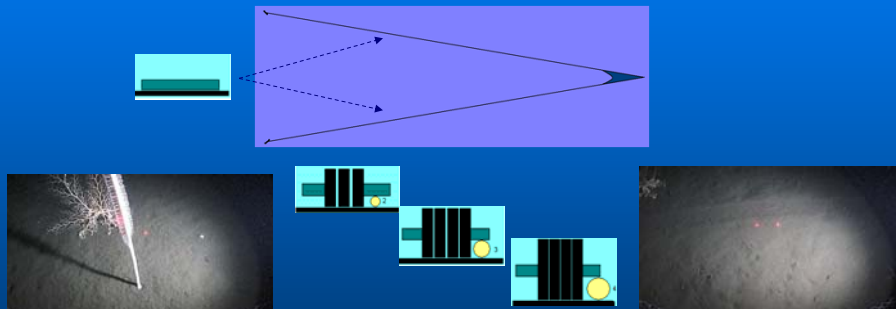


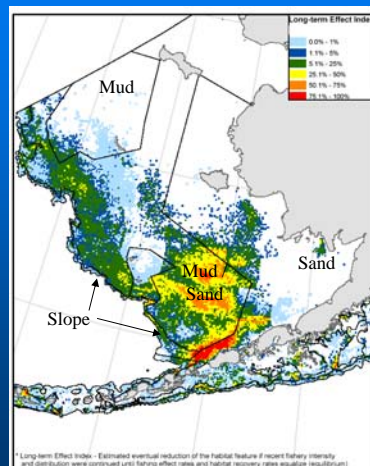
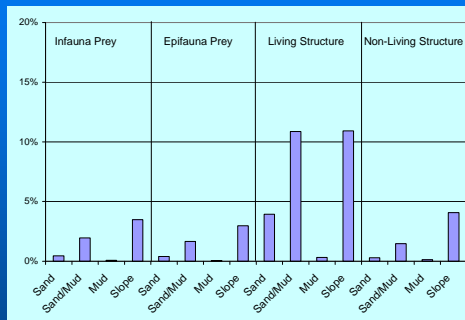
Raising trawl sweeps to protect seafloor animals: What configurations achieve effective clearance?



Cooperative Research – Alaska Fisheries Science Center, Conservation Engineering Project and Bering Sea bottom trawlers

Bering Sea Fishery Effect Distribution

EFH EIS Longterm Effect Index (1998-2002 fishery data)



Sand/Mud – Majority bottom trawl effects

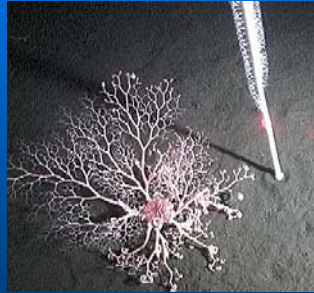
Slope – Majority pelagic trawl effects

Major living structure animals of the eastern Bering Sea shelf



Ascidian (*Halocynthia*)

Sea Whip (*Halipterus*)



Basketstar (*Gorgonocephalus*)



Ascidian (*Styela*)

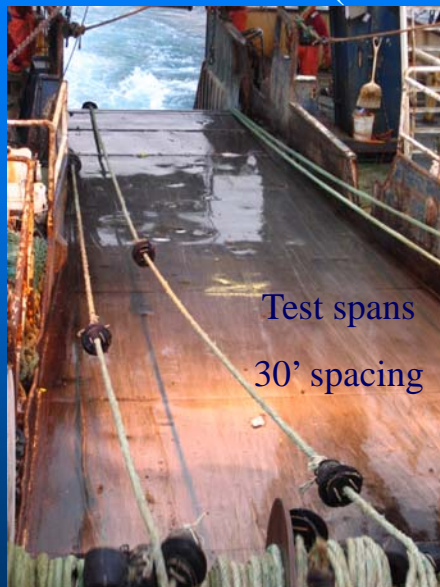


Ascidian (*Botryllus*)

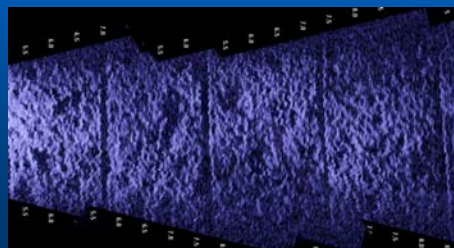
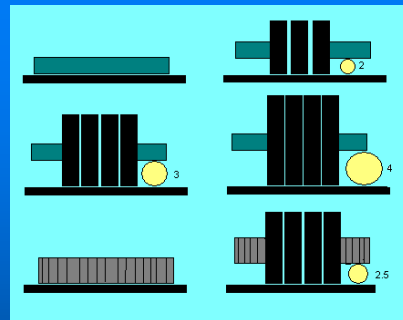


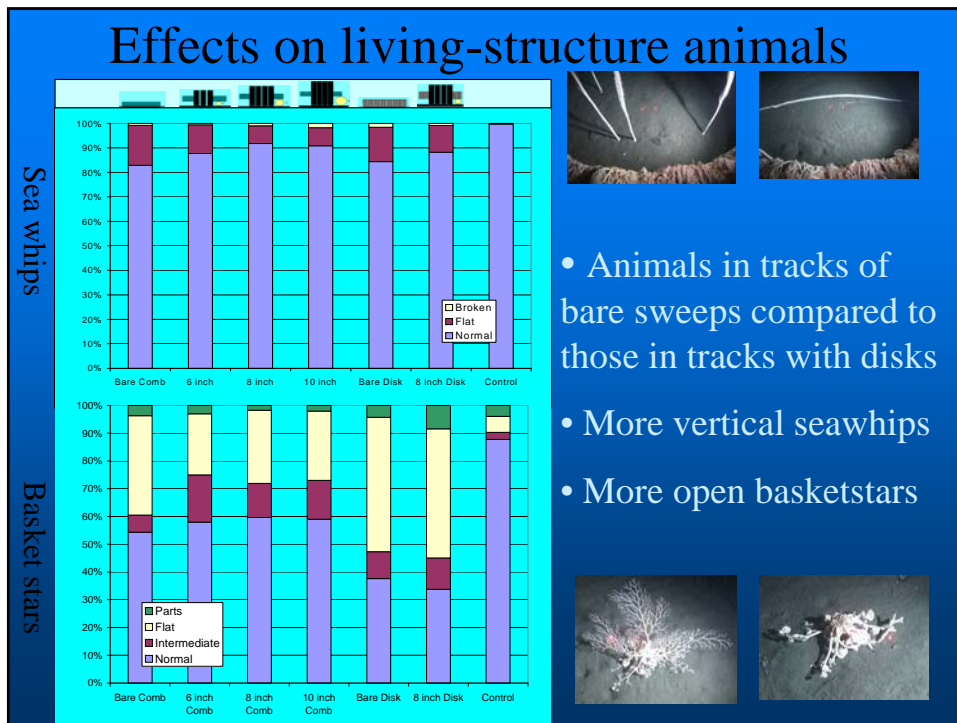
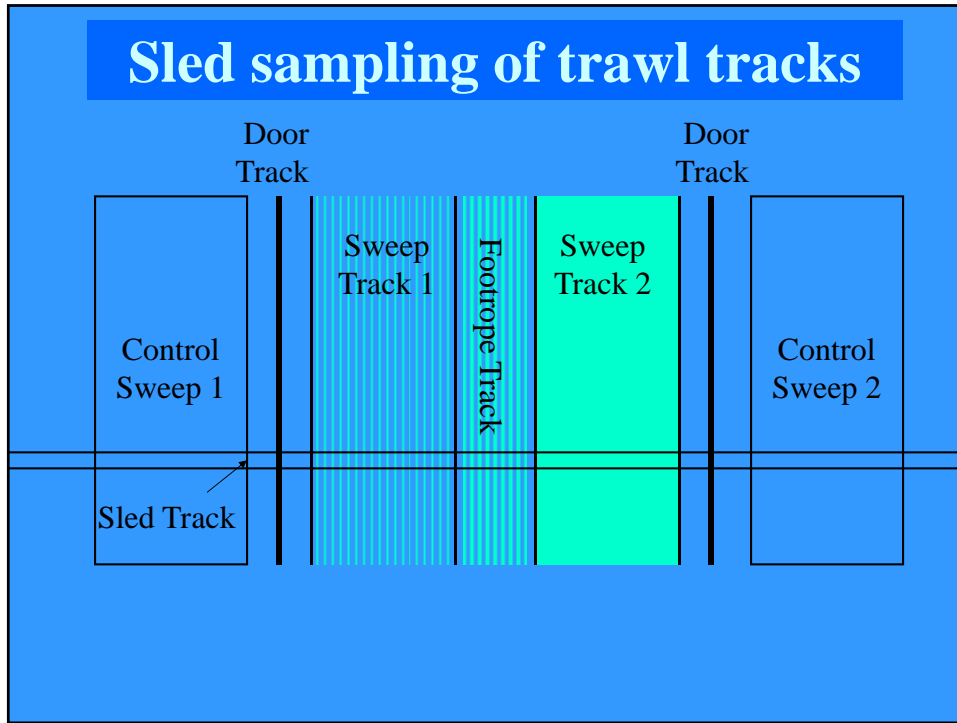
Sponge (*Halichondria*)

Disks Clusters (or Bobbins) on Sweeps

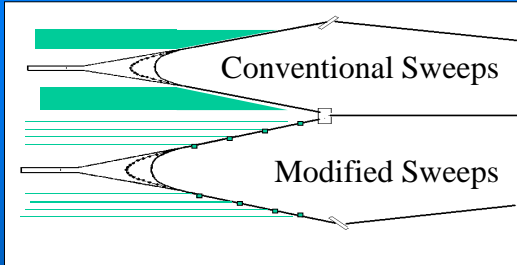


Test spans
30' spacing

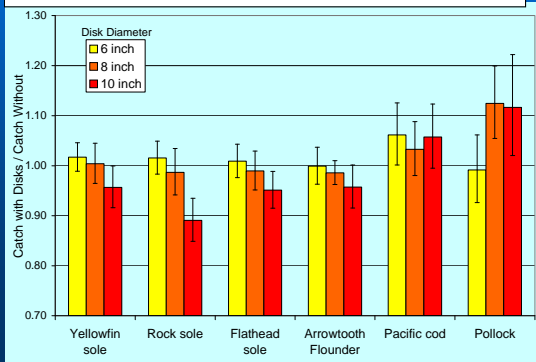




Effects on Fish Capture



- Tested with twin trawls
- No detectable effects with 6 or 8 inch disks (2 or 3 inch clearance)
- Small (5 – 10%) with 10 inch disks (4 inch clearance)



What configurations achieve effective clearance?

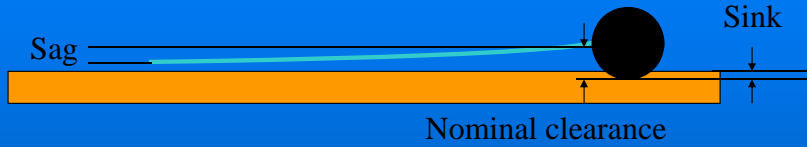


Could similar clearances be achieved with wider spacing? (Tests on 30')

Developed clearance measurement devices based on tilt sensors.

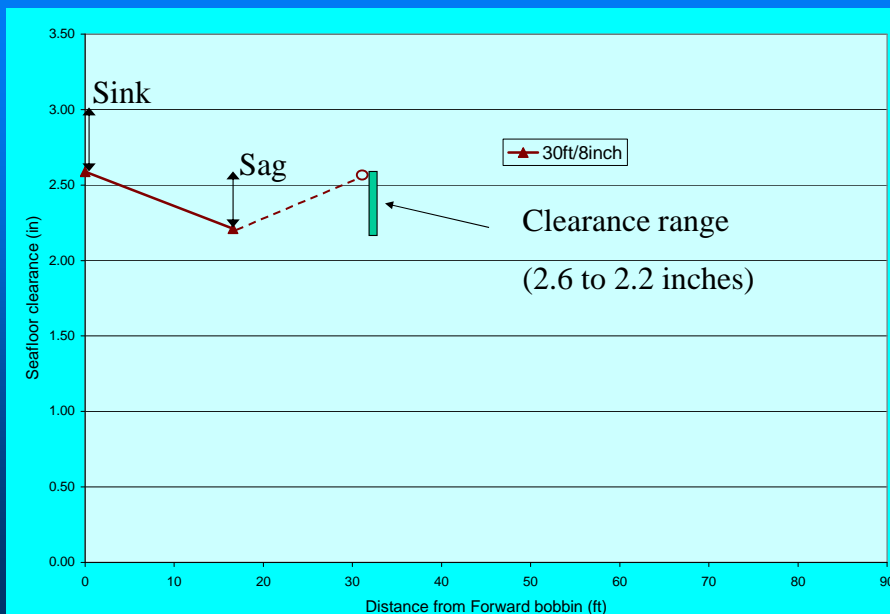


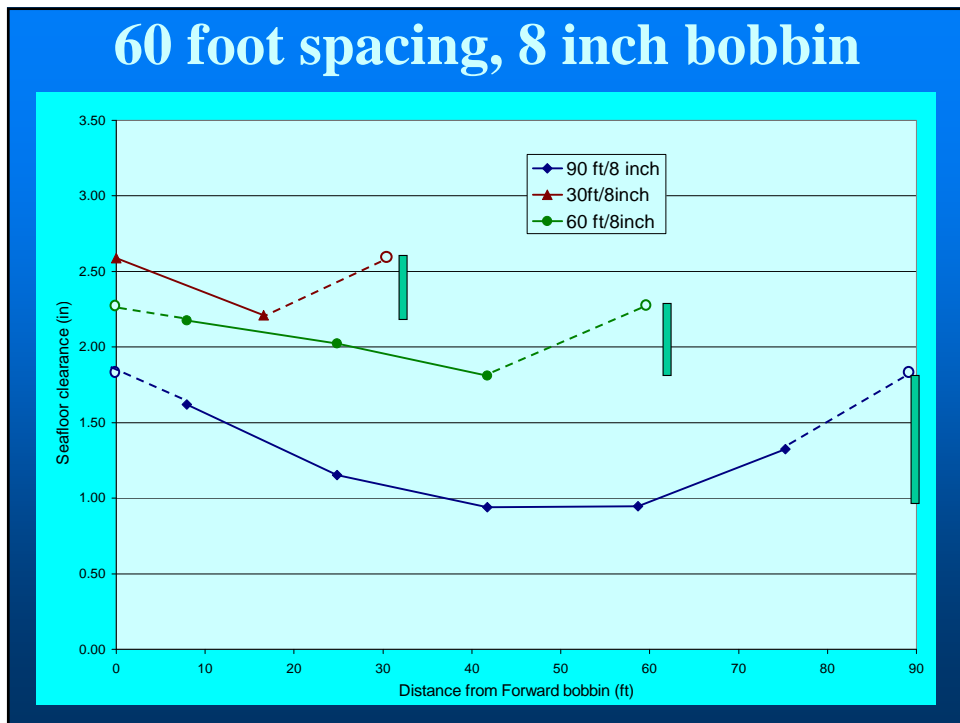
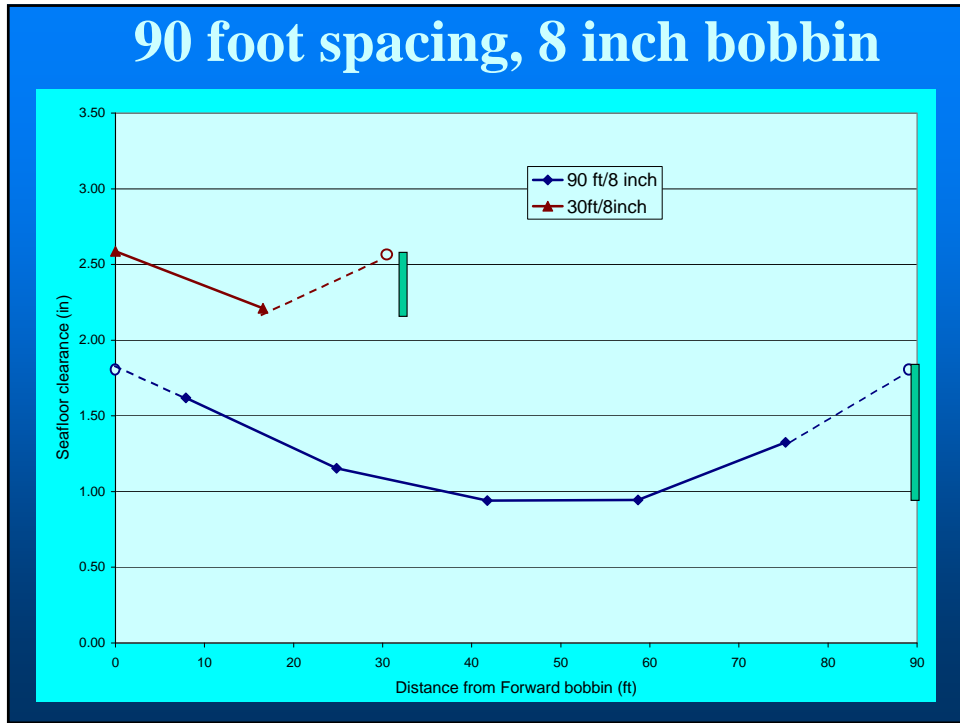
Spacing effects on sweep clearance

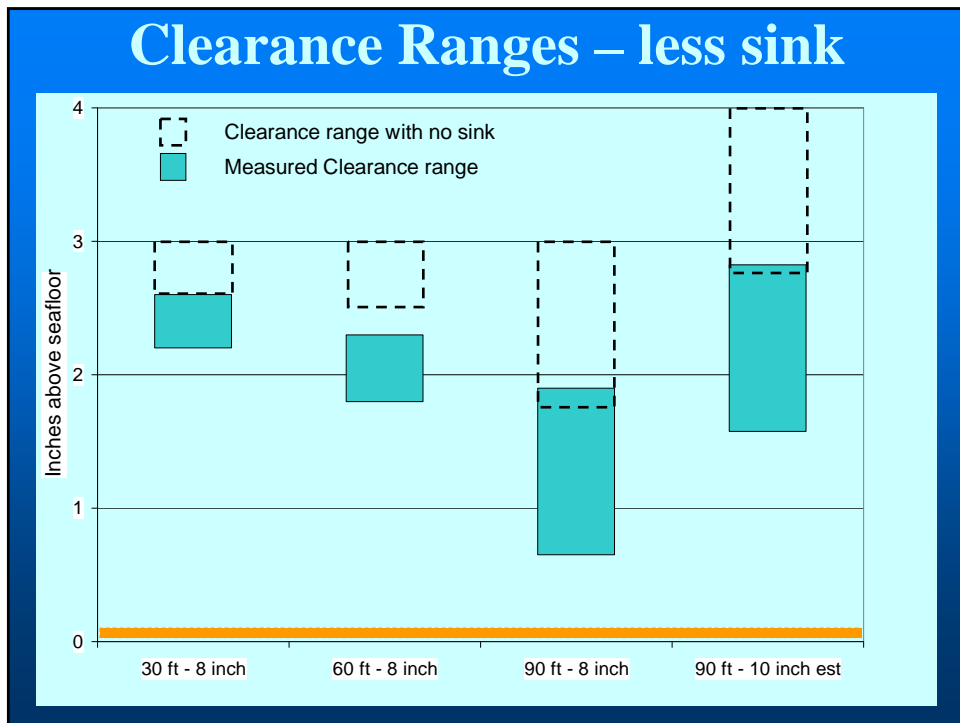
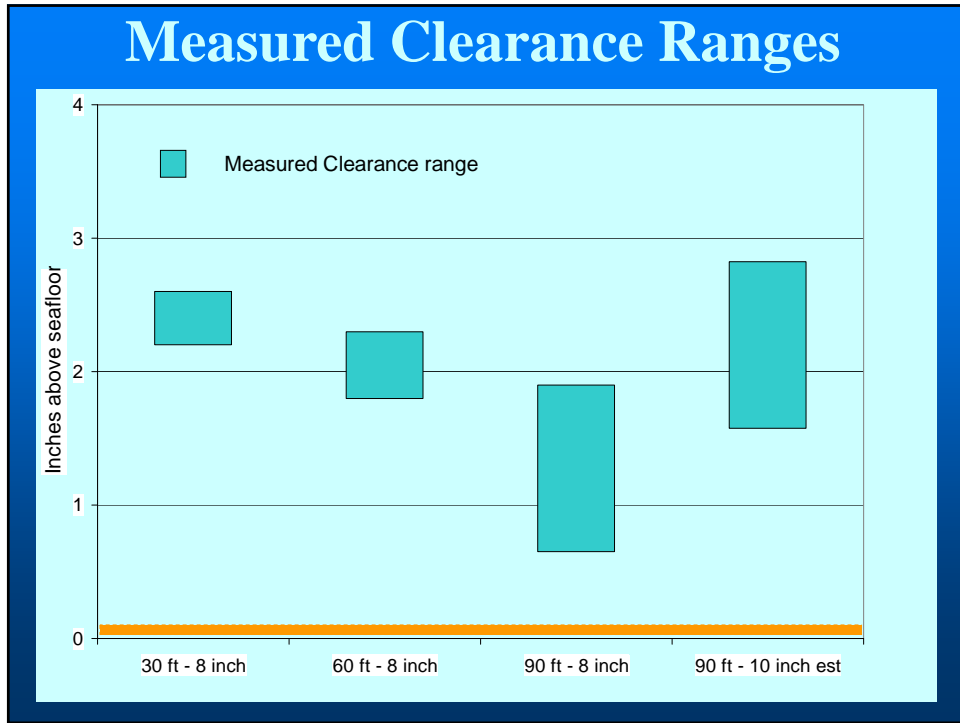


- Sag depends on span, rope weight and tension
- Sink depends on surface area, weight supported and sediment composition
 - Tests were done on relatively soft sediments– Maximized sink values (and exaggerated differences in sink values)

Clearance range with 30 foot spacing







Conclusions

- 60 ft spacing similar clearance to 30 foot – especially on firmer sediments
- 90 foot spacing with 10 inch bobbins - wider range, similar or better average
- Other potential improvements
 - Lighter Combination rope (less sag)
 - More bobbin surface area (less sink)