

NEW RECORDS OF *ALLOPOSUS MOLLIS* VERRILL (CEPHALOPODA,
OCTOPODA) FROM THE PACIFIC OCEAN

Angeles Alvariño and John R. Hunter

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Center
La Jolla, California 92038

ABSTRACT

Two specimens of Alloposus mollis (Alloposidae) captured off southern California are described and illustrated. The anatomical characteristics of the species are discussed, and its distribution is reviewed.

Alloposus mollis is a relative rarely captured mesopelagic cephalopod. Records of this species are few and locations scattered. The published illustrations and descriptions are rather incomplete and diagrammatic because of the lack of specimens in good condition of preservation.

Verrill (1880) originally described the species from specimens collected off New England in the North Atlantic. Additional specimens were reported by Verrill (1881) and Hoyle (1886) from off Newport, Rhode Island, the mouth of the Chesapeake Bay, and in other parts of the Atlantic (Joubin, 1895, 1900; Robson, 1930 for his *A. hardyi*; Thore, 1949; Adam, 1960). Ijima and Ikeda (1902) described an allied species, *A. pacificus*, from the Sagami Sea, Japan, and this species was recorded also for Sagami Bay, Japan, by Sasaki (1929). Berry (1914) suggested that the evidence was not sufficient to warrant two different species. Similarly, *A. hardyi* is believed to be synonymous with *A. mollis* (Thore, 1949). Specimens belonging to the family Alloposidae obtained at Pailolo Channel, Hawaii and other ALBATROSS stations in the Pacific (Hoyle, 1904; Berry, 1914) were considered to belong to *A. mollis*. Alloposidae material from the DANA collections, including specimens from the Atlantic, Indo-Pacific (05°52'N, 131°14'E) and the Indian Ocean (04°52'N, 77°08'E), were placed by Thore (1949) under *A. mollis*. Young (1972) obtained one specimen from Santa Catalina Basin, California (33°23'N, 118°49'W). This specimen, judging from the illustrations, was not complete and in bad condition of preservation, facts also explain-

ed by Young (1972) when he comments "... very large, but rather poorly preserved specimen".

Two specimens of *A. mollis* in excellent condition were taken off the southern California coast during survey cruises conducted by the National Marine Fisheries Service's R/V DAVID STARR JORDAN. These records together with the one by Young (1972) are the first reported specimens obtained from the North American Pacific. This report documents these records, provides a description and illustration of the specimens and review, the distribution and external morphology of the species.

Alloposus mollis Verrill, 1880

Material examined—The specimens collected were: Specimen A (200 mm total length, head and mantle) captured July 18, 1976 (2349 hours PST) at 33°23'N, 117°43'W in a six feet Isaacs-Kidd midwater trawl towed to a maximum depth of 70 m; and Specimen B (67 mm total length, head and mantle to base of arms) collected March 24, 1977 (0410 hours PST) at 33°31.8'N, 117°58'W, in a midwater trawl towed at a maximum depth of 7 m. Both specimens were females.

Description—These animals are ovoid in shape, widest at the head region. They are soft and of smooth gelatinous consistency, translucent, and covered with small red spots, giving the whole animal a brick-purple color. The head is large, short and slightly broader than the body. The mantle opening is wide and full, and in two broad pouches, extending dorsally from

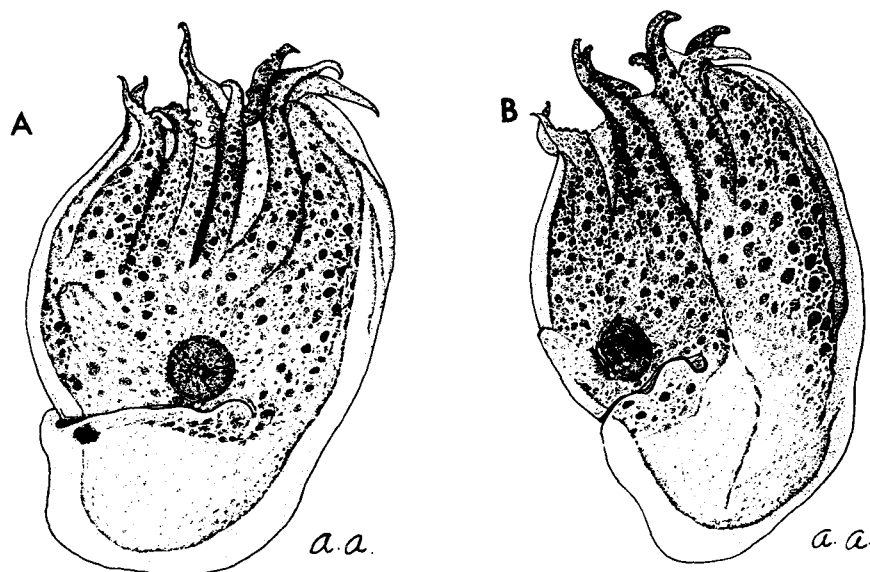


FIG. 1. A—Lateral left view of *Alloposus mollis* (Specimen B); B—Dorso lateral left view of *Alloposus mollis* (Specimen B).

the ventral point of the commissure towards the level of the eyes (Fig. 1). The eyes are large and prominent, covered by the eye lid. The lid has a small central opening which can be expanded to expose the entire eye (Figs. 2A and 2B). The funnel is large and is embedded with the gelatinous tissue of the head, except for the top which is free, reaching to a level higher than the upper edge of the eyes. The olfactory organ, a flat round lump, is located posteriorly to the eyes.

The arms are stout and short, relative to the body length (head and mantle), and they decrease in length from the dorsal to the ventral side. They are connected at the base by a broad membrane, web or umbrella, which attains the greatest extension between the dorsal pair of arms. The suckers are arranged in a straight row of 3 to 4 (ventral arms) or 4 to 6 (dorsal arms), from the mouth to the point on the arm where the web starts. At this point the suckers begin to deviate from a straight course to an incipient zig zag arrangement, which becomes more evident along the webbed and the free part of the arms (Fig. 2C). This pattern occurs in

both specimens we collected, in Verrill's syntype, and in all other specimens we received from the Division of Mollusks at the Smithsonian Institution, which included the material examined by Berry (1914). Measurements from our specimens are given in Table 1.

Discussion—The arrangement of the suckers on the arms is an important character and subject to some disagreement and confusion in the literature. Ijima and Ikeda (1902) described an allied species, *A. pacificus*, from the Sagami Sea, subsequently reported by Sasaki (1929) from the same body of water in the Sagami Bay, Japan. Berry (1914) stated that the anatomical differences between *A. pacificus* and *A. mollis* were insufficient to establish a new species. According to Ijima and Ikeda (1902) the suckers of *A. pacificus* were arranged in a single row for most of the length of the arm, and were biserially arranged only on the free part of the arm, that is, from the edge of the web to the outer tip of the arm. This same characteristic was mentioned by Robson (1930) for *A. hardyi*. Verrill (1880) specifies that the suckers are "large, single, in two alternating rows," and Verrill

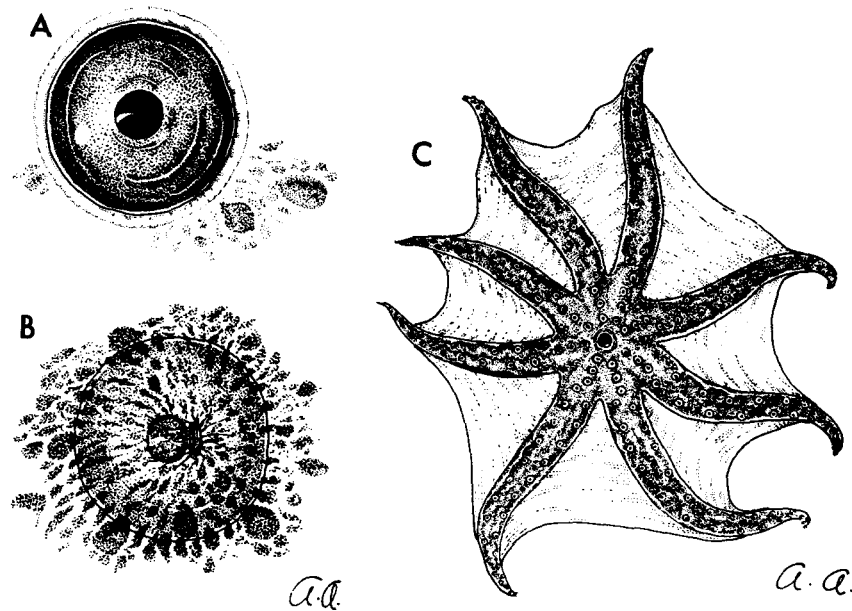


FIG. 2. A—Eye with the eyelid expanded, exposing the eye (Specimen A); B—Right eye with sphincter of eyelid contracted; the diameter of the opening corresponds to that of the pupil of the eye (Specimen B); C—Detail of the crown of arms and interarms web, and the disposition of the suckers of female *Alloposus mollis* (from both Specimen A and Specimen B).

(1881) states that the suckers "are in two rows or rather in a single more or less zig zag row which most conspicuously approached the two rowed condition after reaching the margin of the umbrella (at about the 13th sucker on the dorsal arms)." Robson (1930) explained for *A. hardyi* that "suckers tend to be uniserial or very widely alternating except about or just beyond the margin of the web, where they are more or less biserial." The suckers in our specimens are arranged, as explained above, in a straight row from the mouth to the point where the web starts, and at this point the suckers initiate an incipient zig zag arrangement, which becomes clearly evident along the webbed and free part of the arms (Fig. 2C). The suckers are 1 to 12 mm in diameter and their number varies from 12 (Thore, 1949) to 155 per arm (Joubin, 1900).

The proportions of the body in *A. mollis* change slightly with age; older specimens have

relatively shorter bodies and longer arms than young individuals.

The only sexual dimorphism in *Alloposidae* is the third right arm, hectotylus of males. The males have 7 normal arms and the hectotylized arm. Verrill (1881) reported a hectotylus reaching 200 mm in length and 20 mm in width, with two rows of large 4-mm diameter, 6 or 7 lobed suckers, with a terminal process 30 mm long and 7 mm diameter.

Most of the specimens of *A. mollis* obtained by other authors were partially destroyed, injured during trawling, or only fragments of large individuals. Our specimens were alive and in excellent condition when brought on deck, and the morphological structures were accurately maintained (Fig. 3). No dissections were made to examine the internal anatomy or stomach content, because we felt it was important to keep the specimens in good condition.

TABLE 1. Meristic data on the specimens of *Alloposus mollis* collected off California.

	Total length mm	Width mm	Head width mm	Length funnel mm	Eye diameter mm	Diameter open eye lid mm	Width mantle mm	No. suckers mm	Size suckers mm
Specimen A	200	65	76	36	26	3	80	>80	3 to 1
Total length of arms from ventral to dorsal									
right left									
I 82 76									
II 88 82									
III 92 85									
IV 120 117									
Length of free part of the arms									
right left									
I 43 40									
II 40 37									
III 52 50									
IV 85 82									
Specimen B	67	38	40	16	8	1	42	20-30	1.5 to <1
Total length of arms from ventral to dorsal									
right left									
I 24 20									
II 35 32									
III 36 34									
IV 40 40									
Length of free part of the arms									
right left									
I 12 10									
II 15 15									
III 18 17									
IV 22 22									

FIG. 3. *Alloposus mollis* (Specimen B), length 67 mm.

Distribution—*Alloposus mollis* is a cosmopolitan species, usually found near tropical and subtropical oceanic regions (Tables 2 and 3; Fig. 4). The majority of the deep-sea cephalopods were collected in trawls and probably are adept at avoiding nets of all types. The capture of our specimen B (Fig. 3) was observed by biologists on deck of vessel, and it was efficiently avoiding capture, when net was directly towed in pursuit of the specimen. Similarly, Thore (1949) suggested that *A. mollis* may only appear to be rare because of their ability to avoid capture. *A. mollis* may inhabit the open sea during certain phases of its life cycle, and remain in deep and bottom layers of the continental slope during other (Thore; 1949).

Our specimens were both juvenile females

TABLE 2. *Compilation of world data on Alloposus mollis Verrill.*

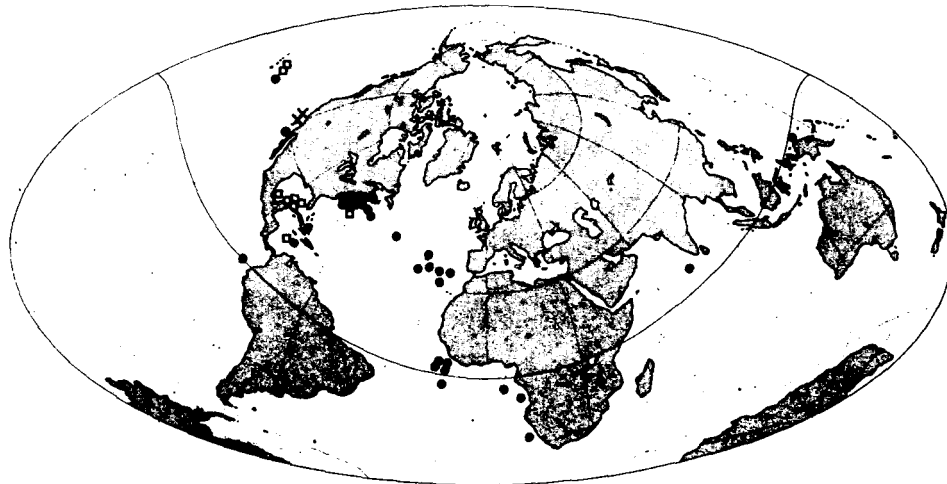
Location	Size	Length of body to base of arms	Mantle	Width of body	Head width mm	Length arms mm	Perfm. arms mm	Number of suckers on:		Diam. suckers	Disposition of suckers on arms	Size of eyes	Sex	Depth	Temp. °C	Author
								arm I	arm IV							
39°48'N, 70°50'W 39°46'N, 71°05'W 39°52'N, 70°58'W 39°56'N, 70°59'W 37°24'N, 74°17'W 38°21'N, 73°32'W		90 mm		70 mm		Dorsal 60 mm longer than ventral					Arranged in one or two rows.	Large				Verrill, 1880
100-150 miles south of Newport (Rhode Island)	160 mm	90 mm	50 mm	70 mm		70				7 mm	In one or two rows.					Verrill, 1881
38°52'N, 38°53'N - 69°24'W, 69°23'W																Verrill, 1884
North Atlantic																Hoyle, 1886
42°45'N, 22°16'W to 41°32'N, 43°20'W							70	60	132	12 mm						Joubin, 1895
37°55'N, 27°44'W and 38°04'N, 25°22'W						650 to 1610 mm		100	155							Joubin, 1900
Sagami Sea, Japan											In a single row or most part of arm and biserially arranged only on free tip					Ijima and Ikeda, 1902
00°19'N, 90°34'W																Hoyle, 1904
Pailolo Channel, Hawaii	147+	65 mm		46-51		51-82				4 mm	In 2 rows or rather in a single zig-zag pattern after reaching margin umbrella					Berry, 1914
00°56'W, 14°80'W			40 mm	35	38	50-112					Tend to uniserial or alternating, except, beyond margin of web, when adopt biserial pattern		M	0 m		Robson, 1930
16°06'N, 76°02'W 25°-35°N and 74°-45°W	13		6		6.5	6.5		19	17	1.17				33	16°6C	
15°31'N, 18°05'W	29		11.9		30	15		17	14	1.2		10.8	M	33	-	
08°26'N, 15°11'W	44		18.9		41.8	22.8		17	12	2.3		14	M	33	-	
05°31'N, 18°05'W	52		20.8		49.4	31.2		25	17	2.5		17.1	M	33	-	
13°31'N, 18°03'W	60,70		22.8, 26.2		60,77	33, 43.1		25, 26	20	2.6, 4.5		21, 26.9	F	33	-	
37°23'N, 26°02'W 37°40'N, 26°00'W	91		34.6		91	59.1		30	25	5.4		36.4	M	333	9°16-11°39C	
05°52'S, 131°14'E 04°52'N, 77°08'E	400		100		440	348				8		152	F	333	"	
27°10'N, 08°59'E												2 sps. 1 sp.				Thore, 1949
West of Saint Louis (Africa)			80-60					250+	220	5		35	M	800-650		Adam, 1960
Santa Catalina Basin (33°23'N, 116°49'W)			115	126	120	360-200						38	F			Young, 1972

TABLE 3. *Data on specimens from the Smithsonian Institution.*

Number of specimens	Total length mm	Position	Depth m	Date
1 male	120	39°52'N-70°58'W (off Rhode Island)	680	1880
1 *	60	Hawaiian Islands (Pailolo Channel)	530.4	22 July, 1902
4 males	variable	21°06'N-156°13'W (Hawaiian Islands)	686	5 April, 1968
1 *	120	21°01'N-156°43'W (Hawaiian Islands)	548.7	17 Nov., 1968
1 *	55	12°24'N-82°24'W (Caribbean Sea)	612.7	22 Nov., 1968
Several *	medium	28°17'N-86°21'W (Gulf of Mexico)	671	20 June, 1969
2 *	55	18°52'N-94°50'W (Gulf of Mexico)	612.7	5 June, 1970
1 *	large	24°24'N-87°49'W (Gulf of Mexico)	567	14 Aug., 1970
1 *	45	28°00'N-85°20'W (Gulf of Mexico)	521	27 Aug., 1970
1 *	88	29°46'N-88°25'W (Gulf of Mexico)	36.5	14 April, 1972

* Due to bad condition of preservation of specimens, sex could not be determined.

Total length includes head and mantle.



- PUBLISHED RECORDS
- × PRESENT DATA
- SPECIMENS FROM THE SMITHSONIAN INST.

FIG. 4. *Distribution of Allopous mollis.*

(200 mm and 67 mm in total length) and were taken at 70 m and 7 m depth respectively. According to Verrill (1881) the bathymetric range of the species extends to 2462 m depth, and fragments of specimens were taken from 3173 m depth. Berry (1914) states that it extends from 180 m to more than 900 m depth. Voss (1967) explains that Alloposidae appear to be distributed in the upper 400 m, although they may extend to more than 3000 m depth, and that larvae and juveniles occur in the upper 100 m.

Populations of *A. mollis* probably are stratified ontogenetically, as is often the case in oceanic animals.

The temperature of the surface waters at the time of capture of our two specimens was 14.6°C (Specimen A), and 13.0°C (Specimen B), which is well within the range of temperature recorded for the species (Thore, 1949).

Cephalopods are important in the food web of the oceans, as they constitute the main food of dolphins, sperm whales, other sea mammals, turtles, Thunnidae, sharks and other large fish. Joubin (1895, 1900) found fragments of *A. mollis* (dorsal region and tentacular crown) in a region of the Atlantic where sperm whales were feeding, but found no *A. mollis* in their stomachs, possibly because of the difficulty in identifying digested gelatinous remains.

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