

INDONESIAN SEAS CEPHALOPODS : A COLLECTION OF FISHERIES LABORATORIES DIPONEGORO UNIVERSITY

Abdul Ghofar

Faculty of Fisheries and Marine Sciences of Diponegoro University Semarang
Jl. Hayam Wuruk 4A Semarang. 50241

ABSTRACT

A Study was conducted to describe the cephalopod fauna and their regional distribution in the Indonesian seas. From specimen collection carried out since 1985 throughout the region, forty four species were identified. The collection represents 11 loliginid squid, 3 sepiolids, 5 ommastrephids, 13 sepiids, 7 octopods, 2 argonautids, 2 nautiloids and 1 spirulid. Eleven identified species (or 25% of total) are evident to show a wide range of regional distribution, i.e. Loligo edulis, L. chinensis, L. duvauceli, L. sumatrensis, Sthenoteuthis oualaniensis, Sepioteuthis lessoniana, Abralia spærcki, Sepia latimanus, S. aculeata, S. pharaonis and Sepiella inermis.

Key words : regional distribution, cephalopod.

I. INTRODUCTION

In the last few decades there has been an increasing scientific interest in the existence of cephalopod resources and biology, coinciding with an expansion of their commercial exploitation (Rosenberg *et al*, 1981; Clarke, 1983). Cephalopods are also recognised as important constituents of marine food webs (O'Sullivan & Cullen, 1983). Arnold & William-Arnold (1977) suggested further that cephalopods are probably the only under-exploited large scale marine resources which have the potential to form important human food supplies in the future.

Cephalopods occur throughout the Indonesian islands, which make this area as one of the main contributors to the world cephalopod fisheries, particularly for squid and cuttlefish. Significant cuttlefish landings has been made from the the north coastal water of Java, the east coast of Sumatera and the Maluku seas. Whereas squid has been important in the pelagic fisheries in West Nusa Tenggara, South Sulawesi and the north coast of Java.

In view of and to support better marine resources management, the diversity of cephalopod resources and their taxonomy in the area are significant to be properly understood. At

present, however, adequate information about these aspects has generally been lacking for Indonesian waters. This study was carried out to describe the diversity of cephalopod fauna of the Indonesian seas and their distribution in the region.

II. MATERIALS AND METHODS

2.1. Materials

Investigation was concentrated upon cephalopods including the species occurring throughout the Indonesian seas, and information on their availability. Collections of cephalopod specimens were carried out from 1985 to 1998 upon fresh specimens by means of snorkelling (plus scoop and hand-line) and from major fish landings in most provinces of the country, including West Sumatera, Aceh, North Sumatera, Riau, South Sumatera, north and south coast of Java, Bali, Timor, South, East and West Kalimantan, South, Central and North Sulawesi, Maluku and Irian Jaya. Specimens collected were then preserved in 5% formalin for 1-3 days depending upon specimen sizes, after which they were dipped in freshwater for 12 hours before then preserved further in 70% isopropyl-alcohol. These specimens were deposited and currently available in the Fisheries Laboratory, Faculty of Fisheries and Marine Sciences, Diponegoro University.

2.2. Species Identification

Identification of fresh specimens was carried out to species level where possible, using the following sources:

Adam (1939, 1954, 1979), Adam and Rees (1966), Filippova (1966), Goodrich (1896), Lu and Dunning (1982), Lu and Phillips (1985), Nesis (1987), Okutani *et al* (1987), Roper *et al* (1969, 1984), Sweeney *et al* (1992), Voss (1963), Voss and Williamson (1971).

III. RESULTS AND DISCUSSION

3.1. Species

Forty four species of cephalopods are available in the collection of the Diponegoro University Fisheries Laboratory in Semarang. These species represent loliginid squid (genus *Loligo*: 9 species; genus *Uroteuthis*: 1 species; genus *Sepioteuthis*: 1 species), sepiolid (3 species), ommastrephid squid (5 species), sepiid cuttlefish (genus *Sepia*: 11 species; genus *Sepiella*: 2 species), octopod (genus *Octopus*: 6 species; genus *Haphalochlaenia*: 1 species), argonautid (2 species), nautiloid (2 species) and spirulid (1 species).

These species are in above order : *Loligo edulis*, *L. chinensis*, *L. sibogae*, *L. duvauceli*, *L. sumatrensis*, *L. singhalensis*, *L. uyii*, *L. bleekeri*, *Loligo sp.*, *Uroteuthis bartschi*, *Sepioteuthis lessoniana*, *Idiosepius pygmaeus*, *Euprymna morsei*, *E. stenodactylus*, *Sthenoteuthis oualaniensis*, *Nototodarus sp.*, *Chiroteuthis picteti*, *Abralia spaercki*, *A. remschi*, *Sepia latimanus*, *S. bandaensis*, *S. aculeata*, *S. subaculeata*, *S. pharaonis*, *S. recurvirostra*, *S. elliptica*, *Sepia sp.(A)*, *Sepia sp.(B)*, *Sepia sp.(C)*, *Sepia sp.(D)*, *Sepiella inermis*, *Sepiella sp.*, *Octopus aegina*, *O. membranaceus*, *O. mactopus*, *O. filamentosa*, *Octopus*

cyanea, *Octopus* sp., *Haphalochlaenia lunulata*, *Argonauta hyans*, *Argonauta* sp., *Nautilus pompilius*, *N. macromphalus* and *Spirula* sp.

3.2. Distribution

The likely distribution of cephalopods described in here is estimated based primarily upon their occurrence in the Indonesian seas during the collection periods. Further cross-check is however significant by comparing the occurrence of each species with that in available references (see list of references). Details of their regional distribution in Indonesian seas are given below (see also Table 1).

Loligo edulis

Pelabuhan Ratu (West Java), Tuban, Tambak Boyo (East Java), Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Takabonerate Island (South Sulawesi) and Ambon (Maluku).

Loligo chinensis

Belawan (North Sumatera), Tanjung Balai (Riau), Alas Strait (West Nusatenggara), Ujung Pandang and Takabonerate (South Sulawesi).

Loligo sibogae

Alas Strait (West Nusatenggara).

Loligo duvauceli

Cilacap, Kebumen (Central Java), Parigi (East Java), Langsa (Aceh), Belawan (North Sumatera), Tegal, Pekalongan, Weleri-Semarang, Jepara, Rembang (Central Java), Tuban-Tambak Boyo (East Java), Bali Strait (East Java-Bali), Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Pontianak (West Kalimantan), Pare-pare to Ujung Pandang (South Sulawesi), Ambon (Maluku).

Loligo sumatrensis

Cilacap (Central Java), Pacitan, Parigi (East Java), Langsa (Aceh), Belawan (North Sumatera), Bagan Siapi-api (Riau), Rembang (Central Java), Tuban-Tambak Boyo (East Java), Rica Islands (East Nusatenggara), Pontianak (West Kalimantan), Takabonerate (South Sulawesi), Ambon (Maluku).

Loligo (Doryteuthis) singhalensis

Padang (West Sumatera), Rembang (Central Java), Ambon (Maluku), Teluk Bintuni (Irian Jaya).

Loligo uyii

Jepara (Central Java), Bali Strait (East Java-Bali).

Loligo bleekeri

Ambon (Maluku).

***Loligo* sp.**

Panipahan (Riau).

Uroteuthis bartschi

Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara).

Sepioteuthis lessoniana

Pelabuhan Ratu, Pangandaran (West Java), Cilacap (Central Java), Weleri to Semarang (Central Java), Tuban-Tambak Boyo (East Java), Alas Strait, Teluk Bima (West Nusatenggara), Rinca Islands (East Nusatenggara), Samarinda (East Kalimantan) Pare-pare to Ujung Pandang, Takabonerate (South Sulawesi), Manado (North Sulawesi) and Palu (Central Sulawesi).

Idiosepius pygmaeus

Rinca Islands (East Nusatenggara).

Euprymna morsei

Alas Strait (West Nusatenggara).

Euprimna stenodactylus

Tegal to Semarang (Central Java), Alas Strait (West Nusatenggara).

Sthenoteuthis oualaniensis

Pelabuhan Ratu (West Java), Cilacap, Kebumen (Central Java), Pacitan (East Java), Pekalongan (Central Java), Alas Strait, Teluk Bima (West Nusatenggara), Rinca Islands (East Nusatenggara), Pare-pare to Barru (South Sulawesi), Ambon (Maluku).

Nototodarus sp.

Cilacap (Central Java), Alas Strait (West Nusatenggara).

Chiroteuthis sp

Alas Strait (West Nusatenggara).

Abralia spaercki

Pelabuhan Ratu (West Java), Kebumen (Central Java), Teluk Bima (West Nusatenggara), Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi) and Ambon (Maluku).

Abralia remtschi

Pelabuhan Ratu (West Java), Kebumen (Central Java), Teluk Bima (West Nusatenggara), Rinca Islands (East Nusatenggara), Ambon (Maluku).

Sepia latimanus

Bali Strait (East Java-Bali), Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Sepia bandaensis

Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi), Ambon (Maluku).

Sepia aculeata

Tegal, Weleri, Semarang, Rembang (Central Java), Tuban-Tambak Boyo (East Java), Rinca Islands (East Nusatenggara), Pulau Laut (South Kalimantan), Takabonerate (South Sulawesi), Ambon (Maluku).

Sepia subaculeata

Tegal, Weleri to Semarang (Central Java).

Sepia pharaonis

Pangkalan Brandan (North Sumatera), Teluk Jakarta Tegal, Jepara, Rembang (Central Java), Tuban-Tambak Boyo (East Java), Manado (North Sulawesi), Ambon (Maluku).

Sepia recurvirostra

Pekalongan (Central Java), Rinca Islands (East Nusatenggara), Pontianak (West Kalimantan), Takabonerate (South Sulawesi) and Ambon (Maluku).

Sepia elliptica

Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Sepia sp.(A)

Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Sepia sp.(B)

Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Sepia sp.(C)

Takabonerate (South Sulawesi).

Sepia sp.(D)

Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Sepiella inermis

Pelabuhan Ratu, Kebumen, Langsa, Pangkalan Brandan, Belawan, Tanjung Balai (North Sumatera), Bagan Siapi-api (Riau), Teluk Jakarta, Tegal, Jepara, Rembang, Tuban-Tambak Boyo, Pulau Laut, Teluk Bentuni.

Sepiella sp.

Bagan Siapi-api (Riau), Jepara (Central Java).

Octopus aegina

Rinca Islands (East Nusatenggara).

Octopus membranaceus

Parigi (East Java), Pekalongan, Weleri-Semarang, Jepara (Central Java).

Octopus mactopus

Alas Strait (West Nusatenggara).

Octopus filamentosa

Pelabuhan Ratu (West Java).

Octopus cyanea

Parigi (East Java), Pekalongan (Central Java), Takabonerate (South Sulawesi), Bunaken Island (North Sulawesi), Ambon (Maluku), Teluk Bintuni (Irian Jaya).

Octopus sp.

Alas Strait (West Nusatenggara).

Haphalochlaenia lunulata

Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Bunaken Island (North Sulawesi).

Argonauta hyans

Alas Strait (West Nusatenggara).

Argonauta sp.

Alas Strait (West Nusatenggara).

Nautilus pompilius

Alas Strait (West Nusatenggara), Rinca Islands (East Nusatenggara), Takabonerate (South Sulawesi).

Nautilus macromphalus

Takabonerate (South Sulawesi).

Spirula sp.

Bunaken Island (North Sulawesi).

From the above description it is possible to estimate the range of regional geographical distribution of the species. Out of 44 species, 11 species (or 25% of total) are evident to have a wide range of regional distribution, i.e. *Loligo edulis*, *L. chinensis*, *L. duvauceli*, *L. sumatrensis*, *Sthenoteuthis oualaniensis*, *Sepioteuthis lessoniana*, *Abralia*

spaercki, *Sepia latimanus*, *S. aculeata*, *S. pharaonis*, and *Sepiella inermis*. The remaining species seem to be more restricted to certain geographical boundaries.

IV. CONCLUSION

Fourty four species of cephalopods were identified to occur in Indonesian seas, and are available at the Diponegoro University Fisheries Laboratory in Semarang. From these eleven species are evident to have a wide range (otherwise limited to certain boundaries) of regional distribution, such as *Loligo edulis*, *L. chinensis*, *L. duvauceli*, *L. sumatrensis*, *Sthenoteuthis oualaniensis*, *Sepioteuthis lessoniana*, *Abralia spaercki*, *Sepia latimanus*, *S. aculeata*, *S. pharaonis*, and *Sepiella inermis*.

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Table 1. The Occurrence of Cephalopods in Indonesian Seas as in Collection at Undip Fisheries Laboratory, Semarang

SPECIES	A R E A																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>Loligo edulis</i>		•																		
<i>Loligo chinensis</i>											•				•					
<i>Loligo sibogae</i>																				
<i>Loligo duvauceli</i>				•	•			•	•		•							•	•	•
<i>Loligo sumatrensis</i>				•			•	•	•		•		•							
<i>Loligo singhalensis</i>	•																			
<i>Loligo uyii</i>																				
<i>Loligo bleekeri</i>																				
<i>Loligo sp.</i>														•						
<i>Uroteuthis bartschi</i>																				
<i>Sepioteuthis lessoniana</i>		•	•	•																•
<i>Idiosepius pygmaeus</i>																				
<i>Euprymna morsei</i>																				
<i>E. stenodactylus</i>																		•		•
<i>S. oualaniensis</i>		•		•	•		•												•	
<i>Nototodarus sp.</i>				•																
<i>Chiroteuthis sp.</i>																				
<i>Abralia spaercki</i>		•			•															
<i>Abralia remschi</i>		•			•															
<i>Sepia latimanus</i>																				
<i>Sepia bandaensis</i>																				
<i>Sepia aculeata</i>																		•		•
<i>Sepia subaculeata</i>																		•		•
<i>Sepia pharaonis</i>										•							•	•		
<i>Sepia recurvirostra</i>																			•	
<i>Sepia elliptica</i>																				
<i>Sepia sp. (A)</i>																				
<i>Sepia sp. (B)</i>																				
<i>Sepia sp. (C)</i>																				
<i>Sepia sp. (D)</i>																				
<i>Sepiella inermis</i>		•			•				•	•	•	•	•				•	•		
<i>Sepiella sp.</i>													•							
<i>Octopus aegina</i>																				
<i>Octopus membranaceus</i>								•											•	•
<i>Octopus mactopus</i>																				
<i>Octopus filamentosa</i>		•																		
<i>Octopus cyanea</i>								•											•	
<i>Octopus sp.</i>																				
<i>H. lunulata</i>																				
<i>Argonauta hyans</i>																				
<i>Argonauta sp.</i>																				
<i>Nautilus pompilius</i>																				
<i>Nautilus macromphalus</i>																				
<i>Spirula sp.</i>																				

Description of areas :

WEST SUMATRA	SOUTH JAVA	MALAKA STR	SOUTH SUMATRA	NORTH JAVA
1 Padang	2 Pelabuhan Ratu	9 Langsa	16 Sungailiat - T.Pinang	17 Tl Jakarta
	3 Pangandaran	10 Pangk Brandan		18 Tegal
	4 Cilacap	11 Belawan		19 Pekalongan
	5 Kebumen	12 Tg Balai (SU)		20 Weleri-Semarang
	6 Yogyakarta	13 Bagansiapi-api		
	7 Pacitan	14 Panipahan		
	8 Parigi	15 Tg Balai (R)		

SPECIES	A R E A																																							
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40																				
<i>Loligo edulis</i>			*			*		*							*				*																					
<i>Loligo chinensis</i>						*								*	*																									
<i>Loligo sibogae</i>						*																																		
<i>Loligo duvauceli</i>	*	*	*		*	*		*		*			*	*					*																					
<i>Loligo sumatrensis</i>		*	*					*		*					*				*																					
<i>Loligo singhalensis</i>		*																	*	*																				
<i>Loligo uyii</i>	*				*														*	*																				
<i>Loligo bleekeri</i>																			*																					
<i>Loligo sp.</i>																																								
<i>Uroteuthis bartschi</i>						*		*																																
<i>Sepioteuthis lessoniana</i>			*			*	*	*				*	*	*	*	*		*																						
<i>Idiosepius pygmaeus</i>								*																																
<i>Euprymna morsei</i>						*																																		
<i>E. stenodactylus</i>						*																																		
<i>S. oualaniensis</i>						*	*	*					*						*																					
<i>Nototodarus sp.</i>						*													*																					
<i>Chiroteuthis sp.</i>						*																																		
<i>Abralia spaercki</i>							*	*							*				*																					
<i>Abralia remschi</i>							*	*											*																					
<i>Sepia latimanus</i>					*	*		*							*																									
<i>Sepia bandaensis</i>						*									*																									
<i>Sepia aculeata</i>		*	*					*		*	*				*				*																					
<i>Sepia subaculeata</i>																																								
<i>Sepia pharaonis</i>	*	*	*													*			*																					
<i>Sepia recurvirostra</i>								*		*					*				*																					
<i>Sepia elliptica</i>								*							*				*																					
<i>Sepia sp. (A)</i>								*							*				*																					
<i>Sepia sp. (B)</i>								*							*				*																					
<i>Sepia sp. (C)</i>															*				*																					
<i>Sepia sp. (D)</i>								*							*				*	*																				
<i>Sepiella inermis</i>	*	*	*							*									*	*																				
<i>Sepiella sp.</i>	*																																							
<i>Octopus aegina</i>								*																																
<i>Octopus membranaceus</i>	*																																							
<i>Octopus mactopus</i>						*																																		
<i>Octopus filamentosa</i>																																								
<i>Octopus cyanea</i>															*		*		*	*																				
<i>Octopus sp.</i>						*													*	*																				
<i>H. lunulata</i>						*		*										*																						
<i>Argonauta hyans</i>						*																																		
<i>Argonauta sp.</i>						*																																		
<i>Nautilus pompilius</i>						*		*							*																									
<i>Nautilus macromphalus</i>															*		*																							
<i>Spirula sp.</i>															*			*																						

Description of areas :

NORTH JAVA	BALI - TIMOR	SW KALIMANTAN	EAST KALIMANTAN	SOUTH SULAWESI	CN SULAWESI	MALUKU - IRJA
21 Jepara 22 Rembang 23 Tuban/Ib Boyo 24 Surabaya	25 Bali Strait 26 Alas Strait 27 Teluk Bima 28 Kep Rince 29 Kupang	30 Pontianak 31 Pulau Laut	32 Samarinda	33 Pare-pare/Barru 34 Ujung Pandang 35 Takabonerate	36 Manado 37 P. Bunaken 38 Palu	39 Ambon 40 Teluk Bentuni