# U.S. COMMERCIAL FISHERIES FOR MARLINS IN THE NORTH PACIFIC OCEAN[1]

Russell Y. Ito
Pacific Islands Fisheries Science Center
NOAA Fisheries Service
Honolulu, Hawaii 96818 U.S.A.

**January 2015**

[1] PIFSC Working Paper WP-15-001
Issued 9 January 2015

Working document submitted to Intersessional Meeting of the Marlin Working Group, International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, January 13-20, 2015, Honolulu, Hawaii, U.S.A. 

# U.S. COMMERCIAL FISHERIES FOR MARLINS IN THE NORTH PACIFIC OCEAN

Russell Y. Ito
Pacific Islands Fisheries Science Center
NOAA Fisheries Service
Honolulu, Hawaii 96818 U.S.A.

## INTRODUCTION

This report summarizes historical trends and recent developments for U.S. commercial fisheries taking marlins (Istiophoridae) in the North Pacific Ocean. Five species of marlins are caught by U.S. commercial fisheries in the North Pacific Ocean. These are striped marlin (*Kajikia audax*), blue marlin (*Makaira nigricans*), shortbill spearfish (*Tetrapturus angustirostris*), sailfish (*Istiophorus platypterus*), and black marlin (*Istiompax indica*). The first two species are predominant in the commercial landings. The description of fisheries in this report serves as background information for standardization models developed in the ISC Billfish Working Group.

## 1. FISHERIES AND CATCHES

U.S. fisheries for marlins in the North Pacific Ocean can be categorized according to three distinct gear types: longline, troll, and handline. The largest is the longline fishery, which for the purposes of this report refers solely to the Hawaii-based longline fishery (Table 1). This fishery takes marlins as incidental catch on sets targeting tuna or swordfish. Troll fisheries in Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) constitute the second largest catches of marlins. These fisheries opportunistically target marlins on a seasonal basis. The Hawaii handline fishery represents the third category, with small incidental catches of marlin. Blue marlin catches from both longline and troll fisheries (Fig. 1) were typically the largest component of the marlin catch (Table 2), followed by striped marlin, landed primarily by the longline fishery (Fig. 2), and shortbill spearfish ranking third. Marlins are also caught by recreational fisheries but there is no mandatory data collection program for this fishery sector, therefore, only the U.S. commercial fisheries are represented in this report.

### Hawaii-based Longline Fishery

The longline gear consists of a single monofilament mainline about 30 to 80 km in length with floats attached to the mainline to support the gear in the water column. Branchlines with baited hooks are attached to the mainline between the floats. Gear configurations and operational techniques differ according to target species (i.e., tunas,

*Thunnus* spp., and swordfish, *Xiphias gladius*) (Ito and Machado 2001). Vessels targeting tunas usually set the longline gear in the morning and haul in the afternoon, use Pacific sauries *Cololabis saira* or sardines (Clupeidae) for bait, set 15 or more hooks between floats, and employ a line thrower (Kawamoto et al. 1989). The latter creates slack in the mainline, which causes the gear to sag between floats as it sinks and results in a "deep-set". In contrast, vessels targeting swordfish typically set gear after dusk and haul the following morning, use mackerel *Scomber japonicas* or mackerel-like bait, attach chemical lightsticks to the branchlines, and typically set 4-5 hooks between floats (Ito et al 1994, PIRO 2014). Because swordfish gear is set relatively shallow, a line thrower is not needed. This technique is referred to as "shallow-set" longline fishing. Longline logbook data suggest that striped and blue marlin catches were the largest components of the marlin catch followed by shortbill spearfish (Table 3). The deep-set longline sector accounts for majority of the effort and marlin catch for this fishery.

The Hawaii-based longline fishery has operated under a limited entry program since 1994. This program capped participation at 164 vessels, although the number of active vessels has never reached this limit. Participation in this fishery included 136 active vessels in 2013 (deep- and shallow-set sectors combined).

Two other important characteristics of this fishery are its geographic range and the annual number of hooks set. The Hawaii-based longline fishery ranged from the equator to 40$^{o}$ N latitude and from 125$^{o}$ W to 175$^{o}$W longitude in 2013. The total range exploited since 1991 extended from 5$^{o}$S to 50$^{o}$N latitude and from 125$^{o}$W to 175$^{o}$E longitude. Effort by the Hawaii-based longline fishery was a record 48.1 million hooks set in 2013. The record effort was due to more hooks set by the deep-set sector of the longline fishery which accounted for 98% of the total number of hooks set and an expansion of longline fishing outside of the U.S. EEZ in 2013.

Longline catches (catch kept) of striped marlin rose rapidly from 272 t in 1987, peaked at 663 t in 1991 and decreased slowly to a low of 165 t in 2010. More recently, striped marlin catches reached 391 t in 2013, up 36% from the previous year. Blue marlin catches increased from 1987, reached a peak in 1995, then exhibited a slow decline through 2000 and varied considerably in subsequent years. The preliminary estimate of blue marlin catches was 384 t in 2013, an increase of 29% from 2012.

Hawaii-based longline catches of striped marlin by stock boundary show 99% of the striped marlin catches originating from the area at or west of 140$^{o}$ W during 2010-2013 (Table 4). Although striped marlin catches east of 140$^{o}$ W and undisclosed areas were highest in 2013, they only represented 3% of the catches by the longline fishery. The deep-set sector of the longline fishery was responsible for 95% of the striped marlin catches. There was substantial variation in catches ranging from 165 t in 2010 to 663 t in 1991.

Plots of the geographic distribution of striped marlin catches (number of fish kept and released) show that the highest catches occurred between 20°N to 30°N latitude and 150°W to 170°W longitude in 2013 (Fig. 3). The highest blue marlin catches occurred southwest of the main Hawaiian Islands between 10°N to 20°N latitude and 160°W to 170°W longitude (Fig. 4).

Catches of marlins exhibited strong seasonal cycles. Striped marlin catches were typically highest in the first and fourth quarters of the year, whereas blue marlin catches were usually highest in the second quarter of the year.

Nominal catch per unit effort (CPUE: number of fish kept and released per 1000 hooks) for the two marlin species exhibited declines from the early 1990s into early 2000. Striped marlin CPUE on tuna targeted trips peaked at 2.2 fish per 1000 hooks in 1992, exhibited a significant decline through 2000, and remained low thereafter. CPUE continued to decrease further to a record low of 0.10 in 2010 and was slightly higher at 0.27 in 2013 (Fig. 5). Blue marlin CPUE exhibited a peak of 0.68 in 1991, decreased sharply in 1992, declined slowly to a record low 0.07 in 2012, and remained low in 2013.

The weight-frequency histogram for striped marlin landings by the Hawaii-based longline fishery, derived from weight records of commercial fish landings (see data sources below), was bi-modal, with peaks in the 11-15 kg and 31-40 kg size classes in 2013 (Fig. 6A). The mean weight for striped marlin was 31.6 kg. The blue marlin weight-frequency distribution was unimodal with a peak at the 61-70 kg size class in 2013 (Fig. 6B). The mean weight for blue marlin was 97.9 kg.

## Hawaii, Guam, and CNMI Troll Fisheries

The troll fisheries in Hawaii, Guam, and CNMI are hook and line fisheries. The gear consists of rods and reels and artificial lures that are typically made of resin or chrome metal heads dressed with colored rubber skirts (Rizzuto 1977). Live bait bridled to hooks is also used to catch marlins and other pelagic fishes. This fishery targets tunas, marlins and other pelagic species such as mahimahi (*Coryphaena spp.)* and wahoo *(Acanthocybium solandri*). Fishing is conducted from relatively small boats.

The number of troll fishers peaked at 2,367 in 1999, declined to a minimum of 1,837 fishermen in 2005, and has since increased gradually to 2,179 in 2013. Seventy-six percent of the troll fishers were from Hawaii, 23% from Guam and 1% from CNMI in 2013. The duration of a typical troll trip is one day. Since this fishery employs small vessels, most trips remain within 50 miles from shore, well inside the 200 mile U.S. EEZ.

Blue marlin totals (landings from Hawaii Commercial Marine Dealer data and landings from Guam and CNMI creel surveys and fish dealer reports) comprised 85% of the troll marlin total. Blue marlin totals peaked at 434 t in 1996, declined to a record low 128 t in 2007, and were 136 t in 2013 (Table 5). Striped marlin made up only 5% of the marlin total at 8 t in 2013.

Marlin CPUE for the Hawaii troll fishery was expressed as kgs of fish per day. Blue marlin CPUE was higher than striped marlin CPUE, but both species exhibited similar declining trends as in the Hawaii-based longline fishery (Fig. 7)

## Hawaii Handline Fishery

The Hawaii handline fishery, which targets tunas, includes day and night components known as the “palu ahi” and “ika shibi” fisheries, respectively. The daytime handline fishery employs “palu” (chum in Hawaiian) to evoke a feeding frenzy in an aggregation of juvenile “ahi” (tuna in Hawaiian) and hook the catch with a handline. The nighttime handline fishery has two sets of gear, one used to catch the “ika” (squid in Japanese) for bait and the other for catching large “shibi” (tuna in Japanese) (Yuen 1979).

There were 535 handline fishers in 2013. The duration of a handline trip is typically one day for the daytime handline fishery and one night for the nighttime handline fishery. As with the troll fisheries, most handline trips remain within 50 miles from shore, although some handline fishers operate offshore by seamounts and weather buoys on trips longer than one day.

The handline fishery marlin total (landings from the Hawaii Commercial Dealer data) was responsible for small amounts of striped and blue marlin. The highest striped marlin total was 2 t in 2001 (Table 6). The highest blue marlin total was 9 t in 1997.

The weight-frequency histogram for striped marlin landings from the troll and handline fisheries (combined) was a bi-modal distribution with peaks at the 11-15 kg and 36-40 kg size classes (Figure 8A). The mean weight for striped marlin was 32.3 kg in 2013. The blue marlin weight-frequency distribution was unimodal with a mean weight of 121.1 kg in 2013 (Figure 8B). The landed weight-frequency distribution of striped marlin and blue marlin were similar to the size distribution of marlins landed by the longline fishery.

## 2. DATA SOURCES

### Category I: Annual Catch Data

Category I catch statistics refer only to the quantity of fish kept, much of which is landed. Catch that was discarded or released was not included. Category I data for the longline, troll, and handline fisheries are collected by Federal (NOAA Fisheries Service), State (Hawaii), and Pacific Island (Guam and CNMI) agencies and used by staff of the NOAA Pacific Islands Fisheries Science Center (PIFSC) to compute annual Category I catch statistics. Various sources of data are used depending on the geographic area and gear of interest (Table 7). The extent of data coverage (i.e., percent of catch reported) and time period of data collection vary among data sources.

In some instances, data sets were combined to estimate the annual weight of the catch. For example, the Hawaii-based longline fishery catch kept was estimated from Federal logbook data, market sample data, and State of Hawaii Division of Aquatic Resources (HDAR) commercial marine dealer data. The numbers of fish kept, as recorded in longline logbooks, are multiplied by the mean weights of landed fish, estimated from the PIFSC market sample data or the HDAR Commercial Marine Dealer data. And for years before logbooks, market sample data were used to approximate the catch kept.

Estimated landings are reported in this paper as whole weights. The recorded weights of processed catches were adjusted by applying raising factors to estimate whole weights (Table 8). And for years before longline logbooks, to account for missing market sample days, the sample data were extrapolated for the number of missing days to estimate total landings as a proxy for catch kept.

### Species Identifications

A longstanding problem in monitoring the Hawaii-based longline fishery at the NOAA PIFSC has been the accuracy of species identifications for the istiophorid billfishes. This problem has primarily affected logbook data, but some fishery observers, particularly newly-hired individuals, have also erred in species identifications. A long-term project to evaluate these problems for the five istiophorid species has been completed (Walsh et al. 2005). A subsequent document showed the overall marlin counts in the Hawaii-based longline logbook data were reasonably accurate but blue marlin was overlogged by 18% while striped marlin was underlogged 11% during the study period (Walsh, W.A. et al. 2007, http://www.pifsc.noaa.gov/tech/NOAA_Tech_Memo_PIFSC_13.pdf)(Figure 9).

## Category II: Spatial Catch and Effort Data

Areas fished, catches and effort are the requirements for Category II data reporting, which is illustrated in numbers of fish for the longline fishery (Figures 3 and 4) and tabulated in weight (Table 4). The Hawaii-based longline fishery provided Category II data calculated from Federal logbooks (number caught) and State commercial fish sales data (average weights). The combination of data sets was sufficient to generate area-specific summaries of catch (by weight) and effort.

## Category III: Biological (size composition) Data

Weight data were provided for the Hawaii longline, troll, and handline fisheries. Raising factors were applied to market sample and commercial fish sales data if the fish was processed to yield an estimated whole weight (Table 7). Weight-frequency distributions for striped marlin and blue marlin were produced from HDAR Commercial Marine Dealer data.

## 3. REFERENCES


Ito R.Y., Dollar R.E., Kawamoto K.E.
1994. The Hawaiian longline fishery for swordfish. International Symposium on Pacific Swordfish: Development of Fisheries, Markets, and Biological Research. Ensenada, Baja California, Mexico, December 11-14, 1994.

Ito, R.Y. and W.A. Machado.
2001. Annual report of the Hawaii-based longline fishery for 2000. Southwest Fisheries Science Center Administrative Report H-01-07, 55 p.

Kawamoto K.E., Ito R.Y., Clarke R.P., Chun A.A.
1989. Status of tuna longline fishery in Hawaii, 1997-88. Southwest Fisheries Science Center Administrative Report H-89-10, 33 p.

Pacific Islands Regional Office.
2014. Hawaii Longline Regulation Summary. 10p. http://www.fpir.noaa.gov/SFD/pdfs/hawaii-longline-reg-summary_(rev.8-26-14).pdf

Rizzuto, J.
1977. Modern Hawaiian Gamefishing. University Press of Hawaii. 254 p.

Walsh W. A., R.Y. Ito, K.E. Kawamoto, and M. McCracken.
2005. Analysis of logbook accuracy for blue marlin (*Makaira nigricans*) in the Hawaii-based longline fishery with a generalized additive model and commercial sales data. *Fisheries Research* 75:175–192

Walsh, W. A., K. A. Bigelow and R. Y. Ito
2007. Corrected Catch Histories and Logbook Accuracy for Billfishes (Istiophoridae) in the Hawaii-based Longline Fishery. NOAA Technical Memorandum NMFS-PIFSC-13, 33 p.

Yuen, H.S.H.
1979. A night handline fishery for tunas in Hawaii. Marine Fisheries Review 41(8): 7-14.

Table 1.—Annual U.S. commercial marlin catch* (metric tons) from the North Pacific Ocean by fishery, 1987-2013.

| Year | Longline | Troll | Handline | Total |
|---|---|---|---|---|
| 1987 | 368 | 324 | 9 | 701 |
| 1988 | 675 | 362 | 7 | 1,044 |
| 1989 | 1,100 | 404 | 6 | 1,510 |
| 1990 | 973 | 373 | 6 | 1,352 |
| 1991 | 1,029 | 444 | 6 | 1,479 |
| 1992 | 947 | 351 | 5 | 1,303 |
| 1993 | 910 | 422 | 6 | 1,338 |
| 1994 | 787 | 385 | 4 | 1,176 |
| 1995 | 1,295 | 424 | 5 | 1,724 |
| 1996 | 1,000 | 504 | 8 | 1,512 |
| 1997 | 983 | 467 | 10 | 1,460 |
| 1998 | 945 | 305 | 3 | 1,253 |
| 1999 | 963 | 387 | 6 | 1,356 |
| 2000 | 681 | 269 | 3 | 953 |
| 2001 | 886 | 368 | 4 | 1,258 |
| 2002 | 643 | 269 | 3 | 915 |
| 2003 | 1,175 | 255 | 4 | 1,434 |
| 2004 | 867 | 243 | 4 | 1,114 |
| 2005 | 1,064 | 220 | 3 | 1,287 |
| 2006 | 1,188 | 193 | 3 | 1,384 |
| 2007 | 697 | 153 | 1 | 851 |
| 2008 | 1,014 | 208 | 1 | 1,223 |
| 2009 | 742 | 197 | 1 | 940 |
| 2010 | 602 | 166 | 1 | 769 |
| 2011 | 984 | 233 | 2 | 1,219 |
| 2012 | 754 | 168 | 2 | 924 |
| 2013 | 1,001 | 160 | 4 | 1,165 |

* Based on estimated whole weight and does not include discards.

Table 2.--Annual U.S. commercial marlin catch* (metric tons) from the North Pacific Ocean by species, 1987-2013.

| Year | Striped marlin | Blue marlin | Shortbill spearfish | Other marlins | Total |
|---|---|---|---|---|---|
| 1987 | 303 | 334 | 43 | 21 | 701 |
| 1988 | 559 | 398 | 65 | 22 | 1,044 |
| 1989 | 636 | 721 | 128 | 25 | 1,510 |
| 1990 | 565 | 715 | 50 | 22 | 1,352 |
| 1991 | 703 | 684 | 60 | 32 | 1,479 |
| 1992 | 498 | 648 | 46 | 111 | 1,303 |
| 1993 | 540 | 678 | 54 | 66 | 1,338 |
| 1994 | 360 | 696 | 59 | 61 | 1,176 |
| 1995 | 595 | 921 | 139 | 69 | 1,724 |
| 1996 | 474 | 908 | 89 | 41 | 1,512 |
| 1997 | 391 | 909 | 100 | 60 | 1,460 |
| 1998 | 404 | 659 | 134 | 56 | 1,253 |
| 1999 | 393 | 689 | 214 | 60 | 1,356 |
| 2000 | 230 | 549 | 123 | 51 | 953 |
| 2001 | 395 | 693 | 120 | 50 | 1,258 |
| 2002 | 249 | 495 | 136 | 35 | 915 |
| 2003 | 588 | 570 | 241 | 35 | 1,434 |
| 2004 | 419 | 471 | 186 | 38 | 1,114 |
| 2005 | 531 | 525 | 207 | 24 | 1,287 |
| 2006 | 626 | 570 | 161 | 27 | 1,384 |
| 2007 | 290 | 390 | 147 | 24 | 851 |
| 2008 | 441 | 529 | 226 | 27 | 1,223 |
| 2009 | 268 | 540 | 113 | 19 | 940 |
| 2010 | 170 | 455 | 118 | 26 | 769 |
| 2011 | 378 | 574 | 234 | 33 | 1,219 |
| 2012 | 293 | 441 | 163 | 27 | 924 |
| 2013 | 399 | 523 | 212 | 31 | 1,165 |

* Based on estimated whole weight and does not include discards.

Table 3.—Hawaii-based longline commercial marlin catch* (metric tons) from the North Pacific Ocean, 1987-2013.

| Year | Striped marlin | Blue marlin | Shortbill spearfish | Other marlins | Total |
|---|---|---|---|---|---|
| 1987 | 272 | 51 | 43 | 2 | 368 |
| 1988 | 504 | 102 | 65 | 4 | 675 |
| 1989 | 612 | 356 | 128 | 4 | 1,100 |
| 1990 | 538 | 378 | 50 | 7 | 973 |
| 1991 | 663 | 297 | 60 | 9 | 1,029 |
| 1992 | 459 | 347 | 46 | 95 | 947 |
| 1993 | 471 | 339 | 54 | 46 | 910 |
| 1994 | 326 | 362 | 59 | 40 | 787 |
| 1995 | 543 | 570 | 139 | 43 | 1,295 |
| 1996 | 419 | 467 | 89 | 25 | 1,000 |
| 1997 | 352 | 487 | 100 | 44 | 983 |
| 1998 | 378 | 395 | 134 | 38 | 945 |
| 1999 | 364 | 357 | 214 | 28 | 963 |
| 2000 | 215 | 314 | 123 | 29 | 681 |
| 2001 | 351 | 399 | 120 | 16 | 886 |
| 2002 | 219 | 264 | 136 | 24 | 643 |
| 2003 | 558 | 359 | 241 | 17 | 1,175 |
| 2004 | 384 | 283 | 186 | 14 | 867 |
| 2005 | 511 | 337 | 207 | 9 | 1,064 |
| 2006 | 605 | 409 | 161 | 13 | 1,188 |
| 2007 | 277 | 261 | 147 | 12 | 697 |
| 2008 | 427 | 348 | 226 | 13 | 1,014 |
| 2009 | 258 | 360 | 113 | 11 | 742 |
| 2010 | 165 | 306 | 118 | 13 | 602 |
| 2011 | 362 | 373 | 234 | 15 | 984 |
| 2012 | 282 | 298 | 163 | 11 | 754 |
| 2013 | 391 | 384 | 212 | 14 | 1,001 |

* Based on estimated whole weight and does not include discards.

Table 4.—Hawaii-based deep- and shallow-set longline commercial marlin catch (metric tons) by stock boundary in the North Pacific Ocean, 2010-2013.

| | Deep-set | | | | Shallow-set | | | | Fleet | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | At or west of 140° W | East of 140° W | No longitude | Total | <140° W | >140° W | No longitude | Total | <140° W | >140° W | No longitude | Total |
| 2010 | 152 | 0 | 1 | 153 | 12 | 0 | 0 | 12 | 164 | 0 | 1 | 165 |
| 2011 | 341 | 1 | 2 | 343 | 19 | 0 | 0 | 19 | 360 | 1 | 2 | 362 |
| 2012 | 269 | 0 | 1 | 270 | 11 | 0 | 0 | 11 | 281 | 0 | 1 | 282 |
| 2013 | 366 | 6 | 4 | 376 | 15 | 0 | 0 | 15 | 381 | 6 | 4 | 391 |
| Mean | 281.9 | 1.8 | 1.9 | 285.7 | 14.4 | 0.0 | 0.0 | 14.5 | 296.3 | 1.9 | 2.0 | 300.1 |

Table 5.—U.S. troll fishery marlin catch* (metric tons) from the North Pacific Ocean, 1987-2013.

| Year | Striped marlin | Blue marlin | Shortbill spearfish | Other marlins | Total |
|---|---|---|---|---|---|
| 1987 | 30 | 275 | 0 | 19 | 324 |
| 1988 | 54 | 290 | 0 | 18 | 362 |
| 1989 | 24 | 359 | 0 | 21 | 404 |
| 1990 | 27 | 331 | 0 | 15 | 373 |
| 1991 | 40 | 381 | 0 | 23 | 444 |
| 1992 | 38 | 297 | 0 | 16 | 351 |
| 1993 | 68 | 334 | 0 | 20 | 422 |
| 1994 | 34 | 330 | 0 | 21 | 385 |
| 1995 | 52 | 346 | 0 | 26 | 424 |
| 1996 | 54 | 434 | 0 | 16 | 504 |
| 1997 | 38 | 413 | 0 | 16 | 467 |
| 1998 | 26 | 261 | 0 | 18 | 305 |
| 1999 | 28 | 327 | 0 | 32 | 387 |
| 2000 | 14 | 233 | 0 | 22 | 269 |
| 2001 | 42 | 292 | 0 | 34 | 368 |
| 2002 | 30 | 228 | 0 | 11 | 269 |
| 2003 | 29 | 208 | 0 | 18 | 255 |
| 2004 | 34 | 186 | 0 | 23 | 243 |
| 2005 | 20 | 185 | 0 | 15 | 220 |
| 2006 | 21 | 158 | 0 | 14 | 193 |
| 2007 | 13 | 128 | 0 | 12 | 153 |
| 2008 | 14 | 180 | 0 | 14 | 208 |
| 2009 | 10 | 179 | 0 | 8 | 197 |
| 2010 | 5 | 148 | 0 | 13 | 166 |
| 2011 | 16 | 199 | 0 | 18 | 233 |
| 2012 | 11 | 141 | 0 | 16 | 168 |
| 2013 | 8 | 136 | 0 | 16 | 160 |

* Based on estimated whole weight and does not include discards.

Table 6.—The U.S. handline fishery marlin catch* (metric tons) from the North Pacific Ocean, 1987-2013.

| Year | Striped marlin | Blue marlin | Shortbill spearfish | Other marlins | Total catch |
|---|---|---|---|---|---|
| 1987 | 1 | 8 | 0 | 0 | 9 |
| 1988 | 1 | 6 | 0 | 0 | 7 |
| 1989 | 0 | 6 | 0 | 0 | 6 |
| 1990 | 0 | 6 | 0 | 0 | 6 |
| 1991 | 0 | 6 | 0 | 0 | 6 |
| 1992 | 1 | 4 | 0 | 0 | 5 |
| 1993 | 1 | 5 | 0 | 0 | 6 |
| 1994 | 0 | 4 | 0 | 0 | 4 |
| 1995 | 0 | 5 | 0 | 0 | 5 |
| 1996 | 1 | 7 | 0 | 0 | 8 |
| 1997 | 1 | 9 | 0 | 0 | 10 |
| 1998 | 0 | 3 | 0 | 0 | 3 |
| 1999 | 1 | 5 | 0 | 0 | 6 |
| 2000 | 1 | 2 | 0 | 0 | 3 |
| 2001 | 2 | 2 | 0 | 0 | 4 |
| 2002 | 0 | 3 | 0 | 0 | 3 |
| 2003 | 1 | 3 | 0 | 0 | 4 |
| 2004 | 1 | 2 | 0 | 1 | 4 |
| 2005 | 0 | 3 | 0 | 0 | 3 |
| 2006 | 0 | 3 | 0 | 0 | 3 |
| 2007 | 0 | 1 | 0 | 0 | 1 |
| 2008 | 0 | 1 | 0 | 0 | 1 |
| 2009 | 0 | 1 | 0 | 0 | 1 |
| 2010 | 0 | 1 | 0 | 0 | 1 |
| 2011 | 0 | 2 | 0 | 0 | 2 |
| 2012 | 0 | 2 | 0 | 0 | 2 |
| 2013 | 0 | 3 | 0 | 1 | 4 |

* Based on estimated whole weight and does not include discards.

Table 7.—Data sources and rates of coverage for the longline, troll, and handline fisheries by category.

| | Hawaii-based longline | Hawaii troll | Guam troll | CNMI troll | Hawaii handline |
|---|---|---|---|---|---|
| Category I: Annual catch data | | | | | |
| Market sample | ~33-90% | +++ | --- | --- | +++ |
| Fish dealer | ~50-100% | +++ | --- | +++ | +++ |
| Logbook | ~100% | --- | --- | --- | --- |
| Fish catch report | --- | +++ | --- | --- | +++ |
| Creel survey | --- | --- | +++ | --- | --- |
| Observer | NA | NA | NA | NA | NA |
| Category II: Spatial catch and effort data | | | | | |
| Market sample | NA | NA | NA | NA | NA |
| Fish dealer | NA | NA | NA | NA | NA |
| Logbook | ~100% | --- | --- | --- | --- |
| Fish catch report | --- | +++ | --- | --- | +++ |
| Creel survey | NA | NA | NA | NA | NA |
| Observer | | | | | |
| Category III: Biological (size composition) data | | | | | |
| Market sample | ~33-90% | +++ | --- | --- | +++ |
| Fish dealer | ~50-100% | +++ | --- | +++ | +++ |
| Logbook | NA | NA | NA | NA | NA |
| Fish catch report | NA | NA | NA | NA | NA |
| Creel survey | --- | --- | +++ | --- | --- |
| Observer | 3-25% | --- | --- | --- | --- |

*NA - not applicable, +++ - available but coverage unknown, --- - not collected

Table 8.—Conversion factors for processed fish.

| Species | Condition of fish | Raising factor |
|---|---|---|
| Blue marlin | Shark bitten | 1.11 |
| | Gutted | 1.15 |
| | Gilled & gutted | 1.25 |
| | No head | 1.28 |
| | No head & guts | 1.47 |
| | No head, guts & tail | 1.54 |
| Striped marlin | Shark bitten | 1.11 |
| | Gutted | 1.15 |
| | Gilled & gutted | 1.23 |
| | No head | 1.25 |
| | No head & guts | 1.37 |
| | No head, guts & tail | 1.41 |

Figure 1.—Blue marlin catch by U.S. commercial fisheries in the North Pacific Ocean, 1987-2013.

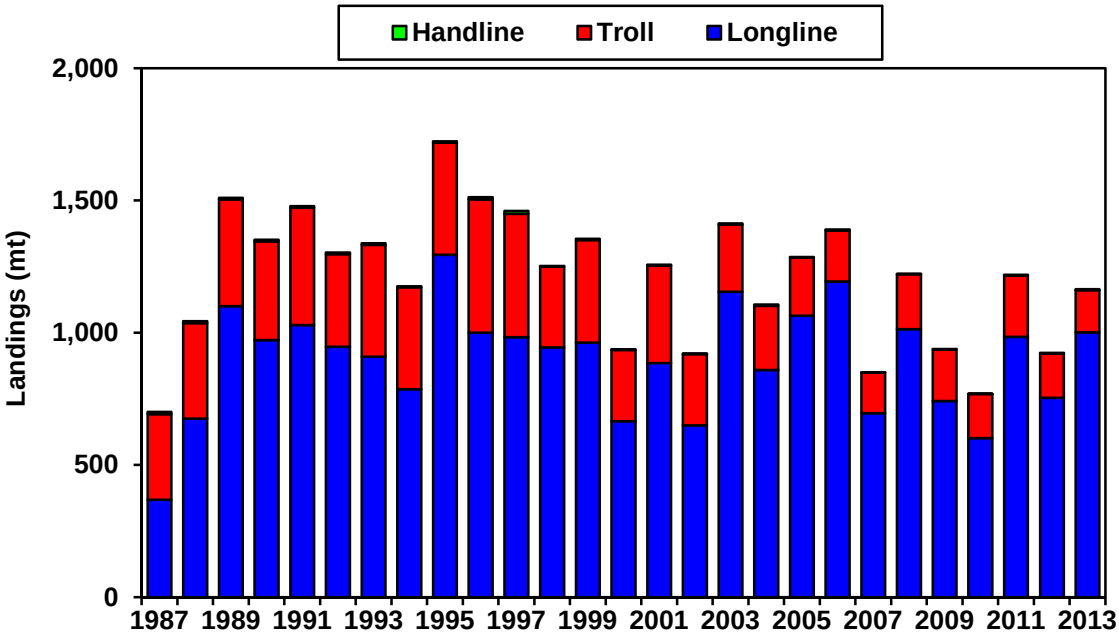



Figure 2.–Striped marlin catch by U.S. commercial fisheries in the North Pacific Ocean, 1987-2013.

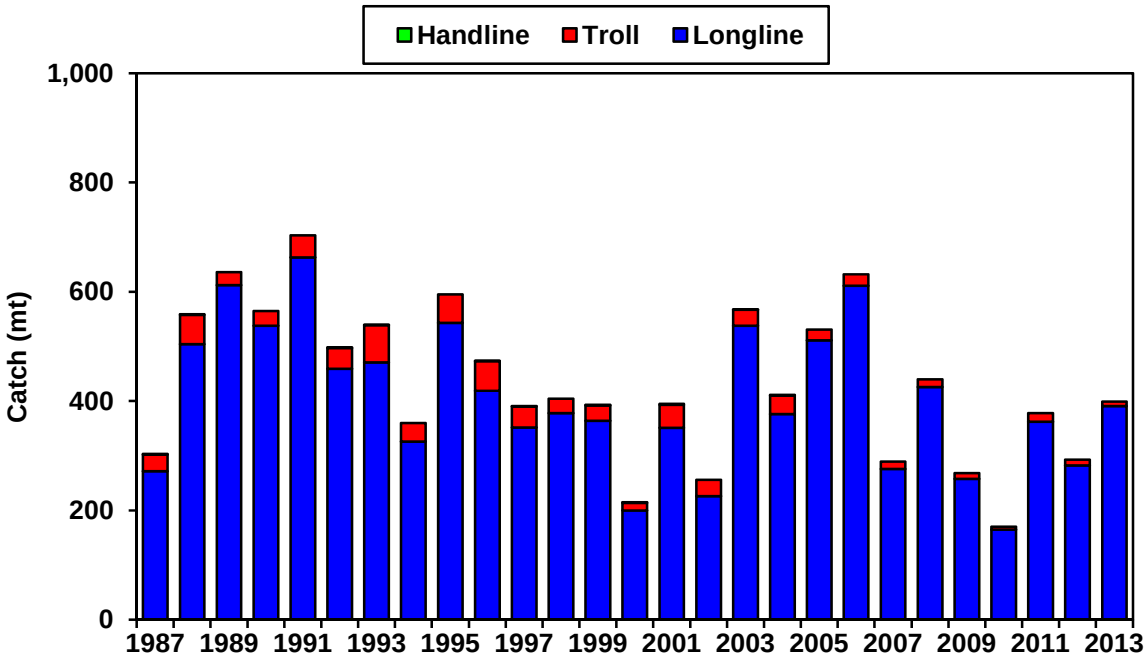


Figure 3.—Hawaii-based longline striped marlin catch (numbers of fish) by area, 2013.

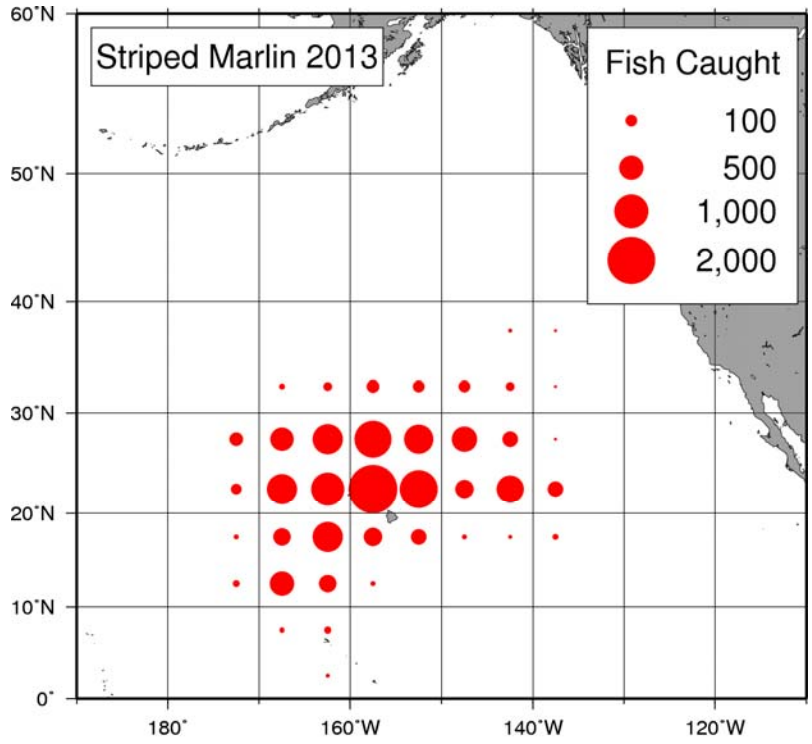



Figure 4.—Hawaii-based longline blue marlin catch (numbers of fish) by area, 2013

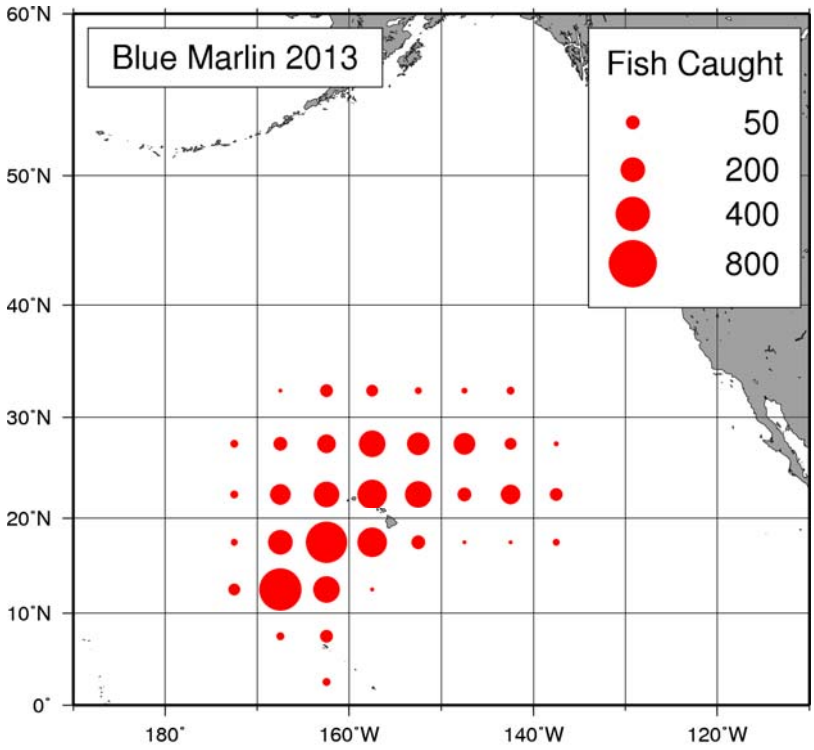


Figure 5.—Hawaii-based longline striped marlin and blue marlin nominal CPUE on tuna-targeted deep sets, 1991-2013.

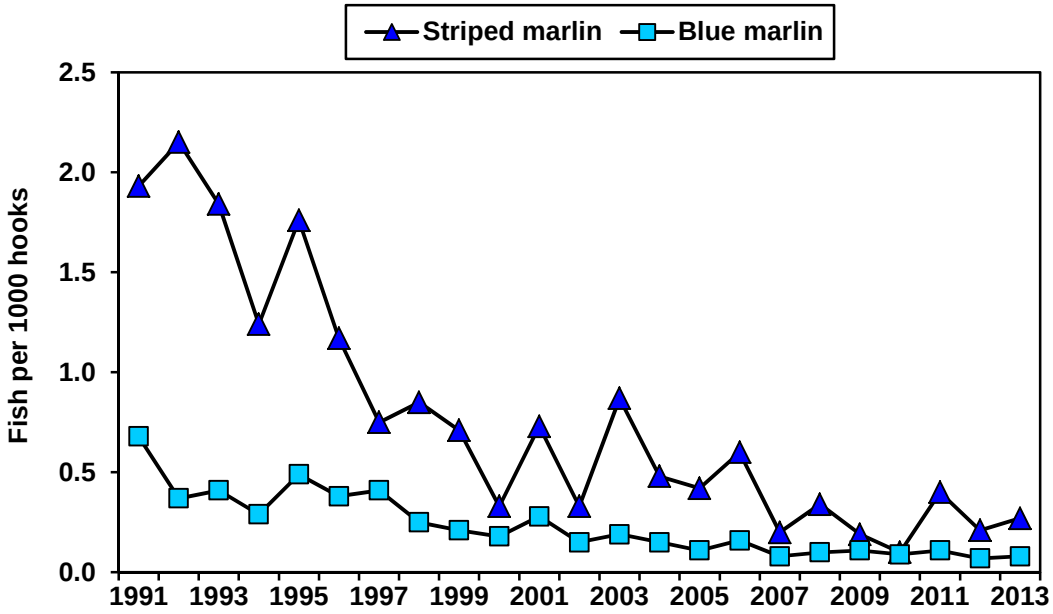
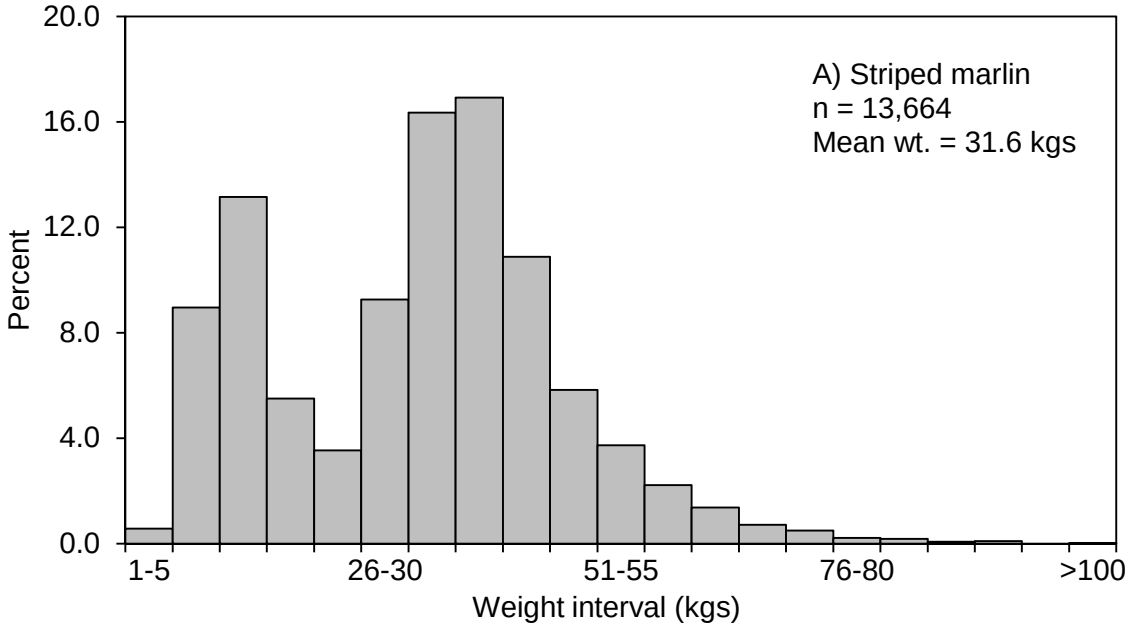


Figure 6.--Hawaii longline A) striped marlin and B) blue marlin weight-frequencies, 2013.



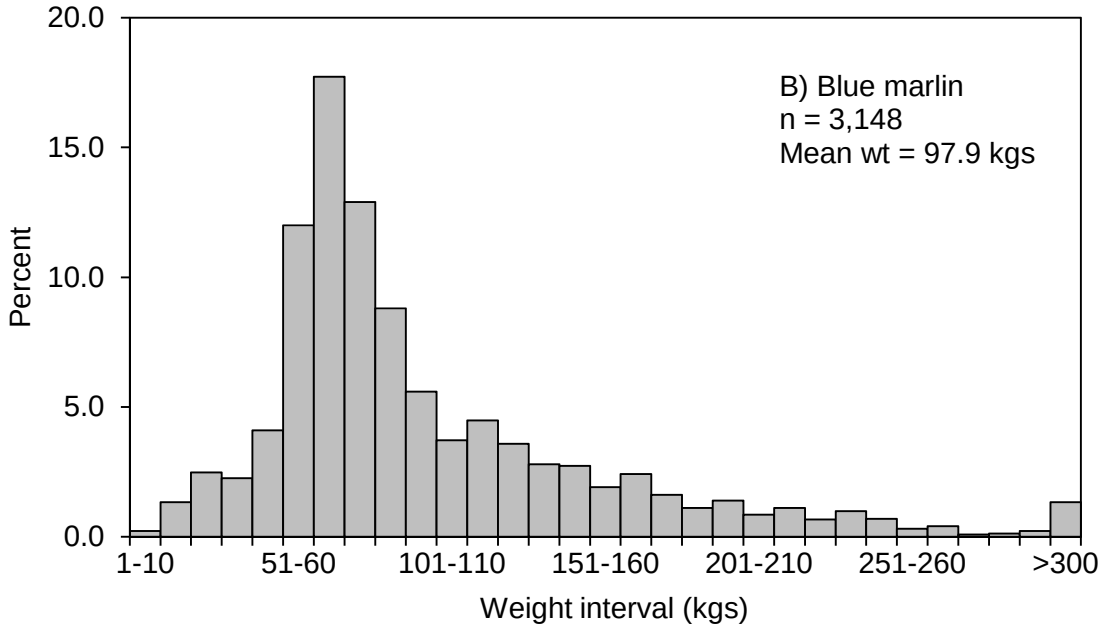



Figure 7.—Hawaii troll striped marlin and blue marlin nominal CPUE, 1991-2013.

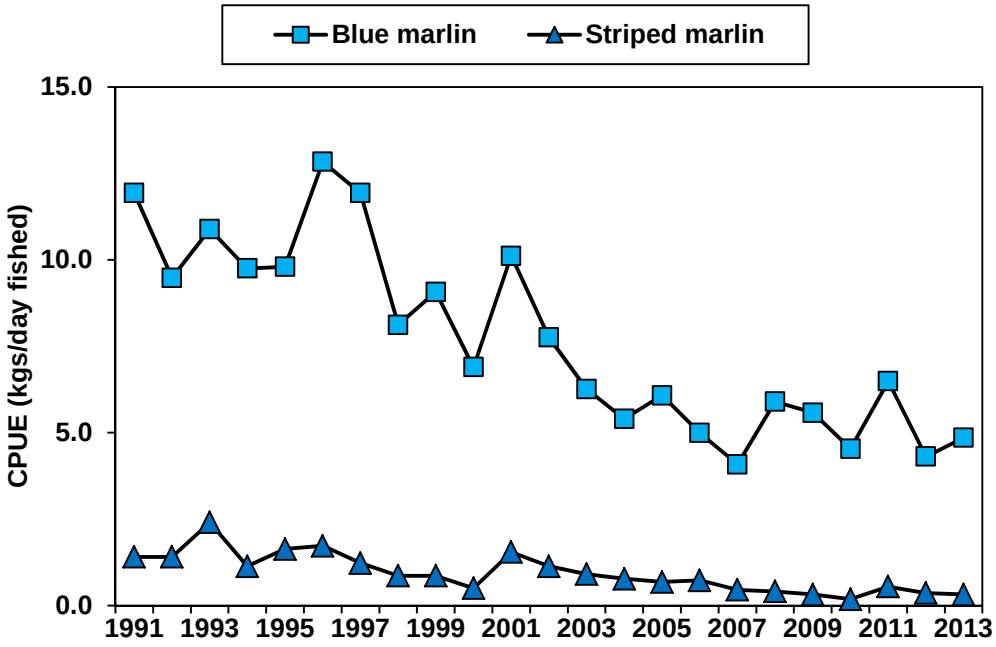
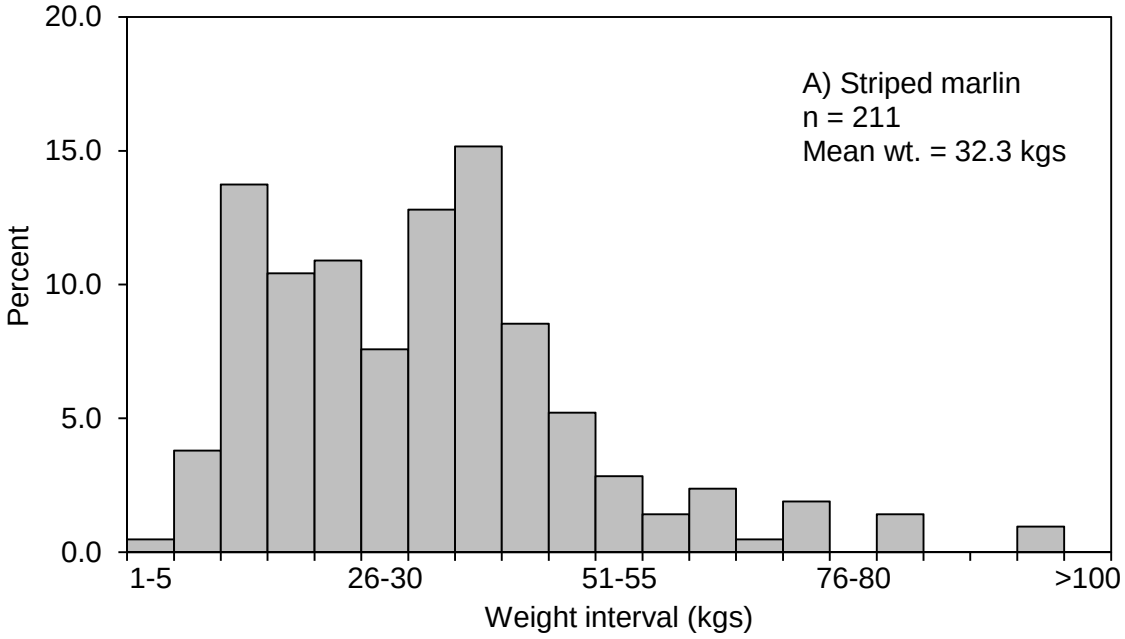


Figure 8.—Hawaii troll and handline A) striped marlin and B) blue marlin weight-frequencies, 2013.



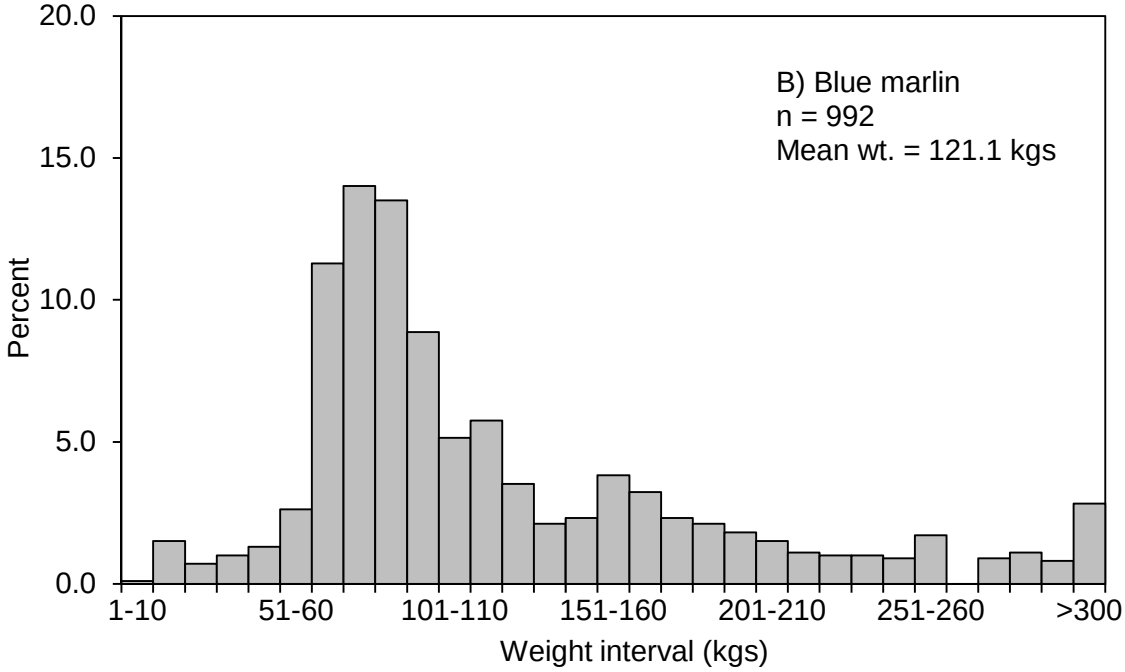
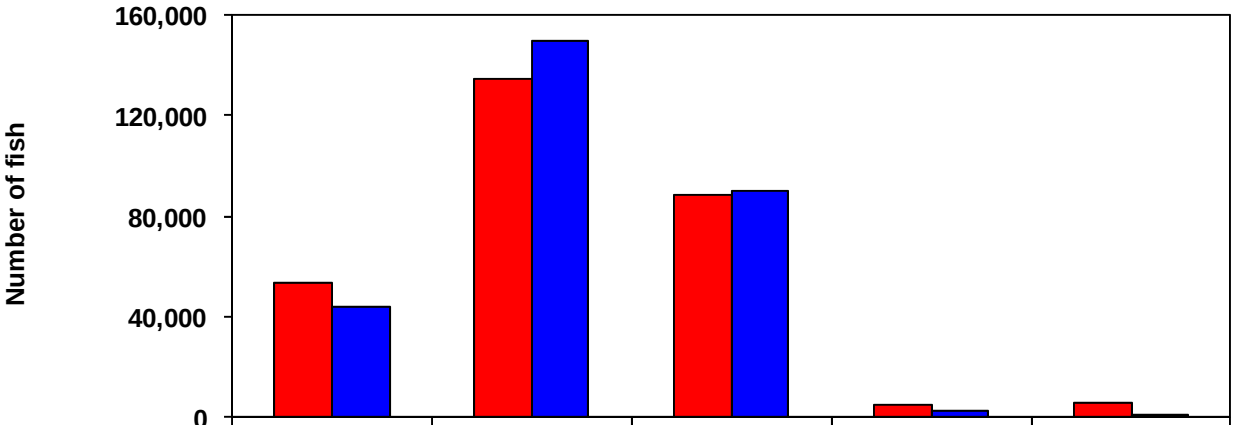




Figure 9. Nominal and corrected marlin catches for the Hawaii-based longline fishery, 1995-2003. Source: Walsh et al. 2007, Table B1.




| | Blue marlin | Striped marlin | Shortbill spearfish | Sailfish | Black marlin |
|---|---|---|---|---|---|
| Nominal catch | 53480 | 134319 | 88210 | 4638 | 5778 |
| Corrected | 43772 | 149381 | 89569 | 2749 | 689 |