

# GOA Spiny Dogfish: Is Tier 5 a reality?



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**Cindy A Tribuzio and Peter-John F Hulson**

Alaska Fisheries Science Center, Auke Bay Laboratories

# Review the issue

- Spiny dogfish are a Tier 6\* species
- Tier 5 methods are used, but not considered a Tier 5 because the trawl survey biomass is unreliable and should be considered a minimum biomass
- $OFL = F * \text{Biomass}$ , where  $F = M$
- Demographic analysis suggests that  $F = M$  is an inappropriate assumption and authors proposed  $F = F_{max}$
- PT endorsed using  $F = F_{max}$ , but delayed implementation until trawl survey catchability was addressed

# Trawl Survey Catchability

Catchability ( $q$ ) is a function of:

- horizontal availability ( $a_h$ )
- vertical availability ( $a_v$ )
- susceptibility (in this case net efficiency) ( $s$ )

$$q = a_h * a_v * s$$

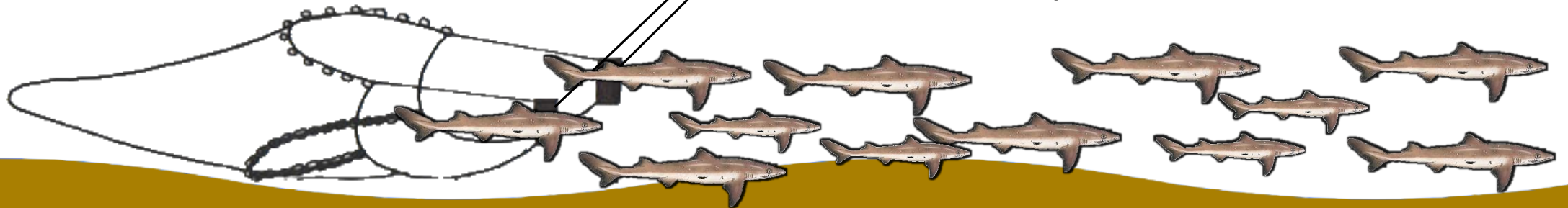
Model 15.1 (Status Quo)

$$a_h = 1$$

$$a_v = 1$$

$$s = 1$$

$$q = 1$$



# Trawl Survey Catchability

Model assumptions –  $a_h$

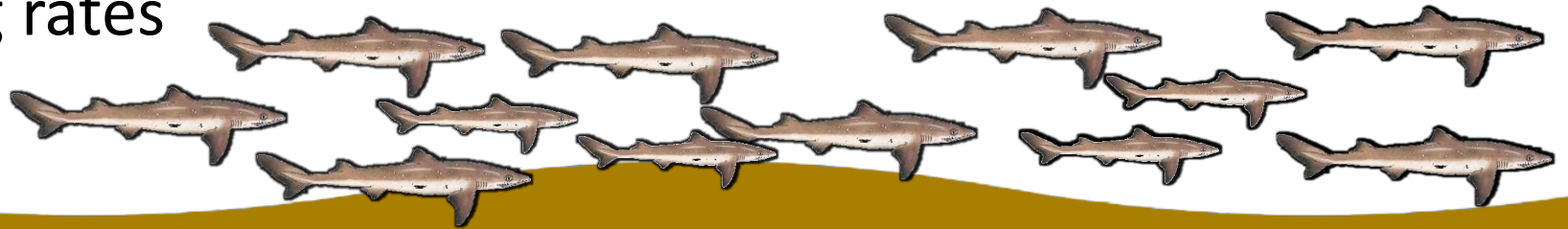
Either no movement into/out of survey area

Or

Equal movement into/out of survey area

$$a_h = 1$$

Various tagging studies suggest movement into/out of survey area,  
but are limited at defining rates

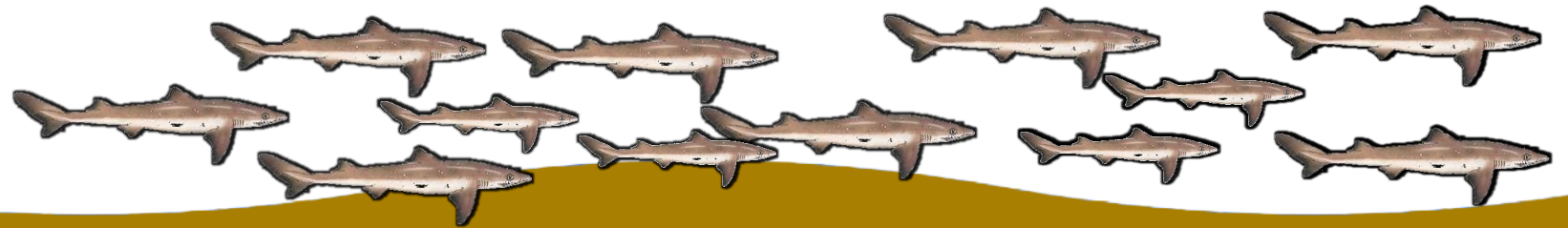


# Trawl Survey Catchability

Model assumptions –  $s$

Net efficiency for *S. acanthias* = 1

$$s = 1$$



# Trawl Survey Catchability

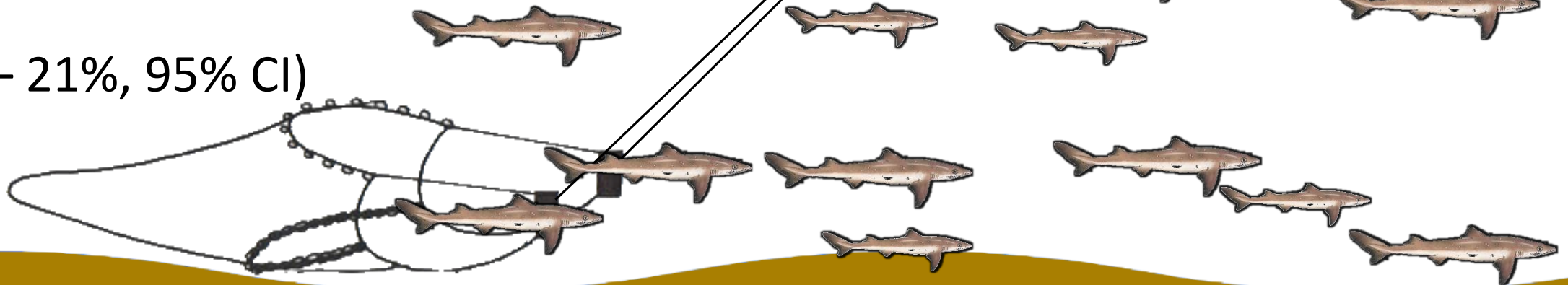


Model assumptions –  $a_v$

Hulson et al. (2016) used tag depth and location to estimate  $a_v$  to the trawl survey (presented previously)

$$a_v = 0.031, 0.21, 1$$

3.1% (0 – 21%, 95% CI)



# Trawl Survey Catchability

Survey biomass ( $B$ ) is adjusted by  $q$ , such that  $B_a = B/q$   
 $B_a$  is the adjusted total biomass estimate

$B$  from the most recent full assessment is used

| Model | $q=a_v$ | $B$ (95% CI)             | $B_a$ (95% CI)                    |
|-------|---------|--------------------------|-----------------------------------|
| 15.1  | 1       | 56,181 (35,484 – 88,950) | 56,181 (35,484 – 88,950)          |
| 15.2  | 0.031   | 56,181 (35,484 – 88,950) | 1,812,290 (1,144,645 – 2,869,355) |
| 15.3  | 0.21    | 56,181 (35,484 – 88,950) | 267,529 (168,971 – 423,571)       |

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| 15.3            | 0.21             | 56,181 (35,484 – 88,950)            | 267,529 (168,971 – 423,571)                  |



# Trawl Survey Catchability

Incorporate status quo ( $F = M$ ) and the approved  $F = F_{\max}$

| Model | F     | Ba (95% CI)                 | ABC (95% CI)             |
|-------|-------|-----------------------------|--------------------------|
| 15.1  | 0.097 | 56,181 (35,484 – 88,950)    | 4,087 (2,581 – 6,471)    |
| 15.1A | 0.04  | 56,181 (35,484 – 88,950)    | 1,685 (1,065 – 2,669)    |
| 15.3  | 0.097 | 267,529 (168,971 – 423,571) | 19,463 (12,293 – 30,815) |
| 15.3A | 0.04  | 267,529 (168,971 – 423,571) | 8,026 (5,069 – 12,707)   |

$F_{\max} = 0.04$  (0.01 – 0.08, 95% CI)

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| <del>15.1</del>  | <del>0.097</del> | <del>56,181 (35,484 – 88,950)</del>    | <del>4,087 (2,581 – 6,471)</del>    |
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| 15.3A            | 0.04             | 267,529 (168,971 – 423,571)            | 8,026 (5,069 – 12,707)              |

# Trawl Survey Catchability

Author recommended model for November assessment

| Model | F    | B <sub>a</sub> (95% CI)     | ABC (95% CI)           |
|-------|------|-----------------------------|------------------------|
| 15.3A | 0.04 | 267,529 (168,971 – 423,571) | 8,026 (5,069 – 12,707) |

Thus, the November assessment would be:

$$B_{a2017} = 0.21 * B_{2017}$$

$$OFL = B_{a2017} * 0.04$$

$$ABC = 0.75 * OFL$$

AND.....

Spiny Dogfish could be considered Tier 5