

Acanthaster Population Levels and Control Efforts on Ponape, Eastern Caroline Islands¹

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Abstract

In 1969, a survey of 16 islands in the U. S. Trust Territory revealed large populations of the coral-eating starfish, *Acanthaster planci*, in certain locations around Ponape. A control team was formed a year later in an attempt to reduce the numbers of these starfish. Surveys conducted in 1971 and 1972, however, continued to indicate the presence of large numbers of *Acanthaster* though almost 70,000 were reported killed by the control team. In 1973, when 99,368 starfish were reported killed, the survey did show a reduced population level. During the 14-month period preceding this survey, the average number of starfish killed per diver-hour in the water also decreased significantly. The population decline did not occur everywhere around Ponape. Rather, reductions were limited to those areas where *Acanthaster* had previously been most abundant and where the greatest control efforts had been exerted.

Ponape, located in the Eastern Caroline Islands at 7° N latitude and 158° E longitude, is a high, basaltic island with an elevation of nearly 800 m at its highest point. It is almost completely surrounded by a barrier reef with a fringing reef only at the southeastern corner of the island. The lagoon has an average width of about three km and contains numerous patch reefs.

The presence around Ponape of large numbers of *Acanthaster planci*, the coral-eating starfish, was brought to world-wide attention following a survey by the Westinghouse Ocean Research Laboratory (Chesher, 1969). The survey covered 16 islands in the U. S. Trust Territory during the summer of 1969. In this survey, as in all subsequent surveys of Ponape, two divers were towed behind a boat, each counting *Acanthaster* and the number of starfish feeding sites (white patches of freshly-dead coral) on his side of the boat for a specified time period (10 or 20 minutes). Tows were made at intervals along and over the barrier, patch and fringing reefs of Ponape.

The Westinghouse survey team, led by Ken Read, reported reef damage and large populations of *Acanthaster* in three areas: 1) along the inner portion of the northeastern barrier reef; 2) along the inner portion of the southern barrier reef; and 3) along both the inner and outer portions of the northern barrier reef.

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As a result of this survey and because Ponapeans depend on the reef to supply them with most of their protein, a starfish control team of six Ponapean divers was trained and began working on September 9, 1970. Two methods were employed by the team to kill *Acanthaster*. When working at depths greater than 6 m, divers used SCUBA and syringes to inject starfish with a killing dose of 15 cc of formalin. Each diver was asked to count the number of starfish he had injected and record it at the end of his dive. At lesser depths, no SCUBA was used and starfish were simply speared with a sharp stick and thrown into the boat. At the end of the day they were counted, dumped on a deserted island and left to die above the high-tide line.

Roy Tsuda (1971) led the second Ponape *Acanthaster* survey in April, 1971. He found the entire outer edge of the western, northwestern, and northeastern barrier reef infested with *Acanthaster*. Large numbers of starfish were also found inside the western barrier reef. During the seven months the starfish control team had been in action previous to this survey, a total kill of 29,459 *Acanthaster* had been reported.

The third survey, led by the author, was completed in March, 1972. The number of starfish observed was similar to that found by Tsuda's team so population levels for the island had not shown a significant decrease even though a total kill of 68,793 was reported by the starfish control team at this date. Exceptionally large numbers of starfish were observed along the outside of the northeastern barrier reef and on the inside of the western barrier reef.

The fourth and most recent survey of Ponape was again led by the author and completed in May, 1973. The members of the survey team, the survey procedure, and the equipment utilized were all the same as in the previous survey so a comparative analysis of the two should reflect population changes during the intervening 14-month period. The comparison is summarized in Table 1. An average of 1.8 starfish/tow was observed during the 106 ten-minute tows of the latest survey. The 1972 survey yielded an average of 3.0 starfish/tow for 117 tows.

Table 1. Results of 1972 and 1973 Ponape *Acanthaster* surveys. The listed values are the average number of *A. planci* counted by two divers during a ten-minute tow.

	Overall Average	Inside Reef	Outside Reef	Inside W Reef	Outside NE Reef	Inside Reef (Excluding W Reef)	Outside Reef (Excluding NE Reef)
1972 (117 tows)	3.0	4.4	1.6	18.2	11.3	1.7	0.8
1973 (106 tows)	1.8	2.8	0.8	4.6	2.0	2.2	0.7

Data analysis is facilitated if the results are broken down into the situations found inside and outside the barrier reef. Starfish were more difficult to spot outside the reef because tows were made in deeper water (5-15 m as opposed to depths of 1-5 m inside the reef) so figures for the two habitats are not comparable. However, within the same habitat, the averages can be compared for different

years or locations. The 1972 survey resulted in averages of 4.4 starfish/tow inside the reef and 1.6 starfish/tow outside the reef. The 1973 survey resulted in averages of 2.5 starfish/tow inside the reef and 0.8 starfish/tow outside the reef so decreasing populations were found in both habitats.

As in 1972, the 1973 survey found *Acanthaster* to be most numerous along the outside of the northeastern barrier reef and on the inside of the western barrier reef. During the 14-month interval between surveys, the starfish control team worked these areas exclusively. Using SCUBA and syringes loaded with formalin, they reported a kill of 3,605 *Acanthaster* from the submarine terrace outside the northeastern barrier reef. With no SCUBA and using sharpened sticks for throwing starfish into the boat, the team reported a kill of 26,970 *Acanthaster* from the reef flat and patch reefs inside the western barrier reef. Of the two methods, the one used in shallow water results in more accurate kill reports. Instead of having to rely on memory to recall how many starfish they injected during a dive, divers count each starfish as it is removed from the boat at the end of the day. Also, because the starfish collected by each diver are mixed together in the bottom of the boat, competition does not influence the report as it might when divers are asked individually how many starfish they killed.

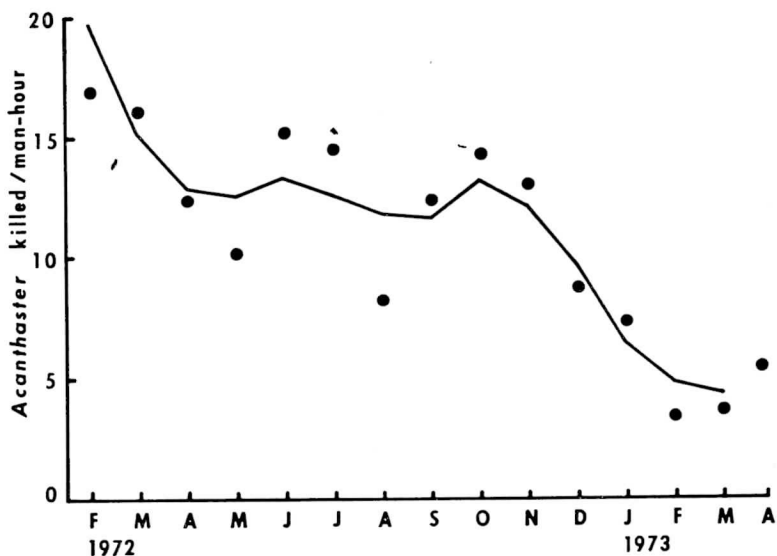


Fig. 1. Monthly averages of *Acanthaster* killed per man-hour in the water inside the western barrier reef. The line is a running average of the three nearest points.

Starfish killed per man-hour in the water inside the western reef declined markedly during the 14 months between the last surveys (Fig. 1). For the month previous to the 1972 survey (February, 1972), the kill per man-hour averaged

16.9 starfish. Prior to the 1973 survey (April, 1973), the average was down to 5.4 starfish/hour.

Analysis of the 1972 and 1973 survey data also indicates a reduction in population levels of *Acanthaster*. The 1972 survey yielded an average of 18.2 starfish/tow (10 tows) inside the western barrier reef while the 1973 survey gave an average of only 4.6 starfish/tow (8 tows). Likewise, the 1972 survey yielded an average of 11.3 starfish/tow (4 tows) outside the northeastern barrier reef while the 1973 survey gave an average of 2.0 starfish/tow (3 tows).

Clearly, populations of *Acanthaster* inside the western barrier reef and outside the northeastern barrier reef have shown significant declines during the past 14 months. This does not appear to be the case, however, for populations in other areas of Ponape. The 1972 average inside the reef (excluding the western portion) was 1.7 starfish/tow (51 tows). The 1973 average for the same area was 2.2 starfish/tow (56 tows). The 1972 average outside the reef (excluding the northeastern portion) was 0.8 starfish/tow (52 tows). The 1973 average for the same area was 0.7 starfish/tow (39 tows).

In conclusion it can be stated that population levels of *Acanthaster* around Ponape have decreased during the past 14 months. However, the decreases occurred in areas previously harboring large concentrations of starfish and in which control efforts have been exerted. Population levels in other areas have remained stable.

REFERENCES

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