

Occurrence of *Maxima* pearl oyster in the Oshima Strait, Amami-Oshima; A northern limit of the distribution

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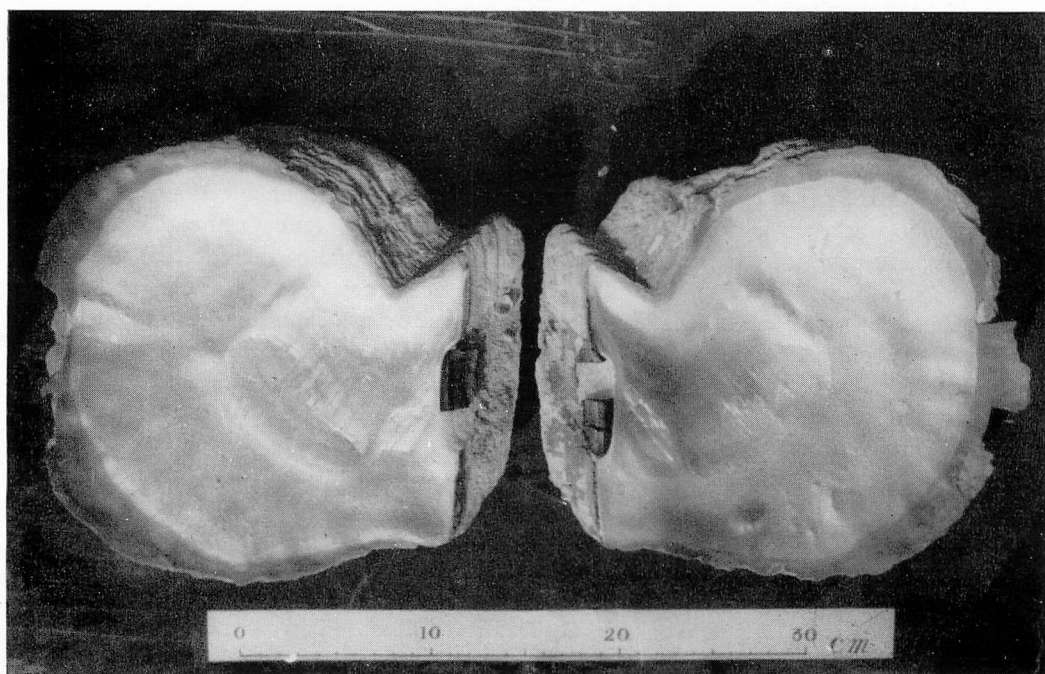
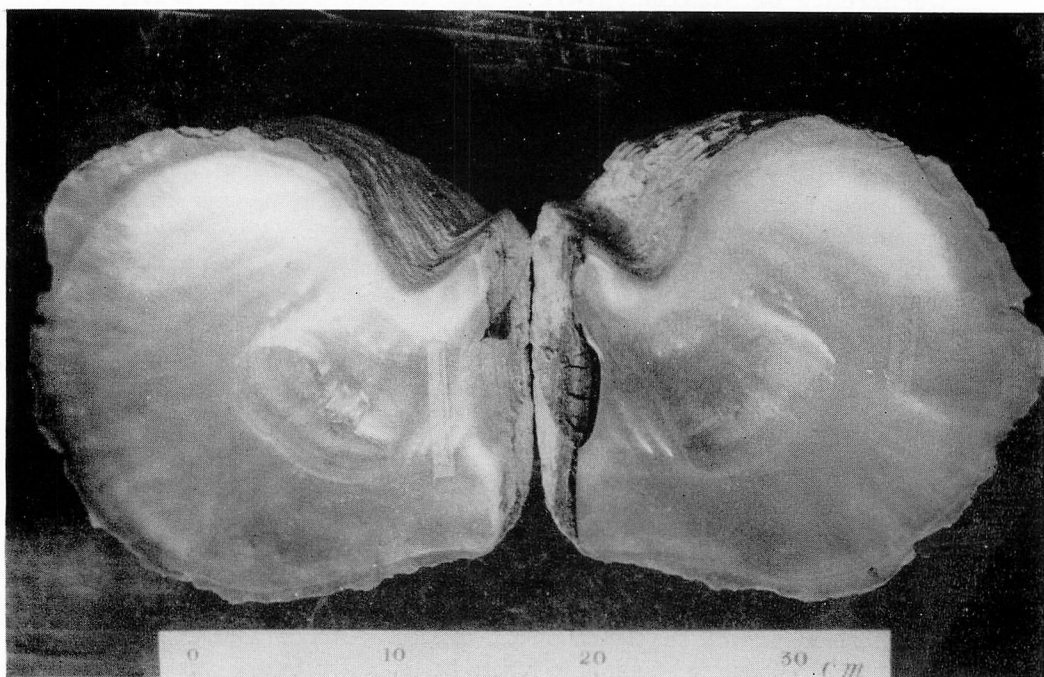
Maxima pearl oyster, *Pinctada maxima* (JAMESON), inhabits coastal waters in the Western Tropical Pacific (JAMESON, 1901). In the North Pacific, the animals are most abundantly distributed around the islands of the Philippines, mainly the Sulu Archipelago (TALAVERA & FAUSTINO, 1931); they are also reported to be found around the Pescadores Islands (TAKI, 1933), the Yaeyama Group of the Riukiu Islands (ODA, verbal communication), and the Palau Islands (WADA, 1941). It seems to have been a general belief among Japanese conchologists that pearl oysters of this species do not inhabit the Japanese territorial waters; for instance, the species is not mentioned in the list of Japanese recent marine molluscs compiled by KURODA and HABE (1952).

The Oshima Strait, located around Lat. 28°10'N and Long. 129°16'E, is a water channel between Amami-Oshima I. and Kakeroma I.; easterly it connects with the Pacific Ocean and westerly opens to the East China Sea.

Occurrence of *P. maxima* in the Strait was for the first time reported by NISHIKAWA in 1904. However, since his report is made only on a specimen exhibited in a commercial fair, the claim cannot be said wholly authentic; he wrote that he was informed the specimen had come from the Satsunan-Seto (the Oshima Strait, hodie). Since then, as far as the writer knows, no authorized report has appeared on the existence of the mollusc in the area, although it seems likely the occurrence has well been known to some local inhabitants.

Recently, after the World War II, two pearl culture companies were established there to produce blister pearls using *Pteria* pearl oysters which were rather abundantly found in the Strait at that time. Professional divers regularly went to the bottom in search for *Pteria*. Some local fishermen also ventured frequent dives to gather dumped scrap iron from the bottom. Eventually, several specimens of *P. maxima* have been brought ashore by these means. According to a private communication from Mr. IWAKI who was a technician-in-charge of the Saneku Pearl Culture Co. now liquidated, the company obtained two specimens from the channel. One of the two, collected in 1953, is now kept in the museum of the National Pearl Research Laboratory at Kashikojima, Mie Prefecture. Another specimen, found by a local fisherman in 1955, is kept in the office of the Setouchi Fisheries Cooperation at Setouchi-Machi, Amami-Oshima. The Amami Pearl & Sponge Culture Co. hitherto collected four specimens, one in 1952, another in 1953, and the other two in 1958. One of these four specimens is now deposited at the Oshima Branch Laboratory of the Prefectural Fisheries Experimental Station, Setouchi-Machi, and another in the present writer's laboratory. One of the rest two is kept by the company. Accordingly, seven alive specimens have been obtained since the War. In addition, in 1956 the writer collected one shell-valve on the shore of Yui-Kojima, a small island located in the central part of the Strait. Most of the alive specimens were found on the bottom some 50-60 meters deep in the eastern half of the channel, e.g., off Shokazu, Oshikaku and Tean. Two of the specimens are shown in the photos on the next page.

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Since there is no record of transplantation to the area of Maxima pearl oysters from other localities, it is unequivocal that the animals naturally inhabit the area, and this is the northern limit of distribution* ever known for *Pinctada maxima*.

During his stay at Yui-Kojima I. between 1956 and 1959 to study the artificial propagation of *Pteria* pearl oyster, the writer had an opportunity to examine four specimens of *P. maxima*, including two alive ones. They are all large in size, ranging from 25 cm to 31 cm in the dorso-ventral measurement, from 24 cm to 26 cm in the antero-posterior measurement, from 6.5 cm to 8.7 cm in the thickness, and from 2 kg to 4 kg in the weight of the shell (two valves together). The inside marginal portion of the shell which is not yet covered by a nacreous secretion is rather broad. The shells generally show a good growth in appearances. Any indication of stunted growth is not discernible even in the largest specimen. It is certain that the molluscs have survived for years in a healthy condition in the Strait. As to the nacre, two specimens are silver-edged and the other two are lightly gold-edged.

Although an annual water-temperature record around the spots where the animals were found is not available, we made a daily measurement of water temperature during the winter months in 1957-1958 in Atetsu Wan, a small inlet facing the main channel. The measurement made at 5 meters under the surface reveals that the lowest water-temperature appeared in the beginning of March, being around 19.5°C. The winter temperature of the main body of the channel water is probably a bit higher than in the inlet. Since in summer the water temperature rises to nearly 30°C, the temperature regime of the channel water seems to be similar to that of the water off the coast of Western Australia (Lat. 25°S) which is believed a southern limit of distribution of *P. maxima* (JAMESON, 1901; HYND, 1955).

MOP shells from Western Australia are generally small in size as compared with those from other localities, the majority not exceeding 20 cm in the dorso-ventral measurement (WADA, 1953a). It is generally believed this is to be attributed to the low winter temperature. Although the number of specimens available is too small to make a general consideration, the great size of the pearl oysters from the Oshima Strait may be said remarkable when the low winter temperature there is taken into account. While the cause of this fact is quite obscure, a similar fact is also found in the size of *Pteria penguin* inhabiting the Strait. The *Pteria* pearl oysters are also distributed in tropical seas; the northern limit lies at Tanegashima I. (Lat. 30°30'N), not so far from Amami-Oshima. In the Oshima Strait, *Pteria* measuring 24 cm in the dorso-ventral length are quite common, being markedly larger in size as compared with those from other, more tropical localities (e.g., the Torres Strait).

Although any attempts have not yet made to determine the population density of *P. maxima* in the Oshima Strait, judging from the foregoing accounts on the collection, it is feasible to say that the molluscs are distributed very sparingly on the bottom of the channel. Since the bivalves can reproduce effectively only by mutual stimulation, a successful fertilization *en masse* of discharged gametes can hardly be expected to occur when the animals lie so far apart one another. In other words, it seems unlikely that the population is maintained by the eggs fertilized *in situ*; it is much more likely that the larvae drifted by ocean currents from southern, more densely populated areas would eventually have settled in the channel. The distribution of *P. maxima* in the

* The writer has been informed that a dead shell was found on the western coast of Satsuma Peninsula (Lat. 31° 30'N), Kagoshima Prefecture, and is now kept in a pearl culture company at Koshikijima I. If it is true, this will turn to be the northern limit.

Oshima Strait may be regarded as an example of "sterile distribution". If this is the case, it is supposed to be of rather unusual occurrence; because, if such an event frequently takes place, the pearl oysters would be found more abundantly in the channel.

Distance between the Oshima Strait and the southern part of the Philippines which may be assumed as one of the possible birthplaces of the larvae is about 1,200 nautical miles. With a velocity of 2 knots it takes 25 days to cover the distance. In the time of typhoons which frequently develop in the region in late summer and early autumn, the ocean current would reasonably be expected to shift its usual pattern with a marked increase in velocity. Maxima pearl oysters breed in summer months but the time of breeding may be extended further on occasions (WADA, 1941, 1953b). Working on *P. maxima* at Thursday Island in the Torres Strait between 1958 and 1960, the present writer succeeded in growing several hundred oysters from the fertilized eggs up to spat in glass jars (As to the culture experiments of the pearl oysters, a more precise report will be published later). Most of the larvae settled down as spat in 4 to 5 weeks. It would not seem entirely improbable that the larvae can travel a long distance in case a fortunate coincidence takes place between the time of spawning and the development of a peculiar type of local and ocean currents.

It should also be noted that the molluscs have been found only in the Strait and not around other islands in the southern vicinity. A similar situation has been observed in the Palau Islands, the West Carolines, where *P. maxima* are distributed near the west entrance of and, mainly, in a channel (called Toahel Mid by the natives) between Babeldaob I. and Korror I. and nowhere else in the lagoon and neighboring islands (WADA, 1941). Such a restricted distribution may have some correlation with the pattern of water flow peculiar to a narrow strait.

In any way, there is no doubt that *P. maxima* can grow in a healthy condition in the Oshima Strait. From an industrial point of view, the bivalves are very important; as well known, the valves are extensively used as mother-of-pearl and the cultured pearls they produce are highly esteemed. When the cultivation of the molluscs is successfully accomplished, a big industry would develop there. The low water temperature in winter months may rather favor the production of pearls of good quality.

The writer is happy to express his indebtedness to Mr. I. SHINMURA of the Kagoshima Prefectural Fisheries Experimental Station for valuable information and for making measurements and photos of the specimens; and to Mr. S. KOZUKA of the Amami Pearl & Sponge Culture Co. for kindly placing the specimens at the writer's disposal and for the assistance in various ways.

Summary

1. *Pinctada maxima* inhabits the Oshima Strait (Lat. 28°10'N; Long. 129°16'E), where the water temperature will go down to about 20°C in winter. This is the northern limit of the distribution for the species.

2. In the Strait, the molluscs, though yet found very sparingly, survive for years in a healthy condition, growing to a large size. This suggests a possibility of cultivation in the area of this economically important animal.

3. It would seem likely that the animals have come from the southern, more densely populated area, drifted by currents in their larval stage. Culture experiments show the free swimming period extends 4 to 5 weeks or longer, which may be long enough to explain the aberrant distribution.

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北限分布地である奄美大島, 大島海峡の

シロチョウガイ

和田 清 治

要 約 大島海峡(北緯 28°10')には僅かながらシロチョウガイ *Pinctada maxima* (JAMESON) が生息する。採取された貝はすべて大形のもので良い成長を示していた。生息数は極めて少いと考えられるので、そこで発生したものでなく、海流等の極めて特異な条件の時に偶々幼生が漂着したものであろう。幼生の浮游期間は飼育実験の結果から4~5週間と推測される。大島海峡はこの種類の分布の北限であり、冬期水温は 20°C 前後になるが、シロチョウガイが長期間健康な状態で生息していることから、この産業的に重要な貝の養殖に我が領土内唯一の適地となる可能性がある。