Which Salmon are using the Bering Sea as their Feeding Area? (Japanese National Overview of BASIS Research)

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Japanese high-seas salmon research in the North Pacific Ocean was initiated in 1952. Research gill-nets have been the standard gear used for the high-seas salmon studies (Takagi 1975). June to August was the most common time for these surveys (Ishida and Ogura 1992). Japanese research activity under BASIS began in 2002, and this research uses surface trawls to cover the high-seas waters of the central Bering Sea.

We expect the data from BASIS will result in new and extensive knowledge on the biology of salmon in the Bering Sea ecosystem. However, because the BASIS data is in the initial phase of collection and analysis, we will provide a retrospective analysis of the drift-net data from 1972–2000 for comparison with the newer surface trawl data. Of special interest is the comparison of distribution of species by age.

Mean catch-per-unit-effort (CPUE) of juvenile or immature sockeye salmon was relatively low in the Bering Sea in June; while, maturing sockeye were common and relatively abundant in June near Bristol Bay (Fig.1). Chum salmon of age 0.1 were rare in the Bering Sea in June. Older chum salmon (age 0.4) were usually more abundant in the northern Bering Sea, even in June (Fig. 2). Apparently, older chum salmon enter the cool Bering Sea earlier than younger chum. Maturing pink salmon were more abundant in the western part of the North Pacific than in the

Fig. 1. Mean CPUE distribution (research gillnet) of sockeye salmon calculated by age group, by month (2°×5°mesh, average from 1972 to 2002) in the Bering Sea and adjacent waters. Left shows for age X.1 age sockeye salmon. Right shows X.2 age sockeye salmon in June.

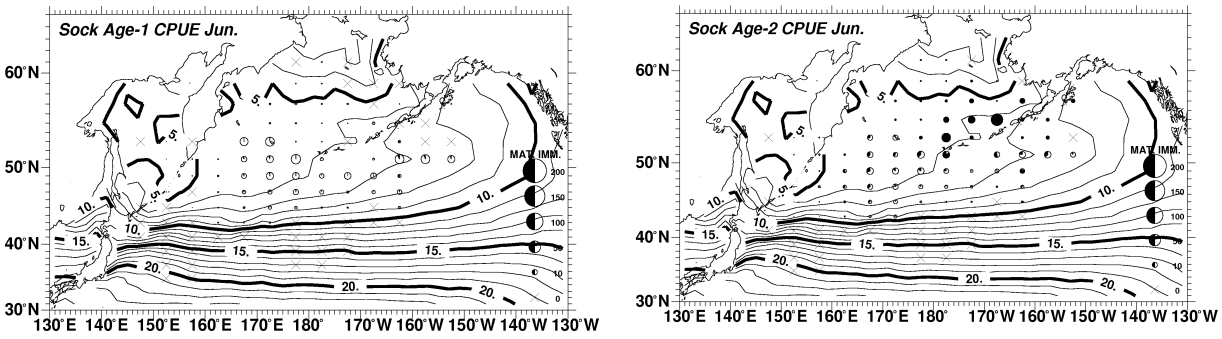
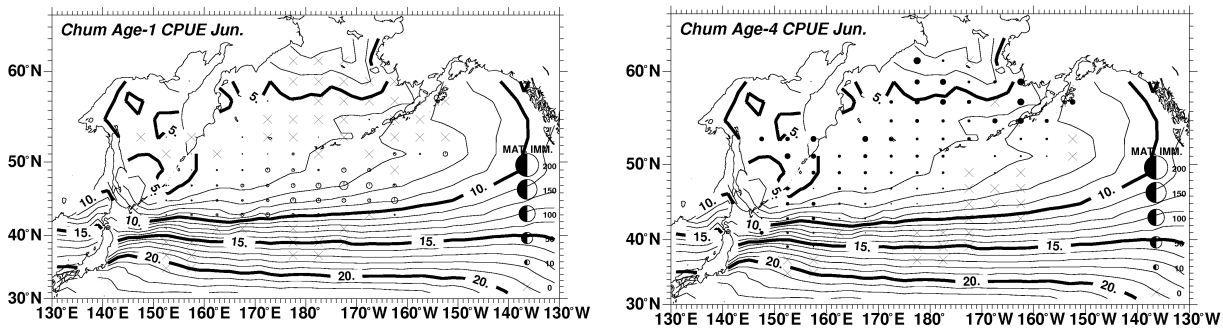


Fig. 2. Mean CPUE distribution (research gillnet) of chum salmon calculated by age group, by month (2°×5°mesh, average from 1972 to 2002) in the Bering Sea and adjacent waters. Left shows for age 0.1 chum salmon, right shows 0.4 age chum salmon.



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Bering Sea (Fig. 3). Although maturing pink salmon of eastern Kamchatka and western Alaska stocks appear in the Bering Sea in June, they must return to their natal rivers by August. Coho salmon were relatively rare in the Bering Sea in each month, but abundant in the northern North Pacific Ocean (Fig.4). It seems that the Bering Sea is not an important feeding area for most stocks of coho salmon. Although a few chinook salmon were captured during the surveys, they occurred widely in the Bering Sea and northern North Pacific from June to August (Fig. 5). Although many maturing pink salmon feed in the Bering Sea, their feeding period is shorter than other Pacific salmon which have longer ocean life. Thus, it appears that the Bering Sea is an especially important feeding area for salmon which have long ocean life periods (e.g. chum, sockeye and chinook).

Fig. 3. Mean CPUE distribution (research gillnet) of pink salmon calculated by age group, by month in the Bering Sea and adjacent waters in June (left) and July (right).

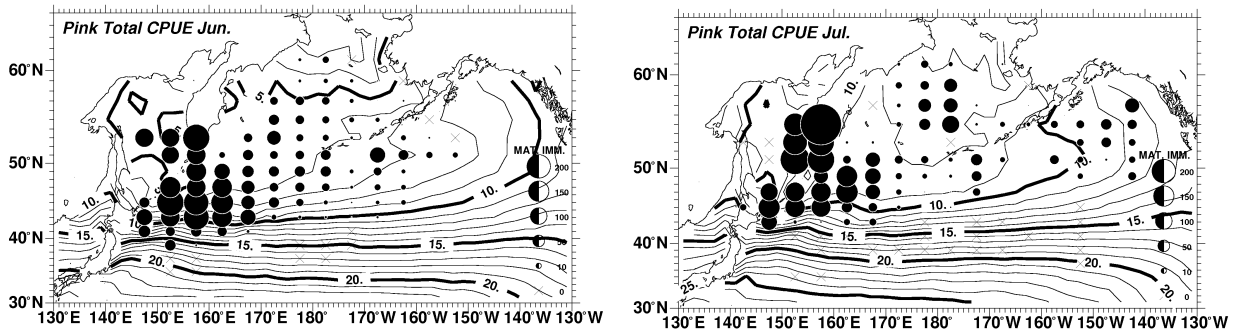


Fig. 4. Mean CPUE distribution (research gillnet) of coho salmon in the Bering Sea and adjacent waters in July.

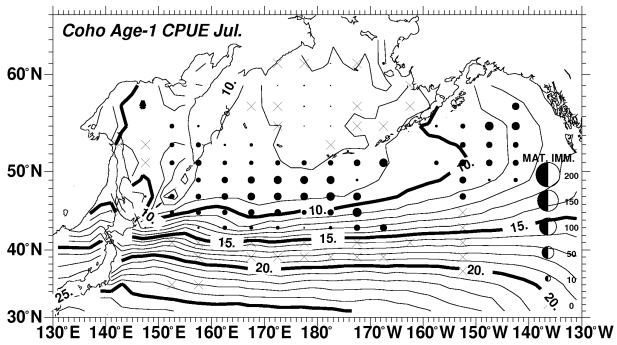
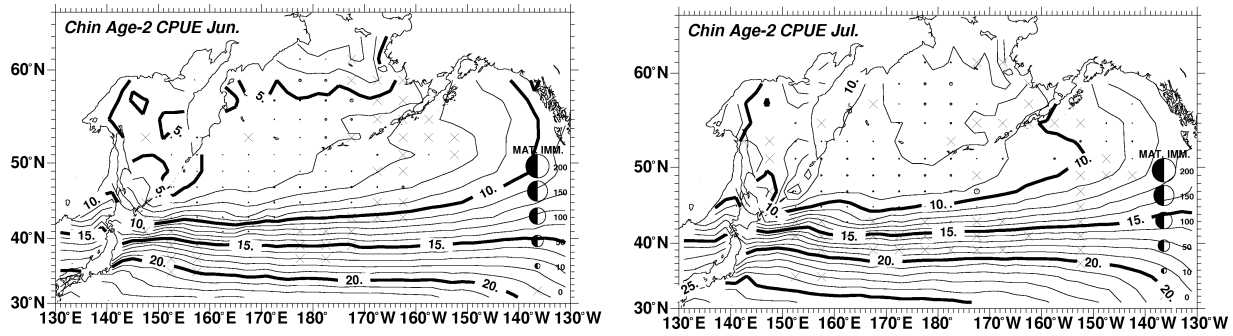


Fig. 5. Mean CPUE distribution (research gillnet) of X.2 age chinook salmon calculated by month (2°×5°mesh, average from 1972 to 2002) in the Bering Sea and adjacent waters in June and July.



Two distinct patterns are apparent in CPUE of salmon (Fig. 6). The CPUE of pink and chinook salmon increased after 1988 and has remained at this level to present. Whereas, the CPUE of sockeye and chum salmon was low prior to 1977, peaked in 1980, declined until 1989, and then increased until the present. The CPUE trends of sockeye and chum salmon seem to coincide with fluctuations in Bering Sea, sea surface temperature (SST) where higher densities of sockeye and chum salmon in the Bering Sea occur during warm periods and lower densities occur during cool periods (Fig. 7).

We have concentrated our research on distribution and biology of pacific salmon during the season from late spring to late summer. We definitely need to add winter and early spring surveys to the BASIS program.

Fig. 6. Time series of mean CPUE (research gillnet) of four Pacific salmon species in the Bering Sea.

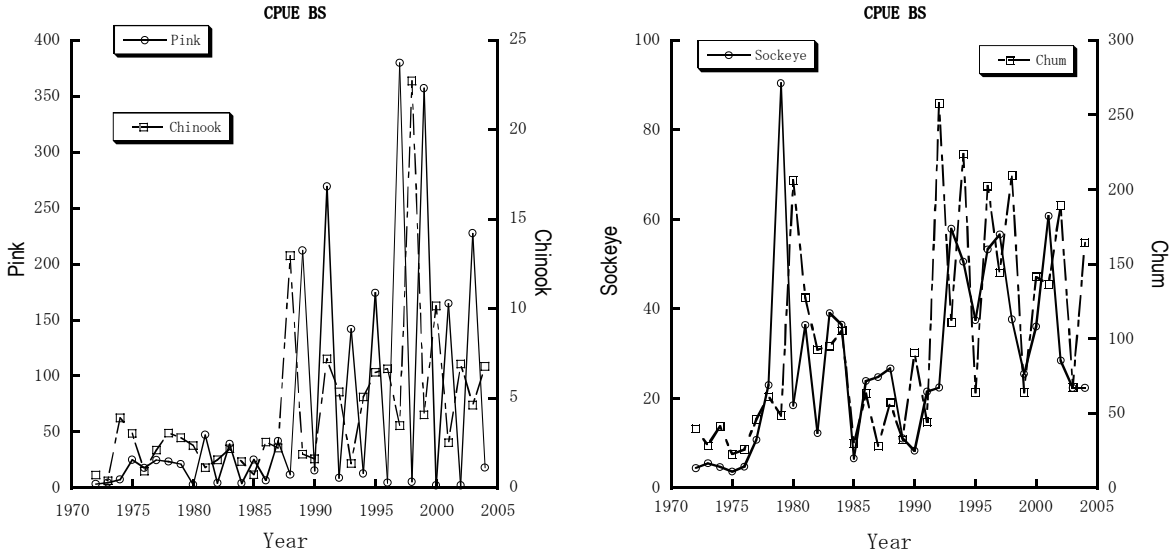
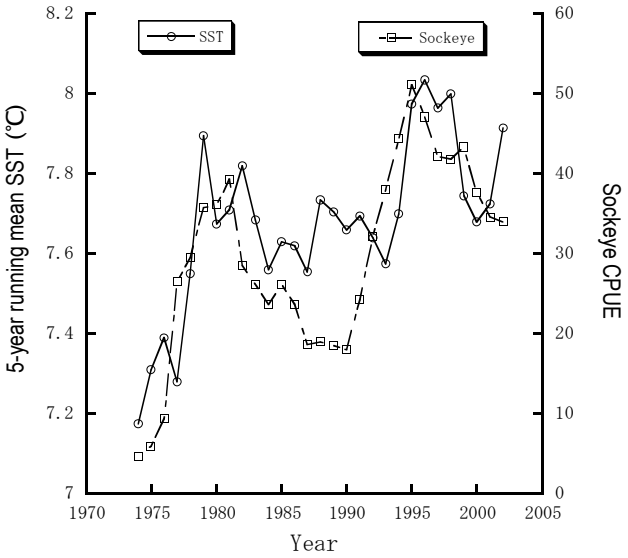


Fig. 7. Time series of five year running mean SST and sockeye salmon CPUE in the Bering Sea.



REFERENCES

Takagi, K. 1975. A non-selective salmon gillnet for research operations. Int. North Pac. Fish. Comm. Bull. No. 32: 13–41.

Ishida, Y., and M. Ogura. 1992. Review of high-sea salmon research by the national research institute of far seas fisheries. Proceedings of International Workshop on Future Salmon Research in the North Pacific Ocean. pp. 23–30.