Lobster was taken with nets set around rocks, snared with a pole to which a noose was attached or captured by hand. A rapid and substantial increase in Hawaii's population during the first decades of the twentieth century resulted in heavy fishing pressure and depletion of lobster resources adjacent to the more populated areas of the MHI. By the early 1950s the commercial catch of green spiny lobsters around the MHI had dropped by 75% to 85%. The depletion of the fishery resources in nearshore areas of the MHI encouraged Hawaii's fishermen to search for alternative grounds.

A NWHI lobster fishery was developed in the late 1970s. By then several commercial vessels, relocated from areas such as the US Pacific Northwest where crustacean overfishing was occurring, began full-scale lobster trapping in the NWHI. A number of smaller, multi-purpose boats also began fishing for spiny lobsters in the NWHI, combining that operation with bottomfish fishing. By the mid-1980s the NWHI lobster fishery was Hawaii's most lucrative fishery. Changing gear from wire to plastic traps led to significant catches of slipper lobster and an increase in fishing efficiency. From 1985 to 1987 the fishery targeted and largely depleted the population of slipper lobsters. In 1990 lobster catch rates dramatically declined, likely due to a climate-induced change in oceanic productivity throughout the NWHI, which also affected the abundance of reef fish, seabirds and Hawaiian monk seals. The decrease in lobster catch prompted the Western Pacific Council to establish a limited access program and fleet wide seasonal harvest quotas that significantly altered fishing operations. Vessels concentrated on trapping lobsters on the banks around Necker Island, Gardner Pinnacles and Maro Reef during the derby-style fishing season. From 1992 to 1997 Necker Island accounted for 48% to 64% of the total effort. In 1998 the quota was allocated among four fishing areas to prevent localized depletion of the lobster population at the most heavily fished banks and to encourage fishers to broaden the geographical distribution of their effort.

The NWHI lobster trap fishery is unique in the Western Pacific Region where other common spiny lobster species normally will not readily enter fish traps. Under the Western Pacific Council's Crustacean Fishery Management Plan, implemented in 1983, traps deployed in the NWHI lobster fishery must have escapement panels to allow the exit of juvenile lobsters. In the same year, the Council also amended the Crustacean FMP to specify the maximum dimensions of the trap funnel entrance, to minimize the risk the traps posed to protected monk seals in the NWHI. There were concerns that the traps may elicit the curiosity of monks seals, especially the pups, who might place their heads in the trap funnel, become trapped and drown.

The lobster harvest guideline is an example of implementation of the precautionary approach to fisheries management, as it uses an accepted level of overfishing risk to set the total exploitable population and then allocates 13% of that as the harvest guideline. Initially a minimum size limit of 5 cm tail width for spiny lobsters and 5.6 cm for slipper lobsters was established for the lobster fishery, along with a ban on the retention of berried females. However, observations on the gross mortality of discarded lobsters, both on deck and through predation, led to a Council decision in 1996 to permit a "take all" fishery in which all lobsters retained are counted against the annual quota. The Hawaii lobster fishery landed 261,000 pounds with an ex-vessel revenue of $1.2 million in 1999, which was the last year the fishery was active (Table 2).

The majority of the vessels participating in this fishery voluntarily deployed satellite VMS through which their location could be tracked and their daily catches reported. This allowed managers to monitor the progress of the fishery through "real time"reporting of catches and give immediate notice when the annual quota was reached.

While calculating the year 2000 estimates of exploitable population of lobsters in the NWHI, using the same analytical procedures used to estimate exploitable populations in 1998 and 1999, NMFS scientists expressed alarm at the increasing level of uncertainty in their computations. The scientists also noted a lack of appreciable rebuilding of lobster populations despite significant reductions in fishing effort throughout the NWHI. Given the shortcomings in understanding the dynamics of the NWHI lobster populations, the increasing uncertainty in model parameter estimates and the lack of appreciable rebuilding of the lobster population, in 2000 the Council recommended that NMFS close the NWHI lobster fishery as a precautionary measure.

The NWHI Coral Reef Ecosystem Reserve was established by Executive Order 13178 of December 4, 2000, and Executive Order 13196 of January 18, 2001. The NWHI Reserve boundary extends 3-50 nm around the NWHI except at Midway Atoll where the NWHI Reserve boundary starts at the outer boundary of the Midway Atoll National Wildlife Refuge and extends to 50 nm. The process to establish a proposed NWHI Sanctuary is underway and will consider a range of reasonable management alternatives related to the crustacean fishery.

4.4. Bottomfish and Seamount Fisheries

Bottomfishing is conducted in Hawaii and the three U.S. territories but is only of major significance in Hawaii, where it represents a fraction of total landed value of all catches (Table 2). Most bottomfish grounds in American Samoa, Guam, the Northern Mariana Islands and the MHI are within the 0-3 nm zone, although there are banks and seamounts such as Penguin Bank in the MHI that lie within or extend into federal waters. In addition, the NWHI represents a substantial area of bottomfishing grounds within Council's jurisdiction.

The Hawaii bottomfish fishery is a hook-and-line fishery that targets a range of snappers and groupers that live on the outer reef slopes, seamounts and banks of the MHI and NWHI at depths of between 50 to 200 fm. Bottomfish fishing was a part of the economy and culture of Native Hawaiians long before European visitors arrived. Native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques employed today. European colonization of the Hawaiian Islands during the early 19th century and the introduction of a cash economy led to the development of

a local commercial fishery. By the turn of the century Japanese immigrants to Hawaii dominated the bottomfish fishery using wooden-hulled sampans propelled by sails or oars. The bottomfish fishing gear and techniques employed by the Japanese immigrants imitated, with slight modifications, those traditionally used by Native Hawaiians. During the early years of the commercial bottomfish fishery, vessels fished at grounds around the MHI. The fishing range of the sampan fleet increased substantially after the introduction of motor powered vessels in 1905. Fishing activity was occurring around the NWHI as early as 1913. Within a few years more than a dozen sampans were fishing for bottomfish around the NWHI. During World War II the bottomfish fishery in Hawaii virtually ceased operations but recommenced shortly after the war ended. The late 1940s saw as many as nine vessels fishing around the NWHI, but by the mid-1950s vessel losses and lower fish prices reduced the number of fishery participants. During the 1960s only one or two vessels were operating around the NWHI. There was renewed interest in bottomfish fishing in the NWHI in the late 1970s following a collaborative study of the marine resources of the region by state and federal agencies. By 1987, a total of 28 vessels actively fished for NWHI bottomfish, with a dozen fishing full time.

Bottomfish are caught both by commercial and recreational fishermen around the MHI and by commercial fishermen in the NWHI. The size of the recreational catch around the MHI is unknown and is confounded not only by non-reporting but also by the blurring of the distinction between commercial and recreational fishermen.

The Bottomfish and Seamount Groundfish FMP was implemented in 1983. It prohibits destructive fishing techniques, including explosives, poisons, trawl nets and bottom-set gillnets; establishes a moratorium on the commercial harvest of seamount groundfish stocks at Hancock Seamount; and implements a permit system for fishing for bottomfish around the NWHI.

A limited entry scheme is in effect for bottomfishing in the NWHI whereas bottomfish stocks in the MHI are open to all fishermen. In the MHI approximately 80% of the bottomfish habitat lies in state waters. The State of Hawaii has implemented a series of area closures around the MHI and recreational bag limits to address the problem of local depletion of bottomfish. In 1989 the Council developed regulations that divided the NWHI into two fishing grounds: the Mau and Hoomalu Zones (Figure 3). Access to the Mau Zone is limited to 10 permit holders, two of which are reserved for indigenous communities through a Community Development Program. Available permits are issued to fishermen based on past participation in the MHI and/or NWHI bottomfish fisheries. Access to the more distant and lightly exploited Hoomalu Zone is limited to seven vessels. Entry to the Hoomalu Zone is through accumulation of points through fishing in the MHI or Mau Zone. Fishermen who have permits to fish in the Hoomalu zone are then restricted to fishing in this zone and must meet minimum landing requirements to remain in the fishery. The limited access programs for the Hoomalu and Mau Zones were established in 1988 and 1999 respectively.

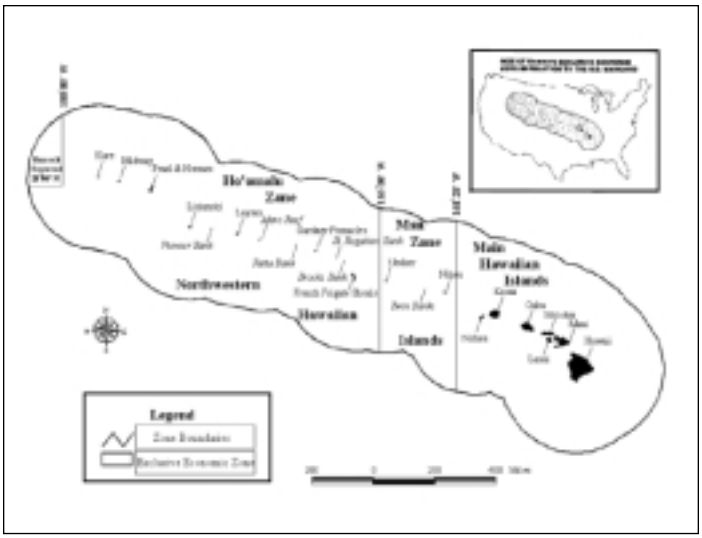

Figure 3.
The Mau, Ho'omalu, and Main Hawaiian Islands management zones for Hawaii bottomfish fishing.

The NWHI Coral Reef Ecosystem Reserve was established by Executive Orders in 2000 and 2001. The process to establish a proposed NWHI Sanctuary is underway and will consider a range of reasonable management alternatives related to the bottomfish fishery.

In addition to the deep-slope fisheries in the MHI and NWHI, a trawl and bottom longline fishery targeting alfonsin at the southeast Hancock Seamount in the NWHI and in the Emperor Seamount Chain was started by Russian and Japanese fishing vessels in the late 1960s. After 10 years of large catches, overfishing caused the fishery to collapse. A moratorium on the harvest of alfonsin on the Hancock Seamounts has been in effect since 1986 in an effort to rebuild the stock. The moratorium is in effect until 2004 and may be extended. Periodic reviews of the stock indicate that no recovery has occurred.

A Guam bottomfish closure was recently recommended by the Council and is being reviewed. Vessels over 50 feet will be prohibited from targeting bottomfish within 50 miles around Guam. The closure will help control fishing effort at offshore seamounts and allow the traditional small vessel fishery to continue to use resources. The measure also requires federal permits and reporting for larger vessels.

The Council is now considering management options for bottomfish resources in the Northern Mariana Islands.

4.5. Precious Coral Fisheries

The Western Pacific Council's Precious Corals FMP was approved in 1980 and regulations for the fishery were promulgated in 1983. The plan established a permit requirement, harvest quotas for separate beds, a minimum size limit for pink coral, gear