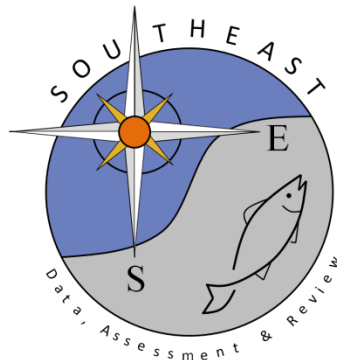Correcting an error in Runde et al's (2019) estimates of discard survival by
release condition, discard survival by depth, and overall discard survival of gray
triggerfish in the southeastern US hook-and-line fishery.

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Correcting an error in Runde et al's (2019) estimates of discard survival by release condition, discard survival by depth, and overall discard survival of gray triggerfish in the southeastern US hook-and-line fishery.

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Runde et al. (2019) provided estimates of discard survival for gray triggerfish by release condition, depth, and for the overall hook-and-line fishery in North Carolina and the east coast of Florida. The discard survival by release conditions were estimated from conventional tag return data using Cox proportional hazards modeling. The hazard ratio estimates from that modeling were used incorrectly as estimates of relative risk or discard survival (see column labeled "Mean est. survival" on Table 2 of Runde et al. 2019). We correct for this error below; the corrected values of overall discard survival for the hook-and-line fishery in North Carolina and Florida were around 6 to 7% higher than those published in Runde et al. (2019).

To correct the error, we used Sutradhar and Austin's (2018) approach to estimate relative risk (discard survival) from the hazard ratio and probability of being event free in the control group ($S_0(t)$). We assumed that Runde et al.'s (2019) "proportion not recaptured" in the control group (adjusted for covariates and shown on Figure 3) represents $S_0(t)$. The proportion not recaptured and the hazard ratios are used to calculate relative risk (discard survival) using Sutradhar and Austin's (2018) notation and equation as follows:

$$\frac{\text{Risk function at time } t \text{ among exposed individuals}}{\text{Risk function at time } t \text{ among control individuals}}$$

$$= \frac{1 - S_0(t)^{e^\beta}}{1 - S_0(t)} = \text{relative risk (at time } t)$$

where, $S_0(t)$ = probability of being event free in control group and e^B = hazard ratio (HR).

From Figure 3 in Runde et al. (2019), the end points of the functions for covariate adjusted "proportion not recaptured" are 0.455 for control fish (SCUBA tagged) from the hook-and-line analysis (panel A) and 0.420 for the control fish (SCUBA tagged) from the trap analysis (panel B). Using these values, relative risk (discard survival) for each release condition can be calculated using the equation above with the hazard ratios presented on Table 2 in Runde et al. (2019; the column label for HRs is "Mean est. survival"). Relative risk here is not the risk of death but rather the "risk of recapture" and represents discard survival. The tag release conditions are: Condition 0=Tagged on seafloor via SCUBA; Condition 1=released at surface and swam down with no trauma; Condition 2=released at surface and swam down with trauma; Condition 3 = floated.

Discard survival of hook and line-caught fish by condition:

Condition 0 discard survival (i.e. relative risk) = 1 (assumed for scuba fish)

Condition 1 relative risk = $(1-0.455^{0.39})/(1-0.455)$ = 0.485 (0.363-0.645) (these are 2.5/97.5 confidence intervals)

Condition 2 relative risk = $(1-0.455^{0.24})/(1-0.455)$ = 0.316 (0.139-0.691)

Condition 3 relative risk = 0

Discard survival of trap-caught fish by condition:

Condition 0 relative risk = 1 (assumed for scuba fish)

Condition 1 relative risk = $(1-0.420^{0.49})/(1-0.420)$ = 0.597 (0.473-0.760)

Condition 2 relative risk = $(1-0.420^{0.24})/(1-0.420)$ = 0.324 (0.184-0.557)

Condition 3 relative risk = 0

Discard survival by depth in hook-and-line fishery given release condition by depth.

We used the same methods described in Runde et al. (2019) to estimate the discard survival by depth (Table 4 in original document) using the corrected discard survival by condition estimates for hook-and-line (see above in this document) and the proportion of hook-and-line releases in each condition from Florida (Figure 2B in original document). As pointed out in Runde et al. (2019), an important assumption is that the discard survival by condition estimates made at 30 to 40m (depths at which the tag-return experiment was done) apply across all depths presented in table below. The updated hook-and-line discard survival by depth estimates are:

Depth in meters	< 21	21-30	31-40	41-50	51-60	>60
Hook and line discard survival	0.450	0.444	0.403	0.393	0.395	0.354

For SEDAR 82, there may be a larger sample sizes of release condition by depth (i.e., updates to Runde et al.'s (2019) Figure 2B) to improve these discard survival-by-depth estimates.

Overall discard survival in hook-and-line fishery

We also provide updated estimates of overall discard survival in the recreational hook-and-line fishery off North Carolina and Florida. The corrected discard survival by depth estimates (above) and the proportion of hook-and-line releases in each depth bin (Figure 2A in original document) were used to estimate an overall discard survival in North Carolina of 0.411 (0.279, 0.623) and in Florida of 0.411 (0.275,0.636). The error (2.5, 97.5 CIs) on the overall discard survival estimates provided above does not include uncertainty in condition-by depth (Figure 2B data) or proportion-of-releases-by-

depth (Figure 2A data); the error only accounts for uncertainty from the discard survival by condition estimates.

For SEDAR 82, there may be proportion of hook-and-line releases by depth bin in other states or updated information for North Carolina and Florida that would improve these overall discard survival estimates.

Runde, B.J., P.J. Rudershausen, B. Sauls, C.S. Mikles, and J.A. Buckel. 2019. Low discard survival of gray triggerfish in the southeastern US hook-and-line fishery. Fish. Res. 219. https://doi.org/10.1016/j.fishres.2019.105313

Sutradhar, R. and P.C. Austin. 2018. Relative rates not relative risks: addressing a widespread misinterpretation of hazard ratios. Annals of Epidemiology 28:54-57.