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# PRELIMINARY ESTIMATES OF CATCH, SALES, AND REVENUE OF GAME FISH FOR THE FISHERY CONSERVATION ZONE AROUND THE MAIN HAWAIIAN ISLANDS, BY TYPES OF TROLL AND LONGLINE VESSELS AND BY SPECIES, 1976

By

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This report presents the best available data to satisfy specific requirements of the Pacific Billfish Fishery Management Plan until statewide surveys can be completed for Hawaii.

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3

The commercial and recreational vessels which fish for game fish around the main Hawaiian Islands can be classified into five groups: 1) Charter vessels. These vessels are available for hire to recreational fishermen. 2) Non-charter recreational-commercial vessels. These vessels are operated by individuals who have non-fishing occupations. Some of these fishermen sell part of their catch. 3) Fulltime commercial trolling vessels. These commercial boats fish by trolling as do the first and second groups. 4) Domestic longline vessels. 5) Foreign longline vessels.

The first section of this report estimates the number of vessels in each of the groups of vessels that troll for fish. The second section estimates the catch, sales and revenue for the same vessel groups generated by catches of billfish, tuna and other game fishes both in the Kailua-Kona area only and in the entire State of Hawaii. These estimates are then combined with the available longline catch data to estimate the total domestic catch and the total catch around the main Hawaiian Islands. The estimates given in this report are for 1976, the most recent year available, except where otherwise noted.

Estimation of the Number of Vessels Fishing for Game Fish in Hawaii. The following information on vessels in Hawaii is available from various sources: the number of commercial fishing boats in operation[1], the number of registered boats in the State of less than 5 net tons[2] and the number of documented vessels in the State greater than 5 net tons[3]. The combined figures for registered boats and documented vessels represent the total vessel population of the State. Additional information

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1. State of Hawaii. Department of Land and Natural Resources, Division of Fish and Game. Operating Units by Island and Gear, 1976-77 (unpublished).

2. State of Hawaii. Department of Transportation, Harbors Division. Report of Undocumented Vessel Registration, 1976, p. 3.

3. United States Coast Guard. Vessel Documentation Files, 14th Coast Guard District, U.S. Department of Transportation. U.S. Documented Vessels in Hawaiian Parts, 1976.

is obtained from two surveys completed for the National Marine Fisheries Service.[1] Table 1 presents the vessel classes involved and the estimates provided by each source.

The total number of vessels trolling for billfishes, tunas, mahimahi and ono in Hawaii is estimated by combining separate estimates for the charter recreational, non-charter recreational-commercial and commercial troller vessel classes. These three groups comprise the troller fishing fleet of Hawaii. The number of charter vessels is determined easily owing to separate vessel registration categories in both the Harbors Divison and Coast Guard listings. However, some vessels listed only participate in the charter fishing business on an occasional basis, and a few vessels active in the industry have been inadvertently omitted from the listings. The original count of 117 charter vessels for the State of Hawaii is amended to 102 vessels.[2]

Non-charter recreational-commercial fishing vessels are first estimated as an aggregated group. The report by Information Concepts indicated that 19% of the vessels in the State in 1973 participated in saltwater fishing at some time during the year. Assuming that this same percentage is applicable now, this implies that there were 3,220 vessels that fished on saltwater in 1976. Information from the Research Associates' Kailua-Kona survey report is usec to determine what proportion of these vessels troll for the relevant species. Corrections are made for improper listings and for vessels which do not fish for these species. It is estimated that 1,704 of the 3,220 total fishing vessels are in the non-charter trolling category.

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1. Information Concepts, Inc. Determination of the Number of Commercial and Non-Commercial Recreational Boats in the United States. Mimeographed. (prepared for NOAA/NMFS, 1973). 111 pp.+ appendices. And, Research Associates. A Study of Bioeconomics and Optimal Management Criteria for Utilization of Pacific Billfish, Module I. (Prepared for National Marine Fisheries Service, Honolulu Laboratory, 1977) 139 pp.

2. Official Program, 19th Hawaiian International Billfish Tournament (HIBT), Kailua-Kona, Hawaii, 1977. Ibid. 17th and 18th HIBT, 1975 and 1976.
Armstrong, Tom. Happy Time Deep Sea Fishing Charters, Honolulu and Keauhou, Hawaii (telephone interview, May 10, 1978).
Gaffney, Rick. Field editor, Hawaii Fishing News, Honolulu (telephone interview, May 10, 1978).

Table 1 -- Estimated number of vessels in Hawaii, by vessel classification and sources outlined in the text.

| | Fish and Game [1] | Department of Transportation [2] | Information Concepts, Inc. [3] |
|---|---|---|---|
| Total vessels in State | - | 16,947 | 15,321 |
| Non-fishing vessels | - | 15,761 | 12,335 |
| Fishing vessels | 1,437 | 1,186 | 2,986 |
| Charter fishing vessels | - | 117 | - |
| Non-charter fishing vessels | - | 1,069 | - |
| Trolling and Charter Vessels | 693 | - | - |

[1]. State of Hawaii. Department of Land and Natural Resources. Division of Fish and Game. Operating Units by Island and Gear, 1976-77 (unpublished).

[2]. State of Hawaii, Department of Transportation, Harbors Division. Report of Undocumented Vessel Registration, 1976, p. 3.

[3]. United States Coast Guard. Vessel Documentation Files, 14th Coast Guard District, U.S. Department of Transportation. U.S. Documented Vessels in Hawaiian Parts, 1976.

[4]. Information Concepts, Inc. Determination of the Number of Commercial and Non-Commercial Recreational Boats in the United States. Mimeographed. (Prepared for NOAA/NMFS, 1973). pp. 63, 67, 87.

The Research Associates' Kailua-Kona survey is again utilized to separate the private fishing vessel estimate into private commercial and non-charter recreational fishing vessel categories. A proportion relating the number of non-charter recreational fishing vessels to the total number of private registered trolling fishing vessels in Kailua-Kona is derived. This proportion is then projected to data for the Island of Hawaii and to the data estimated for the State. A similar extrapolation is made for the commercial trolling vessel class. Table 2 shows the estimate of the total number of trolling vessels in Hawaii in 1976, which is estimated to be 1,806 vessels.

Estimation of Catch, Sales and Revenue. Table 3 gives the summaries of the Kailua-Kona survey. The three vessel classes shown represent the major user groups involved in the trolling fishery. Table 4 lists the values of Table 3 projected to the entire State of Hawaii, based on the number of vessels in the State in each vessel class.[1] This extrapolation assumes that catch rates and fishing effort are the same for Kailua-Kona as for the State. In Table 5 the Total Kailua-Kona troller figures are the combined vessel classes on Table 3. Estimate I under Total Hawaii Trollers respresents a similar compilation of the data from Table 4. Estimate II is an alternate estimate of Statewide troller catch. This estimate is derived from a comparison of the Kailua-Kona troller survey data with similar data of the State of Hawaii Division of Fish and Game[2]. This comparison provides an index of the underestimation of catch and other data for each species by the Division of Fish and Game relative to the survey data. Assuming that Statewide data are underreported by the same proportion, Division of Fish and Game Statewide catch data for each species are increased by a factor of 7.36 for billfishes, 7.33 for tunas and 10.08 for other game fishes.

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1. See Table 2.

2. State of Hawaii. Department of Land and Natural Resources, Division of Fish and Game. 1976 Fish and Game Fishery Statistics -- Kailua-Kona Area (unpublished).

Table 2 -- Estimated number of vessels in Kailua-Kona, the Island of Hawaii and the State of Hawaii, by vessel classification, 1976.

| | Kailua-Kona[1] | Big Island | State |
|---|---|---|---|
| Registered vessels | - - - | 1,382[2] | 16,947[3] |
| Registered fishing vessels | 577* | 1,075 | 3,220[4] |
| Registered trolling fishing vessels | 426 | 730 | 1,704 |
| Non-charter recreational-commercial trolling fishing vessels | 386 | 661 | 1,544 |
| Commercial trolling fishing vessels | 40 | 69 | 160 |
| Charter vessels | 30 | 35 | 102 |
| Total trolling fishing vessels | 456 | 765 | 1,806 |

*Greater than 14 ft.

1. Research Associates. A Study of Bio-economics and Optimal Management Criteria for Utilization of Pacicic Billfish, Module I. (Prepared for National Marine Fisheries Service, Honolulu Laboratory, 1977.) 139pp. plus appendices. (For all vessel classifications.)

2. State of Hawaii. Harbors Division. Department of Transportation. Report of Undocumented Vessel Registration, 1976. p. 3. (For registered vessels classification only.)

3. a) Ibid.
   b) United States Coast Guard. Vessel Documentation Files. 14th Coast Guard District, U.S. Department of Transportation. U.S. Documented Vessels in Hawaiian Parts, 1976 (Unpublished).

4. Information Concepts, Inc. Determination of the Number of Commercial and Non - Commercial Recreational Boats in the United States. Mimeographed. (Prepared for the National Oceanic and Atmospheric Administration/National Marine Fisheries Service, 1973.) p. 67.

Quantity sold was similarly adjusted by factors of 5.34 for billfishes, 6.35 for tunas and 6.46 for other gamefishes. New revenues were computed from the derived quantity sold values and average revenues from the Division of Fish and Game Statewide data.

Thus three estimates are available for the entire State of Hawaii: raw data from the Hawaii Division of Fish and Game, extrapolated Kailua-Kona survey data based on vessel class number (EstimateI) and adjusted Hawaii Division of Fish and Game data (Estimate II). The best estimate appears to be Estimate I, owing to the ability to separate out the user groups. Statewide estimates based on these vessel class extrapolations account for the differential catch rates and fishing efforts between the groups. These distinctions cannot be made using the Hawaii Divison of Fish and Game data or Estimate II.

Table 6 shows the catch and other data for the domestic longline fishery around the Hawaiian Islands. Total domestic catch is the combination of these longline data with Estimate I. Foreign longline catch is represented by Japanese data, since fishing around the main Hawaiian Islands by other foreign countries is negligible. Foreign catch data for 1976 are unavailable, so 1975 data are substituted with an assumption of constant catch between the two years. Catch of mahimahi and ono is also unavailable for foreign longliners. Domestic and foreign catches are combined to estimate the total catch around the main Hawaiian Islands.

Table 3 --Catch, sales, revenue, and average revenue by species, for three troller vessel types in Kailua-Kona, 1976.

| | Charter | | | | Private recreational-commercial | | | | Private commercial | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average revenue ($/kg sold) |
| Blue marlin | 94,834 | 73,572 | 27,221 | 0.37 | 42,565 | 24,939 | 15,545 | 0.62 | 12,085 | 11,178 | 6,587 | 0.59 |
| Black marlin | 5,770 | 4,846 | 1,751 | 0.36 | 11,690 | 5,110 | 4,368 | 0.85 | 7,144 | 7,001 | 5,994 | 0.86 |
| Striped marlin | 5,347 | 4,560 | 1,799 | 0.39 | 2,219 | 891 | 433 | 0.49 | 273 | 273 | 408 | 1.49 |
| Other billfishes | 2,088 | 1,309 | 945 | 0.72 | 2,981 | 647 | 1,036 | 1.60 | 1,006 | 811 | 766 | 0.94 |
| Total billfishes | 108,039 | 84,287 | 31,716 | 0.38 | 59,455 | 31,588 | 21,382 | 0.68 | 20,508 | 19,263 | 13,755 | 0.71 |
| Ahi (large tunas) | 41,806 | 33,315 | 51,931 | 1.56 | 127,687 | 96,079 | 191,361 | 1.99 | 286,144 | 284,521 | 621,970 | 2.19 |
| Aku (skipjack) | 12,412 | 386 | 575 | 1.49 | 17,251 | 3,050 | 4,378 | 1.44 | 2,541 | 1,161 | 1,970 | 1.70 |
| Total Tunas | 54,218 | 33,701 | 52,506 | 1.56 | 144,938 | 99,129 | 195,739 | 1.97 | 288,685 | 285,682 | 623,940 | 2.18 |
| Ono (wahoo) | 14,025 | 10,446 | 22,650 | 2.17 | 43,798 | 18,745 | 35,353 | 1.89 | 15,586 | 15,265 | 28,945 | 1.90 |
| Mahimahi (dolphin) | 8,913 | 5,534 | 15,296 | 2.76 | 9,886 | 5,122 | 13,158 | 2.57 | 6,946 | 6,509 | 21,440 | 3.29 |
| Total ono & mahi | 22,938 | 15,980 | 37,946 | 2.37 | 53,684 | 23,867 | 48,511 | 2.03 | 22,532 | 21,774 | 50,385 | 2.31 |
| Grand total | 185,195 | 133,968 | 122,169 | 0.91 | 258,077 | 154,584 | 265,632 | 1.72 | 331,725 | 326,719 | 688,080 | 2.11 |

Source: Survey questionnaires completed by Research Associates.

Table 4 --Catch, sales, revenue, and average revenue by species, for three troller vessel types in Hawaii, 1976.

| Species | Charter | | | | Private Recreational-commercial | | | | Private Commercial | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Ave rev ($/k |
| Blue marlin | 322,436 | 250,145 | 92,551 | 0.37 | 170,260 | 99,756 | 62,180 | 0.62 | 48,340 | 44,712 | 26,348 | 0 |
| Black marlin | 19,618 | 16,476 | 5,953 | 0.36 | 46,760 | 20,444 | 17,472 | 0.85 | 28,576 | 28,004 | 23,976 | 0 |
| Striped marlin | 18,180 | 15,504 | 6,117 | 0.39 | 8,876 | 3,564 | 1,732 | 0.49 | 1,092 | 1,092 | 1,632 | 1 |
| Other billfishes | 7,099 | 4,451 | 3,213 | 0.72 | 11,924 | 2,588 | 4,144 | 1.60 | 4,024 | 3,244 | 3,064 | 0 |
| Total billfishes | 367,333 | 286,576 | 107,834 | 0.38 | 237,820 | 126,352 | 85,528 | 0.68 | 82,032 | 77,052 | 55,020 | 0. |
| Ahi (large tunas) | 142,140 | 113,271 | 176,565 | 1.56 | 510,748 | 384,316 | 765,444 | 1.99 | 1,144,576 | 1,138,084 | 2,487,880 | 2. |
| Aku (skipjack) | 42,201 | 1,312 | 1,955 | 1.49 | 69,004 | 12,200 | 17,512 | 1.44 | 10,164 | 4,644 | 7,880 | 1. |
| Total Tunas | 184,341 | 114,583 | 178,520 | 1.56 | 579,752 | 396,516 | 782,956 | 1.97 | 1,154,740 | 1,142,728 | 2,495,760 | 2. |
| Ono (wahoo) | 47,685 | 35,516 | 77,010 | 2.17 | 175,192 | 74,980 | 141,412 | 1.88 | 62,344 | 61,060 | 115,780 | 1. |
| Mahimahi (dolphin) | 30,304 | 18,816 | 52,006 | 2.76 | 39,544 | 20,488 | 52,632 | 2.57 | 27,784 | 26,036 | 85,760 | 3. |
| Total ono & mahi | 77,989 | 54,332 | 129,016 | 2.37 | 214,736 | 95,468 | 194,044 | 2.03 | 90,128 | 87,096 | 201,540 | 2. |
| Grand Total | 629,663 | 455,491 | 415,370 | 0.91 | 1,032,308 | 618,336 | 1,062,528 | 1.72 | 1,326,900 | 1,306,876 | 2,752,320 | 2.1 |

Source -- Table 2 and Table 3.

Table 5 — Catch, sales, revenue, and average revenue by species for Kailua-Kona Trollers and Total Hawaii Trollers, 1976.

| Species | Total Kailua-Kona Trollers[1] | | | | Total Hawaii Trollers | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Estimate I[2] | | | | Estimate II[3] | | | |
| | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average Revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average Revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average Revenue ($/kg sold) |
| Blue marlin | 149,484 | 109,689 | 49,353 | 0.45 | 541,036 | 394,613 | 181,079 | 0.46 | 544,927 | 253,324 | 195,059 | 0.77 |
| Black marlin | 24,604 | 16,958 | 12,113 | 0.71 | 94,954 | 64,924 | 47,401 | 0.73 | 18,201 | 9,788 | 8,711 | 0.89 |
| Striped marlin | 7,839 | 5,724 | 2,640 | 0.46 | 28,148 | 20,160 | 9,481 | 0.47 | 408,296 | 177,849 | 158,286 | 0.85 |
| Other billfishes | 6,075 | 2,767 | 2,747 | 0.99 | 23,047 | 10,283 | 10,421 | 1.01 | 24,972 | 10,611 | 11,460 | 1.08 |
| Total billfishes | 188,002 | 135,138 | 66,853 | 0.49 | 687,185 | 489,980 | 248,382 | 0.51 | 996,396 | 451,572 | 373,516 | 0.81 |
| Ahi (large tunas) | 455,637 | 413,915 | 865,262 | 2.09 | 1,797,464 | 1,635,671 | 3,429,889 | 2.10 | 2,333,388 | 1,659,820 | 3,618,408 | 2.18 |
| Aku (skipjack) | 32,204 | 4,597 | 6,923 | 1.51 | 121,369 | 18,156 | 27,347 | 1.51 | 167,710 | 82,588 | 139,574 | 1.69 |
| Total Tunas | 487,841 | 418,512 | 872,185 | 2.08 | 1,918,833 | 1,653,827 | 3,457,236 | 2.09 | 2,501,098 | 1,742,408 | 3,757,982 | 2.16 |
| Ono (wahoo) | 73,409 | 44,456 | 86,948 | 1.96 | 285,221 | 171,556 | 334,202 | 1.95 | 411,768 | 185,835 | 650,423 | 3.50 |
| Mahimahi (dolphin) | 25,745 | 17,165 | 49,894 | 2.91 | 97,632 | 65,340 | 190,398 | 2.91 | 540,076 | 255,467 | 559,473 | 2.19 |
| Total ono & mahi | 99,154 | 61,621 | 136,842 | 2.22 | 382,853 | 236,896 | 524,600 | 2.21 | 951,844 | 441,302 | 1,209,896 | 2.74 |
| Grand Total | 774,997 | 615,271 | 1,075,880 | 1.75 | 2,988,871 | 2,380,703 | 4,230,218 | 1.78 | 4,449,388 | 2,635,282 | 5,341,394 | 2.03 |

1. See Table 3.
2. See Table 4.
3. See text.

Hawaii trollers and longliners, 1976, foreign longline catch, 1975, and total catch around the main Hawaiian Islands, 1976.

| | Domestic Longline[1] | | | | Total Domestic Catch[2] | | | | Foreign[3] Longline | Total Catch Around Main Hawaiian Islands |
|---|---|---|---|---|---|---|---|---|---|---|
| ecies | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average Revenue ($/kg sold) | Catch (kg) | Quantity sold (kg) | Revenue from sales ($) | Average Revenue ($/kg sold) | Catch (kg) | Catch (kg) |
| lue marlin | 7,598 | 7,598 | 12,089 | 1.59 | 548,634 | 402,211 | 193,168 | 0.48 | 5,399 | 554,033 |
| lack marlin | 190 | 190 | 443 | 2.33 | 95,144 | 65,114 | 47,844 | 0.73 | 321 | 95,465 |
| riped marlin | 33,686 | 33,686 | 81,116 | 2.41 | 61,834 | 53,846 | 90,597 | 1.68 | 26,004 | 87,838 |
| her billfishes | 3,652 | 3,652 | 5,537 | 1.52 | 26,699 | 13,935 | 15,958 | 1.15 | 13,441 | 40,140 |
| tal billfishes | 45,126 | 45,126 | 99,185 | 2.20 | 732,311 | 535,106 | 347,567 | 0.65 | 45,165 | 777,476 |
| i (large tunas) | 129,503 | 129,503 | 384,502 | 2.97 | 1,926,967 | 1,765,174 | 3,814,391 | 2.16 | --- | --- |
| u (skipjack) | 13 | 13 | 22 | 1.69 | 121,382 | 18,169 | 27,369 | 1.51 | --- | --- |
| tal Tunas | 129,516 | 129,516 | 384,524 | 2.97 | 2,048,349 | 1,783,343 | 3,841,760 | 2.15 | 288,958 | 2,337,307 |
| o (wahoo) | 3,418 | 3,418 | 6,409 | 1.88 | 288,639 | 174,974 | 340,611 | 1.95 | --- | --- |
| himahi (dolphin) | 7,466 | 7,466 | 30,003 | 4.02 | 105,098 | 72,806 | 220,401 | 3.03 | --- | --- |
| tal ono & mahi | 10,884 | 10,884 | 36,412 | 3.35 | 393,737 | 247,780 | 561,012 | 2.26 | --- | 393,737* |
| AND TOTAL | 185,526 | 185,526 | 520,121 | 2.80 | 3,174,397 | 2,566,229 | 4,750,339 | 1.85 | 334,128 | 3,508,525 |

State of Hawaii, Division of Fish and Game, Department of Land and Natural Resources.
Fishery Statistics, Summary II, 1976 (Unpublished).
Combined Hawaii trollers (Estimate I) and Domestic longline.
Yong, M.Y.Y. and J. Wetherall, (title to be determined), SWFC Administrative Report No. 13H, 1978.

*Domestic only