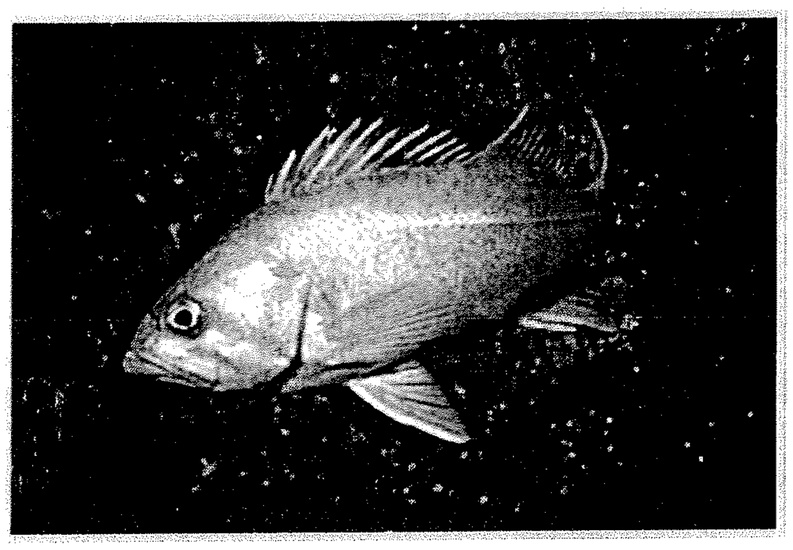
Fishery Effects of Existing West Coast Marine Reserves:
The Scientific Evidence



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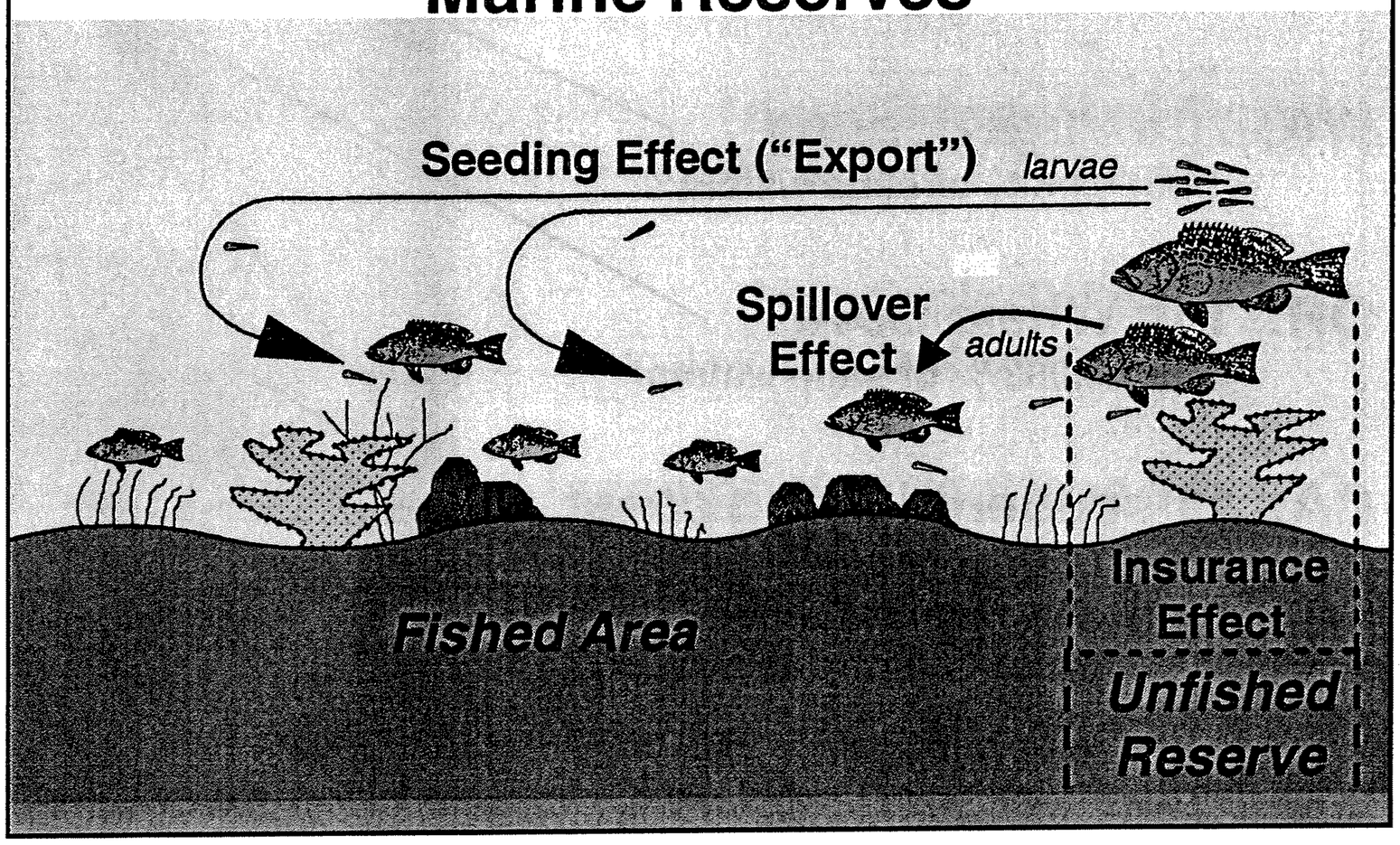
Predicted Fishery Benefits of Marine Reserves



Do West Coast Marine Reserves Benefit Fisheries?

Inside Reserves:

- Are there more fish?
- Are there larger fish?

Outside Reserves:

- Is there "seeding" of larvae?
- Is there "spillover" of adults?

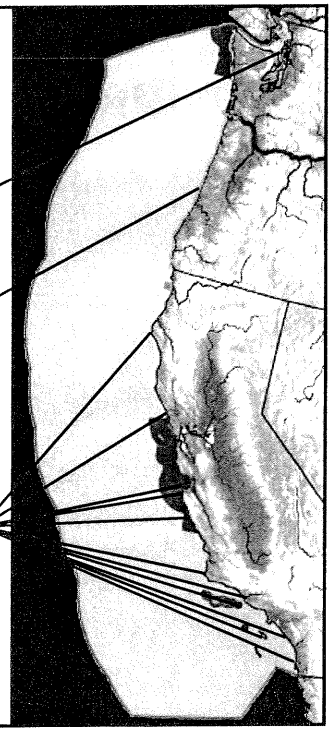
Existing West Coast Marine Reserves

WA: 7 in Puget Sound*
about 0.03 % of state waters

OR: 1 in Whale Cove*
about 0.003 % of state waters

CA: 11 scattered along coast
about 0.2 % of state waters
plus 10 new reserves around Channel Is. implemented January 2003

* some not fully-protected



Do West Coast Marine Reserves Benefit Fisheries?

Problem:

Existing reserves are few, tiny, coastal (mostly rocky bottoms), and often not fully protected.

Approach:

- Compare fish abundance, size, and reproductive output inside reserves (unfished) vs. outside (fished) in similar habitat.
- Examine patterns of fish movement based on tagging studies.

Scientific Studies of Existing West Coast Marine Reserves

13 reserves studied:

3 in Washington (not fully protected)
1 in Oregon (not fully protected)
5 in no. California (3 not fully protected)
4 in so. California

average area = 0.34 square nautical miles
(range: 0.04 – 1.60)

average age = 22 years
(range: 12 – 35)

Scientific Studies of Existing West Coast Marine Reserves

9 independent studies:

22 inside vs. outside comparisons

17 fished species examined:

red sea urchin
red abalone & pink abalone
barred sand bass & kelp bass
California sheephead
cabezon & lingcod
9 rockfishes: black, black-and-yellow, copper, gopher, kelp, olive, quillback, vermilion, yellowtail

More fish in unfished marine reserves than nearby fished areas?

YES

- **15 of 17 comparisons (88%)**
- **37% to >6x more fish inside reserves**

2 exceptions:

quillback rockfish in Puget Sound, WA

black-and-yellow rockfish in no. CA (Pt. Lobos)

Larger fish in unfished marine reserves than nearby fished areas?

YES

- 12 of 15 comparisons (80%)
- fish inside reserves 13-25% larger

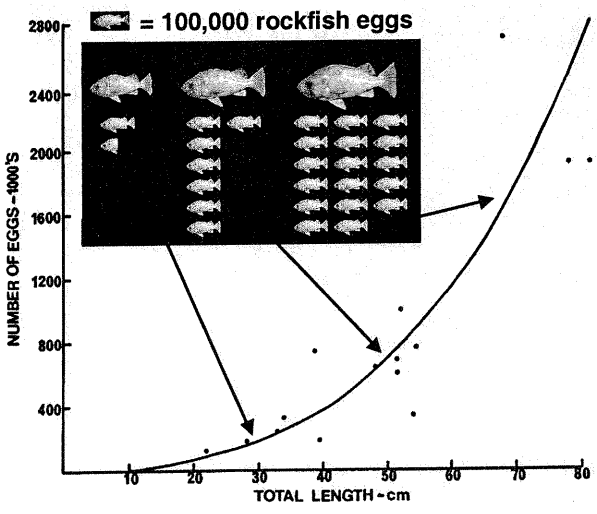
3 exceptions:

quillback rockfish in Puget Sound, WA

cabezon & black-and-yellow rockfish in no. CA (Pt. Lobos)

Seeding Effect?

Egg production increases exponentially with fish size



Love et al. (1990)

Greater egg production
in unfished marine reserves
than nearby fished areas?

YES

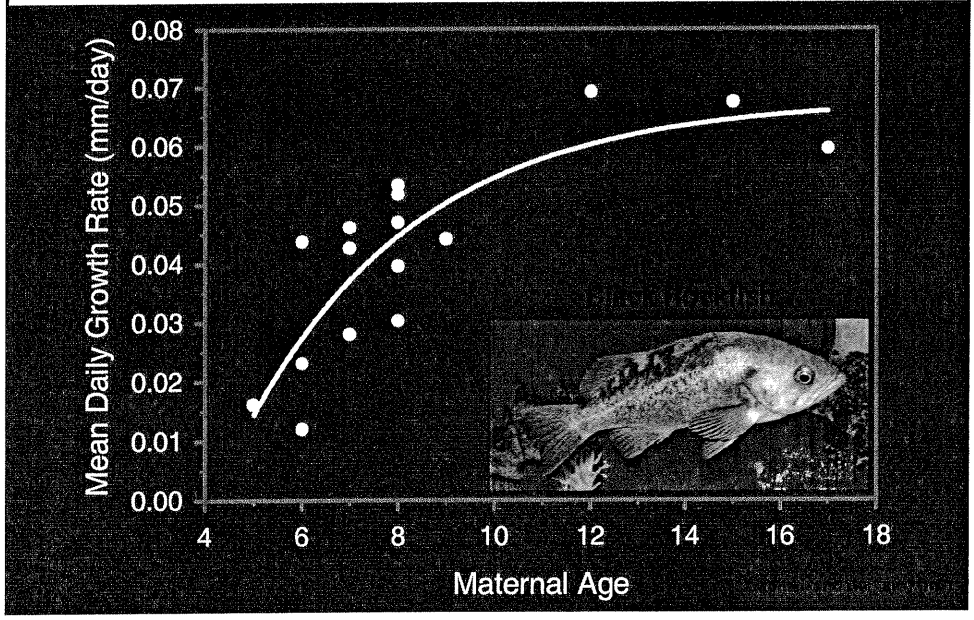
- **15 of 17 comparisons (88%)**
- **3-25x more eggs produced in reserves**

2 exceptions:

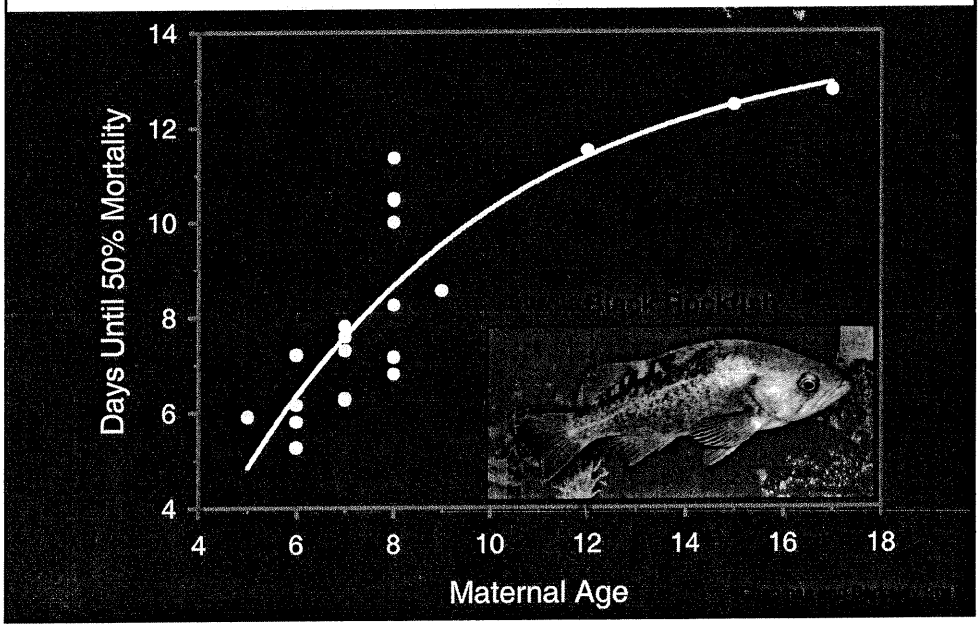
quillback rockfish in Puget Sound, WA

cabezon in no. CA (Pt. Lobos)

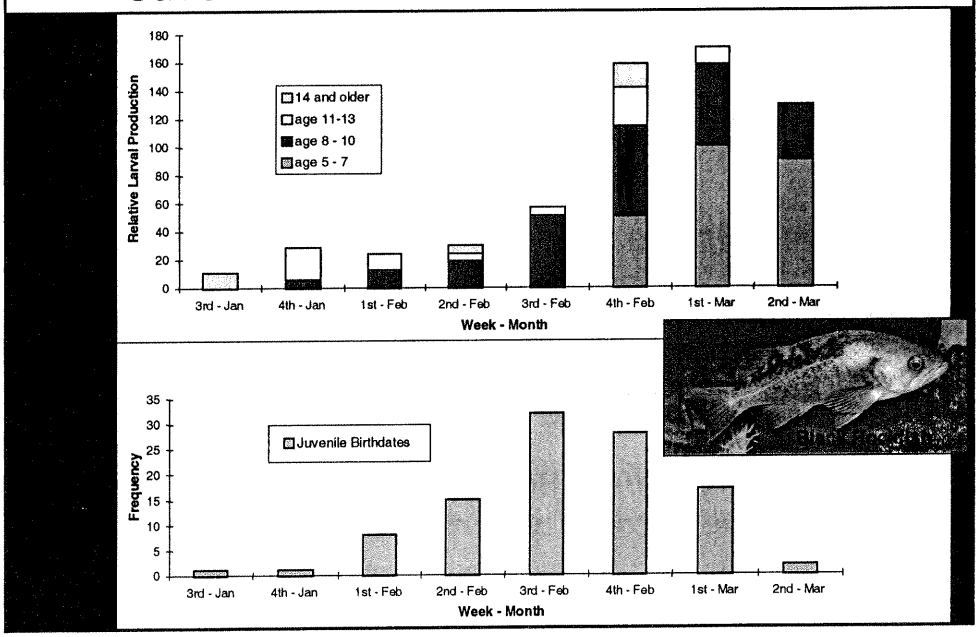
Value of Big Old Fat Females:
Larvae from older fish grow faster



Value of Big Old Fat Females:
Larvae from older survive better



Value of Big Old Fat Females:
Juvenile survivors are from older fish



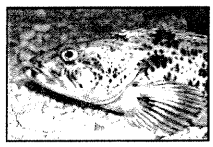
Spillover Effect?
Are movements of West Coast groundfish sufficient?

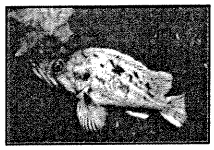
YES

Tagging studies show that various rockfishes, flatfishes, and others move 10s of nautical miles as they grow, sufficient distances for spillover to occur.

Spillover Effect?
Movements of West Coast Groundfish

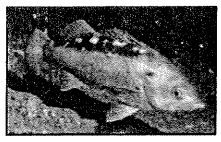
Lingcod (Strait of Georgia, BC):
- 95% of males move up to 9 nmi / yr
- 95% of females move up to 18 nmi / yr





Brown rockfish (San Francisco to CA coast):
- juveniles migrate up to 27 nmi

Yellowtail rockfish (Puget Sound to WA coast):
- juveniles migrate up to 195 nmi



Yellowtail rockfish (Heceta Bank, OR):
- adults move up to 0.7 nmi / mo

Conclusions Regarding West Coast Marine Reserves

Inside Reserves:

- Are there more fish?
  Yes—with few exceptions
- Are there larger fish?
  Yes—with few exceptions

Outside Reserves:

- Is there "seeding" of larvae?
  Probably—increased egg production
- Is there "spillover" of adults?
  Probably—sufficient movement of fish

Conclusions Regarding West Coast Marine Reserves

"Catch-22"

There is no way to fully test the predicted fishery benefits of marine reserves without implementation on a larger scale than presently exists.

For a copy of the full report, e-mail:

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and for info on big, old, fat females:

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