DECISION ANALYSIS
FOR COOK INLET BELUGA

Notes for meeting

September 25-26, 2003
ELEMENTARY FACTS

1. Population is small (<500)
2. Population has been censused since 1994
4. Almost no reported harvest 1999-present
5. No obvious population trend since 1999
6. Historic population size very uncertain
7. Density dependence parameters unknown
COOK INLET BELUGA
DECISION CONTEXT

Present basis ?other basis?

STATUS: N too small Thresholds for N?

TREND: Uncertain Increase/Decrease?

MANAGEMENT:
Legal harvest Other factors?
MANAGEMENT GOALS

ALJ hearing: Not delay recovery too much

MMPA and stipulations: Assure recovery

Implicit PBR: Not allow status to deteriorate
GROWTH PARAMETERS UNKNOWN

Q: WHAT IS UNDERLYING LEGAL-HARVEST-CORRECTED RECENT GROWTH RATE?

\[ N(t+1) = N(t) \times \text{Exp}(r) - H(t) \]
NOMINAL RESULTS

90%: -0.0525 > R > 0.0425

Probability that population will decline with zero legal harvest is 55%

Probability that legal-harvest-corrected growth rate is abnormally low is 79%

Probability that Rmax is lower than assumed in modeling from 2002 is 91%
Bad data?

Bad luck?

Something besides reported harvest is depressing the population growth?
DECISION ANALYSIS

Decision alternatives (actions)

Costs of outcomes (including mistakes)

Choose to minimize expected cost
  (cost x probability)
GOAL: NOT ALLOW DECLINE

Actions:
- If declining -- more protection?
- If not declining -- status quo?
- If increasing enough-- increase quota?

Costs:
- Declining, but chose status quo?
- Not declining, chose more protection?
MINIMIZE EXPECTED COST

Actions: More protection (+)  Status quo (o)
Costs: Declining, chose status quo F(o)  Not declining, more protection F(+)
Probabilities: p(+)  p(o)
EXPECTED COST

Actions:  More protection (+)
          Status quo (o)

Costs:  Declining, chose status quo   F(o)
        Not declining, more protection    F(+)  

Probabilities:  p(+)
                p(o)

Expected cost:  (+)  F(+) \times p(o)
                (o)  F(o) \times p(+)
THRESHOLD: INDIFFERENCE

Expected cost: 
(+) F(+) x p(o)  
(o) F(o) x p(+)

Equal expected costs:
F(+) x p(o) = F(o) x p(+)

Critical p(+): p(+) = F(+)/[F(+)+F(-)]
CRITICAL P FOR ACTION

Probability of decline > Cost ratio

C mistaken protection

C mistaken protection + C mistaken status quo
DECISION RULE TEMPLATE

I. If more than 5% probability of more than 25% delay in time to recovery
   -- more protection

II. If more than x% probability that population trend since 1999 is a not an increase
    -- more protection