ILLUSTRATIONS

for

A DISCUSSION OF ABUNDANCE TRENDS AND MANAGEMENT OF EASTERN BERING SEA KING AND TANNER CRABS

Presented by

D. L. Alverson*

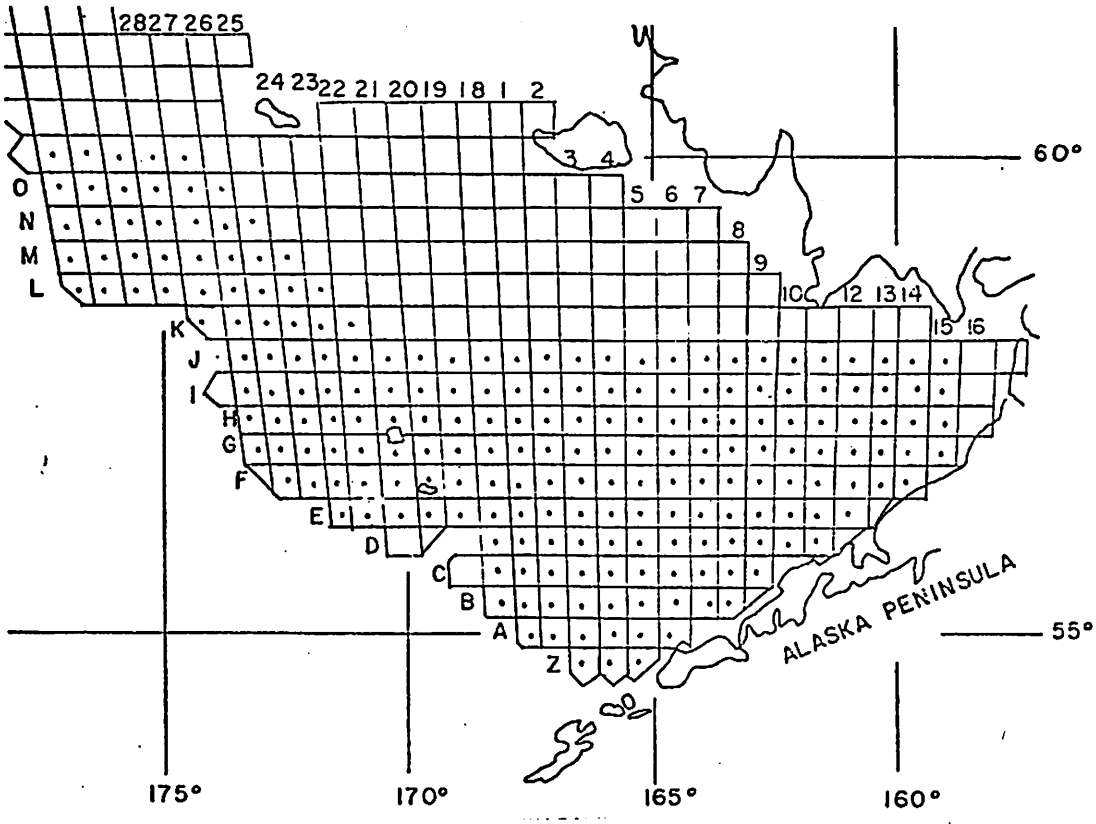
to the

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

February 22, 1979
Anchorage, Alaska

*Center Director, Northwest and Alaska Fisheries Center, 2725 Montlake Boulevard East, Seattle, Washington 98112

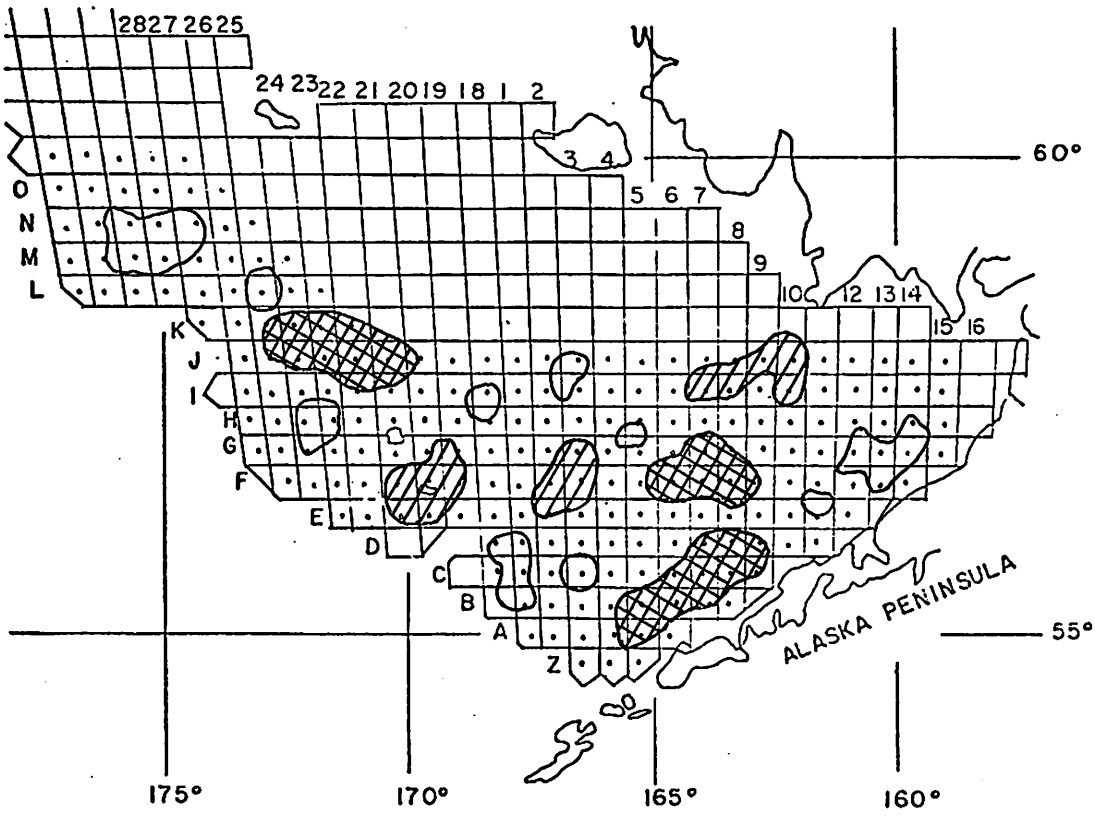
SURVEY LIMITATIONS—SYSTEMATIC SURVEY GRID



SURVEY LIMITATIONS

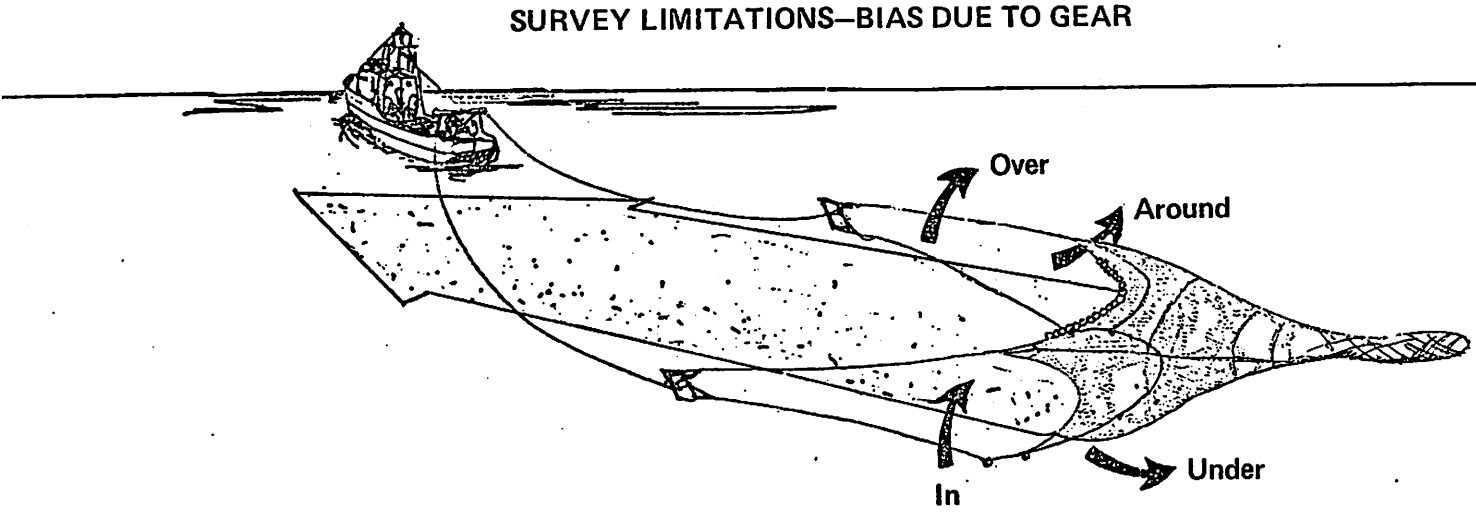
1. Sampling error
2. Bias due to survey gear
3. Bias due to environmental/behavioral changes

SURVEY LIMITATIONS—SAMPLING ERROR



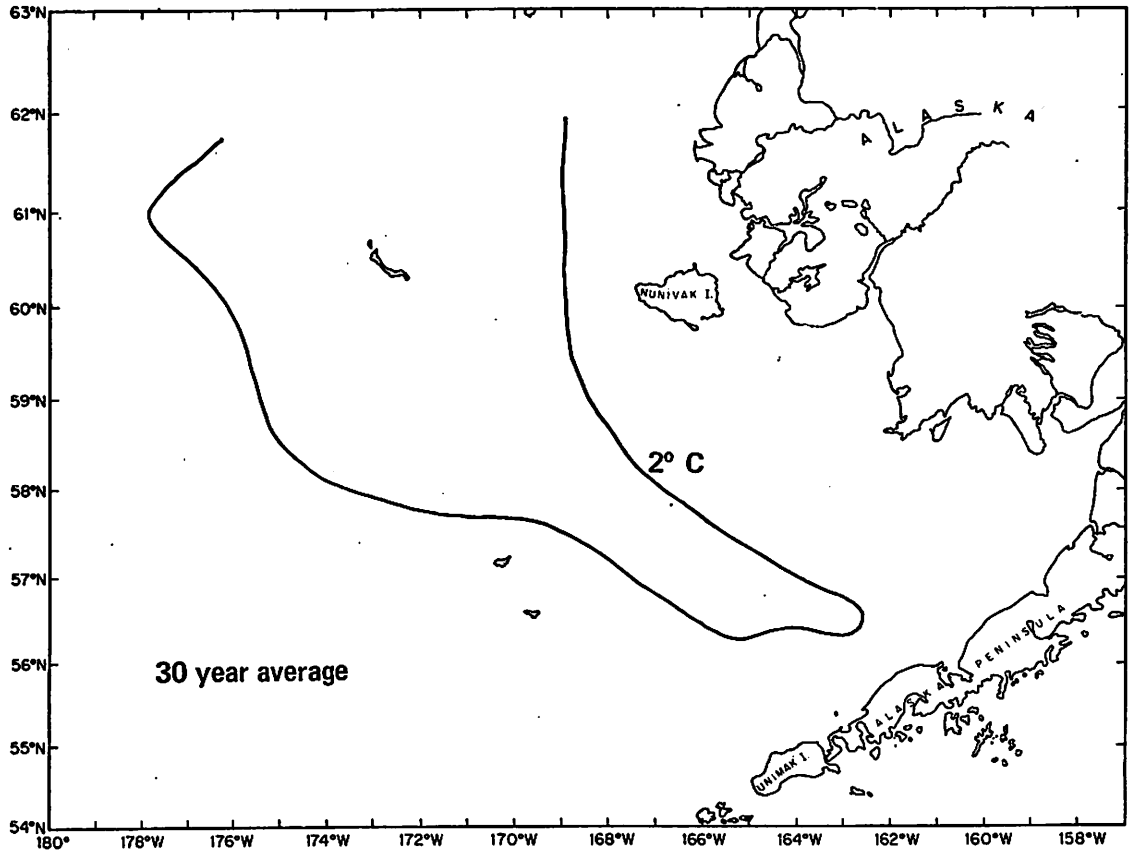
1. Clumped crab distribution sampled with systematic grid survey.
2. Assumption: large and small catches balance out to give reasonable population estimate.
3. Estimate is subject to some variation.
4. Variation can be reduced by more effort, but at an increased cost.

SURVEY LIMITATIONS—BIAS DUE TO GEAR

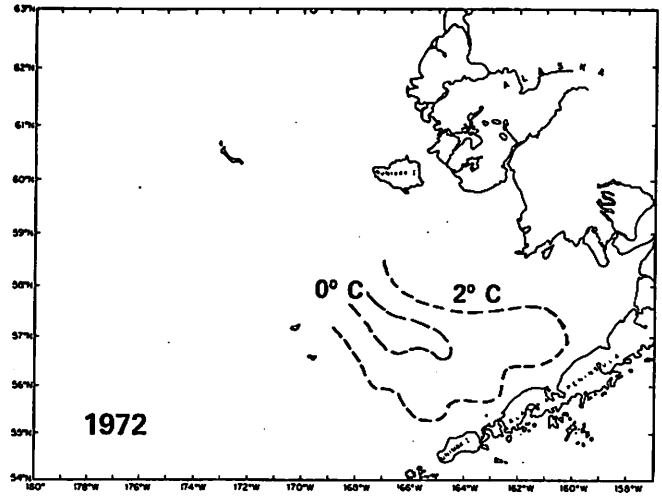


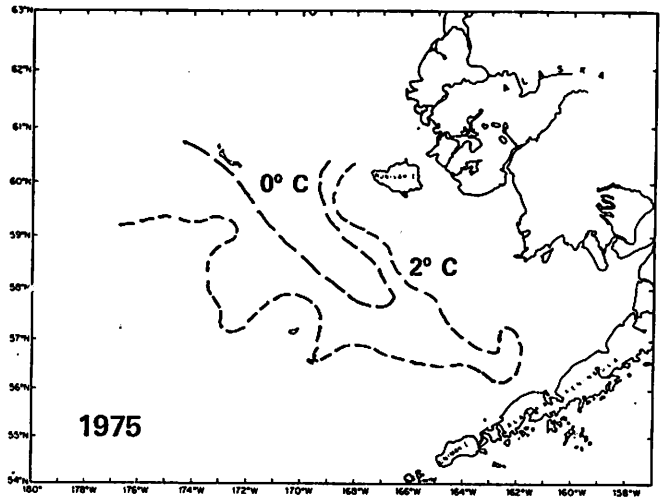
1. Avoidance of trawl.
2. Herding by trawl.

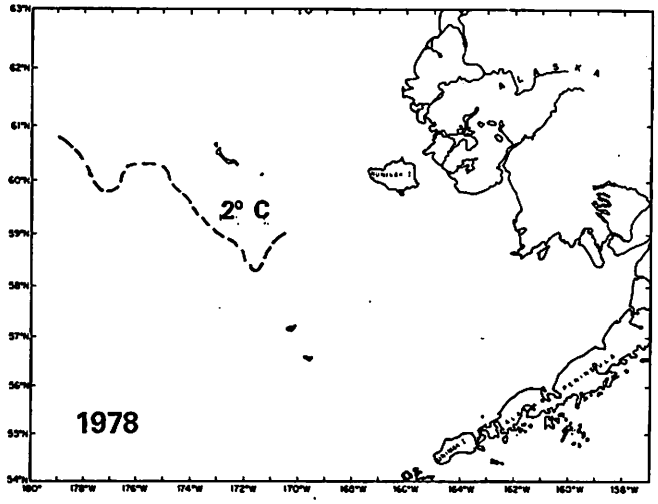
SURVEY LIMITATIONS–ENVIRONMENTAL/BEHAVIORAL CHANGES



1. Average 2° C bottom temperature contour.

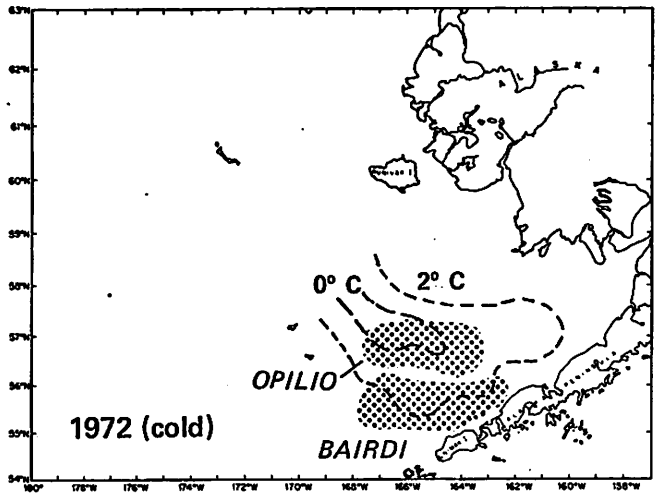


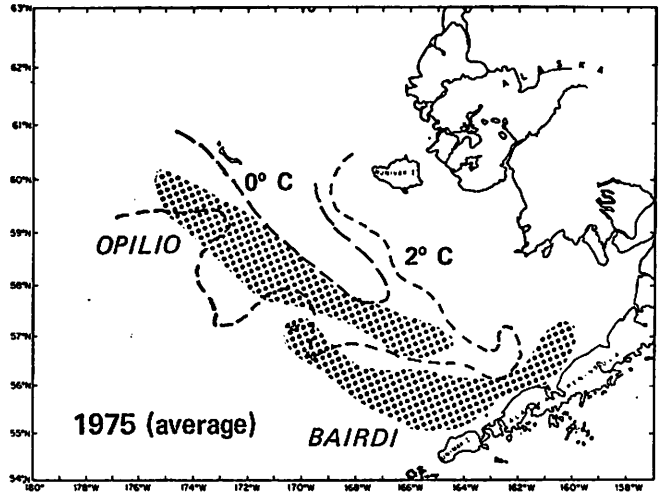


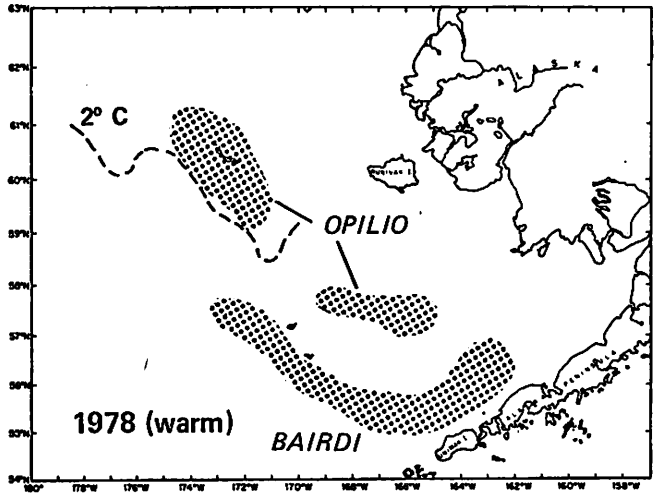


SURVEY LIMITATIONS–ENVIRONMENTAL AND BEHAVIORAL CHANGES

1. Bottom temperature is variable annually and seasonally.
2. Temperature changes may effect the behavior and distribution of crabs.

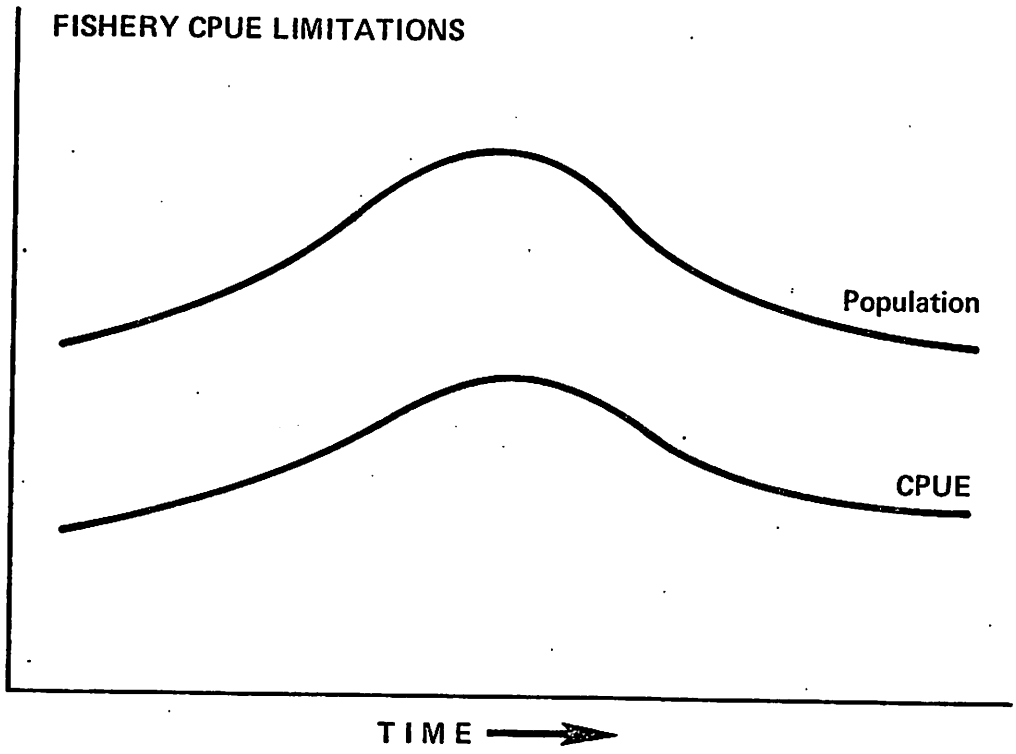




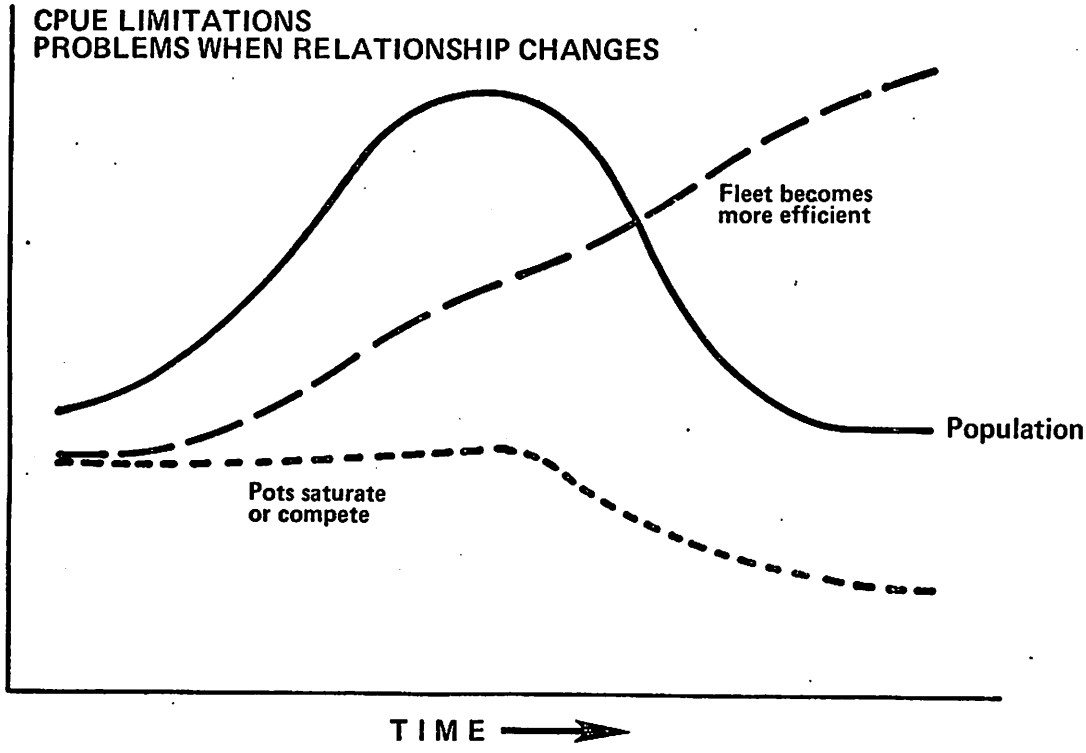


SURVEY LIMITATIONS–ENVIRONMENTAL AND BEHAVIORAL CHANGES

1. Temperature effects tanner crab concentration.
2. Surveys at the same time of year may encounter different conditions.



1. Assumption: a constant relationship between CPUE and population.

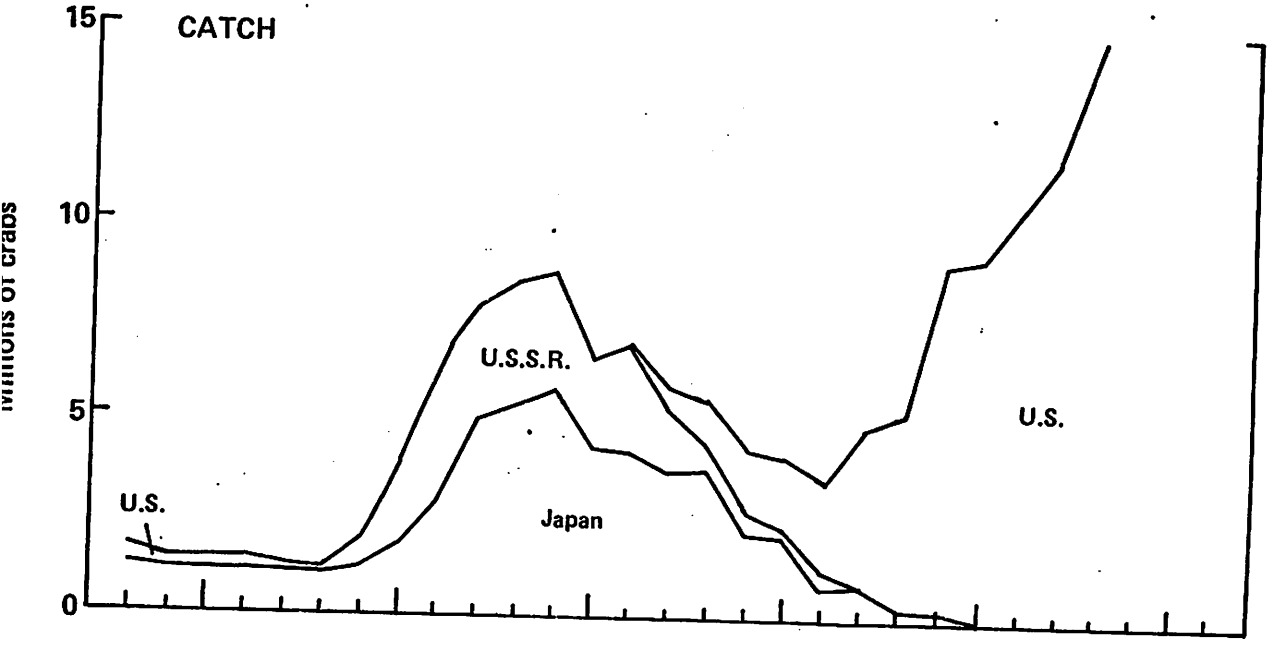


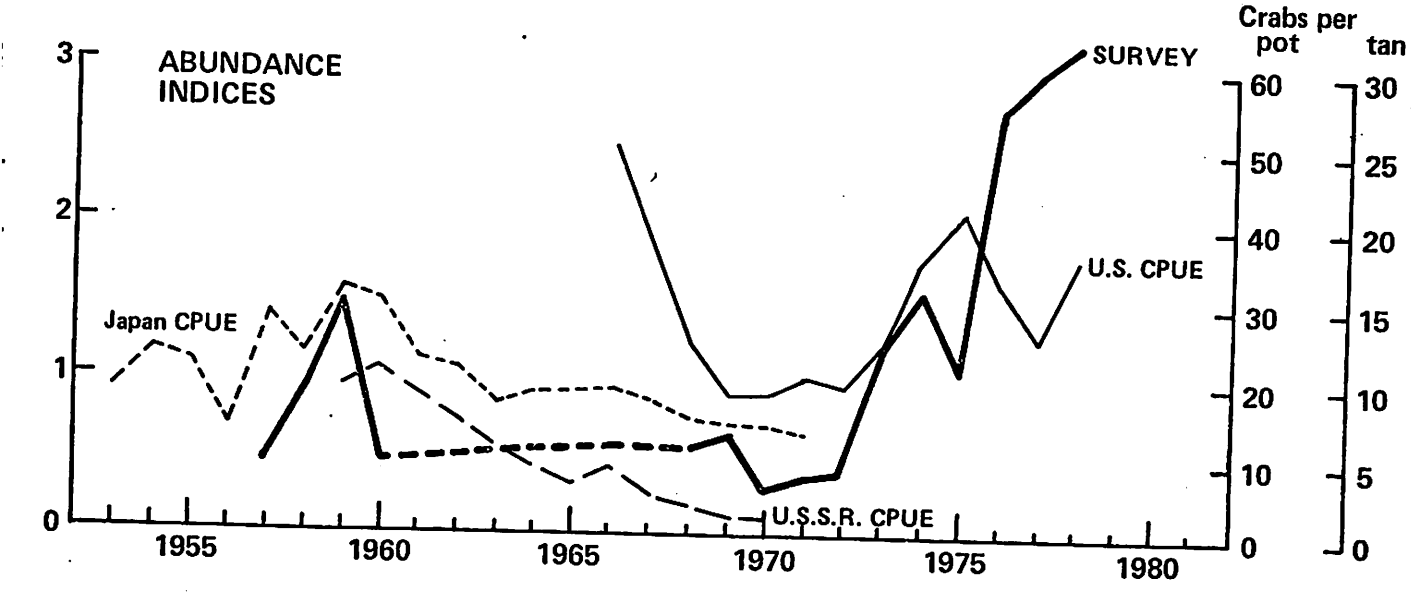
CPUE LIMITATIONS

Relationship between CPUE and population can change with changes in:

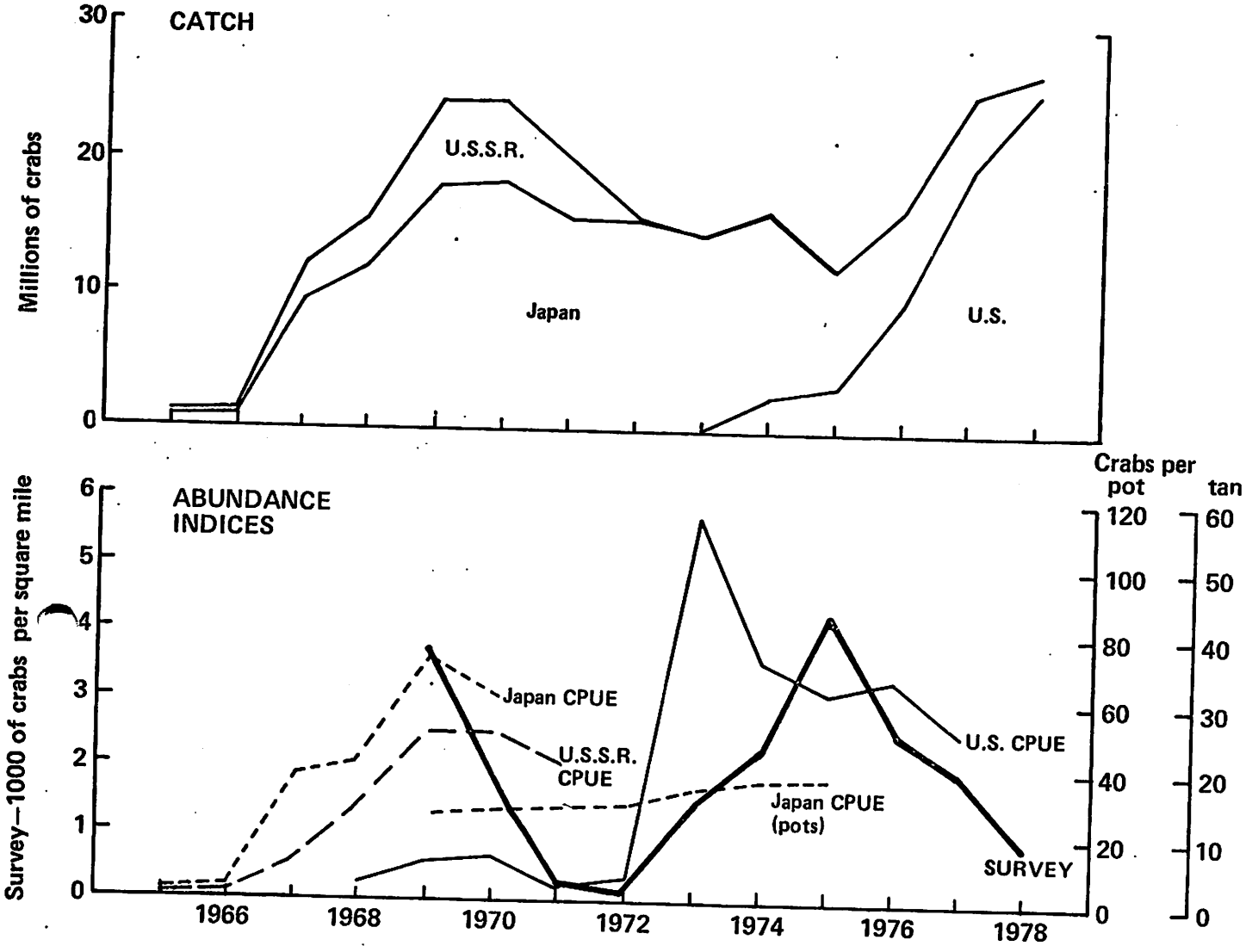
1. Skipper experience
2. Pot size
3. Bait type
4. Soak time
5. Amount of effort
6. Population abundance

RED KING CRAB



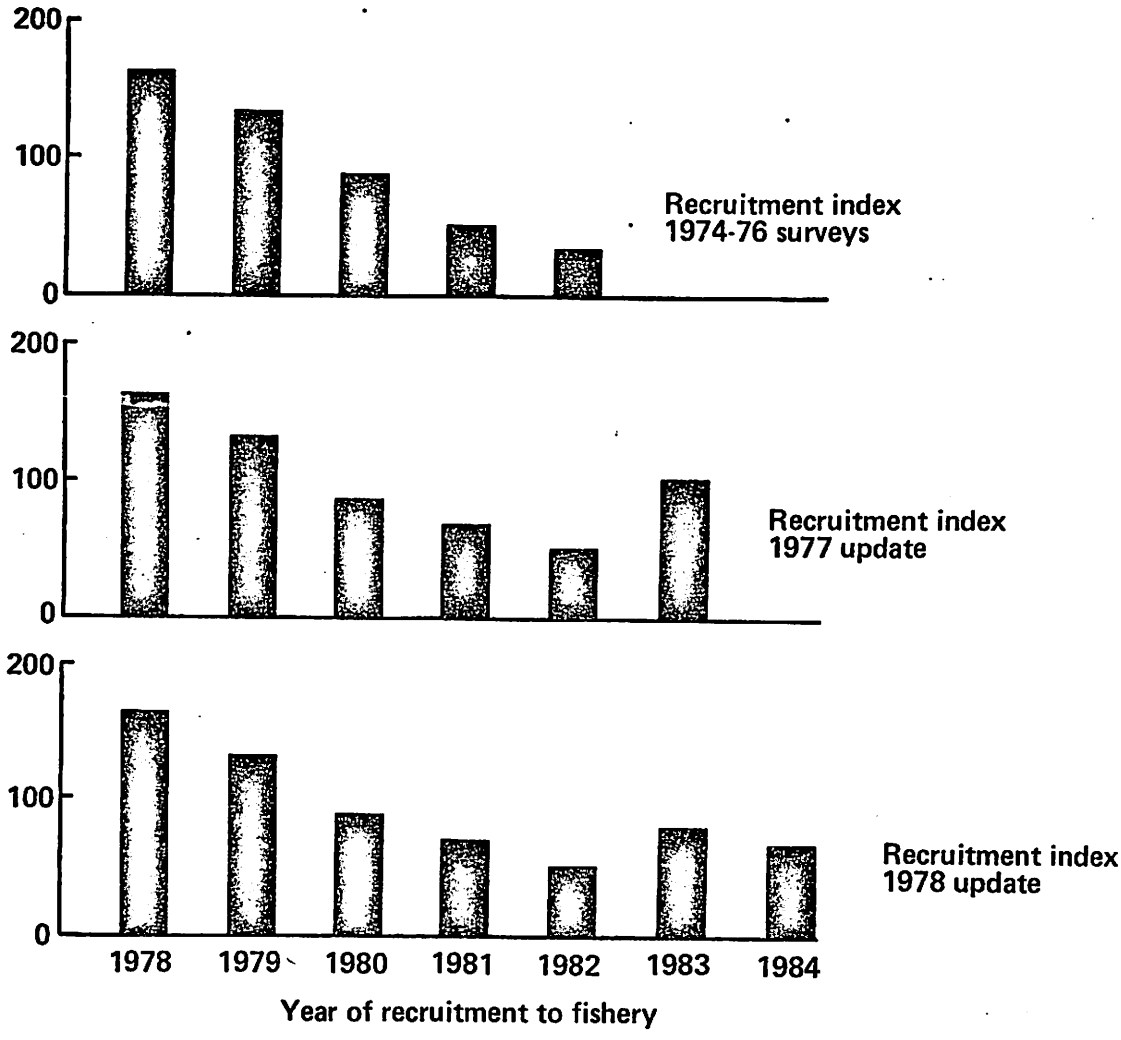


C. BAIRDI



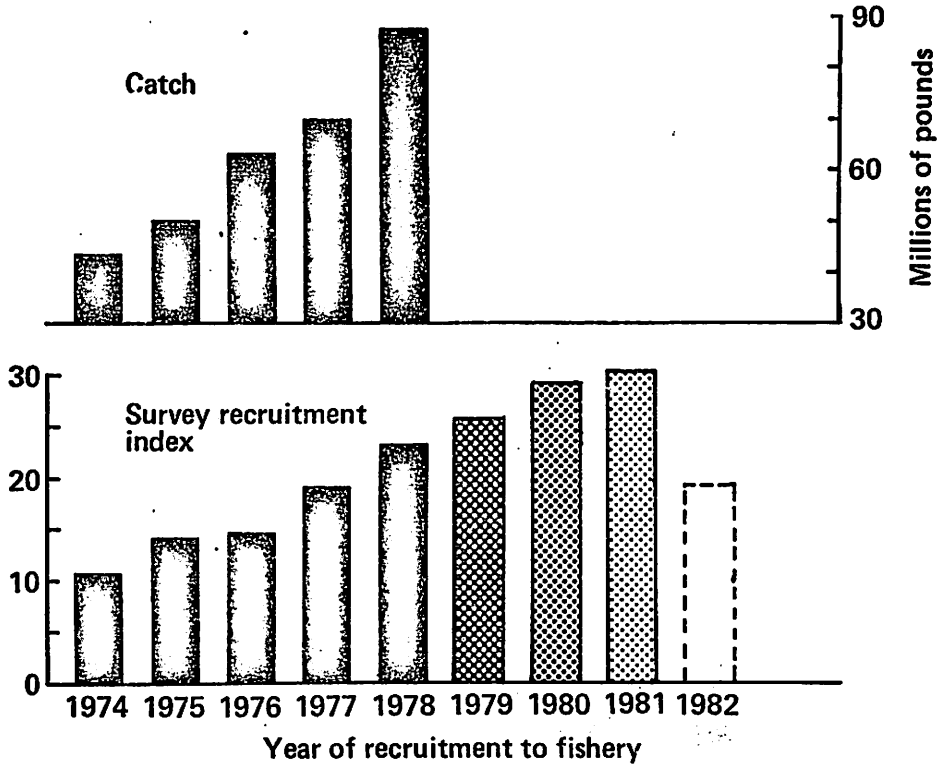
1. Foreign catches are predominantely *C. Bairdi*, but include some *C. Opilio*, except for the most recent years.
2. Since 1971, the fishery CPUE reflects the previous year's survey index, e.g., 1978 CPUE reflects the 1977 survey.

C. BAIRDI
RECRUITMENT TREND



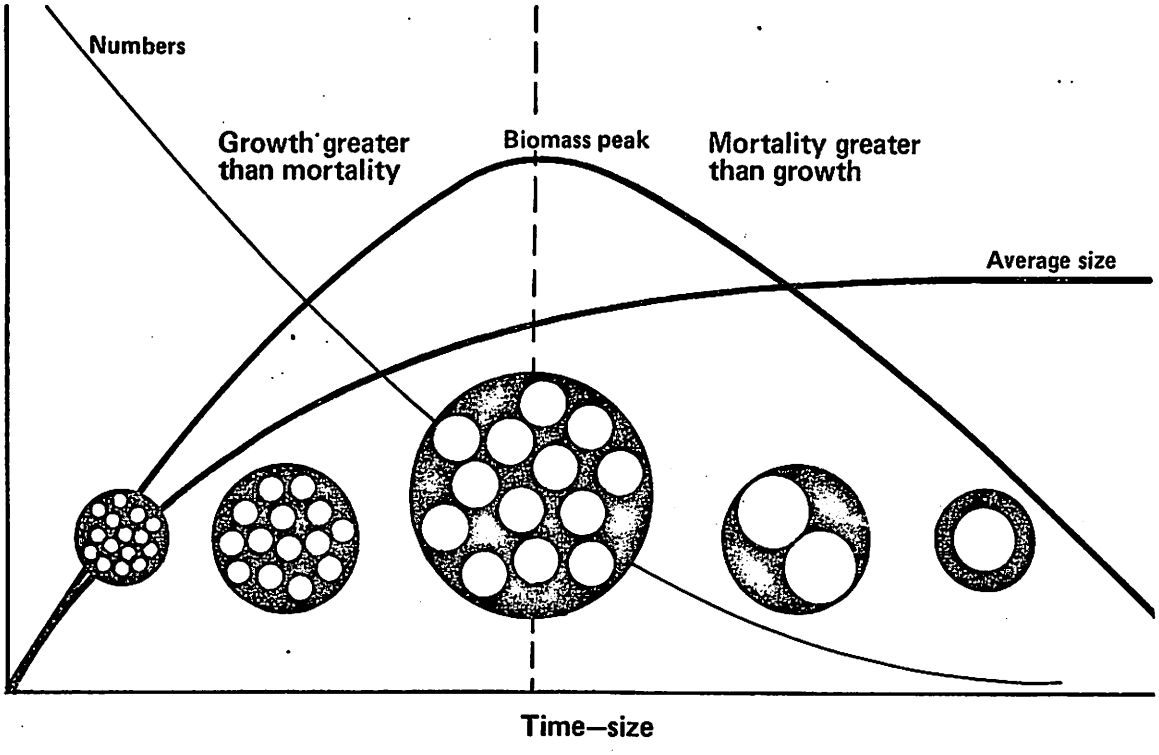
1. 1983 and 1984 recruitments could be higher; based on questionably low 1978 survey estimate.

RED KING CRAB RECRUITMENT TREND



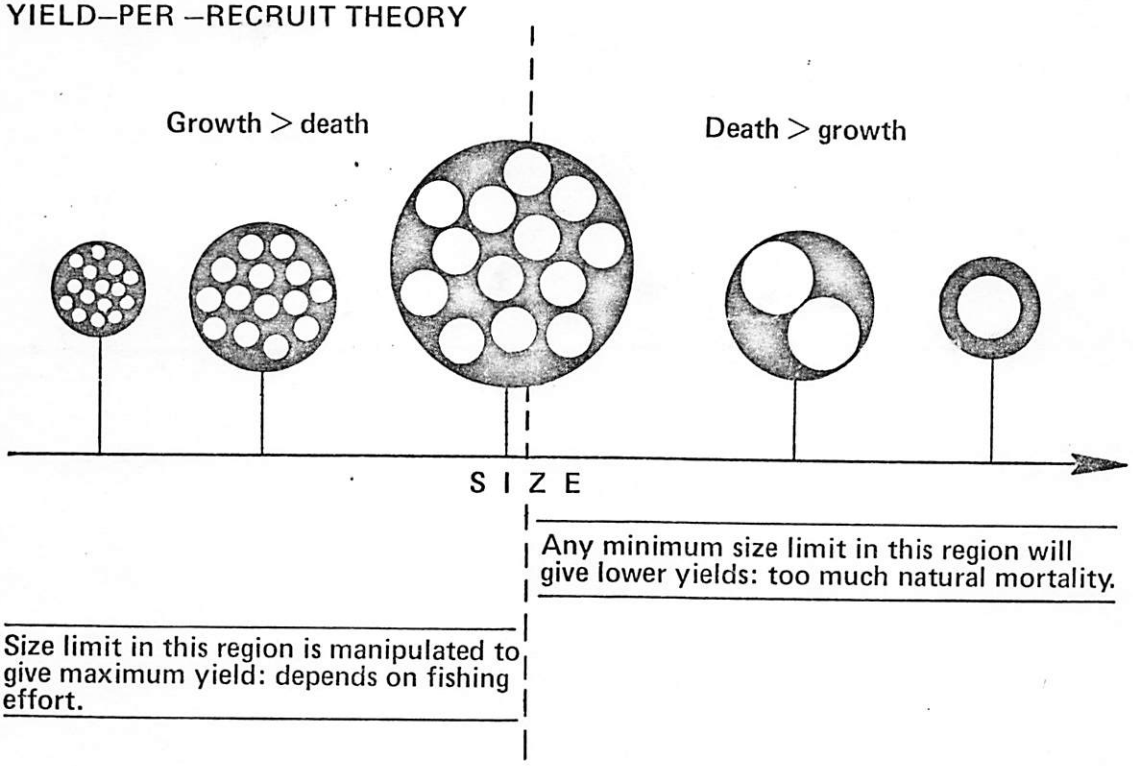
1. Shading indicates decreasing strength of estimate.
2. Dashed lines indicate a *tentative* estimate.

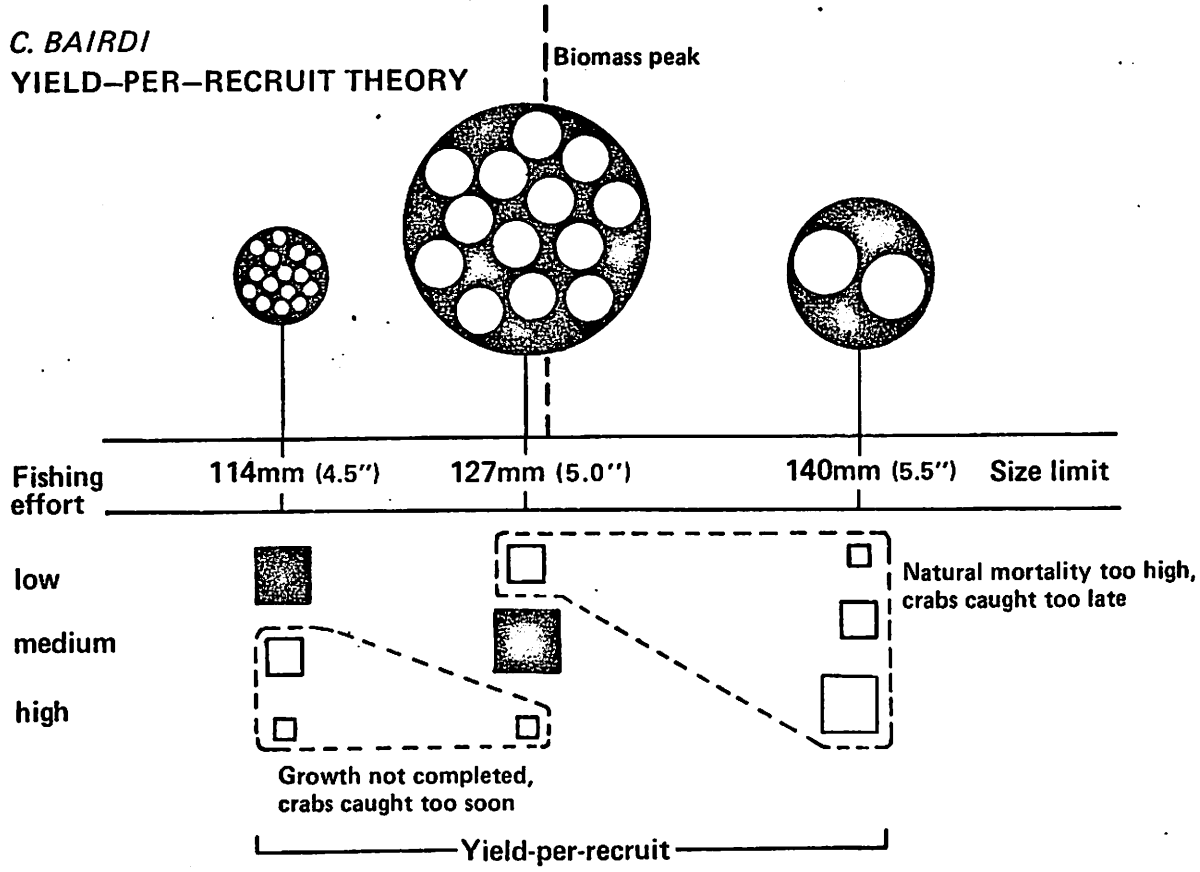
YIELD–PER–RECRUIT THEORY



1. Crabs are increasing in weight, decreasing in numbers with time.
2. At some point in the lifespan, biomass peaks.
3. Yield per recruit strategy: set the size limit as close as possible to the size of peak biomass.

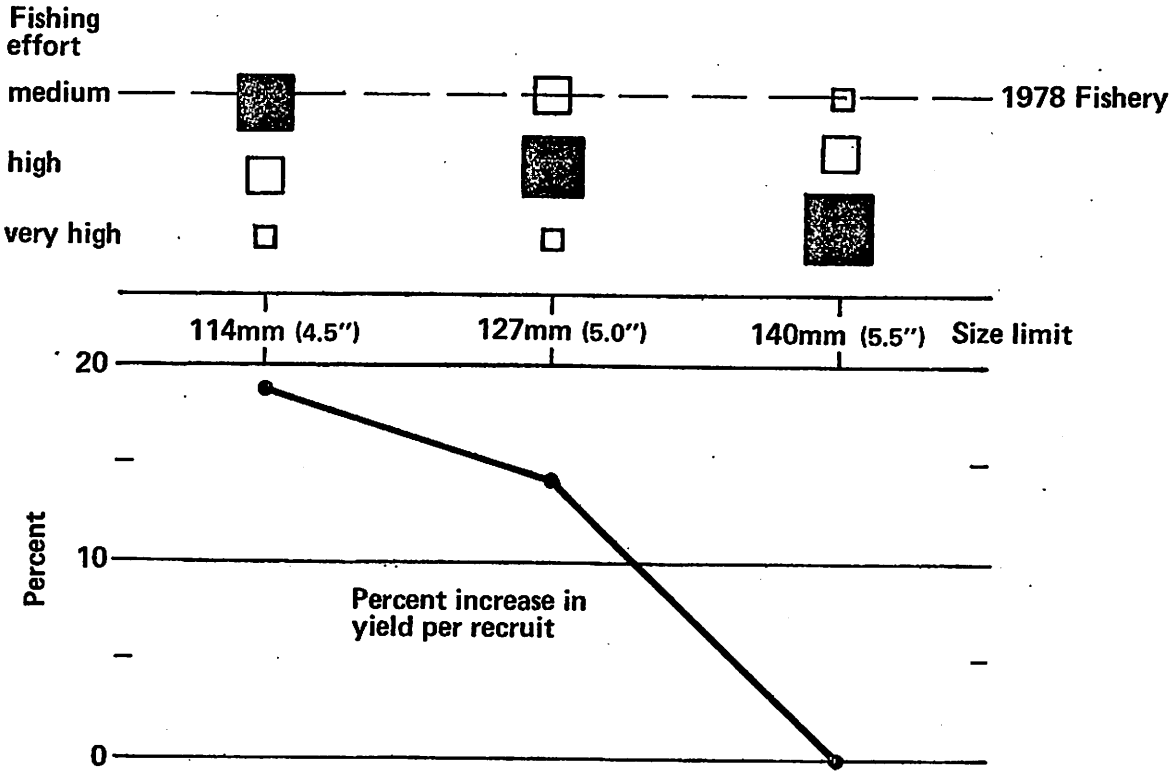
YIELD–PER –RECRUIT THEORY





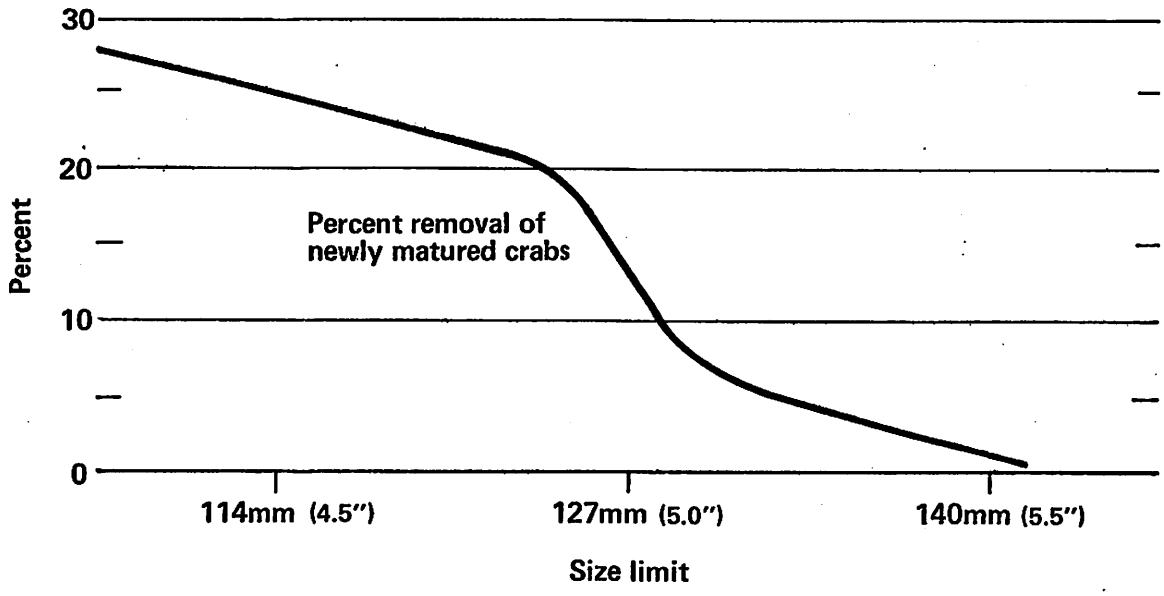
1. As fishing effort increases, the minimum size limit must be increased to get the highest yield.
2. If fishing effort decreases, the minimum size limit must be reduced to get the highest yield.

C. BAIRDI
CHANGING SIZE LIMIT—EFFECT ON YIELD



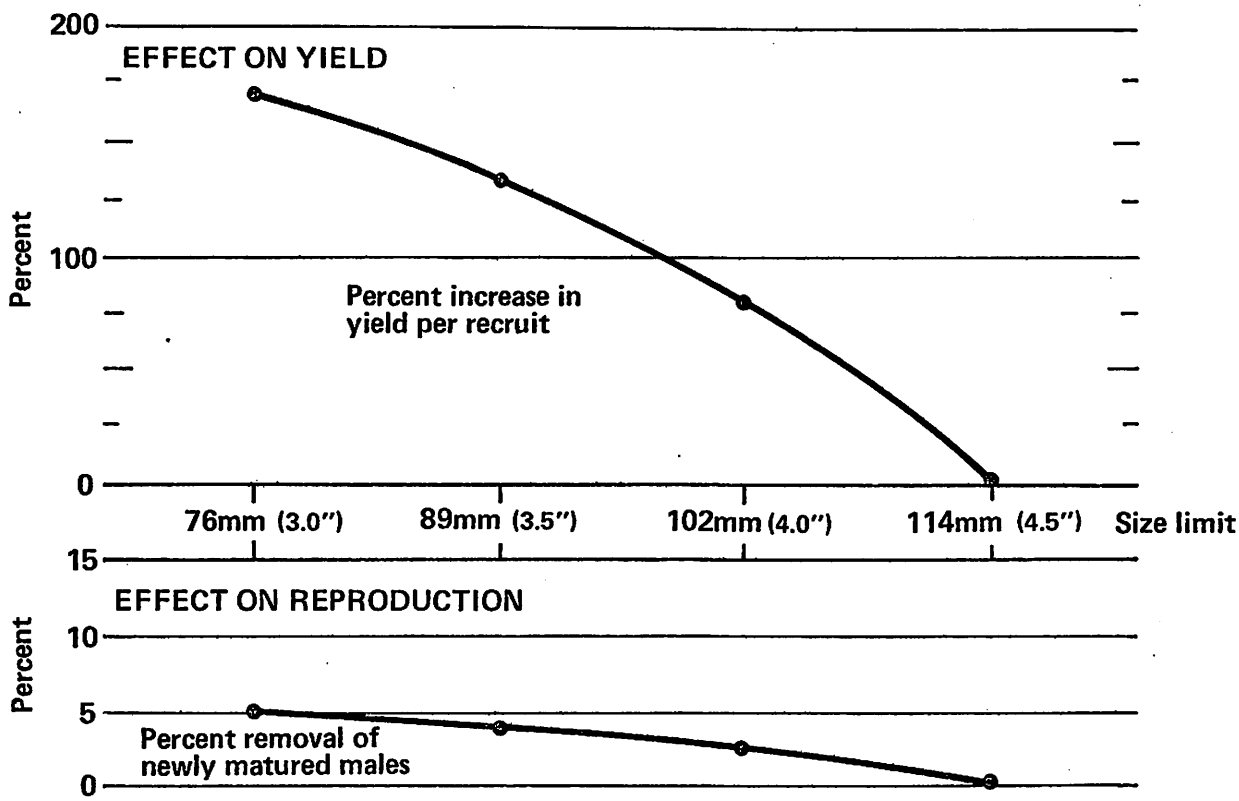
1. At the current exploitation rate, lowering the size limit to 5" should increase the yield per recruitment by about 15%.
2. Lowering the size limit to 4.5" should increase the yield by another 5%.
3. Yield-per-recruit theory assumes reproduction is not effected by changing the size limit.

C. BAIRDI
CHANGING SIZE LIMIT—EFFECT ON REPRODUCTION



1. At the current level of exploitation, lowering the size limit to 5" should mean catching about 10—15% of newly matured males.
2. Lowering the size limit to 4.5" should mean catching about 25% of newly matured males.

C. OPILIO
CHANGING SIZE LIMIT



1. The relevant size range for *opilio* is lower than for *bairdi* because biomass peaks at a smaller size.
2. These curves apply for the current low level of exploitation.
3. At higher exploitation, removal of newly matured males should be higher.