

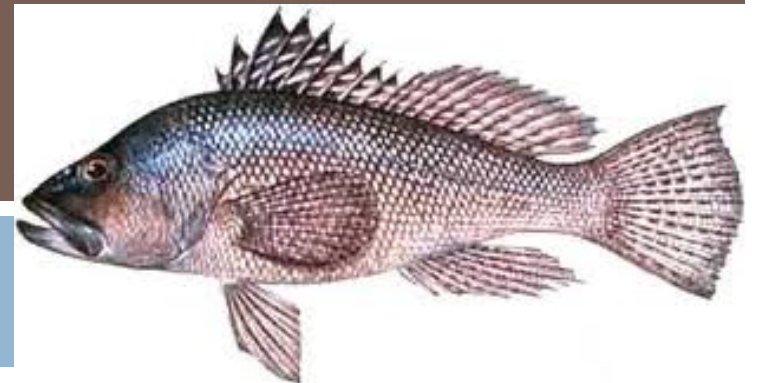
# Estimating discard mortality of black sea bass (*Centropristis striata*) using a tag-return approach

Paul J. Rudershausen<sup>1</sup>, Jeffrey A. Buckel<sup>1</sup>, and Tom Burgess<sup>2</sup>

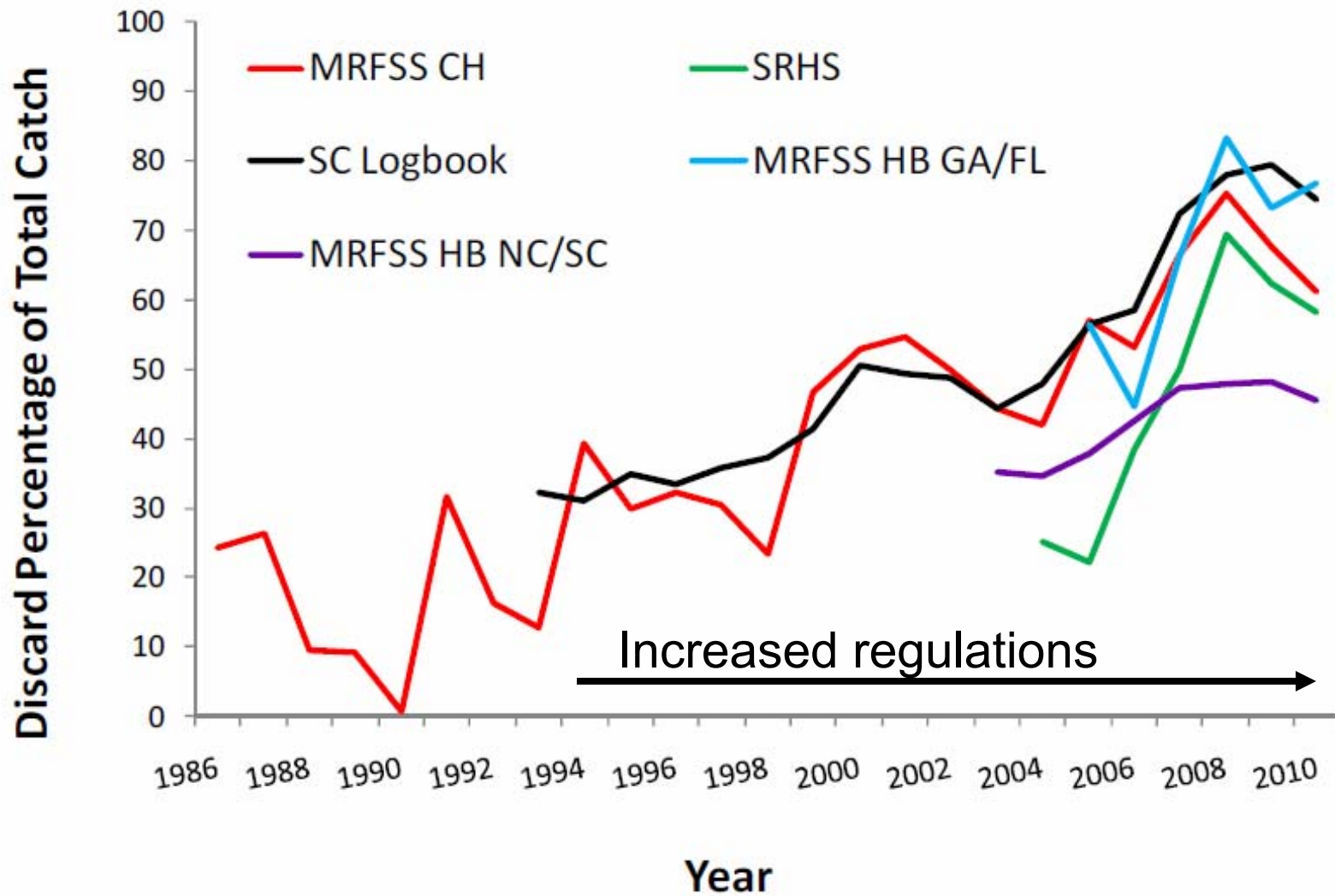
<sup>1</sup>Department of Biology, Center for Marine Sciences and Technology,  
North Carolina State University, 303 College Circle, Morehead City, NC 28557

<sup>2</sup>P.O. Box 33, Sneads Ferry, NC 28460

North Carolina Sea Grant  
Fishery Resource Grant Program



# Black sea bass: justification



# Black sea bass: justification

| <u>Publication</u>       | <u>Gear</u> | <u>Depth (m)</u> | <u>BSB d.m. %</u> |
|--------------------------|-------------|------------------|-------------------|
| Bugley & Shephard 1991   | HL          | 6-12             | 2                 |
| Collins et al. 1999      | HL          | 20-23            | 15                |
| Collins et al. 1999      | HL          | 29-35            | 12                |
| Collins et al. 1999      | HL          | 43-55            | 39                |
| Rudershausen et al. 2007 | HL          | 19-143           | 66                |
| Rudershausen et al. 2008 | Traps       | 12-30            | 3                 |

# Objectives



- ❑ Estimate delayed survival by release condition
  - ❑ Test assumptions of approach
- ❑ Compare delayed survival to survival estimated from proxies
- ❑ Estimate discard mortality in recreational and commercial fisheries

# Discard mortality methods

- Captured fish with traps and hook and line
- Narrow depth range: 95-110 feet deep (29-37 m)
- Internal anchor tags
- Recorded release condition
  - no injuries
  - barotrauma
  - hook injury
  - floating/dead



# Relative risk analysis

Compute relative survival ( $S$ ) of each compromised condition relative to best condition

$$S = \frac{R_n / N_n}{R_1 / N_1}$$

$S$  = survival rate

$R$  = number recaptured within each group

$N$  = number released in each group

**Major assumption:** tagged fish with no injury have 100% survival

# Discard mortality methods

- Assigned release conditions for hook and line and trap caught fish
  - ▣ Separate fishery-dependent trips - no tagging (4 rec and 22 commercial)
  - ▣ ~5,600 caught and ~1,000 released
- Estimated discard mortality and relate to depth



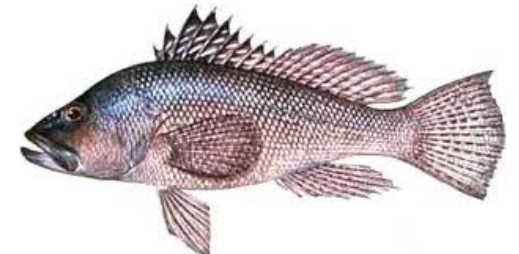
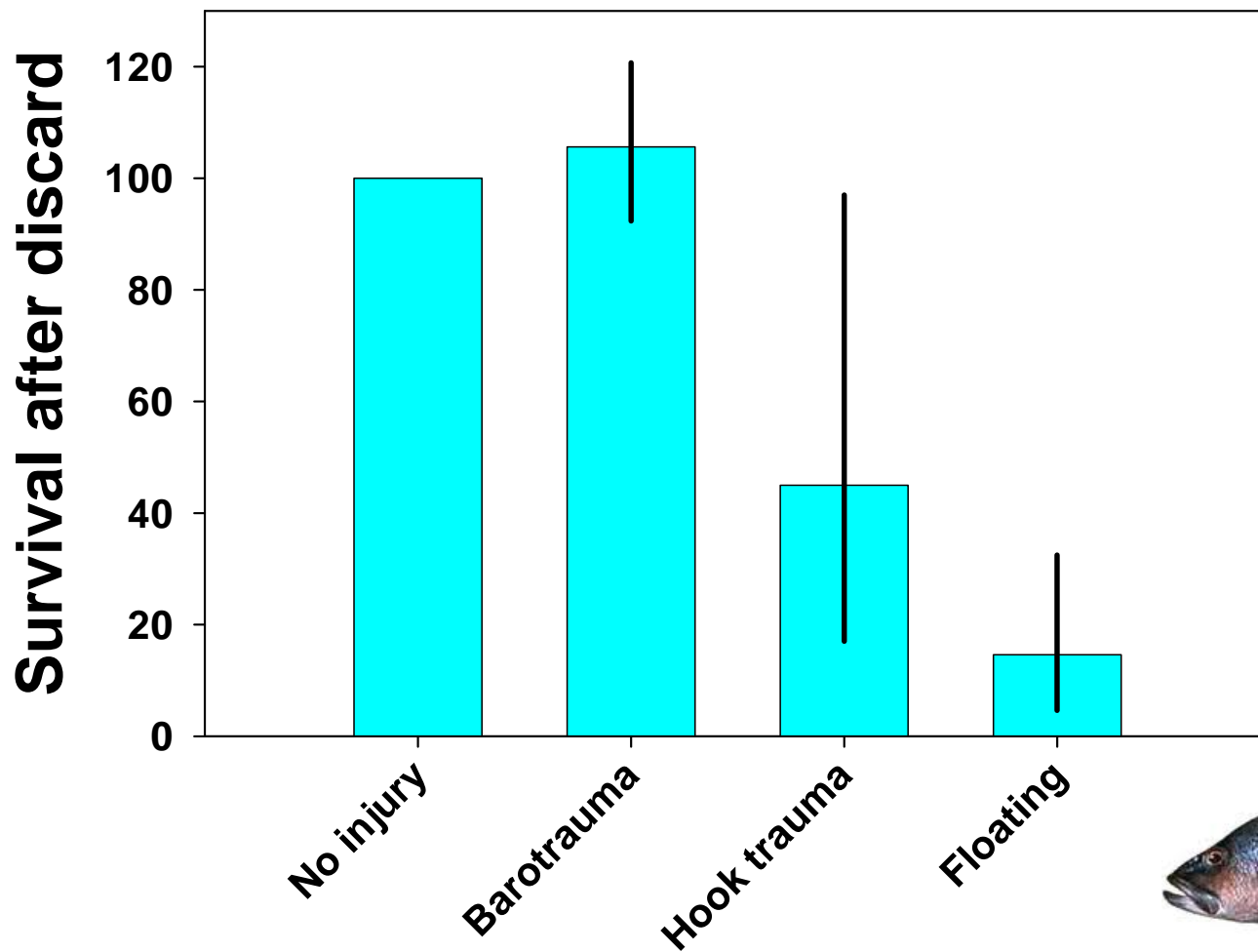
# Black sea bass tag returns

| <u>Condition</u> | <u># released</u> | <u># returned</u> | <u>% return</u> |
|------------------|-------------------|-------------------|-----------------|
| no injury        | 2496              | 585               | 23              |
| barotrauma       | 1712              | 420               | 25              |
| hook injury      | 94                | 9                 | 10              |
| floating/dead    | 253               | 11                | 4               |





# Survival by condition – black sea bass



# Is swimming a reliable survival proxy?

| Fate ►<br>Calculation ▼       | <u>Dead</u> | <u>Alive</u> |
|-------------------------------|-------------|--------------|
| <u>Expected</u>               | 0           | 3236         |
| <u>Computed via<br/>model</u> | 50          | 3186         |

$$\chi^2 = 0.77 \quad p = 0.379$$

# Is floating a reliable mortality proxy?

| Fate ►<br>Calculation ▼       | <u>Dead</u> | <u>Alive</u> |
|-------------------------------|-------------|--------------|
| <u>Expected</u>               | 220         | 0            |
| <u>Computed via<br/>model</u> | 188         | 32           |

$\chi^2 = 4.68$     $p = 0.030$

# Tests of assumptions: influence of tagging on release condition

Higher % of tagged than untagged BSB swam down in paired trials ( $\chi^2 = 7.03$ ,  $p = 0.008$ )

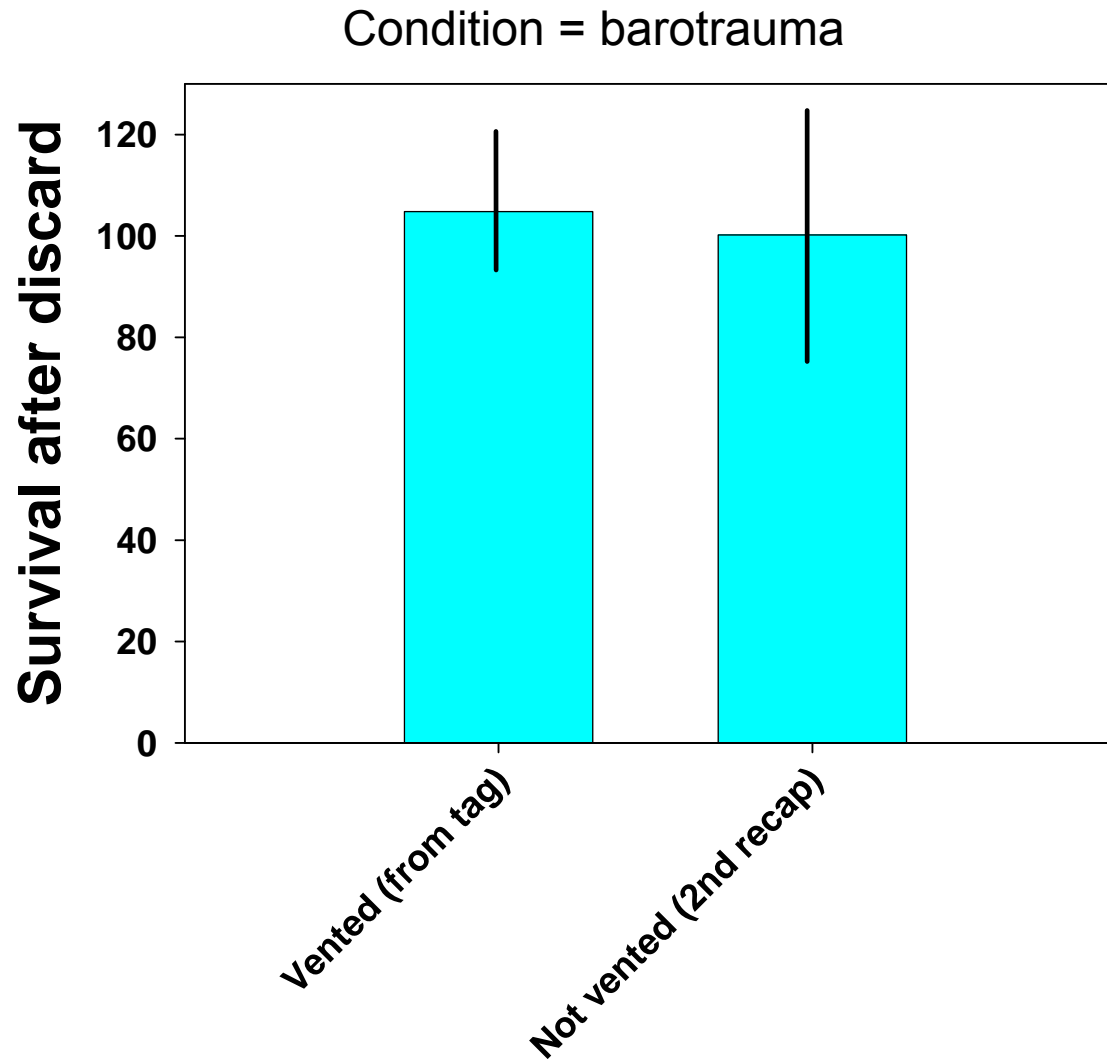
Does survival of barotrauma fish (swimmers) differ from tagging (vented) vs not tagging (non-vented)?



# Tests of assumptions: number of multiple recaptures

| <u># times recapped</u> | <u># BSB</u> |
|-------------------------|--------------|
| 1                       | 1026         |
| 2                       | 159          |
| 3                       | 25           |
| 4                       | 5            |
| 5                       | 2            |
| 6                       | 1            |
| 7                       | 1            |

# Tests of assumptions: first release (tagged) vs second release



## Tests of assumptions

Do “no injury” fish have 100% survival?

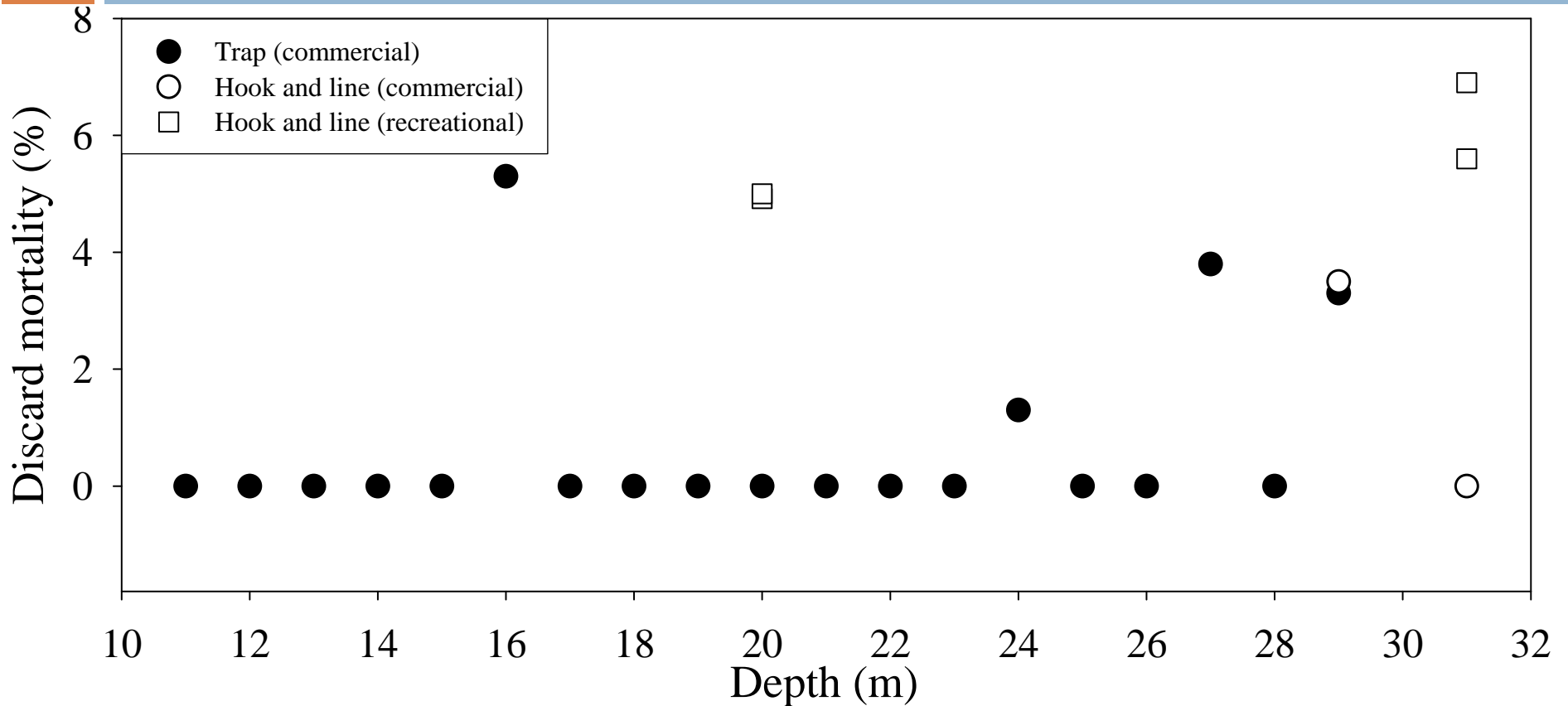
“no injury” fish released at surface and bottom

| <u>Release location</u> | <u># returned</u> | <u># not returned</u> | <u>% return</u> |
|-------------------------|-------------------|-----------------------|-----------------|
| Surface                 | 37                | 281                   | 11.7            |
| Bottom                  | 33                | 280                   | 10.5            |

$$\chi^2 = 0.19 \quad p = 0.662$$



# Discard mortality – black sea bass



**Traps: 0 to 5% (0.7%)**

**Hook and line: 0 to 7% (4.3%)**



# Black sea bass - conclusions



- Relative survival was high for fish with barotrauma
- Discard mortality estimates are low
  - ▣ Mean hook and line (j-hooks) = ~4.5%
- Gear-specific discard mortality rates
  - ▣ Limited influence of depth
- Swim vs float proxies are fairly good indicators of survival

# Current project

- Do “no injury” BSB have 100% survival?
  - ▣ Tagging at depth for proper control

