Recent change in the operation of Japanese longline fishery in the northeast Pacific[1]

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by

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Summary

The cause of very low catch and CPUE of albacore in the northeast Pacific by Japanese longline during 2003-2007 was examined. Based on the plot of distribution of Japanese longline effort and albacore catch and CPUE by month and 1 degree latitude/longitude, it has become clear that high albacore catch and CPUE are observed in a limited season and area and that little effort was deployed in such a season and area during 2003-2007. It was caused by the shift of area of Japanese longline operation in the northeast Pacific. Recently, in the northeast Pacific, the proportion of deep longline gear increased and catch rate of albacore by deep longline is low. That indicates that more fishermen were targeting bigeye tuna in the northeast Pacific and thus be reflected in a decline in CPUE in recent years. The information obtained through this study is useful for analyses of albacore stock in the north Pacific.

1. Introduction

Longline is one of main Japanese albacore fishing methods in the north Pacific. Catch of albacore by Japanese longline fishery accounts for about 20-30% of entire albacore catch in the north Pacific in recent years. Also, Japanese longline fishery has very high temporal and spatial coverage and its logbooks contain information on fishing gear specifications (e.g. number of hooks per basket). Therefore, its abundance indices are very important for stock assessments of albacore. Annual catch amount of albacore by Japanese longline is comparatively stable with slight fluctuations, but sharp drop in both CPUE and catch in the northeast Pacific (25-40N, 120-170W, Fig. 1) has been observed since 2003 to a very low level (Matsumoto and Uosaki, 2009; Uosaki and Nishikawa, 2006) (Fig. 2). Such a sudden decrease is not seen in the CPUE for entire north Pacific (**Fig. 3**). Northeast Pacific is one of the main fishing grounds for Japanese longline fishery. Therefore, this phenomenon may affect abundance indices of albacore by Japanese longline fishery and the results of analyses of the stock. The reason of sudden decrease had not been clear. We examined recent changes in the operation of Japanese longline fishery in the northeast Pacific to find the cause of this phenomenon by investigating fine scale distributions of catch and effort in combination with effect and change of fishing gear.

2. Materials and methods

As for the catch and effort data for Japanese longline fishery, logbook database compiled at National Research Institute of Far Seas Fisheries (NRIFSF) was used. The data, which include date of operation, location, number of hooks per set, number of hooks per basket, number of individuals caught by species, and so on, were aggregated by month and 1X1° block. Monthly distributions of albacore CPUE and species composition of catch as well as distribution of effort (number of hooks) were plotted for examination of distributions of the operation, catch and CPUE. Also, to investigate the change and effect of fishing gear and target species, annual changes in number of hooks per basket (number of hooks between floats) and catch rates of albacore by different types of gear in the northeast Pacific were examined.

3. Results

3.1. Distribution of catch and effort

Fig. 4 shows monthly distributions of albacore CPUE by Japanese longline fishery during 1998-2008. Within

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the northeast Pacific (25-40˚N, 120-170˚W), higher CPUEs are observed in (1) 140-165˚W, 25-35˚N in January, (2) 135-170˚W, 25-35˚N in February, (3) 150-160˚W, 30-35˚N in November, and (4) 140-170˚W, 30-35˚N in December. Generally, CPUE was high in the area west of 135˚W between 25˚N and 35˚N in the winter season. Albacore CPUEs in the other seasons and areas were usually very low. Monthly distribution of albacore catch in number (**Fig. 5**) is similar to that of albacore CPUE.

Appendix Fig. 1 shows monthly distribution of fishing effort (number of hooks) in January, February, November and December (main albacore fishing season in that area) between 1998 and 2008. Until 2002, both effort and catch were high in the albacore season and area. However, since 2003, both effort and particularly catch dropped sharply in this time-area. As the results, the nominal CPUE of albacore dropped suddenly in the northeast Pacific. That may have caused sudden decrease in catch and CPUE of albacore in the northeast Pacific.

Fig. 6 shows distribution of species composition of catch in number by Japanese longline fishery (1998-2008 total) in January, February, November and December. It seems that albacore is main target in the area of high albacore catch and CPUE mentioned above, and bigeye tuna seems to be main target in the southern part of northeast Pacific. Substantial effort is often deployed in the southern area where bigeye tuna seems to be main target (Appendix Fig. 1).

3.2.Change in longline gear and CPUE by gear configuration

Fig. 7 shows annual change in the proportion of number of hooks per basket (number of hooks between floats) in the northeast Pacific (25-40˚N, 120-170˚W) during main albacore fishing season (first and forth quarter). Number of hooks per basket was mostly 7-9 (“intermediate longline”) or 10-14 (“deep longline”) before 2003 in the first quarter and before 2002 in the forth quarter. After that, those were mostly replaced by “super-deep longline” (15-16 or 17-20 hooks per basket).

Fig. 8 shows albacore CPUE by number of hooks per basket in the northeast Pacific. Highest CPUE is observed at 7-9 or 10-14 hooks per basket and CPUE declines as the number of hooks increases. Therefore, deep longline gear which is recently used by Japanese vessels is less effective for albacore, and it may be one of the causes of recent decline in albacore CPUE in the northeast Pacific. Generally, catch rate of bigeye tuna increases with higher number of hooks per basket. As is shown in **Fig. 6**, bigeye catch is high in the southern part of northeast area (south of 30˚N). So it appears that longline vessels shifted to the south which resulted in lower catch and CPUE of albacore.

4. Discussion

Information about operation of Japanese longline fishery in recent years in the northeast Pacific was obtained through this study. It seems that recent low catch and CPUE of albacore were mainly caused by the shift of area of longline operations, not necessarily reflecting decrease of albacore stock. Much less Japanese longline vessels than normal operated in the northeast Pacific during 2003-2007. Also, during that period less effort was deployed in the area where albacore CPUE is usually high. That may also have accelerated decrease in albacore CPUE. In such a situation, it may be better to eliminate longline CPUE in the northeast Pacific from the analyses of the stock.

Polovina et al. (2001) reported that high albacore CPUE area by US troll fishery coincides with “chlorophyll front” (0.2 mg/m^3 surface chlorophyll isopleth) in the eastern and central north Pacific between May and September, and reported that chlorophyll front lied around 35˚N at 140˚W and around 30˚N at 150˚W in the first quarter (January to March) in 1998. That approximately agrees with high albacore CPUE area by Japanese longline fishery (**Fig. 4**). Albacore CPUE may be influenced by sea surface temperature (SST). It may be possible to analyze in detail about the distribution pattern of albacore in relation to oceanographic conditions such as chlorophyll concentration and SST. However, it is beyond the scope of this study.

It has also become clear that longline gear configuration (number of hooks per basket) affects catch rate of albacore. Therefore, it seems to be essential to incorporate the effect of fishing gear in standardizing longline CPUE.

The results of this study will become useful information for analyses of the stock of albacore in the north Pacific.

5. Reference

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Polovina, J. J., E. Howell, D. R. Kobayashi, and M. P. Seki 2001. The Transition Zone chlorophyll front, a dynamic global feature defining migration and forage habitat for marine resources. Progress in Oceanography(49)1-4:469-483.

Uosaki K. and Y. Nishikawa. 2006. A review of Japanese albacore fisheries in the North Pacific. ISC/06/ALBWG/04. 20 pp.

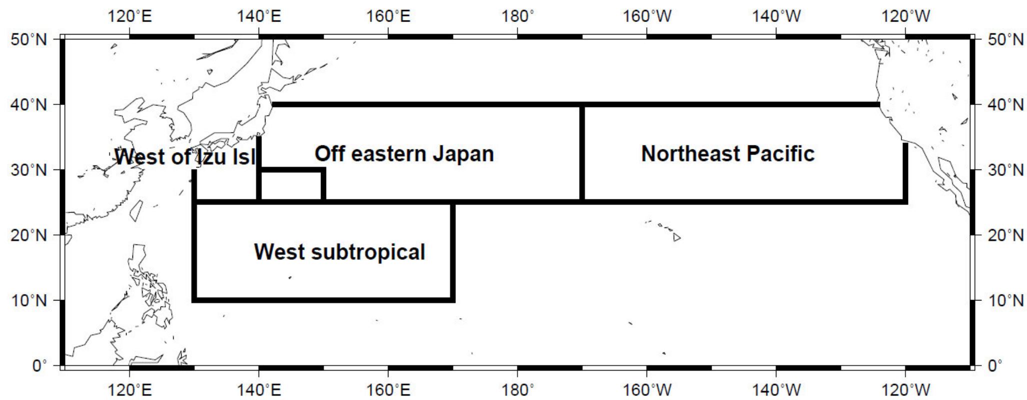


Fig. 1. Classification for the major fishing ground in which albacore account for large portion among species in the catch of the longline fishery (Matsumoto and Uosaki, 2009).

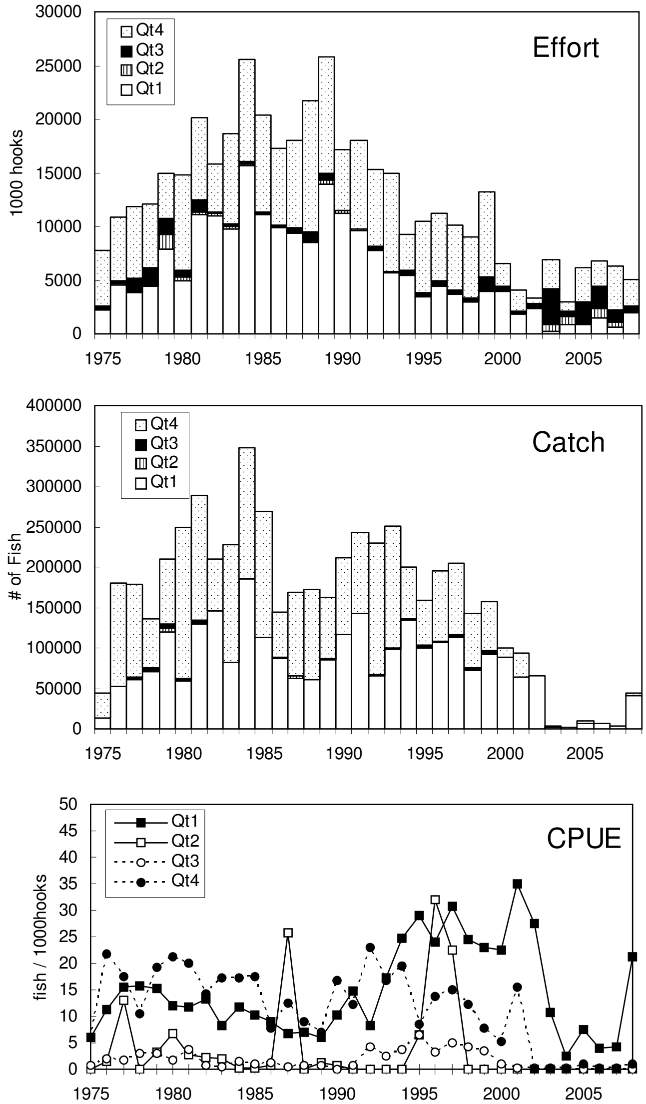


Fig. 2 Quarterly fishing effort, albacore catch and albacore CPUE (nominal) for the larger than 20 GRT Japanese longline fishery in the northeast Pacific region (update of Matsumoto and Uosaki, 2009).

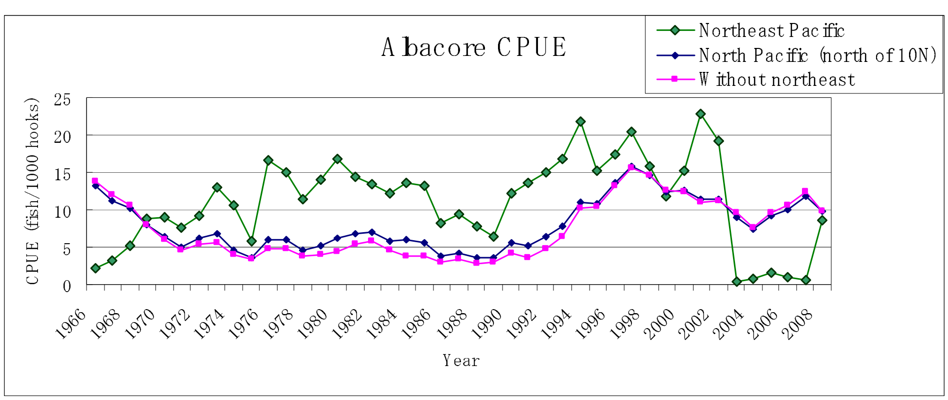


Fig. 3 Annual change in albacore CPUE (nominal) for Japanese longline fishery in the north Pacific. "Northeast" means 25-40N, 120-170W (Fig. 1)**. "Without northeast" means north Pacific excluding northeast area (25-40N, 120-170W).**

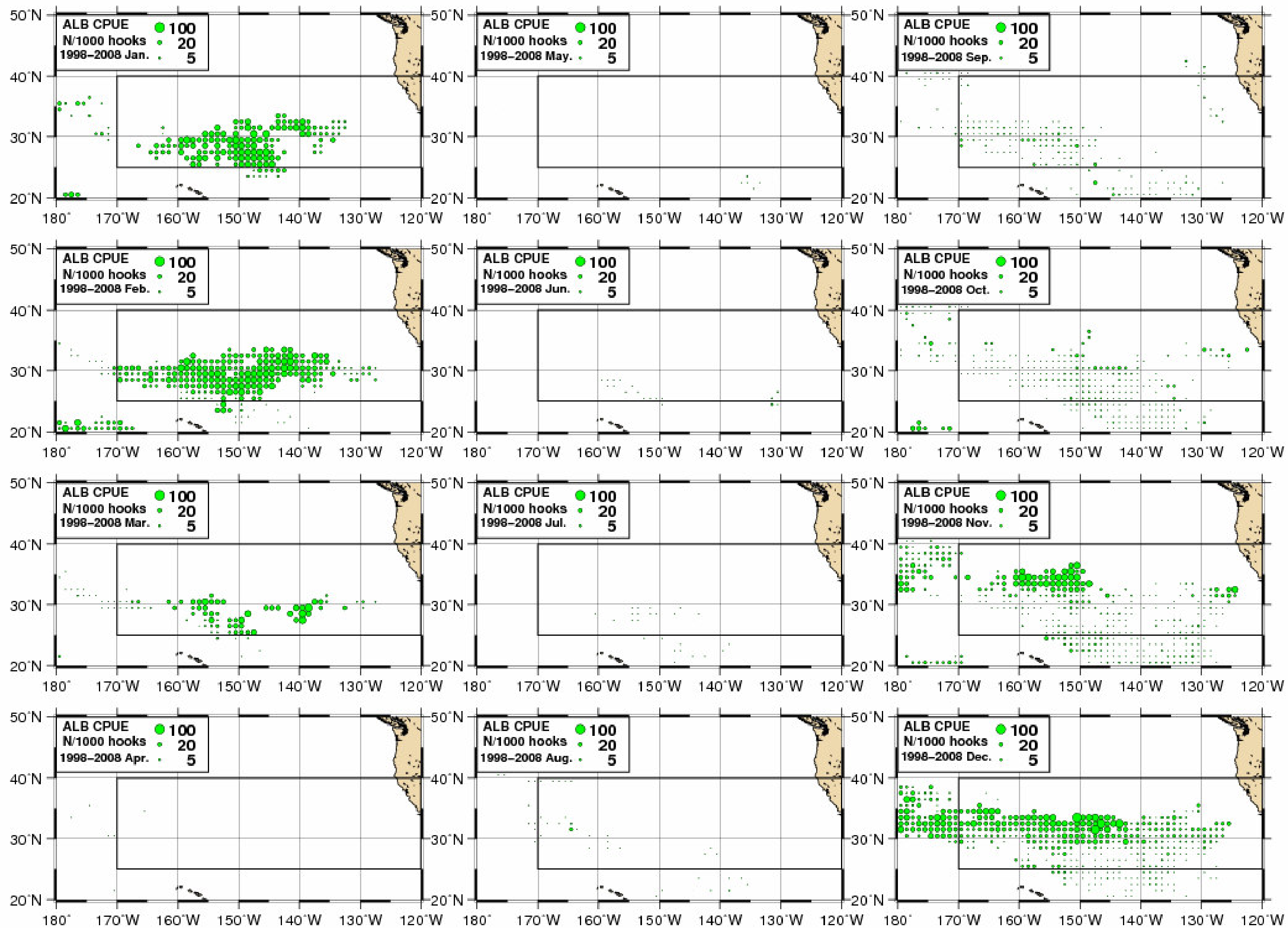


Fig. 4 Monthly distribution of albacore CPUE (number of fish per 1000 hooks) by Japanese longline fishery in the northeast Pacific (1998-2008 average).

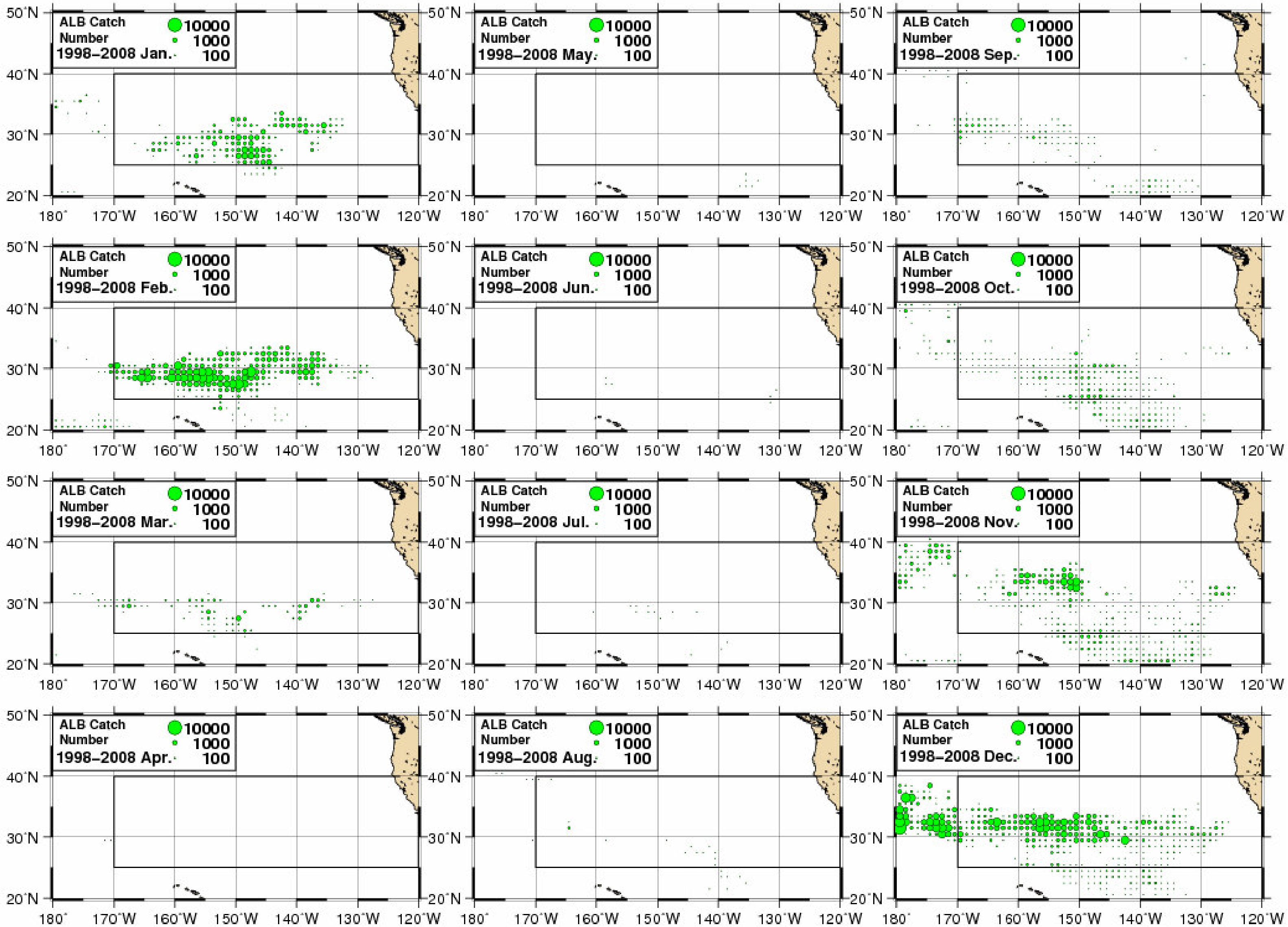


Fig. 5 Monthly distribution of albacore catch (number of fish) by Japanese longline fishery in the northeast Pacific (1998-2008 average).

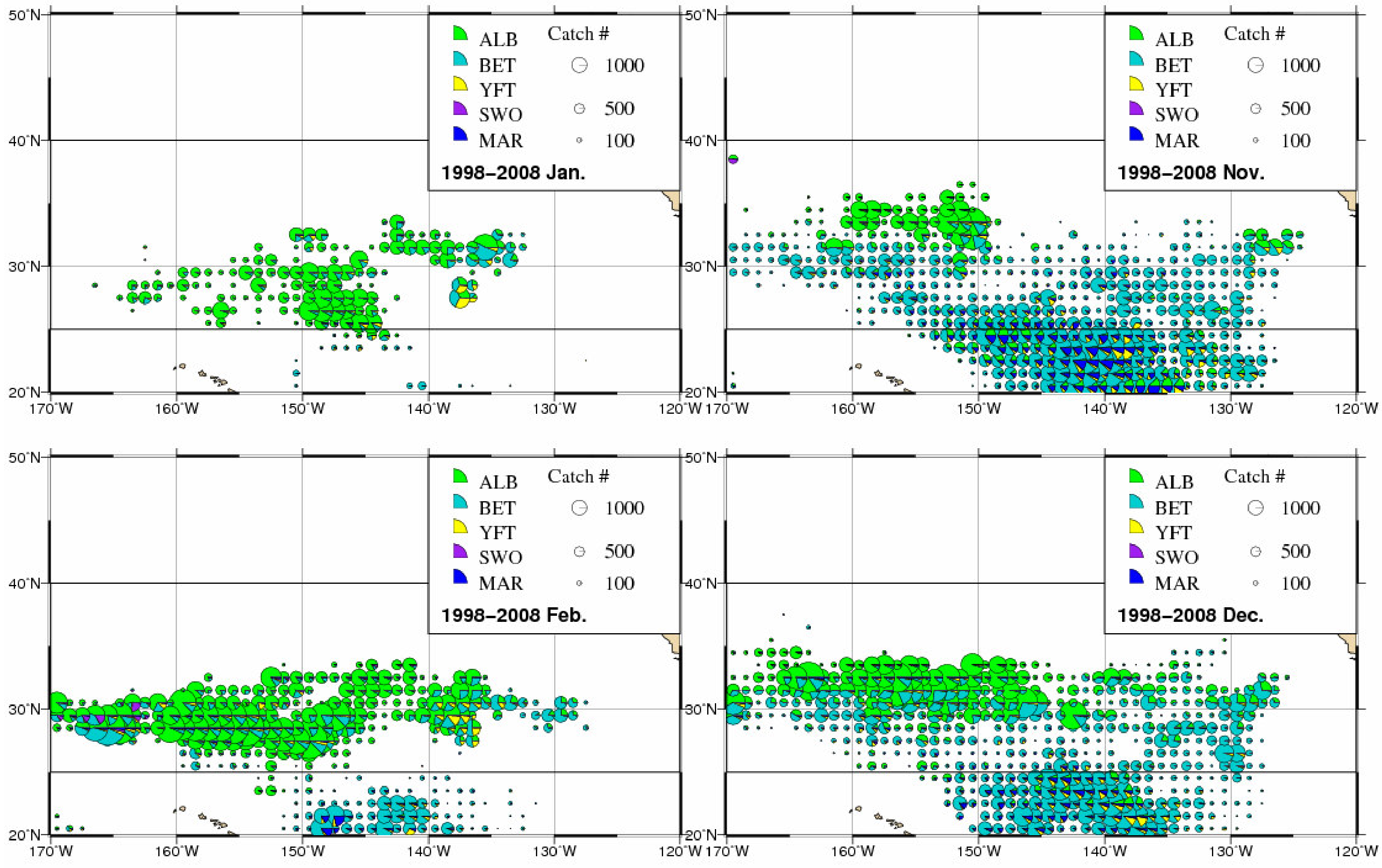


Fig. 6 Distributions of species composition (in number) of catch by Japanese longline fishery in the northeast Pacific (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MAR: marlin species) (1998-2008 total).

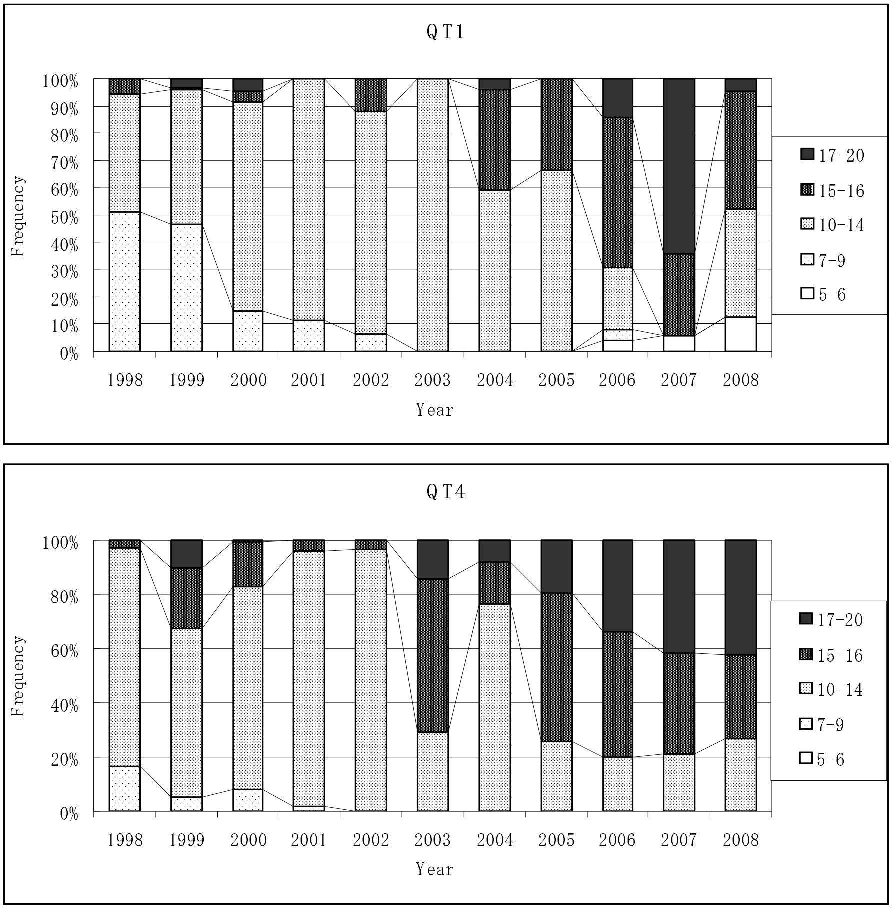


Fig. 7 Annual change in the proportion of Japanese longline effort (number of hooks) by number of hooks per basket in the northeast Pacific.

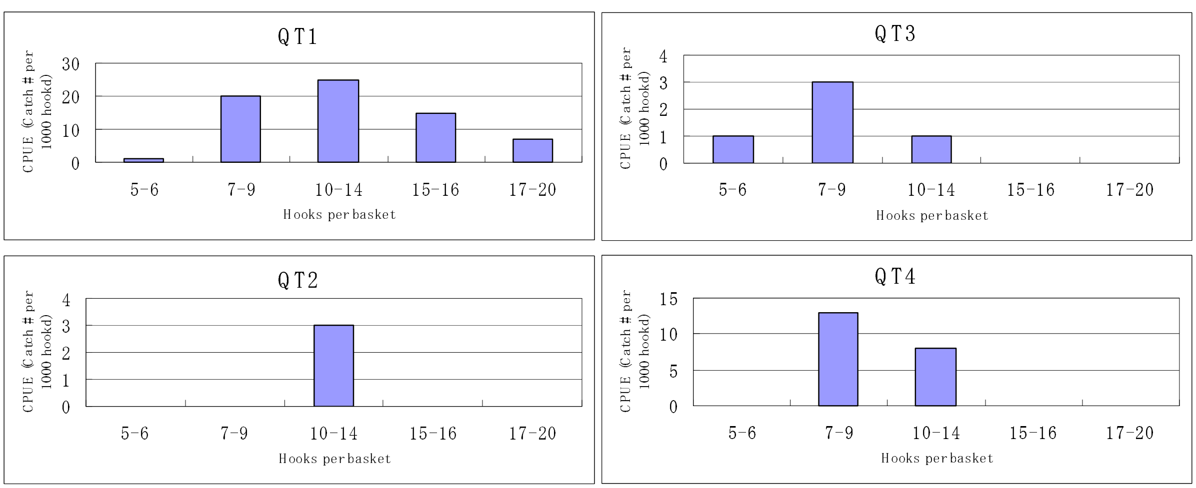
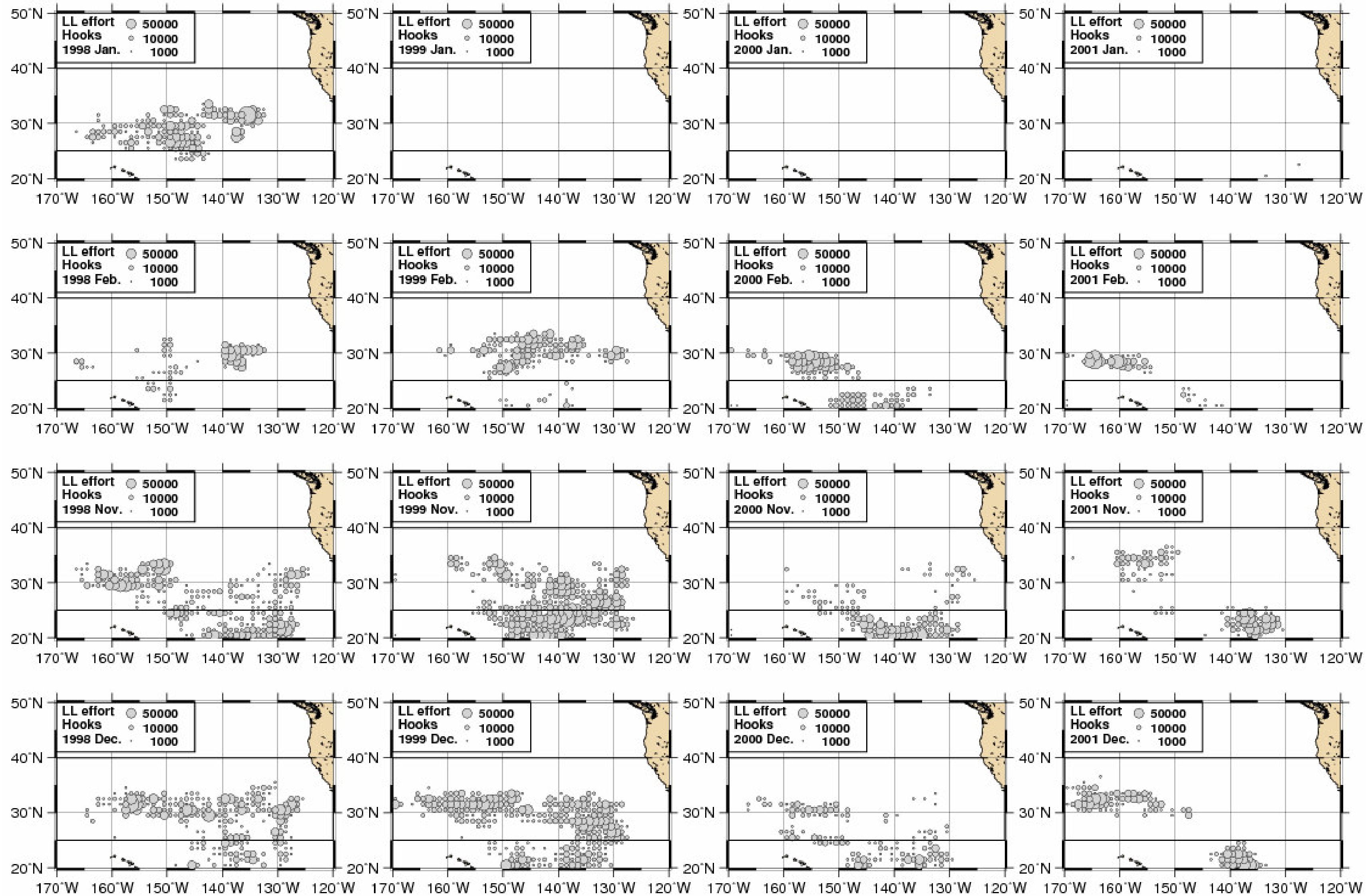
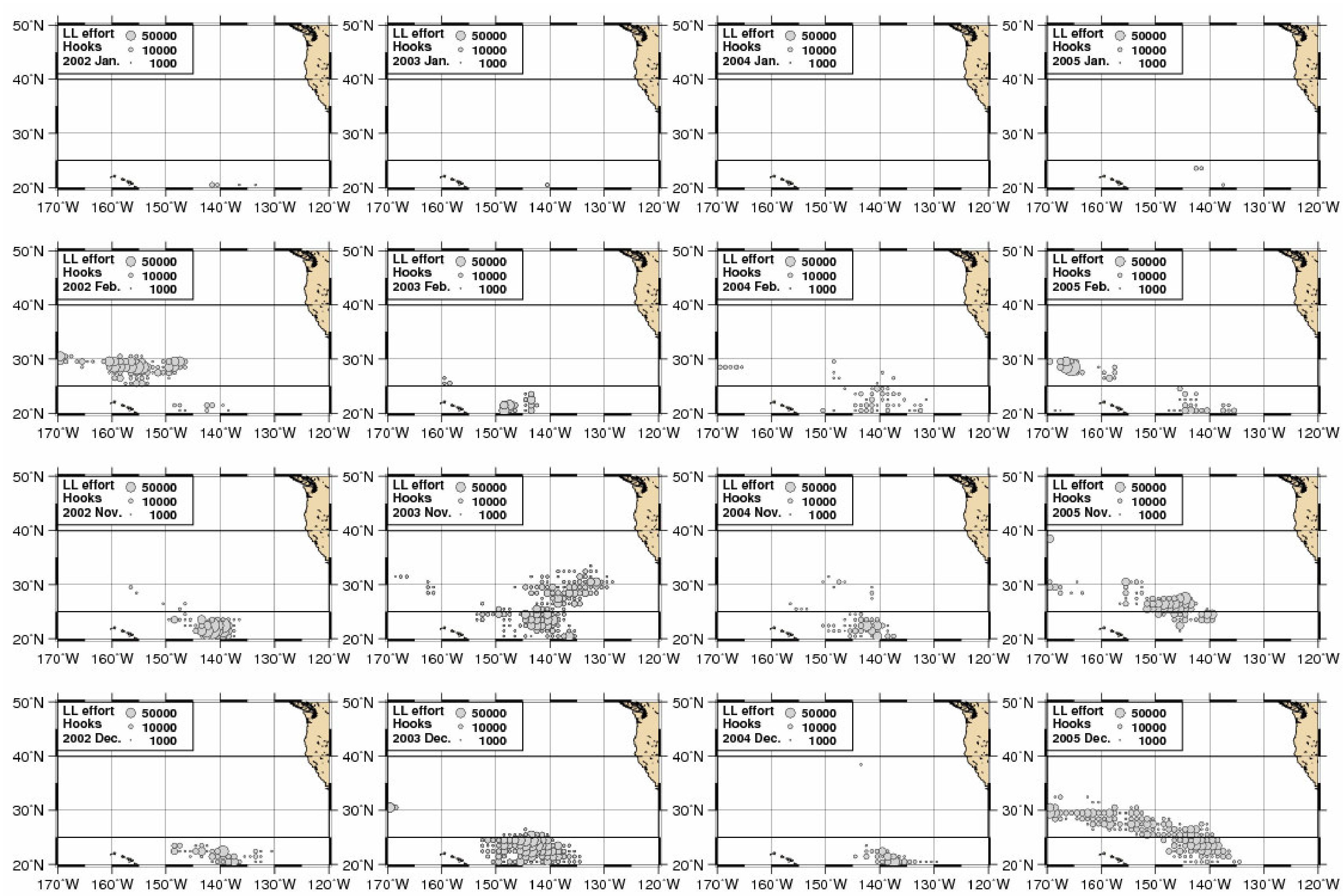


Fig. 8 Albacore CPUE by Japanese longline in the northeast Pacific by number of hooks per basket.



Appendix Fig. 1. Distribution of effort (number of fishing hooks) by the Japanese longline fishery in the northeast Pacific during 1998-2008 (January, February, November and December only).



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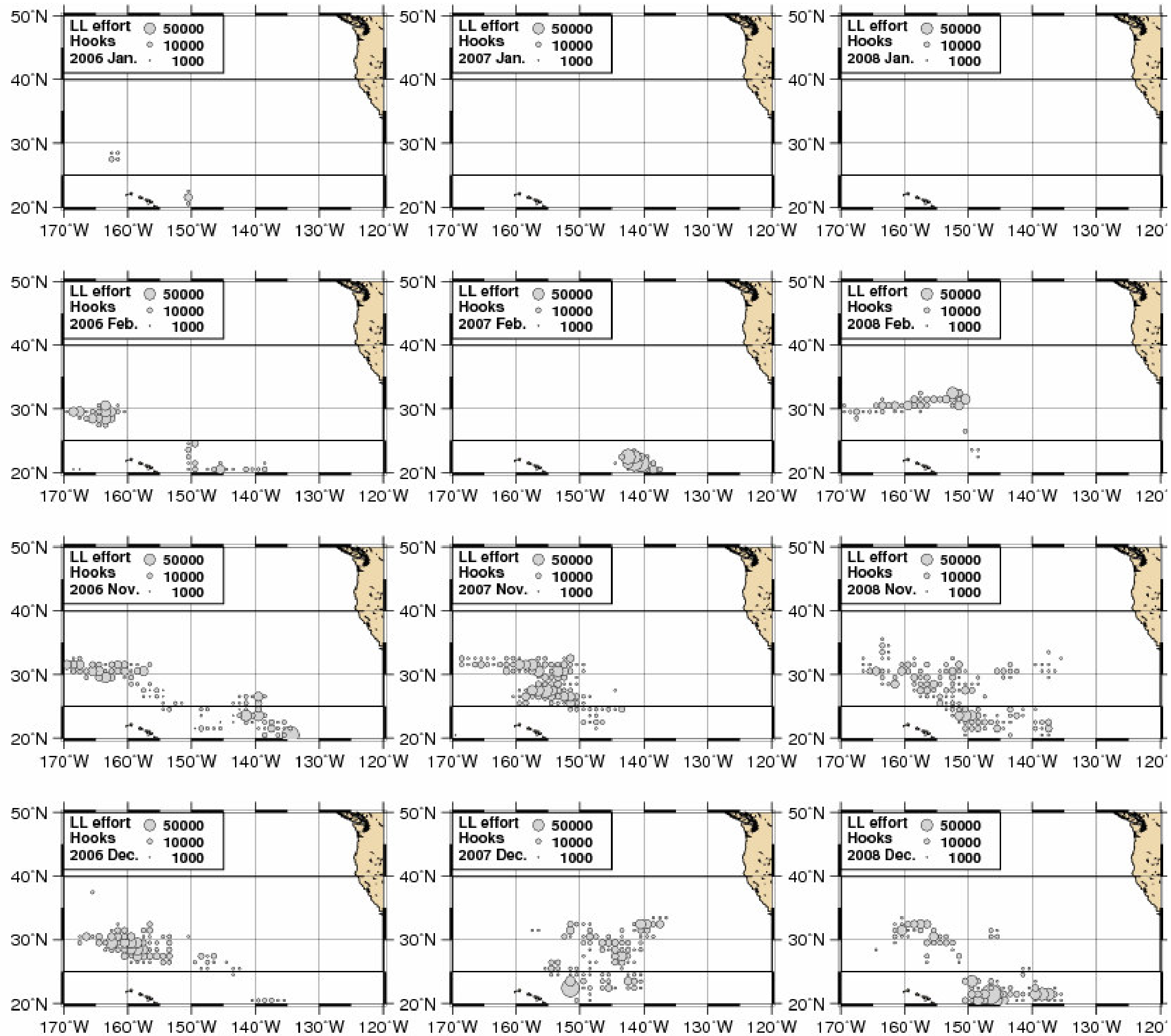

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