

**Mortality Estimates for Red Snapper, *Lutjanus campechanus*,  
Based on Acoustic Telemetry and Conventional Tagging in the Northern Gulf of Mexico**

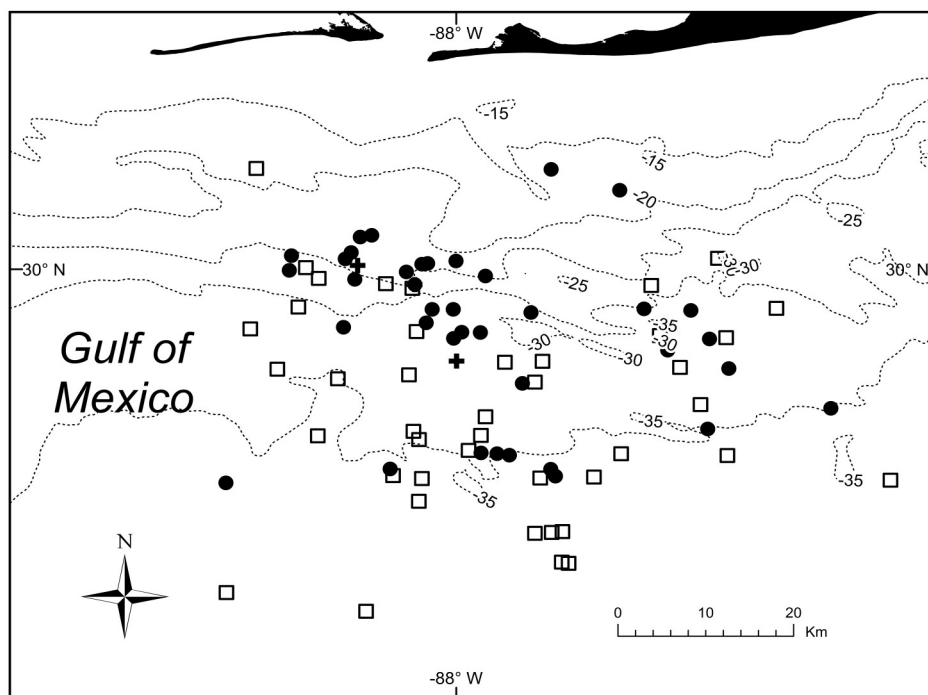
**Estimaciones de Mortalidad para el Pargo Rojo, *Lutjanus campechanus*,  
Basado en la Telemetría Acústica y el Marcado Convencional en el Norte del Golfo de México**

**Estimation de la Mortalité chez le Vivaneau Rouge, *Lutjanus campechanus*, Bbasée sur la  
Télémétrie Acoustique et le Marquage Conventionnel dans le Nord du Golfe du Mexique**

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**EXTENDED ABSTRACT**

Red Snapper, *Lutjanus campechanus*, is an economically important species in the northern Gulf of Mexico, and accurate estimates of mortality rates are important for management of the species. The present study estimated tagging mortality, natural mortality, tag shedding and fisher non-reporting based on telemetry of transmitter tagged Red Snapper. These estimates were then applied to a conventional tagging study that allowed a substantial increase in sample sizes compared to telemetry. A total of 774 conventionally tagged Red Snapper were released on 83 reef sites from 2015 through 2017 (Figure 1). All conventionally tagged fish were released prior to the June 1<sup>st</sup> opening of the sport fishing Red Snapper season for each year. Transmitter tagged Red Snapper were monitored on four reef sites with the Vemco Positioning Systems (VPS). The VPS system allowed determination of the fate of each fish as emigrated, natural mortality or fishing mortality independent of fisher reported recaptures. As fish emigrated or suffered mortality at each VPS site, they were replaced with new transmitter tagged Red Snapper (Vemco V-16). All transmitter and conventional tagged Red Snapper were released using a remote cage release method (Williams et al. 2015), and all tagged fish were greater than the present 406 mm TL sport fishing size limit. Fishers were offered a high reward (\$150 USD) for reporting recaptures to increase fisher returns.



**Figure 1.** Release site locations for conventionally tagged Red Snapper off Alabama USA. Black dots = 2015, squares = 2016, and triangles = 2017.

Telemetry showed a tagging artifact mortality rate of 1.3% and a fisher non-reporting rate of 18% over the first season at liberty, 29% for the second season at liberty and 45% for the third season at liberty. The increase in fisher non-reporting with increased time at liberty was due to external tag loss over time. No transmitter tagged Red Snapper died from natural mortality during the present study, thus we applied an  $M = 0.1$  in the present analyses based on previous telemetry studies (Topping and Szedlmayer 2013, Williams Grove and Szedlmayer 2016a). Sport fishers on private vessels returned 179 conventional tags, fishers on charter vessels returned 49 conventional tags and commercial fishers returned 52 conventional tags, for a total of 280 conventionally tagged Red Snapper reported by fishers. The present estimates of fishing mortality ( $F$ ) were higher for transmitter tagged Red Snapper in 2015 ( $F = 1.05$ ,  $n = 49$ ), 2016 ( $F = 0.55$ ,  $n = 33$ ) and 2017 ( $F = 0.49$ ,  $n = 27$ ) compared to  $F$  estimates for conventionally tagged Red Snapper in 2015 ( $F = 0.44$ ), 2016 ( $F = 0.34$ ) and 2017 ( $F = 0.27$ ). Red Snapper have high (> 80 %) residency on artificial reefs (Topping and Szedlmayer 2011, Piraino and Szedlmayer 2014, Williams-Grove and Szedlmayer 2016b), thus we were able to compare return rates by reef type. Tag return rates were significantly higher for Red Snapper on big (> 25 m<sup>2</sup>) reefs compared to small reefs (< 25 m<sup>2</sup>), higher on reefs with published locations (ADCNR 2016) compared to reefs with unpublished locations, and higher on reefs that were closer to shore (< 33 km) than reefs that were further from shore (33 to 65 km).

The tag return rates for big reefs and small reefs were then adjusted for Red Snapper abundance estimates on these different reef types (Unpublished data, Szedlmayer and Mudrak). This mortality adjustment based on Red Snapper abundance patterns lowered the overall  $F$  to 0.22 with a mean annual harvest of 208,705 Red Snapper greater than 406 mm off coastal Alabama in the northern Gulf of Mexico. Based on the tag return rates observed in conventionally tagged Red Snapper 38,760 Red Snapper were harvested by commercial fishers and 169,946 Red Snapper were harvested by sport fishers each year. The present study showed that telemetry produced the most accurate estimates of tag mortality, tag retention rates and fisher mortality, while the conventional tagging allowed for substantially increased sample size. These two tagging methods combined with abundance distribution patterns provided the most accurate  $F$  estimate.

**KEYWORDS:** Red Snapper, *Lutjanus campechanus*, mortality, acoustic telemetry, tagging

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