GOA Spiny Dogfish: Is Tier 5 a reality?

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 * Biomass, where F = M
- Demographic analysis suggests that F = M is an inappropriate assumption and authors proposed F = Fmax
- PT endorsed using F = Fmax, 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)

$q = a_h * a_v * s$

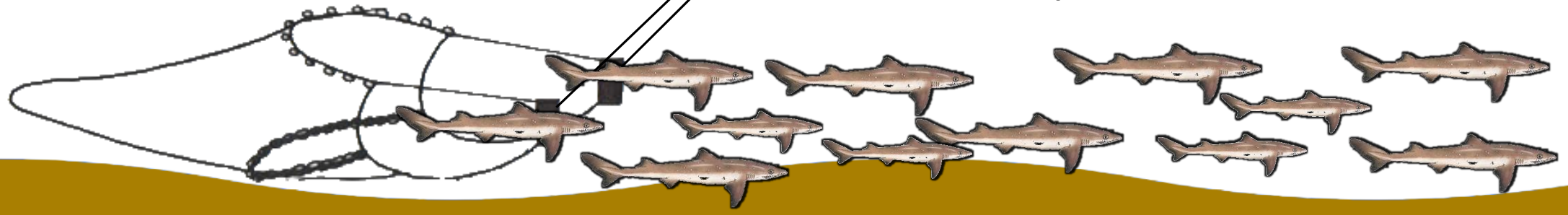
Model 15.1 (Status Quo)

$a_h = 1$

$a_v = 1$

$s = 1$

$q = 1$



Trawl Survey Catchability

Model assumptions – a_h

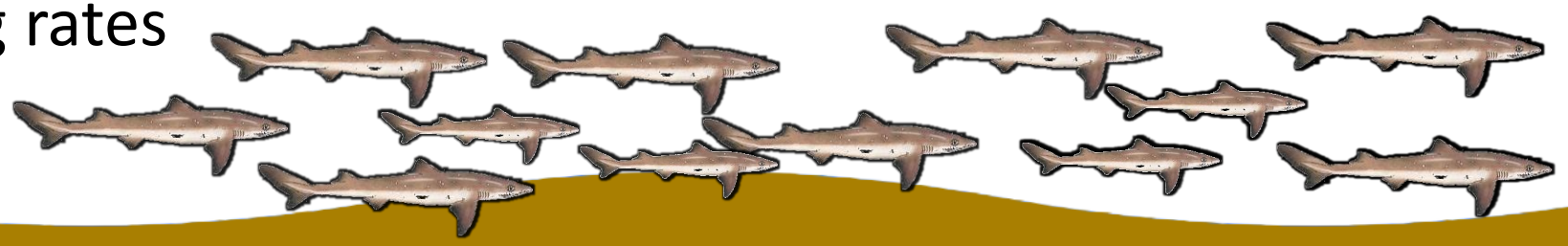
Either no movement into/out of survey area

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

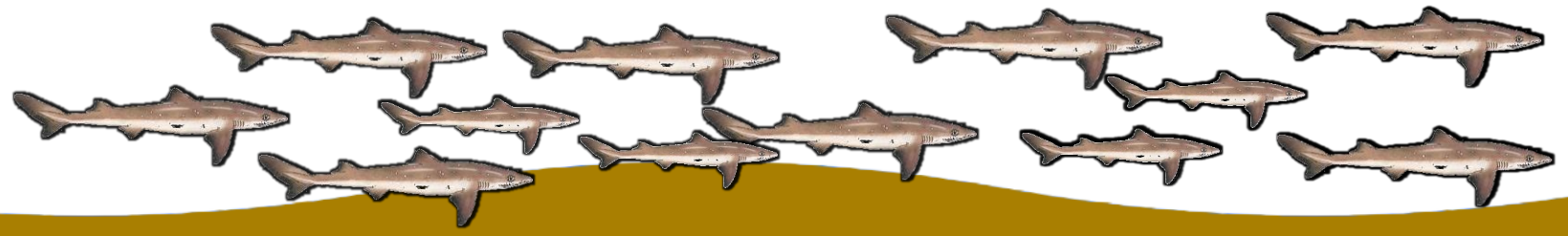


Trawl Survey Catchability

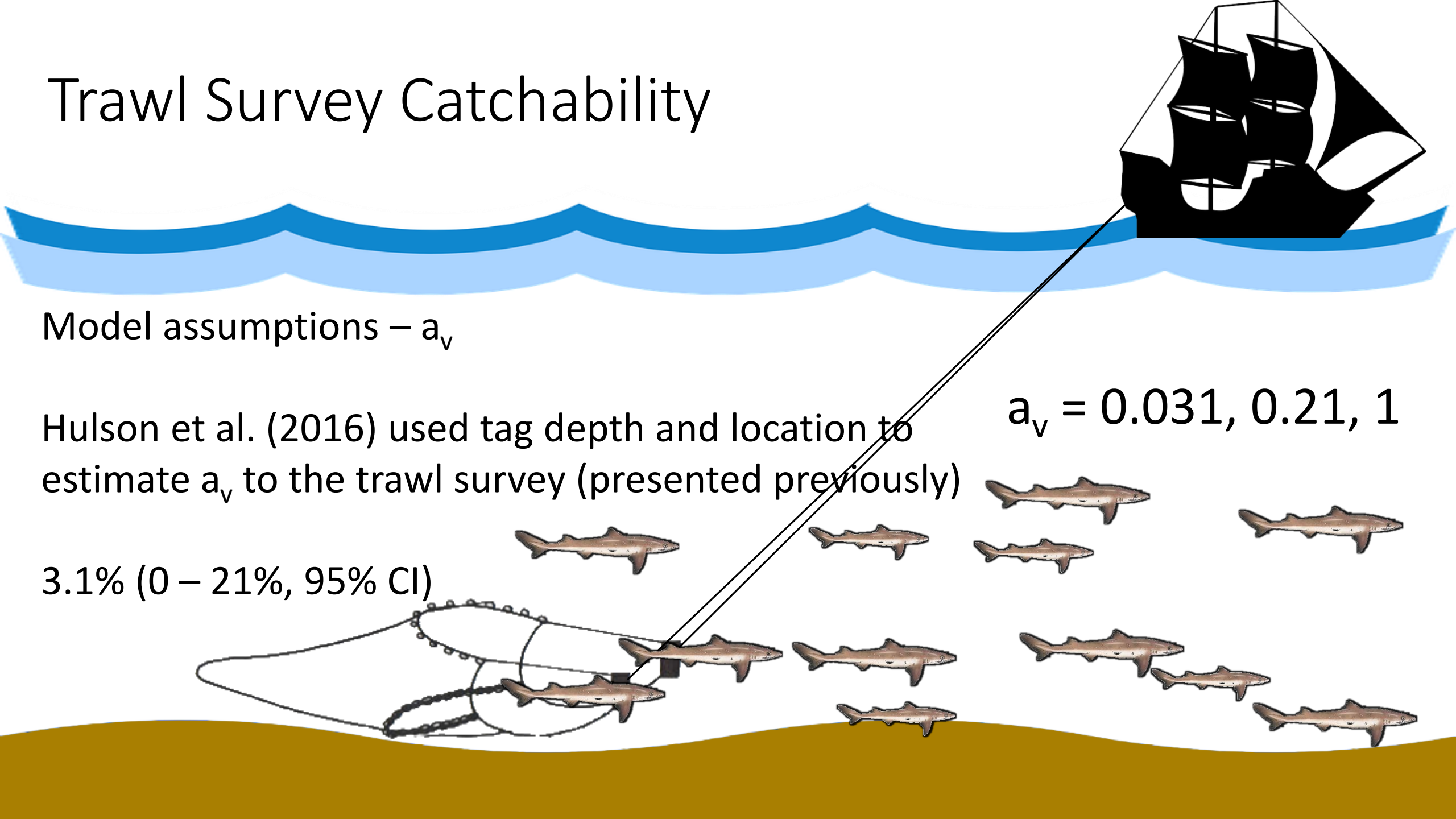
Model assumptions – s

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)

3.1% (0 – 21%, 95% CI)

a_v = 0.031, 0.21, 1

Trawl Survey Catchability

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

B from the most recent full assessment is used

Model	$q=a_v$	B (95% CI)	Ba (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)

Trawl Survey Catchability

Survey biomass (B) is adjusted by q, such that Ba = B/q

Ba is the adjusted total biomass estimate

B from the most recent full assessment is used

Model	$q=a_v$	B (95% CI)	Ba (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)

Trawl Survey Catchability

Incorporate status quo (F = M) and the approved F = Fmax

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)

Fmax = 0.04 (0.01 – 0.08, 95% CI)

Trawl Survey Catchability

Incorporate status quo (F = M) and the approved F = Fmax

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)

Trawl Survey Catchability

Author recommended model for November assessment

Model	F	Ba (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