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HAWAII'S MARINE FISHERY RESOURCES: YESTERDAY (1900) AND TODAY (1986)

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INTRODUCTION

"Fishing is not what it used to be" is a common complaint today of commercial and recreational fishermen all along Hawaii's extensive waterfront. Even the consumer attributes the high price of fresh fish to the lack of fish in Hawaiian waters. Fishing is a topic of high interest in Hawaii, where the seafood consumption rate is at least twice as high as the national average of 12.8 lb[1] per capita (Hudgins 1980; Cooper and Pooley 1982). Any drastic change in the abundance or availability of domestic fishery resources is of major concern to the people and government officials of Hawaii. The available data, although not entirely reliable, suggest that the coastal fishery resources have declined drastically during the 20th century. What has happened to Hawaii's fishery resources in the 20th century? The present report is a preliminary look into this issue.

BACKGROUND

Hawaii was annexed by the United States in 1898 and became a U.S. territory. The population in 1900 numbered 154,001 ([Hawaii] DPED 1986) ethnically was composed mostly of native Hawaiians and a small but growing number of people of Asian and Caucasian descent. Hawaii was in a growing phase of agricultural activity entering the 20th century, with an increased emphasis on producing sugar and pineapple. With the exception of Honolulu, living was decentralized and consisted of small towns and villages located around the main Hawaiian Islands. Fishing was done from shore and from canoes; no motorized vessels were reported to be operating in the fishing industry in 1900 (Cobb 1902). Cobb (1902) reported 2,159 registered fishermen on Oahu, Hawaii, Maui, and Kauai; thus, the total number of commercial fishermen in the Territory of Hawaii probably did not exceed 2,500. In addition to this small but active commercial fishery, the lifestyle at the turn of the century must have included a substantial artisanal fishery whose catches were not recorded in the official territorial files.

The years after World War II saw an increase in population; the 1950 census reported the Territory of Hawaii at 499,794 ([Hawaii] DPED 1986). People were centering in Honolulu and a few other major cities on the other islands. The influx of people from the continental United States and the postwar availability of materials of convenience accelerated Hawaii into modern-day living. The 1950's also saw the beginning of the influx of tourism and an acceleration in the changes along the shoreline and the general coastal environment.

Hawaii's population continued to increase into the 1980's; the 1980 census showed 964,691 residents of Hawaii ([Hawaii] DPED 1986). There was a marked increase in tourism, and in 1986, about 5.7 million tourists

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[1]Weights are given in pounds, the common unit in Hawaii's fisheries. One kilogram is 2.2 lb.

visited Hawaii. The present number of commercial and recreational fishers is not known for the State of Hawaii; however, 2,638 individuals held commercial fishing licenses in 1985. The current number of commercial and recreational fishing vessels reportedly exceeds 8,000 (Skillman and Louie 1984).

What happened to its marine fishery resources as Hawaii changed from a small population living a rural existence in 1900 to a setting of more than 1 million residents and tourists living within the infrastructure and trappings of a modern urban society in 1986? The following sections provide a brief review of some of the available statistics, which were examined in a preliminary manner to determine whether problems exist with the fishery resources of Hawaii.

TOTAL COMMERCIAL FISH CATCH STATISTICS

Figure 1 shows the commercial fish catch statistics for the turn of the century (1900), post-World War II years (1950 and 1953), and recent years (1985 and 1986). The 1900 statistics were taken from a report by Cobb (1902), who described the commercial fisheries of Hawaii at annexation. The statistics for the other years were taken from reports published by the Board of Agriculture and Forestry of the Territory of Hawaii (1950, 1954) and from unpublished Hawaii Division of Aquatic Resources data for 1985 and 1986.

Although the 1900 catch was the smallest of the years examined, it is surprising to note that the 1985 and 1986 catches were only 38 and 80% higher than 1900, respectively. The modest increase is especially surprising because of the substantial growth of the fisheries for tunas and billfishes in recent decades. Again, the uncertainty of the data bases' accuracy must be reiterated. There is a general acknowledgment by State and Federal agencies that the recently reported statistics are based on underestimated figures, which are principally the result of some unreported commercial catches. It also should be emphasized that the recreational and non-marketed subsistence catch is not included in any of the summaries from 1900 to 1986. Nonetheless, these figures appear to be a reflection of major trends over the years.

COMMERCIAL CATCH BY HABITAT

Figure 2 shows the distribution of catch, summarized by habitat, for the years covered in this study. The coastal habitat includes the resources associated with embayments, nearshore areas, and reefs. The neritic-pelagic habitat includes those resources generally found just offshore of the reefs, e.g., the akule and opelu resources. The slope and seamount habitat includes the resources associated with deeper bottom areas and offshore seamounts. Finally, the pelagic habitat includes resources associated with the open ocean.

Several major changes apparently have occurred since 1900. There has been a dramatic decline in the catch of coastal species. The catch during the post-World War II (1950, 1953) and recent years (1985, 1986) ranged

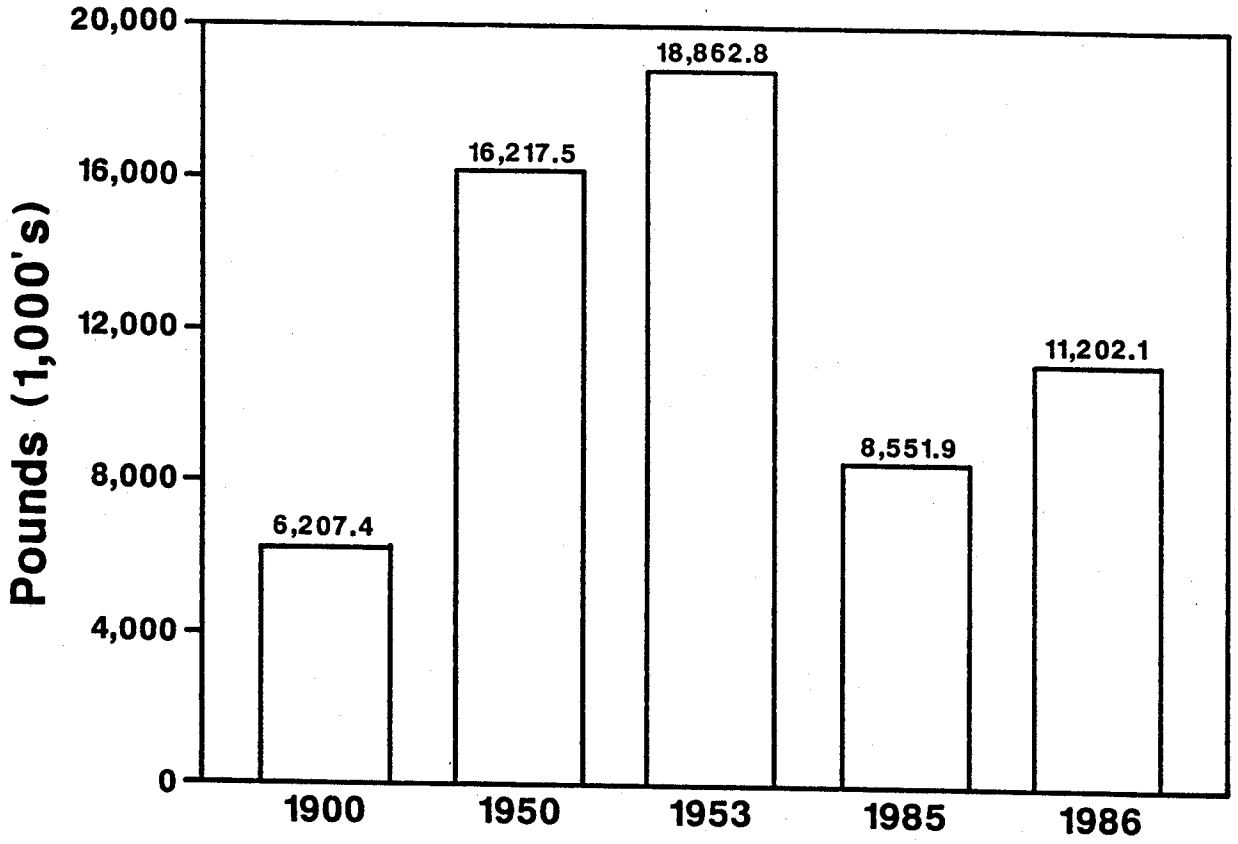

Figure 1.--Hawaii commercial marine fisheries catch, 1900-86.

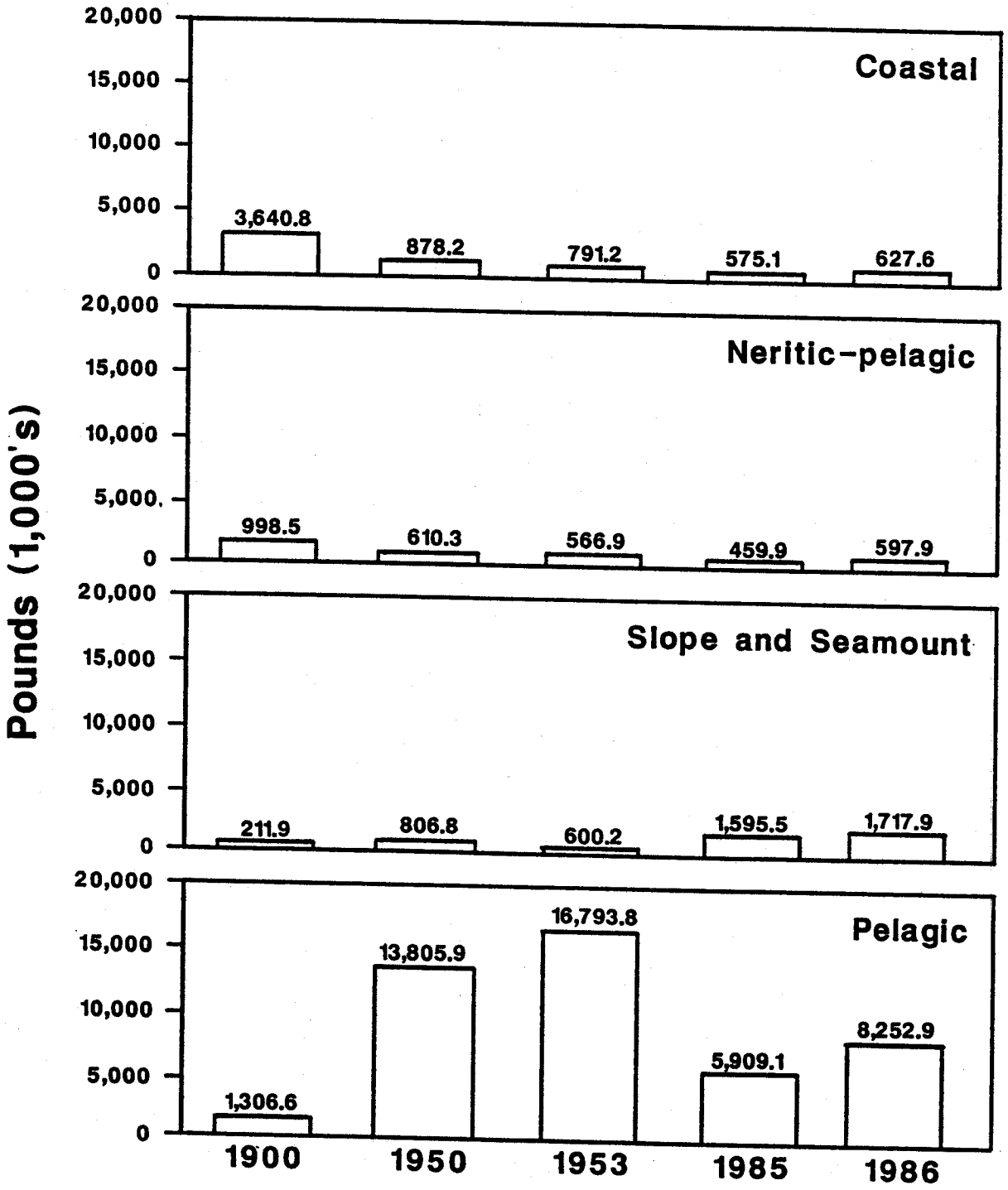

Figure 2.--Habitat distribution of Hawaii commercial marine fisheries catch (year averages).

from 16 to 24% of the 1900 catch of coastal species; thus, an 80% reduction in the catch of coastal species apparently has occurred since 1900.

A 44% decline has occurred in the commercial catch of neritic-pelagic species. The catch of species from the slope and seamount habitat has increased markedly; the 1986 commercial catch was about 80% greater than that in 1900, although some of this reflects the growth of the Northwestern Hawaiian Islands' (NWHI) fishery.

Another prominent feature of the catch distribution by habitat is the marked increase in catch of pelagic species. The 1953 catch of pelagic species was nearly 13 times greater than the 1.3 million lb reported for 1900. This increase was not unexpected because fishing beyond the reef in 1900 was with canoes, whereas present-day fishing is carried out on modern motorized vessels with hydraulic gear, modern navigational aids, depth sounders, and fishing gear made up of synthetic materials. The present-day vessels are, thus, capable of fishing the distant banks and waters for extended periods with efficient fishing gears.

CATCH BY SPECIES GROUPS IN THE COASTAL HABITAT

The marked decline in the commercial catch of species in the coastal habitat, if real, warrants further study. Although only selected years are examined in this report, a closer examination of the coastal species provides some insight into the problem. Figure 3 shows the catch figures for some key species groups in the coastal habitat.

Opihi

There has been a virtual collapse of the commercial fishery for opihi in Hawaii (Fig. 3). The commercial catch in 1900 was 147,200 lb, whereas that of 1986 was 14,400 lb. Although it has generally been claimed that the opihi resource has been overfished, especially with the taking of sublegal sized opihi, one should not discount the possibility that changes in the shoreline and the presence of onshore and nearshore pollution may also be major factors in the decline of the opihi stock.

Baitfishes

This group includes the iao, nehu, makiawa, and piha. The apparent collapse of the baitfishes is mostly an artifact of the data collection system. Although the species listed under baitfishes were sold in 1900, the practice became illegal in the post-World War II years. Except for capture set aside for home consumption purposes, the baitfish resources have been reserved for use by the pole-and-line tuna fishery. Therefore, quantitative data are lacking; however, fishermen involved in the present pole-and-line tuna fishery are unanimous in their view that the nehu resource in Hawaii has declined over the recent decades. The collapse of the pole-and-line fishery based in Hilo has been attributed to the lack of

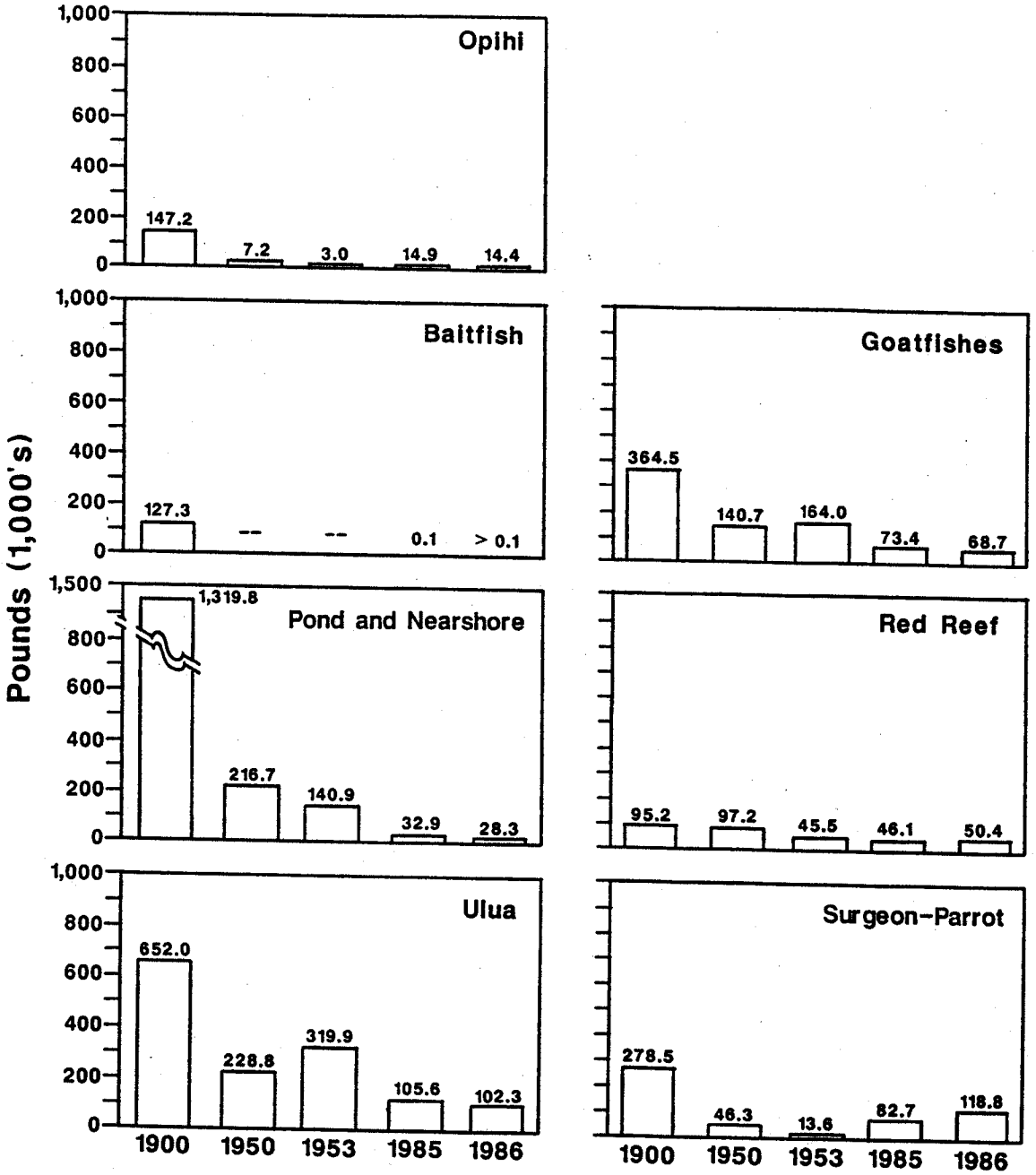

Figure 3.--Hawaii commercial marine fisheries catch by species group for the coastal habitat.

baitfish in Hilo Harbor. Although the present Honolulu-based aku fleet has been reduced to six active fishing vessels, there are still complaints of scarcity of nehu once found in abundance in Pearl Harbor.

Pond and Nearshore Species

One of the most dramatic declines in the coastal habitat has been the species group associated with fish ponds and the nearshore waters (Fig. 3). This group includes the awa, mullet, oio, and moi. Based on the 1950 data, the awa and mullet comprised 78% of the pond catch for that year. The commercial catch of this species group in 1986 was only 2% of that in 1900. It is not known how much of the 1900 catch of these species should be attributed to pond culture. Cobb (1902) reported 97 active fish ponds covering about 3,576 acres (1,447 ha) in 1900; by 1950, there were only 12 licensed commercial ponds. Whether the demise of pond culture explains the marked decline in the commercial catch of the awa-mullet-oio-moi complex needs to be studied carefully.

Ulua

The coastal ulua catch is also shown in Figure 3. The butaguchi catch has not been included in these data because this species has been taken predominately in recent years from the NWHI by the deep bottom fish fishery. The commercial catch of coastal ulua species in 1986 was 102,300 lb, which represented only 16% of that in 1900. Because the ulua group is highly prized by recreational fishermen, the total Hawaii catch is probably considerably higher than the total reported today.

Goatfishes

The several species included in the goatfish category have always commanded a high place in the commercial fish markets of Hawaii; thus, the commercial data from this species group probably reflects the true catch closely. The marked declines from 1900 to 1985 and 1986 (declines of 80 and 81%, respectively) suggest that the population levels of these species may have been severely impacted in recent decades. Whether the apparent decline is due to overfishing or to other factors needs to be examined critically.

Red Reef Fish

This group includes the uu, aweoweo, and upapalu; all species are generally taken by handline at night, speared, or taken in traps. The catch of this species group in recent years is about one-half that in 1900 (Fig. 3). Because this group is similar to the goatfishes in popularity in the commercial fish markets, the comments noted in the goatfish section apply here.

Surgeonfish and Parrotfish

This species group includes the species most closely associated with reefs. A marked decline in catch of this species group has occurred; the 1953 commercial catch was only about 5% of that in 1900 (Fig. 3). The subsequent years show a lesser decline. This species group is an important component of the reef community; therefore, it would be highly desirable to find out the causative factors that led to the decline in the commercial catch of the surgeonfish-parrotfish complex.

One possible factor that must be examined carefully is a possible shift in consumer demand. The marked change in the ethnic composition of Hawaii's population and the increased tourist industry may have led to a shift in species selection by the commercial fishing industry.

CATCH BY SPECIES GROUPS IN THE NERITIC-PELAGIC HABITAT

The akule and opelu species make up the bulk of the catch from the neritic-pelagic habitat. The 1985 and 1986 akule catches show a decline of 73 and 75%, respectively, from the 1900 catch (Fig. 4). Interestingly, the opelu catches show an increase in landings of 32 and 79% for the post-World War II years (1950 and 1953, respectively), and a 52% increase over 1900 for 1985. The increase in opelu landings for 1986, however, was a dramatic 159% over the 1900 catch. Whether this is due to increased fishing effort or to good recruitment should be examined further. For these schooling species, determination of their population dynamics and the status of stocks will be extremely difficult.

CATCH BY SPECIES GROUPS IN THE SLOPE AND SEAMOUNT HABITAT

Unlike the coastal and neritic-pelagic habitats, the slope and seamount habitat catches show a marked increase in recent years, as might be expected with the growth of fisheries using new technology and exploring new areas in Hawaii.

Deepwater Snappers and Groupers

The commercial catch of deepwater snappers and groupers in 1900 was 211,900 lb (Fig. 5). The catch of this species group increased markedly in the post-World War II years and recent years. For 1985 and 1986, the catch increased 330 and 360%, respectively. However, when one considers that a large proportion of this increase stems from the NWHI fishery, then concern must be expressed for this fishery too (Ralston and Kawamoto 1987).

Lobsters

The lobster (spiny and slipper lobster) catches show an interesting change (Fig. 5). In 1900, the commercial lobster catch was reportedly

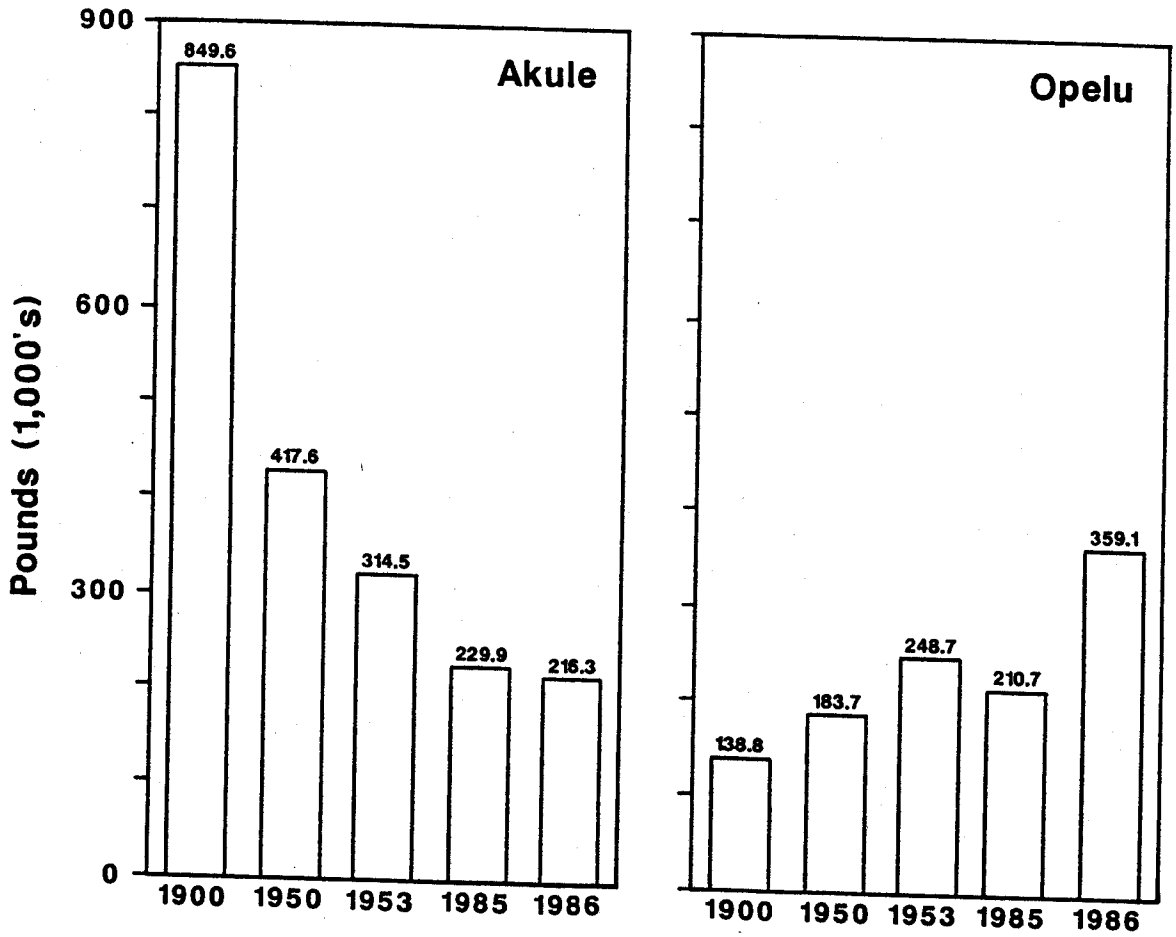

Figure 4.--Hawaii commercial marine fisheries catch for akule/opelu group in the neritic-pelagic habitat.

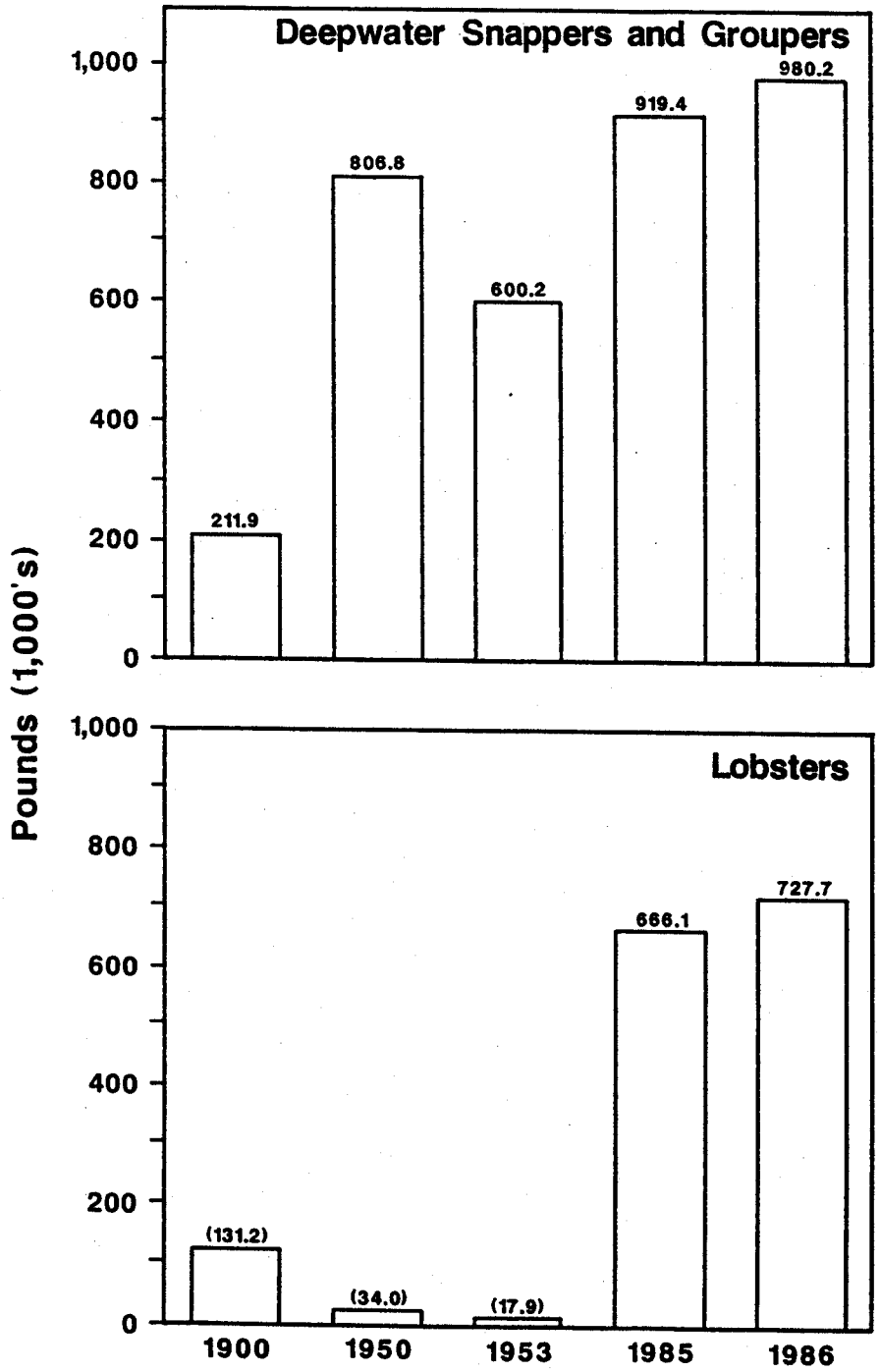

Figure 5.--Hawaii commercial marine fisheries catch by species group for the slope and seamount habitat. In the lobster category, numbers in parentheses are listed under coastal habitat.

131,200 lb. The majority of the catch is presumably composed of the near-shore species Panulirus penicillatus because fishing was confined to coastal waters. The 1950 and 1953 lobster catches were 34,000 and 17,900 lb, respectively, a substantial drop from the 1900 catch. Although motorized vessels were already commonly used in the 1950's, the lobster catch still came from coastal waters.

The lobster catch increased markedly in recent years. A small part of the total lobster catch for 1985 and 1986 came from coastal waters of the main Hawaiian Islands; the bulk of the lobster catch in recent years has come from a newly developed fishery operating in the NWHI. The catch of this new fishery consists mostly of the deepwater species P. marginatus.

CATCH BY SPECIES GROUPS IN THE PELAGIC HABITAT

Unlike catches from the coastal habitat, nearly all the catches from the pelagic habitat have increased markedly since post-World War II and in recent years.

Aku

The aku catch for 1900 (422,100 lb) is considered remarkable because offshore fishing was conducted from canoes and without any methods of refrigeration. The aku catches for 1950 and 1953 show a marked increase at 9.5 and 12.1 million lb, respectively (Fig. 6). The principal reason for the increased catches has been generally attributed to the increased fishing effort and increased demand for aku by the local cannery and the fresh fish market. The drop in aku catches in 1985 and 1986 to 2.1 and 2.3 million lb reportedly was the result of several factors. The principal factor was the closure of Hawaiian Tuna Packers in 1985; this cannery represented the major outlet for the aku catch in Hawaii. The fresh fish market could not absorb the large catches made during the peak summer months; therefore, the industry is reported to have voluntarily reduced fishing effort, thus contributing to the lower catches in recent years. Additionally, the poor economic condition of the aku fishery has resulted in an inability to attract new capital to build new vessels or to replace old vessels that have sunk or left the fishery (Boggs and Pooley 1987).

Large Tunas

This species group includes the yellowfin tuna, bigeye tuna, and albacore. The 1985 catch showed a phenomenal 1,330% increase over 1900 (Fig. 6). As noted earlier, the increase in catch of pelagic species has been due to use of motorized vessels and modern-day equipment and fishing gear. However, it is worth noting that much of the current catch comes from a fleet of quite small boats using modernizations of traditional handlining techniques (Hudgins and Pooley 1987).

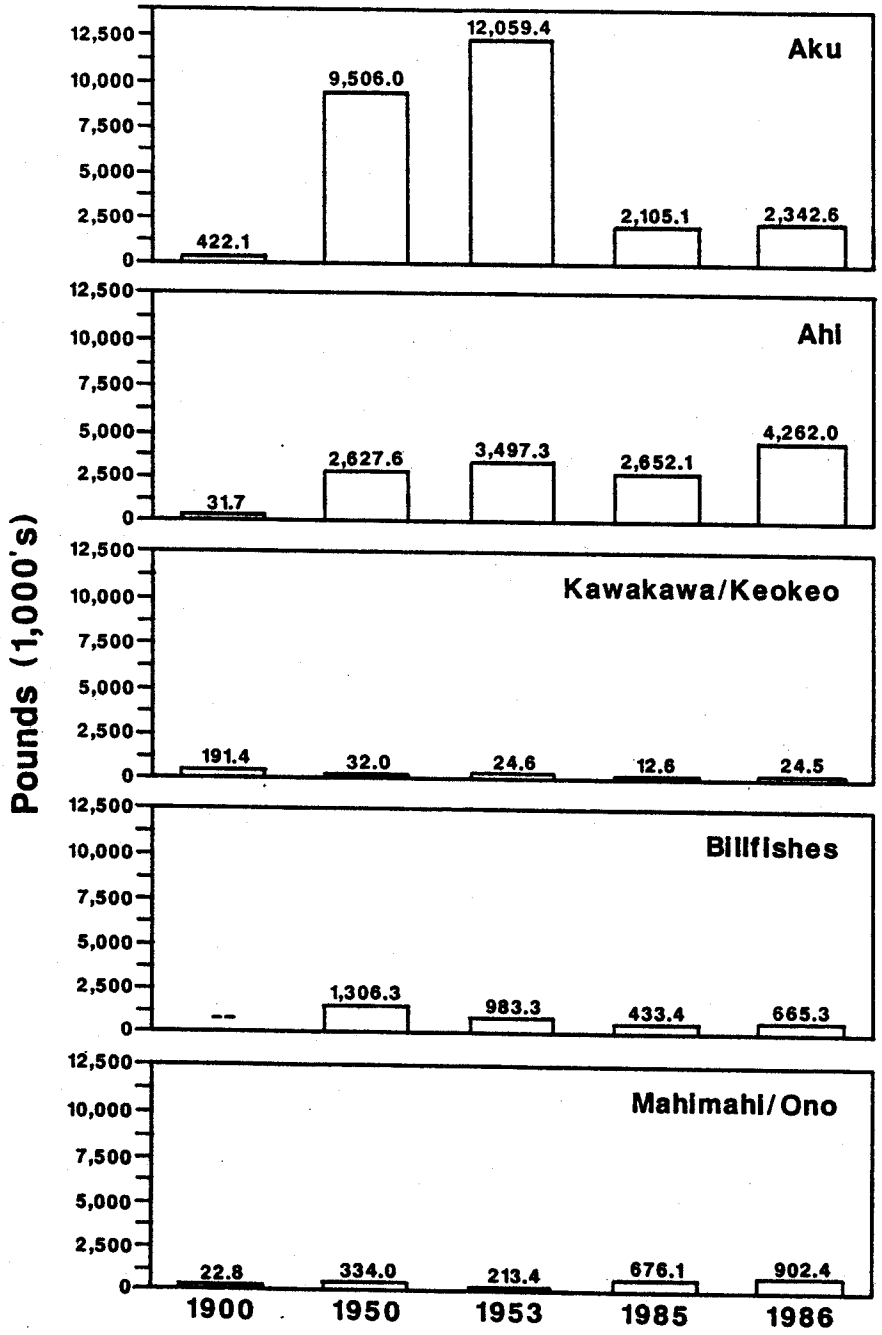

Figure 6.--Hawaii commercial marine fisheries catch by species group for the pelagic habitat.

Small Tunas

The small tunas include the kawakawa and keokeo. This group shows a trend that is counter to that of the other pelagic species groups; the 1986 catch declined 87% when compared to that in 1900 (Fig. 6). One possible cause is that the kawakawa, which dominates the small tuna catch, does not command a high market price. Thus, a concerted effort may not have been made by commercial fishermen to place this species on the market.

Billfishes

No billfishes were reported in the commercial catch statistics for 1900. Catch records show a total billfish catch of 1.3 million lb for 1950 and 983,300 lb for 1953 (Fig. 6). Although recreational fishermen in recent years have commented on the low catches of billfishes in Hawaii, the commercial catches appear to be markedly low in 1985 and 1986. There is a need for further examination of the billfish statistics and resources to determine whether the resources have declined or the decline is attributable to other factors, e.g., unreported catches.

Mahimahi and Ono

The trends for these pelagic species are representative of what would be expected by the improvements in troll fishing technology during this century. Landings have increased almost fortyfold from 1900 to 1986, and landings have increased by 270% from 1950 to 1986 (Fig. 6). Partly this represents improved technology; partly this represents increased targeting for these species due to high prices.

SUMMARY

This brief review of the commercial fishery statistics for 1900, 1950, 1953, 1985, and 1986 suggests that, barring gross shortcomings in the statistical data bases, some fundamental changes in the resources and fisheries appear to have occurred since the turn of the century. Generally the changes can be ascribed to 1) shortcomings in the statistical data bases; 2) overfishing; 3) shifts in targeting of species; 4) changes in biomass of species due to man-induced changes in the environment of embayments, shoreline, and coastal waters, e.g., reduction of fresh water into bays, loss of ponds, filling in of mudflats and coastal areas, building of shoreline bulkheads, and creating sand beaches where none existed previously (Waikiki is an outstanding example); and 5) reduction in the standing biomass of a species due to pollution. This list does not exhaust the possible factors; however, the data suggest that a study must be undertaken to examine critically the causative factors responsible for the apparent marked decline in the catch of a wide range of species of the coastal habitat. A study of the resources in the other habitats also should be undertaken to understand the dynamics of the tropical fishery resources of the Hawaiian Islands. Sound management decisions can be made only with a thorough understanding of the resources and the environment.

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