SOUTHWEST FISHERIES SCIENCE CENTER

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MARCH 1992

REPORT ON THE 1991 COOPERATIVE NORTH PACIFIC ALBACORE OBSERVER PROJECT

By

Norm Bartoo, David Holts and Laura Halko

ADMINISTRATIVE REPORT LJ-92-07

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In 1991 the Southwest Fisheries Science Center (SWFSC) in cooperation with members of the Western Fishboat Owners Association (WFOA) continued the Cooperative North Pacific Albacore Project begun in 1990 (Bartoo et al. 1991) by placing observers on cooperating vessels fishing in the north Pacific. This effort was a part of a comprehensive impact assessment program on the effects of the high-seas drift net fisheries on the north Pacific albacore (*Thunnus alalunga*) stocks and other fisheries. Albacore that encounter drift nets and escape often bear some external marks that can subsequently identify it (to a greater or lesser extent) in the troll catch. This provides direct evidence of interaction between the fisheries. In this report, the results of the 1991 observer project are described.

BACKGROUND

Catches and catch-per-effort from the U.S. albacore troll and Japanese pole-and-line fisheries in the north Pacific have declined continuously, since the mid-1970's (Tsuji et al. 1992; Coan et al. 1991; Kleiber and Perrin 1991). In addition to these surface fisheries, Japan and Taiwan each have a longline fleet catching albacore in the north Pacific and their total catch appears to have remained constant over time. Drift net fleets from Japan, Taiwan and the Republic of Korea (ROK) operated in the north Pacific since the 1970s, and were active in 1991.

The small mesh drift net fleets include more than 600 vessels from Japan, Taiwan and the Republic of Korea.The Japanese and Taiwan fleets fish for flying squid (*Ommastrephes bartrami*) using small, 90 to 120 mm stretch mesh, nets in the north Pacific Transition Zone from about May through December. The ROK operates in the same area with the same gear but on a year-around basis. The landings from these drift net fisheries are greater than 10,000 mt per year.

The large mesh drift net fleet is composed of approximately 160 vessels from Japan and Taiwan. These fleets use nets with stretch mesh sizes of 170 to 185 mm. The Japanese fleet is restricted by domestic regulations to waters east of 170° E. Taiwan has no east-west restrictions. Both Taiwan and Japan have imposed internal regulations limiting fishing effort in higher latitudes west of 170° E latitude to minimize interceptions of high seas salmon.

Accurate drift net landings are not yet available. Current best reported estimates put the minimum aggregate annual catch in recent years for all drift net fisheries in the north Pacific near 30,000 mt with the possibility of another 20,000 mt in unreported/underreported catches.

1991 OBSERVER PROJECT

In 1991, SWFSC biotechnicians observed 4 fishing trips aboard 4 different U.S. troll vessels fishing in the north Pacific. Vessels were selected to provide maximum spatial and time coverage of the fishery. Observers documented daily catches and profiled drift net inflicted damage on albacore caught during trolling operations over a wide area of the north Pacific.

The project goal was to provide an (minimum) estimate of the magnitude of direct interaction between high-seas drift net and U.S. troll fisheries in 1990,and to provide biological information from which delayed mortality of albacore due to net encounters might be inferred. Specific objectives are as follows:

A. Describe the type and severity of drift net damage on troll-caught albacore

B. Estimate the relative frequency of undamaged albacore and damaged albacore

C. Estimate the size-frequency of undamaged albacore and albacore

D. Determine the relative physiological condition of troll-caught albacore that show gill net damage.

METHODS

The methods used in 1991 were the same as used in 1990 (Bartoo et al. 1991) to reduce the chance of introducing bias into the results. Observers were provided common instruction for executing duties and were interviewed post-cruise when data collected are being checked for errors and omissions.

The marks left on a fish after an encounter with a drift net are most visible just after being caught and boated during troll operations. Many marks cannot be seen once the fish is frozen. Observers were instructed to examine each boated fish and note marks on the fish which could be identified as net scars or marks. Observers were provided reference photographs for each damage code. If the particular classification of a fish was in doubt the observers photographed the damage and it was coded during the post-cruise interview. The codes used were (Figure 1):

Code	Damage Description
0	No gill net damage to fish.
1	Minor damage along sides of fish, pattern of stripes due to minor scale loss where fish forces its way through or along net.
2	Minor damage to head, chiefly forwards of pectoral fins, brush like pattern of scale loss.

3 Severe damage with bruising or scraping away of parts of the skin, primarily in area of greatest girth.

4 Old gill net damage of any degree that is partially or completely healed.

In addition to damage code, observers collected information on fork lengths, maximum girth, and weights for as many fish as possible. Fishing operations usually continued all day from first light to just after dark. Biological samples were collected for studies of delayed mortality resulting from observed injuries. Photographs of fish with various damage codes were taken randomly (Figure 1).

RESULTS

A total of 154 observed sea days were completed on 4 fishing vessels between the beginning of July and the end of September 1991. The distribution of catch for the entire fishery (Figure 2) shows the fishery concentrated off Canada, Washington and Oregon generally west of 130° W with some catch extending further offshore in the north Pacific Transition Zone. The observed cruise tracks (Figure 2) cover the fishery distribution reasonably well.

A total of 12,466 fish were examined from all observed cruises for drift net related injuries and were measured for fork length. Total weight measurements to the nearest pound were taken for each of 4,497 fish. An aggregate average catch-per-observed days fishing of 80.8 fish was measured.

Of the 12,466 fish examined for damage 96.9 % showed no visible damage (Table 1). The total of new and old damage was 3.1% of the sample, less than the 12.4% seen in 1990. Of this, 1.2% of the sample showed healed or partially healed damage from earlier net encounters. 1.9% of the sample had new damage. The quantity of damage varied slightly by area (Table 1) with less new and old damage seen north of 50° N, an area which provided more small fish in the sample (see below).

The overall length frequency of all fish sampled (Figure 3) shows three distinct size modes representing ages 2, 3 and 4 which are typical for in the U.S. troll catch. The pattern in the relative abundance of the 3 modes (approximately 52, 62 and 76 cm) is similar to the pattern seen in the 1970's and early 1980's and considerably different than seen in 1990 (Bartoo et al. 1991).

The sample length frequencies for each 5° latitudinal band along the coast were different (Figure 4). The northern portion of the fishery, north of 45° N, showed a high proportion of fish in the 52 to 65 cm range. This was also the case for the area west of 140° W. Along the coast, south of 45° N smaller fish were not as prevalent as in the north, and the catch had 2 main size modes at 65 cm and 76 cm.

The length frequencies of undamaged fish by latitude band (Figure 5) is not different from the total length frequency for damaged fish in the same bands. The length frequencies by area for all recently damaged fish (codes 1, 2 and 3) show relatively few of the fish in the

52 to 56 cm size mode with damage (Figure 6). Most of the damage is associated with the larger sizes, roughly in proportion to the modes proportion in the total catch. Old damage (code 4) is associated with larger size fish in all areas (Figure 7).

A total of 91 blood and tissue samples were collected from damaged and undamaged albacore to be examined for indicators of stress which might affect near-term survival. No statistical effect was found between damaged and undamaged fish for condition factor, RNA to DNA ratio (a measure of recent stress), and number of lymphocytes/200 red blood cells ratio. Additionally, no fish were found to be septic (i.e., bacteria in the blood) (personal communication, Richard Brill, NMFS Honolulu Laboratory).

Marine mammal and turtle sightings were routinely documented using standard observation forms. A summary of such sightings includes:

Species	Sightings
Pacific white sided dolphin	801
Northern right whale dolphin	150
Common dolphin	150
Dalls porpoise	81
Killer whale	28
Short-finned pilot whale	1
Unidentified dolphin	7
Unidentified whale	5

CONCLUSIONS

In 1991 a relatively large sample of albacore from the U.S. troll catch were examined for evidence of previous encounters with drift nets in the north Pacific. The proportion of fish sampled with new or recent marks declined in 1991 to 3.1% from 7.1% in 1990. Old marks were seen on 1.2% of the total sample.

More old damage was seen in areas with relatively lower proportions of smaller fish. The amount of new damage in fish of the 52 cm length mode is less than in fish of the larger modes. Statistically, the size of damaged fish was significantly smaller than undamaged fish at $\alpha = .05$ (73.5 cm vs 79.1 cm).

The gradient of higher proportions of new damage to the west seen in 1990 was repeated in 1991. No explanation for the observed gradient is given at this time. However, as seen in Figure 8, the fishing effort of the monitored portion of the Japanese squid drift net fleet in 1990 was concentrated in the area west of 146° W. If this pattern was repeated in 1991, the gradient could be caused by the albacore moving eastward through the small mesh net fishery and into the troll fishery. Mortality and diffusion or mixing with albacore not passing the net fishery could create the gradient.

ACKNOWLEDGEMENTS

We thank the owners and skippers of albacore troll vessels who participated in this study, and the Western Fishboat Owners Association. We thank the observers, Joe Ivers, Randy Rassmussen, Gary Rensink and Greg Yee who measured nearly 13,000 fish and collected the basic data. We also thank Richard Brill and Jerry Wetherall for providing assistance and data analysis of tissue samples. Jacqueline Tran produced the observed cruise track plot and catch effort distribution.

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Table 1. Percentage of albacore caught by U.S. troll vessels that were determined to be damaged from encounters with high-seas driftnets.

	1991 FISHING AREA				
DAMAGE TYPE	WEST OF 160° W	160° W TO 140° W	NORTH OF 50° N	EAST OF 140° W AND SOUTH OF 50° N	ALL AREAS
NO DAMAGE	0.0	96.9	98.8	96.3	96.9
NEW DAMAGE					
CODE 1	0.0	2.1	1.2	0.9	1.5
CODE 2	0.0	0.2	0.0	0.2	0.2
CODE 3	0.0	0.0	0.0	0.4	0.2
TOTAL NEW DAMAGE	0.0	2.3	1.2	1.5	1.9
OLD DAMAGE	0.0	0.8	0.0	2.2	1.2
TOTAL ALL DAMAGE	0.0	3.1	1.2	3.7	3.1
SAMPLE SIZE, n	0	5738	1721	5007	12466

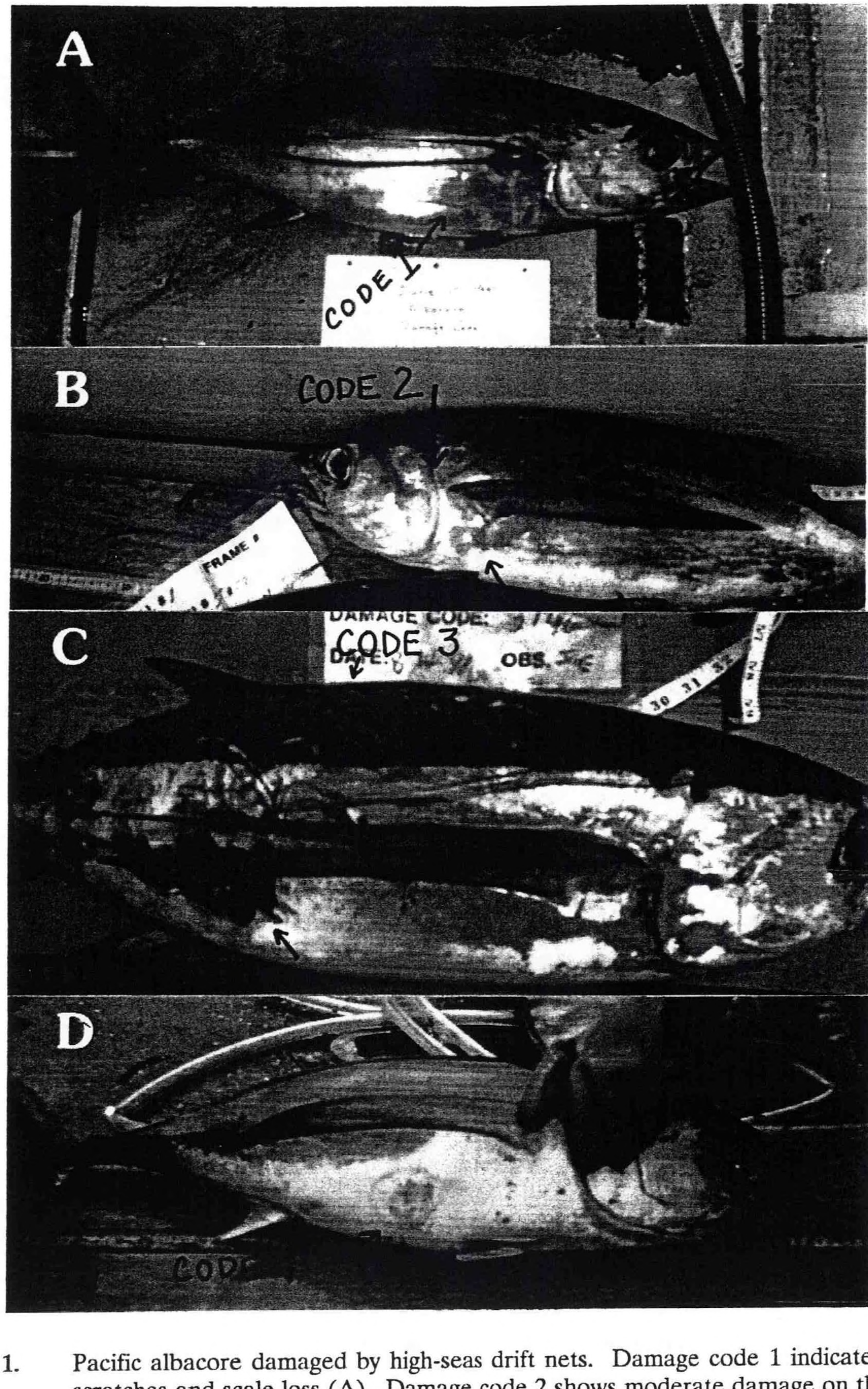

Figure 1. Pacific albacore damaged by high-seas drift nets. Damage code 1 indicates minor scratches and scale loss (A). Damage code 2 shows moderate damage on the head, forward of the pectoral fins (B). Damage code 3 indicates signifigant loss of scales or skin (C). Damage code 4 indicates old gillnet damage of any degree that has healed (D).

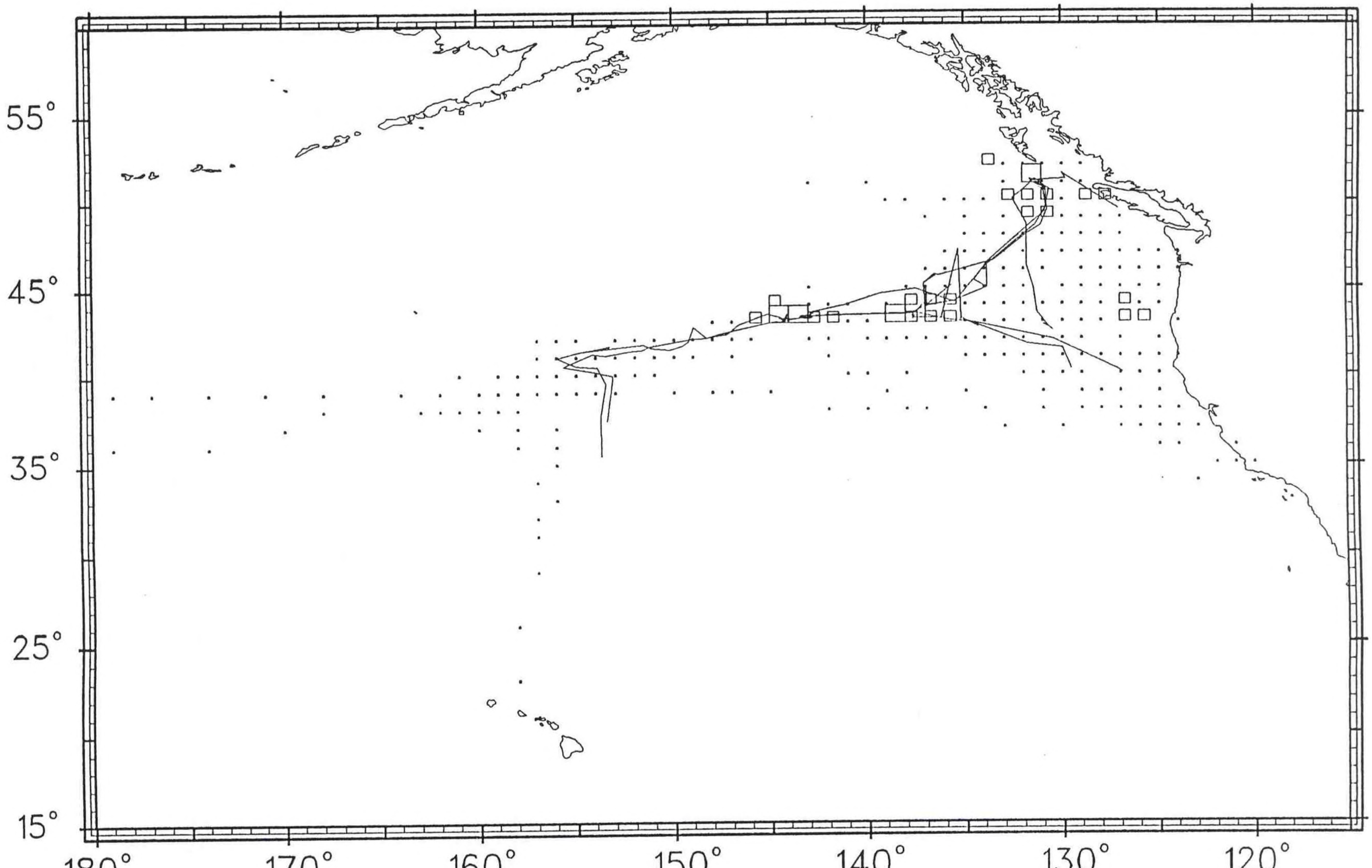

Figure 2. General cruise track and fishing areas (shaded areas) for four trips by U.S. albacore troll vessels with government observers aboard. Two vessels departed Honolulu and two departed from ports on the U.S. West Coast. All cruises terminated on the West Coast.

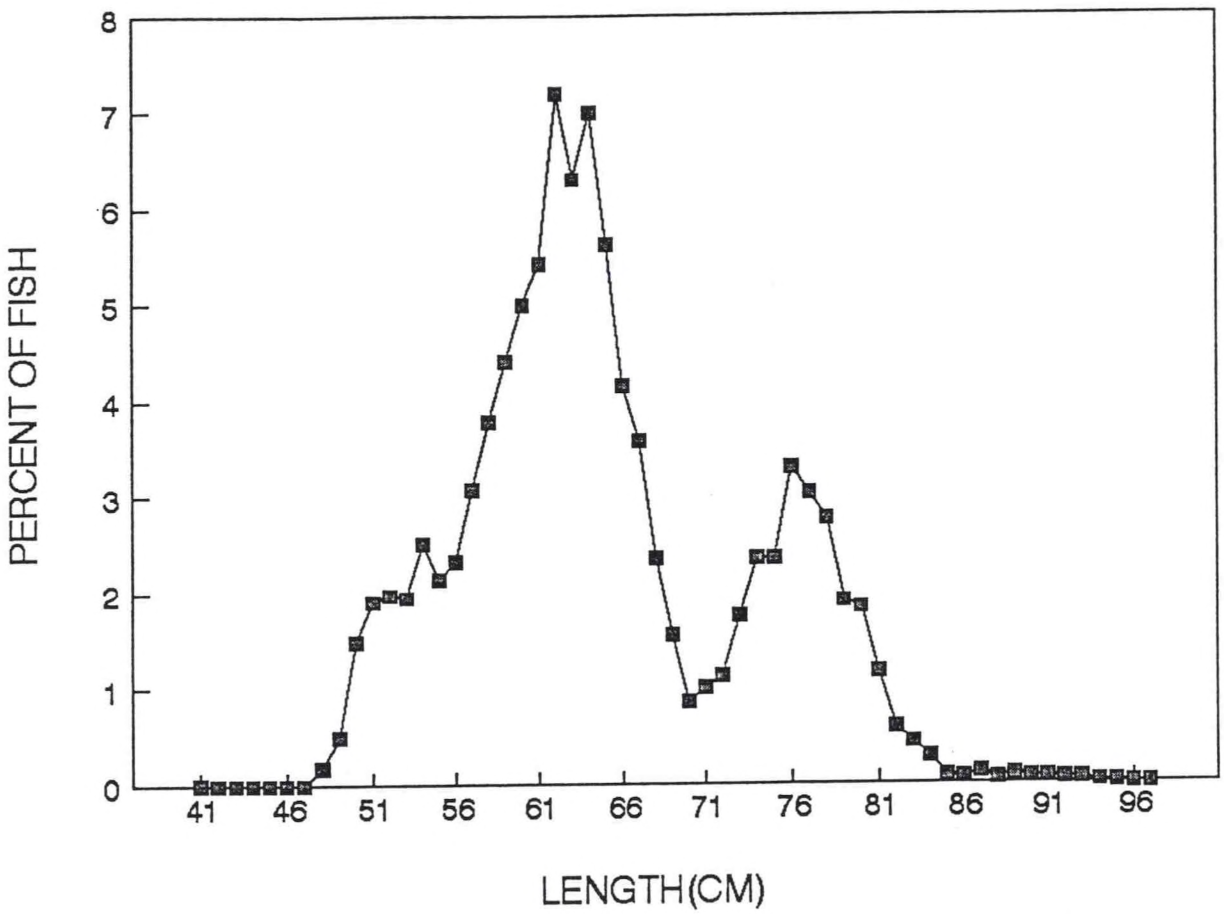

Figure 3. Length frequency of 12,466 albacore measured during the albacore observer program in 1991.

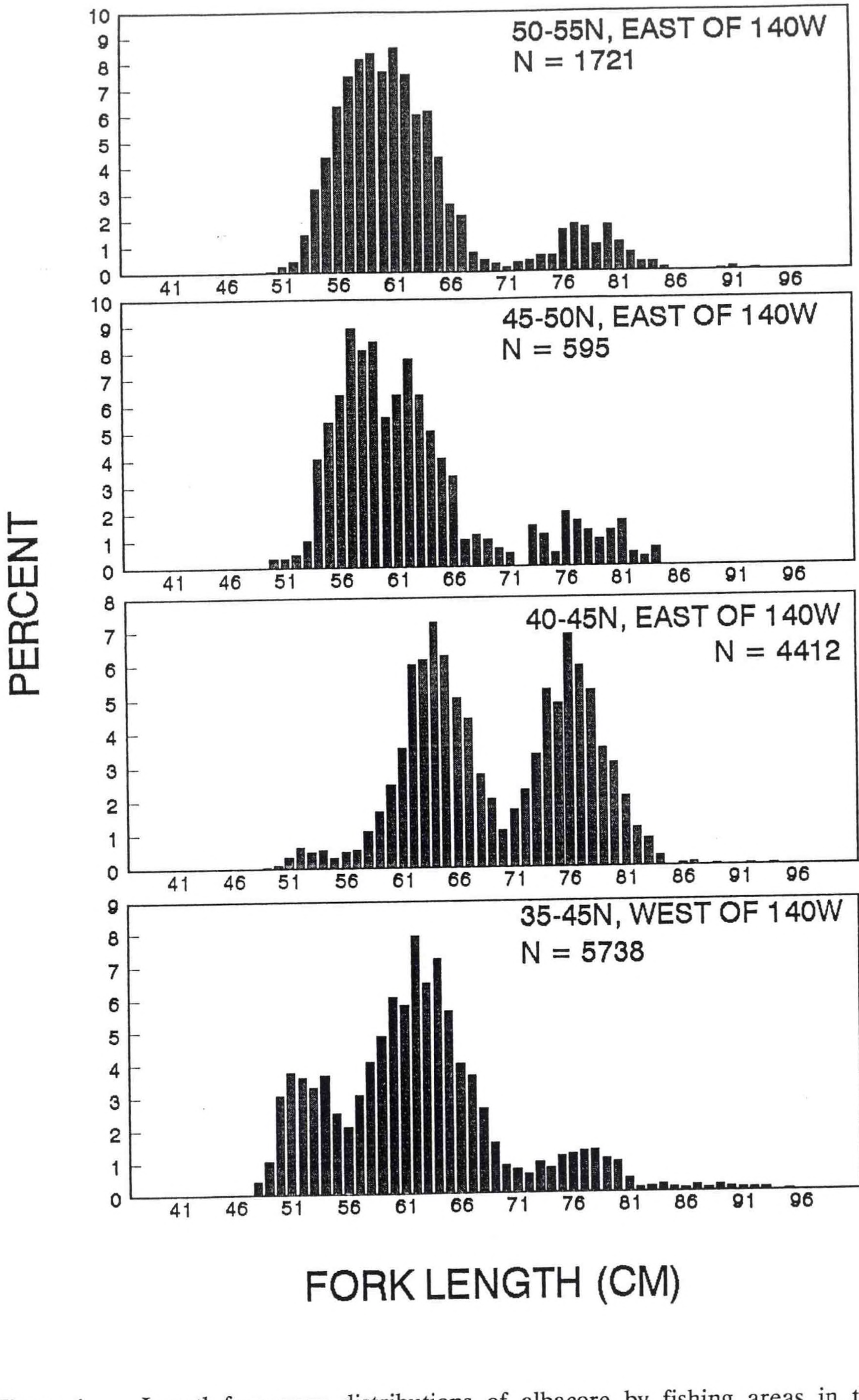

Figure 4. Length-frequency distributions of albacore by fishing areas in the north Pacific, 1991. (N = sample size).

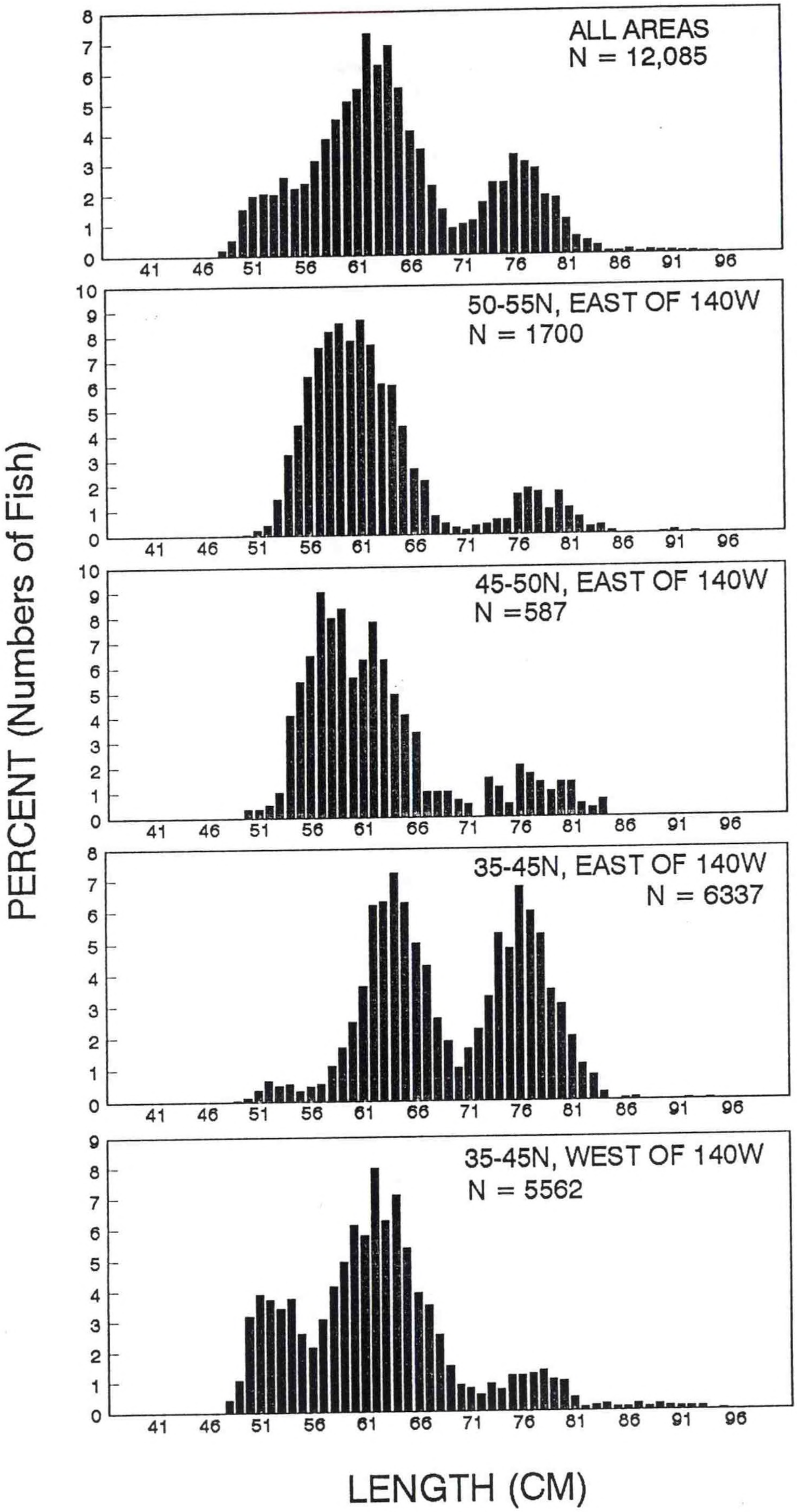

Figure 5. Length-frequency distributions of un-damaged albacore (Code 0) by fishing areas in the north Pacific, 1991. (N = sample size).

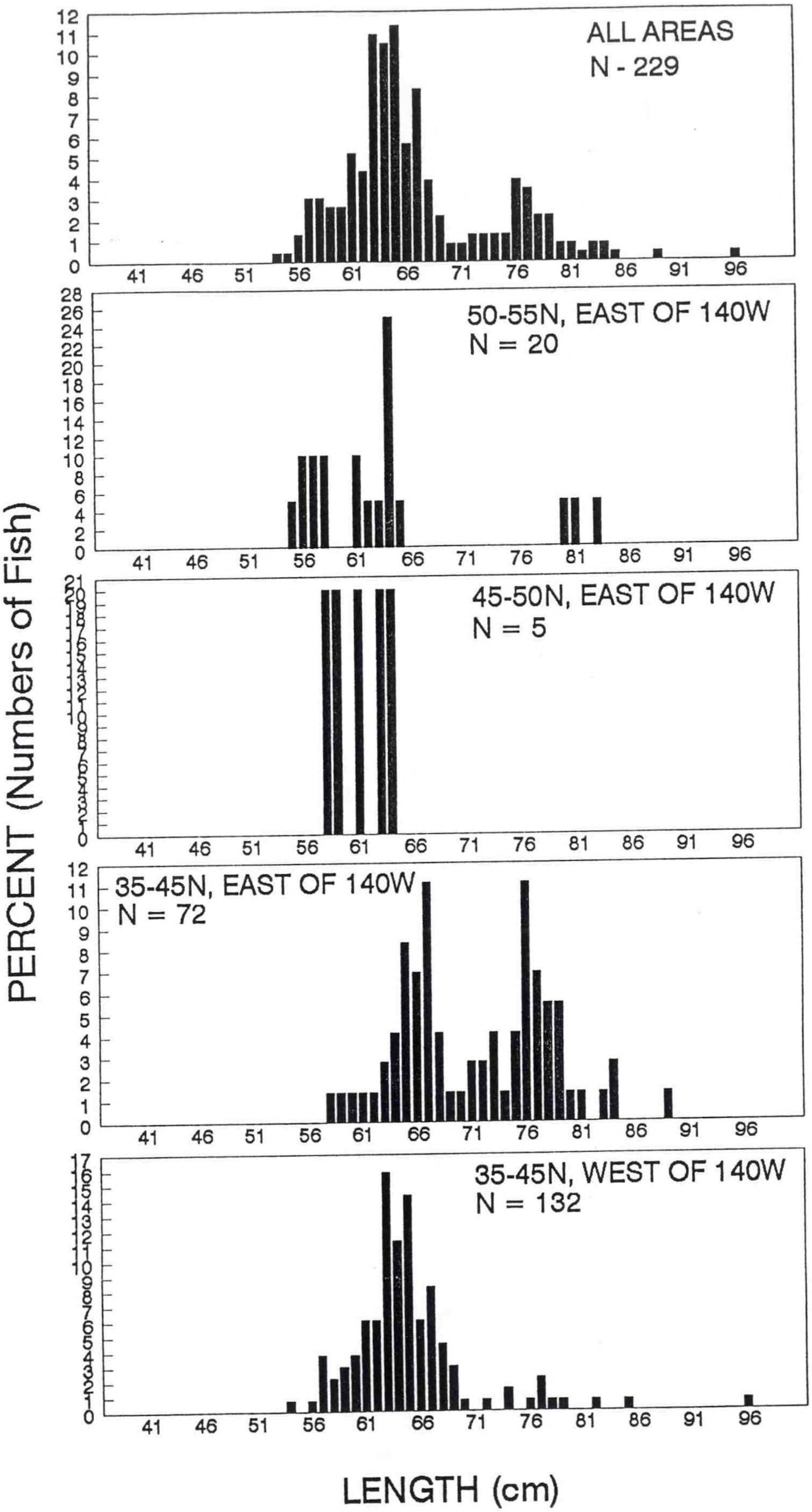

Figure 6. Length-frequency distributions of recently damaged albacore (Codes 1, 2, and 3) by fishing areas in the north Pacific, 1991. (N = sample size).

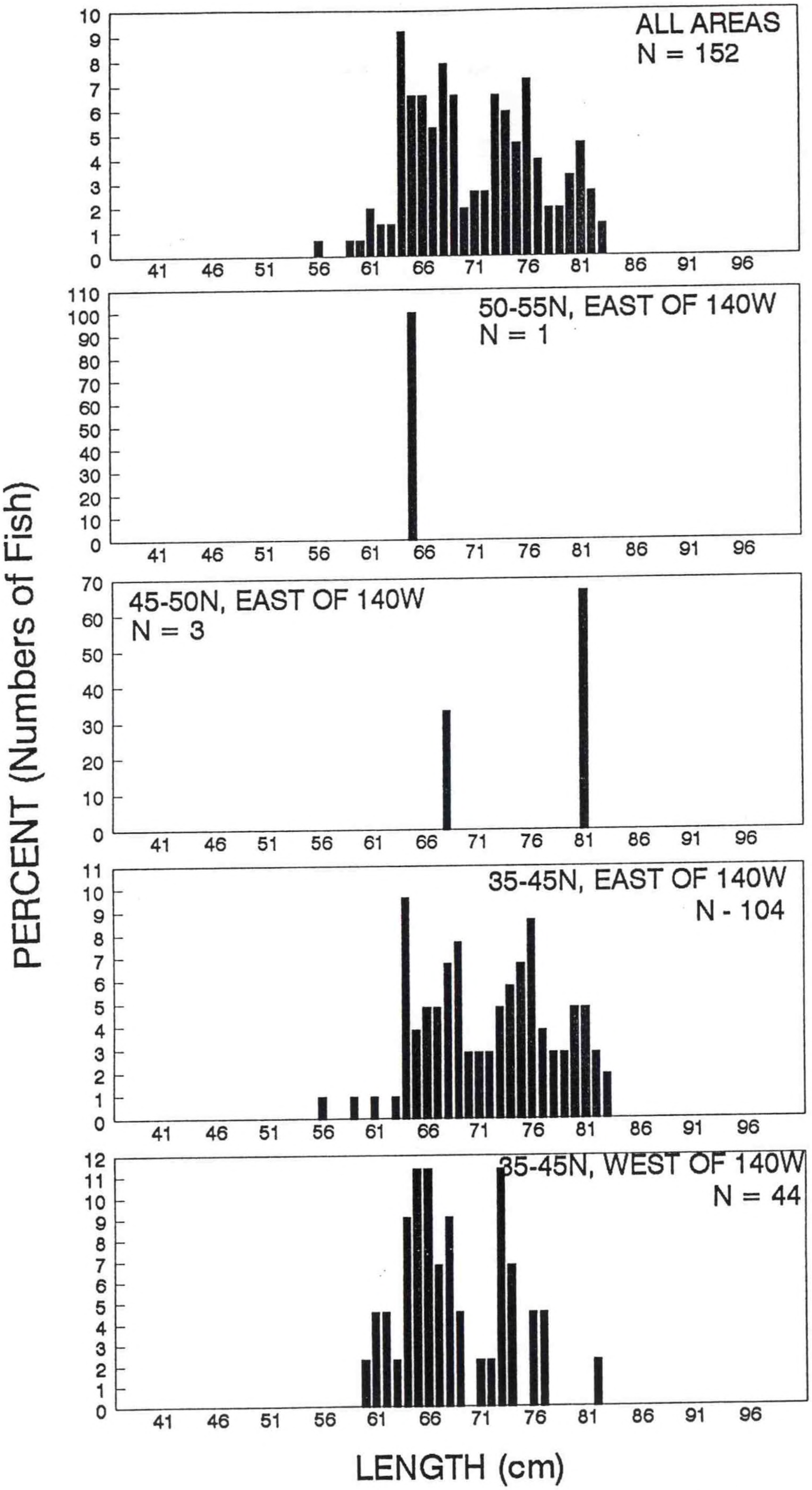

Figure 7. Length-frequency of albacore with old injuries (Code 4) by fishing areas in the north Pacific, 1991. (N = sample size).

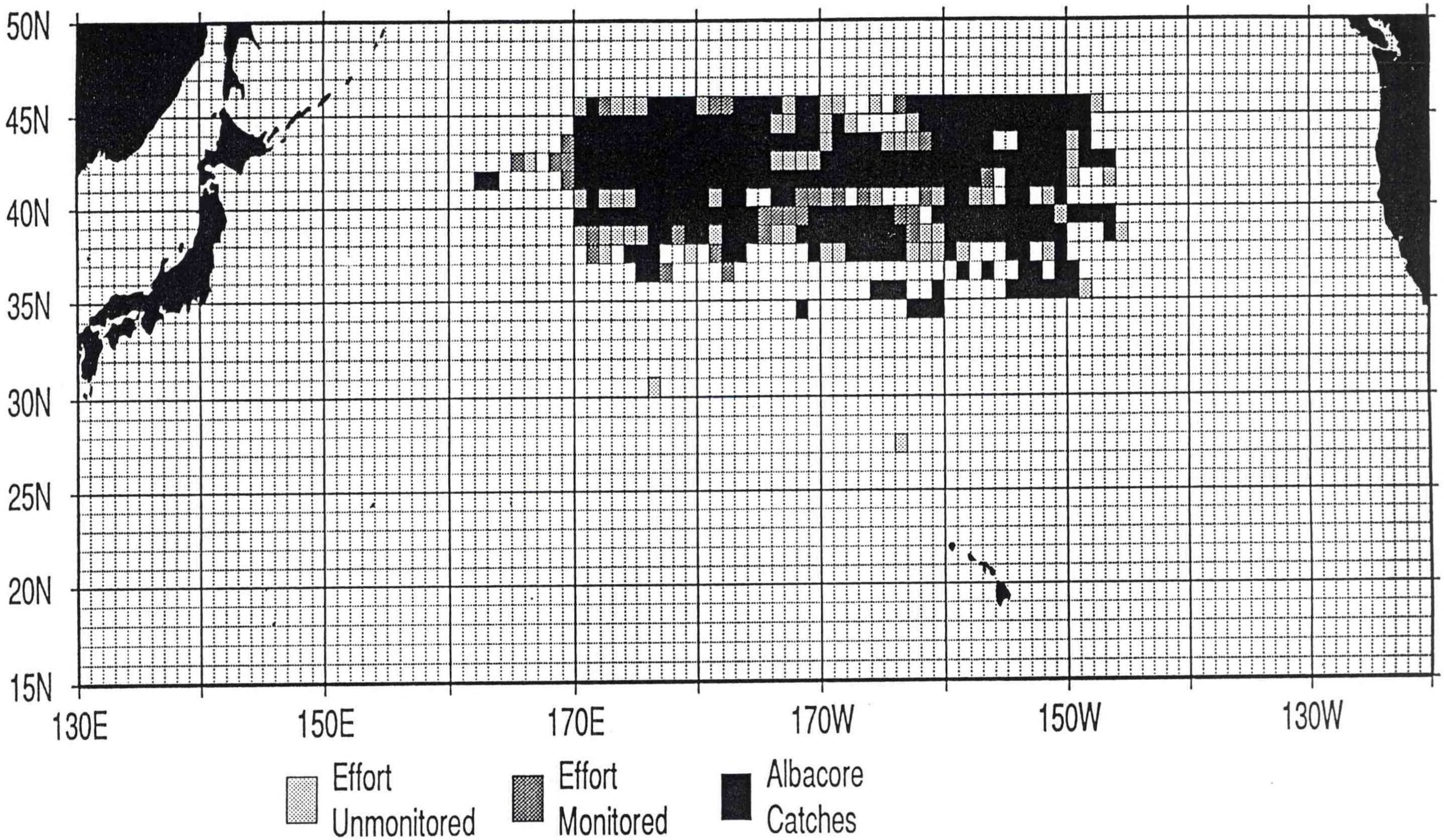

Figure 8. Location of Japanese squid drift net fishing effort and albacore catch in the north Pacific for 1990. Monitored effort is effort observed by onboard observers. (Personal communication, J. Wetherall, NMFS, Honolulu Laboratory).