

higher natural sablefish bycatch. In 1995 and 1996 (Figures 5 and 6) hauls targeting sablefish occurred between hauls for either northern rockfish or Pacific ocean perch, both of which have relatively low natural bycatch rates of sablefish. Hauls such as these indicate topping-off behavior in which sablefish are specifically sought out within the MRB guidelines.

Employing GIS is a useful addition to the temporal analysis. This is especially true because topping-off behavior is ultimately driven by the intentions of the vessel skipper and impossible to identify for certain from the data. Often hauls which temporally appeared to indicate topping-off behavior were questionable when viewed in a GIS context. For example, the high sablefish hauls by one vessel appeared to exhibit topping-off behavior because they occurred among hauls for northern rockfish. When displayed on a map of haul locations to the south of Kodiak Is-

land, the hauls for sablefish were in close proximity to the hauls for rockfish (Figure 7). The movement of the vessel between the rockfish and sablefish hauls occurred generally along the 2 lines in Figure 7 and represented a distance of only 10–15 km. It is possible that topping off was intended since the rockfish catch locations tend to be concentrated; however, the close proximity between rockfish and sablefish hauls probably indicates that the sablefish were taken in the further pursuit of rockfish. Note that the sablefish hauls at depth are generally made by longline gear. A similar case was found in vessels fishing off of Yakutat Bay for rockfish (Figure 8). Temporally the hauls seemed to indicate topping-off behavior, but the sablefish hauls occurred along a shallow trench with vessel movement of approximately 30 km maximum between hauls. There is a gradation from hauls which are mainly rockfish at the deeper haul locations to hauls which

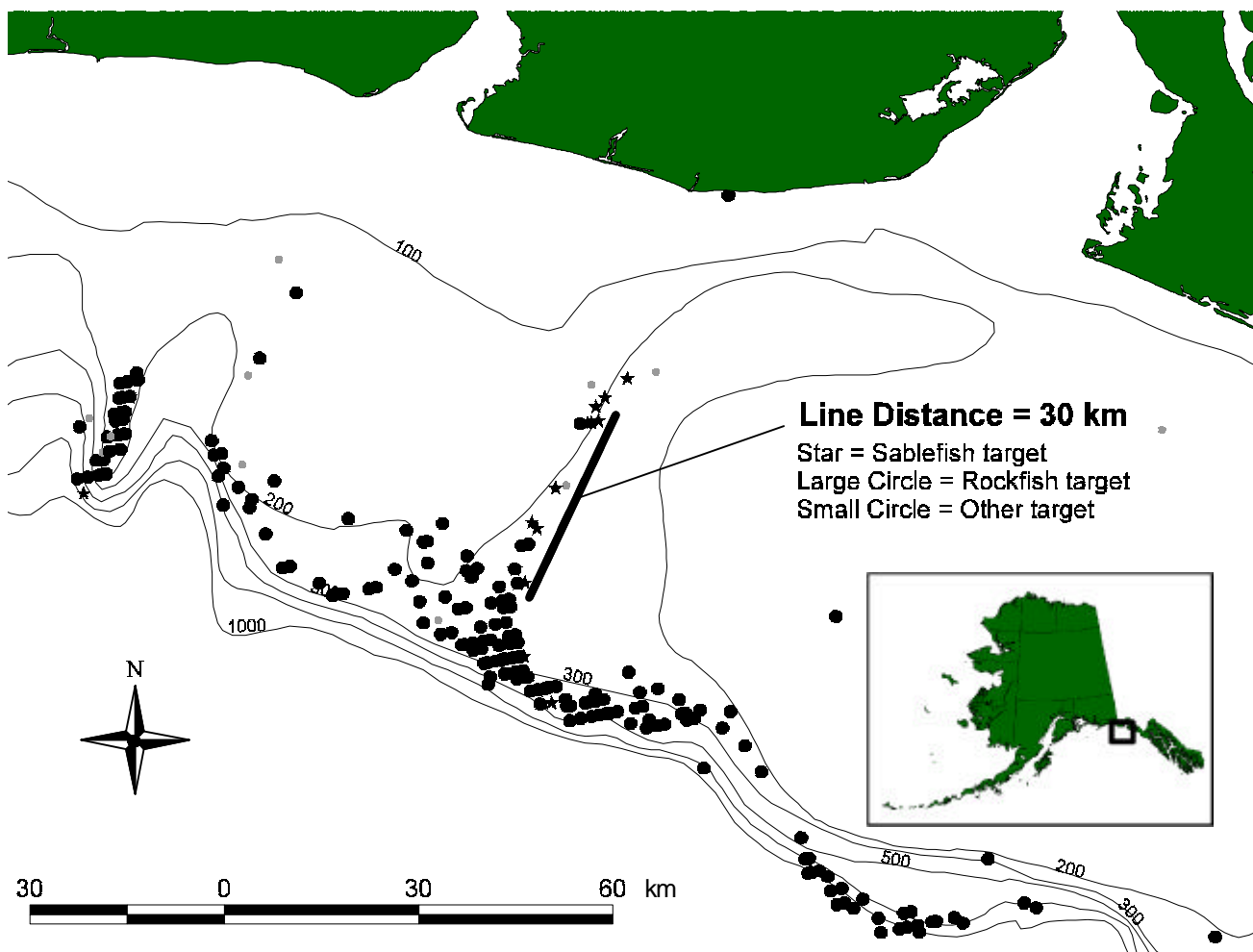


Figure 8. Location of all observed trawl hauls near Yakutat Bay during the years 1994–1996. Stars indicate hauls with sablefish as the dominant catch, and large circles denote hauls with rockfish as the dominant catch.

are mostly sablefish at more northerly locations. The targeting intention is difficult to verify in such hauls since it is possible more sablefish bycatch was encountered as the search area for rockfish expanded.

Topping off is more evident in other cases, and the spatial analysis confirmed the temporal analysis. Haul locations from the central Gulf of Alaska south of the Kenai Peninsula for 1994–1996 are presented in Figure 9. The sablefish haul locations from longline fishing are apparent along the deeper waters of the steep continental slope. An area of intense rockfish fishing is indicated at approximately the middle of the map at the edge of the continental slope (large circles on eastern edge). An analysis of individual vessel hauls revealed that several vessels engaged in what is almost certainly topping-off behavior: fishing for rockfish within the fairly concentrated area described above

and then moving a distance of 50–60 km or more. After a few tows for sablefish in the new area, the vessels returned to the concentrated rockfish area. Several vessels alternated between the 2 areas several times during the open rockfish period. Interestingly, the area of high sablefish catches accounted for approximately 7% of the observed sablefish taken by bottom trawl gear in 1995 and approximately 13% in 1996.

In another example of topping-off behavior, the sequential graph of hauls in July 1996 (Figure 6) indicated that the vessel fished for Pacific ocean perch then made several sequential sablefish hauls. The vessel then resumed Pacific ocean perch fishing before switching to northern rockfish. Plots of vessel hauls indicated a marked change in fishing locations when the target switched from rockfish to sablefish and back. Without identifying specific locations, the vessel be-

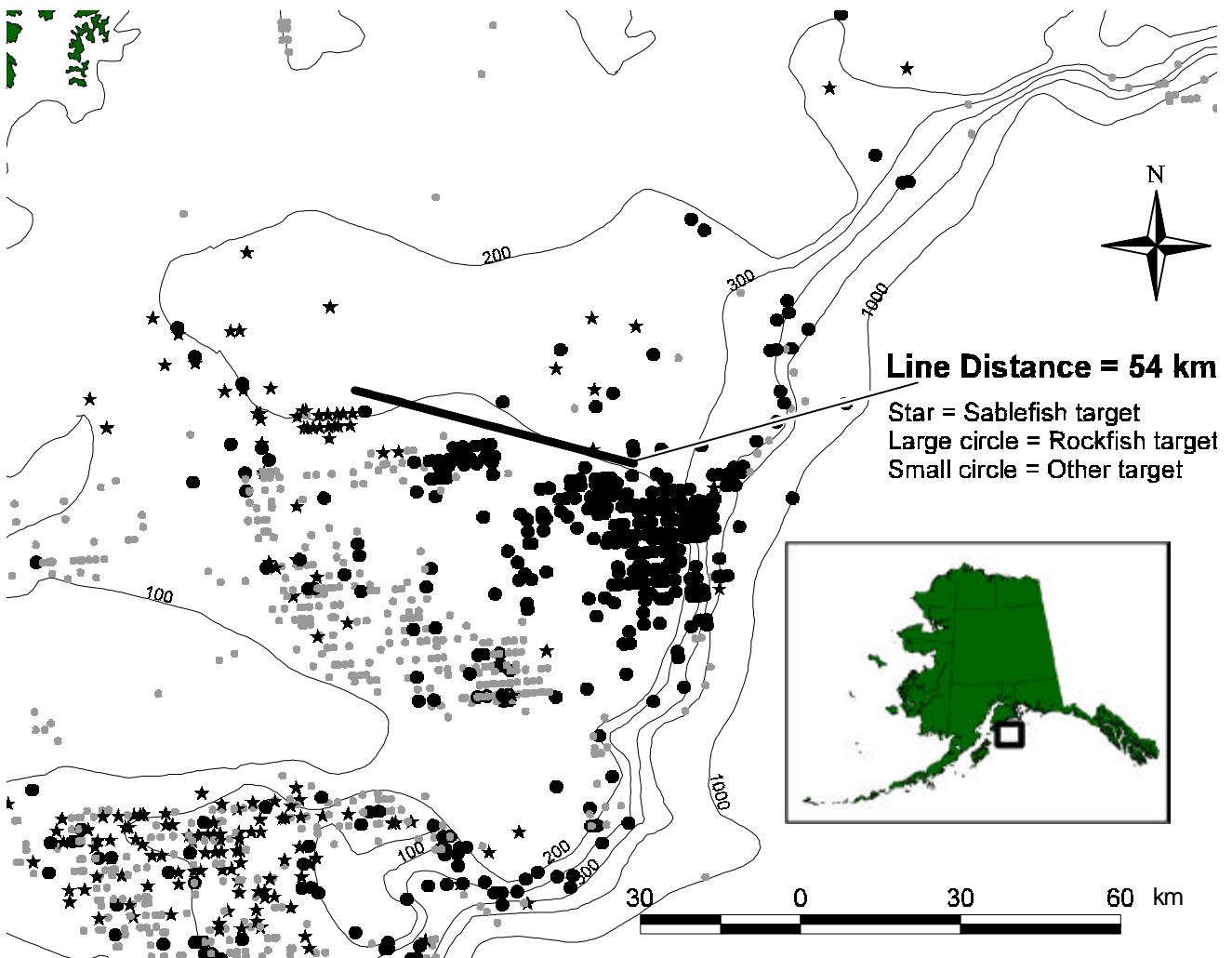


Figure 9. Location of all observed trawl hauls to the south of the Kenai Peninsula during the years 1994–1996. Stars indicate hauls with sablefish as the dominant catch, and large circles denote hauls with rockfish as the dominant catch.