

## Inappropriate activities around coral reefs

Coral reef degradation and sustainable use in the Yaeyama Archipelago, Okinawa:  
A Study of Lift-Net Fishery and Fishermen's Perspectives and Opinions

Tomoya Akimichi

### 1 Introduction

In recent decades, degradation of coral reefs has been widely reported from many tropical and sub-tropical regions around the world. In Southeast Asia, coral reefs are under serious threat (Wilkinson and Rahman 1994). Declines in biodiversity and biomass on coral reefs have been highlighted recently by a severe bleaching event, which led to extensive coral mortality in a number of locations, including Okinawa (Kayanne 2002). Coral reef degradation is caused by natural and anthropogenic factors, and occurs on a variety of scales, ranging from the small-scale destruction of individual colonies by anchor damage to large-scale bleaching of entire reef systems, caused by the prolonged elevation of sea temperatures. The activities of humans have led, unintentionally or otherwise, to more serious impacts on coral reefs than those caused by natural phenomena such as typhoons, heavy wave action, predation by crown-of-thorns starfish (*Acanthaster planci*), and global warming. For example, coastal reef systems are vulnerable to sedimentation and increased riparian runoff caused by remote, inland logging and mining (Cesar *et al.* 1997). Coastal land reclamation for purposes of industrial and agricultural development has had a more direct impact on coral reefs, through the conversion of former reef-sites into man-made coastal flat land. Given the complexity of coral reef ecosystems, which are not yet fully understood, targeted socio-economic research is urgently needed to identify anthropogenic pressures on coral reefs in order to prevent or minimize future degradation (Ruddle 1993).

For the purpose of proposing an appropriate framework for the sustainable use and management of coral reefs, four topics will be discussed here:

#### a. Holistic approach:

The causes of coral reef degradation are varied and complex, even within a limited geographical area, and research is vital to the identification and assessment of the mosaic of factors involved. The land-sea interface,

in particular, should be integrated into management planning for coral reefs in the region.

#### b. Indigenous knowledge and practices:

When considering relevant ecological and socio-economic factors, indigenous perception, knowledge and experience of coral reefs and their ecology are important. This knowledge is often retained by local fishermen through their daily fishing activities, and helps us to understand the nature and causes of coral reef degradation. Field experience, especially in Southeast Asia and the Pacific, has demonstrated that local fishermen are generally knowledgeable about marine ecology, as they have the opportunity to observe the changes occurring in the coral reef environment on a daily basis (Ruddle and Akimichi 1984; Ruddle and Johannes 1985; Akimichi 1995).

#### c. Temporal and transitional processes:

Coral reef disturbance should be seen as a process and as an accumulation through time, rather than as a one-off episode or occurrence caused by direct natural and anthropogenic factors. For instance, agricultural land reform and road construction do not always have direct impacts on marine environments. However, these land-based activities show indirect or gradual impacts over the course of time. These impacts may be delayed until the onset of the rainy season, or even for several years. Typhoons often cause direct damage to coral reefs, but these impacts can also only be assessed after the end of seasonal and annual cycles. Both short-term and long-term natural and anthropogenic impacts on coral reefs should be regarded as transitional processes.

#### d. Illegal fishing on coral reefs:

Fishing activities on coral reefs are not always undertaken on a sustainable basis. Destructive and illegal techniques such as blasting and cyanide fishing are prevalent in developing countries (APEC-MRCWG 1998). Poverty is generally considered the primary cause of destructive fishing. However, regulatory measures executed by the Japanese Fisheries Cooperative Association (FCA) and *sasi* practices in eastern Indonesia have demonstrated that community-based enforcement is one of the most effective ways to prevent illegal



Photo. 1. Small-scale fixed net for reef fish in the Yonara Waterway. (photo taken in 2003)

fishing (Bailey and Zerner 1992; Akimichi 1995). Regional economic markets for fish in the central Philippines also suggest that rapid development in the domestic economy, rather than poverty, is the primary cause of illegal fishing (Akamine 1999). In this regard, illegal fishing should be seen as a universal phenomenon rather than as poverty-driven.

Based on the four areas of interest outlined above, this study focuses on changes in coral reefs, as recorded from small-scale observations by fishermen over several decades in the Yaeyama Archipelago, southwestern Japan. The author has also studied coral reefs in the Yaeyama Archipelago; therefore, a comparison of scientific findings with the observations and opinions of local fishermen may facilitate future discussions of coral reef degradation and issues pertaining to sustainability. This study concludes by emphasizing the significance of the four areas of interest outlined above, and by offering them as the basis for effective approaches to understanding transformations in small-scale coral reef fisheries in tropical and sub-tropical regions.

## 2 Study area and coral reef fisheries in the Yaeyama Archipelago

The Yaeyama Archipelago is located at the southwestern extremity of Japan. The environment and climate is sub-tropical, although the sea is considered tropical, as the annual mean surface temperature off Ishigaki is 24.7°C (Shokita 1988). The Yaeyama Islands consist of eight major islands: Ishigaki, Iriomote, Taketomi, Kuroshima, Kohama, Aragusuku (Uechi and Shimochi) and Hatoma (Fig. 1). Most of these islands are fringed by coral reefs, and they have at their centre the Sekisei Lagoon. This

lagoon is characterized by extensive coral reefs (ca. 13,000 ha), the outer margin of which is barrier reef. It is rich in diverse coral habitats and supports major fishing grounds for local small-scale fisheries.

Coral reefs are characterized by their high diversity of habitats and organisms. Fishing activities on coral reefs tend to be small-scale, and are often divided into nocturnal and diurnal fisheries; in addition, fishing strategies also show a dichotomy, in that they are divided into strategies for individuals and for aggregations. In this region, a variety of small-scale fisheries are in operation. Some of the fishing methods currently employed in the coastal zones of the Yaeyama Archipelago include, fish driving for fusiliers and reef fish, gill netting, small-scale fixed nets for reef fish (Photo. 1), lift nets for live bait, cage trapping for groupers and lethrins, spear-fishing, line-fishing and shell collecting. Some of these fisheries are seasonal, while others continue year-round. Most of the catch consists of surface, demersal, and benthic reef-dwelling species. At the outer reefs and in off-shore zones, troll-lining for tuna, wahoo and skipjack, bottom-lining for snapper and large squid, pole-lining for skipjack, and long-lining for tunnids are the major fishing techniques (Kuchikura 1977, Ruddle and Akimichi 1989). Recently, *payao* (fish aggregating devices) for large surface swimmers such as tuna, wahoo and marlin have been commonly deployed in deep water (Kakuma 2002). As well as these capture fisheries, coastal mariculture operations for seaweed, pearl shells, giant clams, and groupers have been launched.

This study aims to examine how fishing sites, and their value to the live bait fishery in the Yaeyama Archipelago, have changed in the last few decades. The objectives of this study were, first, to identify changes in the use of fishing sites; second, to examine the causes of these changes in relation to economic development; and third, to propose possible measures for future conservation initiatives.

Research focused on changes in the perceptions and practices of coral reef fishermen over the last few decades was conducted at Ishigaki Island and in the adjacent coastal waters in the Yaeyama Islands. Using field data collected during 1971-2002, and through direct observations, on-board interviews, and GPS techniques, research was conducted in January and March, 2003. The research was undertaken as part of an annual survey carried out by the Japan Wildlife Research Center; field research was



Fig. 1. Distribution of *yana* sites (coral rocks and patch reefs) in the lift-net fishery surveyed in 2003.

Fig. 2. Location of degraded *yana* sites (coral rocks and patch reefs) in Sekisei Lagoon. The numbers indicate specific survey points and *Johki-ukiju* (lit., steamships floating) and *Urubishi* (lit., reefs made of *Acropora* corals) are given local names on *yana* sites.

conducted with the assistance of local staff at the International Coral Reef Research and Monitoring Center on Ishigaki Island. Six expert lift-net fishermen participated in the identification and evaluation of fishing sites from on board the boat, over five days.

### 3 Perception and use of corals in lift-net fishery

In the Yaeyama Archipelago and elsewhere in Japan, lift-net fishery is employed to obtain live bait for skipjack pole-line fishery. Live bait is scattered throughout schools of the voracious skipjack fish (*Katsuwonus pelamis*) and is used to entice them to take artificial bait. Target fish for live bait are small aggregating species such as fusiliers (*Caesio* spp.), cardinalfish (*Apogon* spp.), and damselfish (*Abdefuduf* spp.). These fish aggregate in holes and crevices in coral rocks in the daytime, leaving their shelter to feed nocturnally. Large numbers of aggregating fish are usually hauled in lift nets at dawn when the fish return to their shelter (Kuchikura 1977).

According to fishermen in Yaeyama, dwelling sites for any kind of fish are generally called *yana* (lit., house), but in the case of lift-net fishery, the term *yana* refers specifically to the coral rock habitat of small live bait fish. According to previous research conducted from 1972 to 2002, a total of approximately 800 named *yana* are known to lift-net fishermen. A *yana* may be a small coral rock about one to two meters long, but which often indicates extensive coral reefs several hundreds of meters in length. These *yana* are scattered extensively throughout the Sekisei Lagoon, Nagura Bay and adjacent waters (Fig. 1). Expert fishermen, given only the name of the *yana*, can recount site details such as the location, shape and nature of each *yana*, the seasonality of the locale, and the species of fish that shelter there.

Local names for *yana* sites are a combination of the geographical name of the area, features of the coral, names of fish, depth, direction etcetera. For example, the name *Kannunduu shichuu nu yaa* designates 'a house of sweetlips (*Kyphosus* spp.) of the Kannondo Chinese Temple' (point 645 of Fig. 2), and *Takidon agari nu shiraumii nu yaa* means 'a house of fusilier (*Paracaesio* spp.) at the

east of Taketomi Island' (point 742 of Fig. 2). At the former site, sweetlips are said to feed on small fish among the coral rock, while the latter site is reputed to be abundant in fusiliers.

As well as lift-net fishery, coral reefs in the Yaeyama Archipelago are utilized for numerous other types of fishery, in which fishing grounds are not specifically named. This is because lift-net fishery demand more accurate site allocation than the other fisheries operating in the Yaeyama Archipelago. For example, *Urubishi* reefs (lit., reefs made of *Acropora* corals) extend for about 4 km along the NW to SE axis north of Kuroshima (Fig. 2). These reefs are frequently used for fish-driving, gill-netting, nocturnal spear-fishing, and other types of reef fishing. In these fisheries, there is no need to pinpoint the fishing site. Instead, it is more important to have the temporal knowledge required to productively cast nets in response to daily and tidal rhythms that govern fish movement. In night diving, searching extensive coral reef areas does not require on-board site allocation.

Lift-net fishing is a group activity, which involves four to six divers operating a lift net. When a school of live bait fish is hauled, it is immediately stored in a floating bamboo container measuring ca.  $1.0 \times 2.0 \times 1.5$  m. Skipjack boats collect these live bait fish from the container and use them to attract skipjacks. Two bamboo containers are used by each group. Each lift net group has an annual contract to provide bait fish to a skipjack mother boat during the fishing season.

Only two skipjack boats were operating in 2002, in contrast to the twenty-seven boats employed at the peak of the fishery in Yaeyama waters in the early 1970s. During this peak period, competition occurred for prime fishing sites in the live bait fishery. It is not clear exactly when the lottery practice commenced, but by 1971 there was an established agreement among lift-netters to limit access to *yana* sites.

In order to select the most productive fishing sites and to avoid conflicts, an annual meeting is organized by the Yaeyama FCA at the beginning of the fishing season (early April) to decide on the assignation of exclusive fishing rights to ten sites. Leading lift-netters conduct a lottery at the meeting, in which the first winner in the lottery has top priority in choosing one *yana* site, the second claims another site, and so forth. After the first round of drawing, the order of the process is reversed, with the

last group having the opportunity to be the first to choose their second site. This method for ordering site selection is repeated until each group has chosen ten different sites. The fishing sites that are claimed by the lift-netters are generally called *kuji-ana* (a hole by lottery), and exclusive fishing rights are guaranteed to each group for the duration of the fishing season. All of the other sites, which were not claimed, are referred to as *uki-ana* (empty hole), and open access to these sites by any group is allowed. Thus, if twelve groups enter the fishery in a given season, 120 distinct *kuji-ana* will be chosen (Akimichi 1985). During the operation of the fishery, no conflicts among the groups or poaching have been observed; floats and markers are generally deployed to designate the exclusive ownership of *kuji-ana* sites.

#### 4 Factors affecting coral reef degradation

More than thirty years have passed since my initial research in the Yaeyama Archipelago. The testimonials of fishermen who have witnessed changes to the coral reef environment are now crucial to our understanding of the degradation process, as theirs are the only continuous long-term site observations. Although scientists and administrative officers have also visited these sites, their trips are more sporadic and are of relatively short duration. During the winter and spring of 2003, lift-netting sites were visited with expert fishermen, both retired and still working, in order to identify the locations of *yana* sites using GPS, and to investigate whether each site is presently in use. The reasons why certain sites had been abandoned or avoided were investigated. This study is still underway, and the present findings represent the results of visits to 230 sites and areas, about one-third of the 800 previously investigated sites.

The research revealed marked changes in coral communities. Most corals located in the shipping lane and anchorages for large vessels between Ishigaki Port and Taketomi Island have been destroyed. This area has been generally called *Johki-ukiju* (lit., steamships floating) (Fig. 2, Photo. 2) which suggests that in former times steamships frequented. Since Okinawa's return to Japan in 1972, large-scale investment in port construction has been promoted. As a result, large container vessels now anchor in front of Ishigaki Port, and it is evident that the coral in the shipping lane has been completely destroyed by this anchoring. Discussion with lift-net fishermen



Photo. 2. A large container vessel on the shipping lane. This area has been generally called *Johki-ukiju* (lit., steamships floating). Corals in such areas have been destroyed by anchoring.

revealed that, of 42 *yana* between Ishigaki Island and Taketomi Island, more than 70% were abandoned because of the physical damage caused by anchoring.

In areas other than the shipping lane, the reasons for disuse differ from site to site, and site-specific or generalized explanations were provided by the fishermen. For example, *hireekuu* corals (flat-shaped corals of the *Acropora* genus) in the lagoon were destroyed by a typhoon that hit the area in 2000, and coral trout (*Plectropomus* spp.) subsequently disappeared. Since the piscivorous coral trout is known to feed on small fusiliers and damselfish in coral, it is possible that the typhoon damaged the habitats of both prey and predator. At the *Naga-guu* site (lit., a long coral rock), a large coral patch reef in Nagura Bay (site 660 of Fig. 2), bleaching has frequently occurred and fishermen have reported that there are a number of *A. planci* on the corals.

Other causes of coral reef deterioration identified by the fishermen were red-soil sedimentation caused by land reclamation, the construction of roads and factories, and coastal pollution caused by an influx of waste water, pesticides, and soap. Such ideas are clearly not founded on speculation based on newspapers and television programs; these ideas are based on the fishermen's personal observations. The fishermen's concern, with respect to coral reef deterioration, has been focused on both sea and land-based impacts.

In short, the degradation and disturbance of coral reefs in the Yaeyama Archipelago has been shown to have been caused by a combination of natural factors such as typhoons and predation by *A. planci*, and anthropogenic

factors such as anchor damage, red-soil runoff, pesticides, livestock waste and waste water. Why coral-bleaching has been prevalent at some sites rather than others is as yet, unknown, although high water temperatures are undoubtedly one factor in the phenomenon. Even expert fishermen may have difficulty in identifying specific causes of bleaching at particular coral reef sites.

Thus, much information on the changes occurring in coral reefs can be gained from the underwater observations of individual fisherman. Explanations for the possible causes of reef degradation are also based on their observations. However, up-to-date information on coral reefs from such sources may not be easily available. This is because there are, at present, only two groups engaged in lift-netting; thus, the current situation offers no comparison to that which existed when as many as twenty-seven groups competed for the best fishing grounds. However, the location of *yana* for lift-netting is also an important concern for those who conduct other types of fishing, since *yana* are generally regarded as good fishing grounds for catching large, carnivorous fish that feed on the smaller fish. Data on *yana* that were presented to representatives of the Yaeyama FCA elicited extraordinary interest.

It must be added here that destructive practices such as blast and cyanide fishing, which are prevalent in Southeast Asia, seem to be minor causes of coral reef degradation in the Yaeyama Archipelago. On the other hand, socio-economic change and development have had significant negative effects on marine environments. The question of whether reefs are suffering simply because of rapid economic development needs to be clarified. In the following section, past trends in fishing technology and fish sales systems are examined in order to assess changes in the use of coral reefs.

---

## 5 Transformations in coral reef fishing technology

---

### 1. Small-scale fishing economy up to the early 1970s

In the past, blast and cyanide fishing occurred illicitly in the Yaeyama Archipelago. When I conducted research in Ishigaki in 1971, destructive fishing seemed to be common. Clearly, these fishing methods damage the coral reef environment, yet the question of why such destruc-

tive practices continue is not easy to answer. In developing countries where illegal fishing is prevalent, poverty is regarded as the main factor leading to destructive fishing. In Okinawa, however, this does not seem to be the sole reason. During the period of US administration (1945-1972), inspection of the fishery sector and enforcement of fishery laws were not appropriately implemented. Also, in the past, the Yaeyama FCA did not fulfill its role as the coordinating agency for conflict avoidance among fishermen, or for the control of illegal fishing. Instead, informal agreements in the small-scale fisheries, such as those at Itoman, southern Okinawa, were important for avoiding conflict and managing resources (Akimichi 1984).

In addition to these characteristics of the fishery sector, we must also note that the economic side of fish selling and the fish processing industries was commonly dealt with through small-scale economic transactions in Okinawa. Fishermen's wives and mothers frequently worked as fish retailers, or ran small-scale sashimi (raw-fish) shops or kamaboko (fried fish-cake) factories (Imamura 1990; Akimichi 2002). In other words, the fish catch brought back by the fishermen was dealt with through family-based networks, rather than through the fish marketing channels of the Yaeyama FCA. In 1971, there were more than 100 fish shops in Ishigaki city, and only a few middlemen ran businesses to contract with individual fisherman to obtain exclusive rights to purchase fresh fish. This reduced the ability of the Yaeyama FCA to influence fisheries' management and the fish marketing system. This family-based economy allowed individuals to ignore social conflicts and penalties, even with regard to illegal fishing.

## 2. Innovation of underwater diving equipment after the 1970s

Institutional reorganization and modernization processes have drastically transformed the management system and the economic channels of fisheries as a whole. After the re-establishment of the Yaeyama FCA, under the control and management of the central government, fishermen were urged to sell fish through FCA's market, rather than through family-based, small-scale enterprises. Development of the cold-chain and modern marketing systems have also led to an increase in the long-distance transport of fresh and frozen fish, which is air-freighted directly to Naha, and even to Tokyo and Osaka.

Innovations in fishing equipment and techniques have also greatly modified diving activity. In the early 1970s,



Photo. 3. Crown-of-thorns starfish (*Acanthaster planci*) collected in the extermination program (January-October, 2003).



Photo. 4. Preliminary work on the boat for the coral fragments' transplantation.

immigrant fishermen from Miyako Island introduced a new method of nocturnal spear-fishing, using a waterproof flashlight. Diurnal fish species were the major targets in this fishery (Kuchikura 1977). In the 1980s, a powerful battery pack, carried on the back, replaced hand-held flashlights. This improved the efficiency of nocturnal fishing, and the technique became widespread among a number of small-scale fishermen.

Since the 1980s, scuba diving technology has been applied to fish-drive fisheries. This has inevitably caused more intensive fishing, and large hauls of fish have been landed (Takekawa 1998, 2001). Unfortunately, some divers have suffered from decompression sickness, as a result of prolonged periods underwater. Since the 1990s, oxygen supply equipment has come into use. This apparatus greatly improves bottom-time and fishermen now work through the night. This has led to over-fishing (Takekawa 2003).

## 3. Live bait and groupers

The major fishing sites for nocturnal divers largely over-

lap with those used by the lift-net fishery. Major target species for nighttime spearing are daytime feeders such as groupers, coral trout, and parrotfish. These piscivores and coral-eating fishes feed in the daytime and take shelter at night. For divers it is easier to spear resting fish than swimming ones and, therefore, for the night-divers, the location of the coral heads and reefs to which these fishes tend to retreat is very important. For this reason, the *yana* locations used in the lift-net fishery have also attracted the attention of divers.

Parrotfish used to be one of the less expensive reef fish. However the sale price has risen, perhaps due to over-fishing. On the other hand, coral trout and grouper are highly-prized, and the prices for these species have long been the highest among reef fish. Recent declining trends in grouper catches have increased awareness among local fishermen, and among fisheries scientists affiliated to the prefecture, of the need for conservation. This is clearly shown by the discussion concerning the closure of lehrinid fish aggregation sites during the spawning season (Akimichi 2001).

---

## 6 Conservation and sustainable use of coral reefs in the Yaeyama Archipelago

---

As seen above, many complex factors are associated with the environmental disturbance of coral reefs in Yaeyama. It is of primary importance to determine the relative status of these factors, in addition to seeking practical measures to eliminate both direct and indirect negative impacts, when attempting to integrate the conservation and management of coral reefs. However, the conservation of coral reefs should not depend solely on mere responses to external impacts and to legal enforcement. Positive action programs such as mariculture (Shokita 1988), coral transplantation, beach cleaning, and the promotion of eco-tourism must be implemented. A few examples of projects that have been undertaken during the last decade or so in Yaeyama will be described below. These developments have implications for future holistic management schemes. The cases of *A. planci* extermination and coral transplantation are described in '2-2' (Photo. 3) and '5-1' (Photo. 4), respectively.

### 1. Consensus making on the closing of fishing grounds

Apart from *A. planci* extermination, the legal regulation of

fishing practices is another effective means of conserving coral reefs from degradation. As we have clearly seen above, environmental laws and conservation acts are insufficient for the elimination of illegal fishing. The local FCA's hegemony represents influential political power, which most affiliated fishermen follow. However, once stakeholders operate outside the FCA's regime, consensus becomes increasingly difficult. A recent discussion on the closure of four sites during spawning aggregations offers a good example of this problem (Akimichi 2001). In other words, a long process of discussion must take place before any action on the closure of fishing grounds or fishing seasons is implemented.

### 2. Eco-tourism: accepted or rejected?

In a number of tropical and subtropical regions of the world, marine eco-tourism has attracted much attention from policy-makers, tourists, the hotel industry, and anthropologists. Eco-tourism promotes the sustainable use of valuable marine resources, and subscribes to the positive values of environmental education, psychological relief, aesthetic satisfaction, and the conservation of biodiversity. Local economic benefits are gained through increased employment, small-scale tourism industries, and other facilities. A recent report by the WWF also suggests that coral reefs have tremendous economic potential (Spergel and Moye 2004), and that eco-tourism in coral reef environments shows great promise. However the blue-print of eco-tourism is not always fully accepted by local communities.

In the Yaeyama Archipelago, beautiful coral reef environments have attracted tourists who wish to experience the diving and tropical atmosphere first-hand. In the 1990s, a scuba diving boom began, and thousands of people of all ages have visited the Yaeyama Archipelago. Many new dive shops have opened in Isihgaki, offering diving tour packages; in addition, weeklong diving schools have been established for incoming tourists.

Local fishermen, particularly those who engage in diving activities, have formed a negative opinion of tourist divers. The reason for this antagonism is simple: it is feared that tourist divers' careless underwater activities will frighten fish, and may eventually cause fish to disperse, leading to a serious negative impact on the fishermen's livelihood (Akimichi 2002). The fishermen's frustration is apparently directed primarily towards tourist divers and dive operators who guide tourists to the prime dive sites. As there is no law excluding tourist divers

from coral reefs, local fishermen feel powerless to prevent this disturbance. Although there seems to be no explicit dispute between fishermen and tourists in the Yaeyama Islands, the possibility remains that conflicts may emerge in the near future. It is hoped that serious incidents, such as the physical confrontations and decade-long conflicts seen in the Miyako Archipelago, can be avoided (Ueda 1992; Takekawa 2003).

Conflicts between fishermen and tourists may not be easily resolved, as demonstrated by the recent dialogue case-study into reef fish resource management in Ishigaki (Akimichi 2001). The coordination of round-table discussions among stakeholders is also problematic. As the management of common property resources is at issue here (Ruddle and Akimichi 1989; Feeny *et al.* 1992), it is expected that further theoretical considerations may produce guidelines for a future maritime regime.

---

## 7 Fishermen's perspectives and opinions on the coral islands

---

Finally, I offer an example of the way in which local fishermen perceive the importance of interactions between land and sea. After the completion of the research conducted for this study, the author visited the village of Shiraho in the company of a lift-net fisherman. On the beach at Shiraho, the fisherman pointed out that waste waters from the residential area discharge directly into the sea. I learned that in the past, environmentalists and some community members in Shiraho had opposed a new airstrip development that was likely to pose a threat to the blue coral (*Heliopora coerulea*) located in front of the community. At present, the infrastructure of the community remains underdeveloped. We observed some construction work that was underway within the village, and we were told that a new waste water pipe was being created that would discharge into the sea. It is clear that before protests are organized on a national and international scale, there are many issues that have to be addressed at a local level. Fishermen in the Yaeyama Islands know this, and that is why their points of view and opinions must be acknowledged and taken into account.

### *Acknowledgments*

I am deeply indebted to Katsuya Hamasaki for his assistance. I would also like to express my thanks to all the fishermen and staff of the Yaeyama FCA, who kindly provided me with information and advice, especially Mr.

Keiji Yogi and Mr. Tadashi Yogi for their guidance to fishing spots, and for their helpful advice.