while suddenly they stung by jellyfish. They felt burnt and itchy on the skin, back pain, abdomen and feet are getting reddish with caused by the sting. Their body spasming, a foam like fluid coming out from the mouth and getting unconscious. Their friends evacuated and treated using beach sand for smearing their body. They transported to local medical facility, however, they die during this evacuation (Radar Banyuwangi, 06 June 2008; 05 July 2008). Toxin of *Physalia* work as carditoxic, haemolytic and dermatonecrotic (Alam & Qasim, 1991). Physalia utriculus stings are usually somewhat painful, but bearable and not too severe. Pain is also often felt in the draining lymph glads, in the groin if the legs are stung, and the arm pit if the upper limbs are stung. *Physalia phisalis* stings are more painful. There is usually pain in the draining lymph glands and often nausea, back pain, muscle cramps in the limbs, abdomen and chest, which cause painful breathing. General symptom are blistering and intense pain in near-by muscle, general paralysis, intense general distress and weakness, particularly breathing difficulty (Fenner, 1998; 2000). The case from Mlandingan and Banyuputih showed that the toxin of Physalia phisalis is powerful to kill young and mature person. In Australia, particularly on the east coast, up to 10.000 stings occur each summer from Physalia spp. alone. More stings occur in South Australia and Western Australia. Three fatal envenomations from Physalia phisalis have been reported from Florida and North Carolina, in the United States and both sides of the Atlantic (Fenner & Williamson, 1996). For treating the victims, it is necessary to use hot water (60^{o}C) to rinse the wound. As most toxins are proteinaceous molecules, heating can be denature the structure and reduce it's effect (Halstead, 1971; Taylor, 2007; Daubert, 2008). Vinegar or Acetic acid (CH_3COOH) in

solutions of 4-6% is the most widely accepted treatment of initial stings. Pour vinegar over adhering tentacles for at least 30 seconds. In the absence of vinegar, Coca cola or old wine may be used (Fenner *et al.*, 1993; Fenner, 1997; Daubert, 2008).

Other first aid measures for jellyfish sting have been advocated, including urinating on tentacles, use of papain containing meat tenderizer, aluminium sulfate ($Al_2(SO_4)3$, alcohol/ethanol (C_2H_5OH), sodium hypochlorite (NaClO) bleach, Ammonia (NH_3), gasoline/kerosene and rubbing sand on the involved area (Burke, 2002).

There are several procedures advocated by Halstead (1971), Fenner (1998) and Goggin *et al* (2004) which can prevent and keeping save from jellyfish sting:

1. Wearing tight-fitting long woolen underwear or rubber skin diving suits,
2. Wearing other equipment such diving shoes and head protector like helmet if you want to dive with your head drown into the water,
3. Swim in supervised areas such as a beach where lifeguards monitor the presence of dangerous jellyfish,
4. Obey warning signs (advising of dangerous jellyfish)
5. Swim in stinger-resistant nets, if available.

Summary

During the years 2005 to 2009, there are thirteen cases of jellyfish sting reported from Indonesian waters with three fatal cases occurred in Jebus and Situbondo. At least three species of jellyfish suspected responsible for these case *Physalia utriculus, Physalia physalis* and *Chrysaora quinquecirrha*. All case occurred between June to October which is in dry season in Indonesia.

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