DR. J. MARCUS DRYMON (Orcid ID : 0000-0002-2104-004X)
MS. AMANDA E JEFFERSON (Orcid ID : 0000-0002-6149-5903)

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Understanding and enhancing angler satisfaction with fisheries management: insights from the "Great Red Snapper Count"

Steven B. Scyphers[1*], J. Marcus Drymon[2,3], Kelsi L. Furman[1], Elizabeth Conley[1], Yvette Niwa[1], Amanda E. Jefferson[3,4], Gregory W. Stunz[4]

[1]Coastal Sustainability Institute, Northeastern University, Nahant, MA
[2]Coastal Research and Extension Center, Mississippi State University, Biloxi, MS
[3]Mississippi-Alabama Sea Grant, Ocean Springs, MS
[4]Harte Research Institute for Gulf of Mexico Studies, Texas A&M University - Corpus Christi, Corpus Christi, TX

***Corresponding Author**: Steven Scyphers, s.scyphers@northeastern.edu, 781-581-7870 x306.

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Abstract: Gulf of Mexico Red Snapper (*Lutjanus campechanus*) management has been a topic of much scientific debate and intensive public scrutiny. In response to political, public, and management desires for more robust data on Red Snapper populations, a Gulf-wide initiative commonly referred to as the "Great Red Snapper Count" (GRSC) was funded to estimate the absolute abundance of Red Snapper in the US Gulf of Mexico. Here, we describe the results of an online survey designed to: a) characterize the social dimensions of Red Snapper anglers, b) measure satisfaction with current Red Snapper populations and regulations, c) assess overall patterns of awareness of the GRSC, and d) evaluate the potential benefits of GRSC stakeholder engagement videos. A key finding of our survey was that awareness of the GRSC was associated with up to 3 times higher satisfaction with fisheries management. Through an in-survey experiment, we found that anglers presented a video on specific GRSC project components reported slightly higher management satisfaction than those presented an overview video or no video. Collectively, our results indicate that angler awareness, when underpinned by effective engagement and outreach activities, can enhance angler satisfaction.

Keywords: Human Dimensions; Participatory Management; Social Science; Ecosystem-based management

Introduction

In the U.S. Gulf of Mexico, Red Snapper (*Lutjanus campechanus*) populations and their management have been subject to intense scientific debate and public scrutiny (Cowan et al. 2011; Cowan 2011). Over the past decade, Gulf of Mexico Red Snapper has undergone multiple formal assessments through the Southeast Data, Assessment, and Review program (SEDAR). The 2013 assessment suggested that Gulf of Mexico Red Snapper was overfished but not experiencing overfishing (SEDAR-31

2013). In contrast, the most recent assessment, completed in 2018 with a revised approach for stock status determination, deemed the stock as neither overfished nor experiencing overfishing, yet needing to remain on a rebuilding plan (SEDAR-52 2018). Much of the controversy and angler disenfranchisement in the Red Snapper fishery can be attributed to a relatively unique problem of a rebounding fishery with very high catch-per-unit-effort (CPUE), coupled with decreasing season lengths for recreational sectors (i.e., access).

The recreational fishery for Red Snapper has undergone several management changes in recent years. Since 1990, Red Snapper recreational fishing regulations have generally become more restrictive with per-person bag limits decreasing from 7 to 2 fish, minimum size limits increasing from 33.0 to 40.6 cm, and season lengths decreasing from a full calendar year down to as low as several days. Compounding the problems, a 2014 federal court ruling requiring greater accountability measures in the fishery led to the implementation of more conservative annual catch targets. In subsequent years, recreational fishing seasons in federal waters were as short as 3-4 days. However, studies of angler behavior revealed that the shorter seasons did not proportionally reduce catches, instead promoting “derby-style fishing” and worsening perceptions of angler dissatisfaction (Powers and Anson 2016; Farmer et al. 2019). In recent years, recreational season lengths have been extended and landings for Red Snapper have been at all-time highs, collectively providing a major source of concern and conflict within the fishery.

In 2016, NOAA Sea Grant invested approximately $9.5M (plus an additional $1.5M in matching funds for a total budget of $12M) to provide an independent estimate of Red Snapper absolute abundance in the U.S. Gulf of Mexico (MASGP-18-019-). Commonly referred to as the “Great Red Snapper Count” (GRSC), this research was largely in response to both scientific uncertainty and public interest in the Red Snapper fishery. The GRSC was implemented by academic research institutions in each of the five Gulf states and involved four common components aimed at assessing Red Snapper populations: habitat characterization, direct counts using video, fishing depletion experiments, and tag-and-recapture studies. Through working directly with legislators and fisheries managers, the desired outcomes of the study included an

improved stock assessment, increased public and scientific confidence in the status of the fishery, and maximum access to the fishery for stakeholders.

Notably, the GRSC was designed with an angler engagement priority "to work directly with the Gulf fishing community and engage stakeholders". For instance, the GRSC's tag-and-recapture study was modeled after long-standing and widely popular tagging programs throughout the Gulf of Mexico where anglers report data on the tagged fish they catch. An overarching goal of the GRSC was to increase public understanding of the scientific tools and processes involved in estimating fish populations, such as Gulf of Mexico Red Snapper. One specific effort towards this goal involved the development of a series of whiteboard videos describing the GRSC and its various scientific components. The series of five videos included a project overview and four more focused videos detailing each of the GRSC's scientific methodologies: habitat characterization, video counts, depletion experiments, and tagging-and-recapture. While other studies have previously demonstrated that short educational videos can be effective tools for promoting stakeholder understanding and management support (Giglio et al. 2018; Jacobson et al. 2019), these strategies have not been explicitly tested or evaluated for diverse and contentious fisheries like Gulf of Mexico Red Snapper.

In this paper, we describe the results of a Gulf-wide survey focusing on four objectives: a) characterizing the social dimensions of Red Snapper anglers, such as avidity and specialization; b) measuring satisfaction with current Red Snapper populations and fishing regulations; c) assessing overall patterns of awareness of the GRSC; and d) evaluating the potential benefits of stakeholder engagement videos using an in-survey experiment.

Methods

The human subjects research in our study was approved by Northeastern University's Institutional Review Board (IRB # 13-07-16), and informed consent was acquired from all participants.

Survey Instrument and Experimental Design

The general structure of our survey instrument and experimental design is shown in Figure 1. After screening for qualified participants and obtaining informed consent, the first three sections of the survey were presented identically to all participants. The questions in these sections spanned three general themes: 1) general fishing characteristics (e.g., location, specialization, etc.), including the importance of Red Snapper and other reef fishes as target species; 2) general attitudes and beliefs towards reef fishes, and 3) specific attitudes and beliefs regarding Red Snapper, including awareness of the GRSC.

Next, the fourth section of the survey involved a video experiment that was designed to evaluate the GRSC stakeholder engagement videos on the overall GRSC program and specific research components. For this part of the survey, we used a split sample design with randomization. First, each survey participant was randomly assigned to one of three top-tier treatments, where they were presented either a GRSC overview video, a video about a specific research topic, or no video as a control. Within the research topic video treatment, participants were randomly shown one video describing one of the four core project components: habitat characterization, direct counts using video, fishing depletion experiments, and tag-and-recapture studies. All videos are available at: https://www.youtube.com/channel/UCejpASgofRSoaFvuI-N-Kmw.

Finally, following the video experiment, the survey included two additional sections of questions that were identical for all respondents. The fifth section measured self-assessed knowledge and satisfaction with Red Snapper populations and regulations (Table 1). The sixth block of questions collected demographic information including age, gender, education, and income. The survey instrument with all questions described in the paper is provided in the Supplement (available in the online version of this article).

Data Collection and QA/QC

We used Qualtrics Research Panels to recruit a sample of 1000 individuals (200 per Gulf state) who saltwater fish in the Gulf of Mexico. Panel samples have rapidly gained popularity over the past decade as a quick and cost-effective approach to online

surveys, and Qualtrics Research Panels has been described as among the most robust tools (Zack et al. 2019). As with all non-probability sampling methodologies, it is important to consider and minimize potential issues of data quality. The panel sample was proportioned to the general public and randomized before the survey was deployed. To evaluate and assure data quality, we applied a multi-step process during and after survey implementation. First, we used a self-affirmation screening question where only participants who committed "to providing their best answers" were allowed to proceed with the survey. Additionally, we included two "attention check" questions to detect "straight-lining" (i.e., respondents who repeatedly selected the same answer), and we set a completion time threshold of 50% of the mean completion time to identify "speeders" (i.e., respondents who rapidly answer questions without closely reading them) (Zhang and Conrad 2014). After the survey closed, we reviewed all open-ended responses using a 3-category system: *Definitely Bad*, *Possibly Bad*, or *Not Suspicious*. All cases of duplicate entry were coded as *Definitely Bad.* As a second step, we reviewed all *Possibly Bad* and *Not Suspicious* responses for duplicate entry, such as a respondent pasting the same answer into multiple questions. From this process, we flagged 16% of responses as *Definitely Bad* and 11% as *Possibly Bad*, leaving 73% as *Not Suspicious*. Following this review, all bad responses were replaced by Qualtrics and new responses were subsequently reviewed.

Analysis

We used Fisher's Exact Tests to assess potential relationships among recreational fishing specialization and Red Snapper importance. We used non-parametric Kruskal-Wallis tests to evaluate whether awareness of the GRSC was associated with differing levels of satisfaction. Among respondents not previously aware of the GRSC, we also used Kruskal-Wallis tests to explore potential influences of the video treatments on self-assessed knowledge and satisfaction. All data were analyzed using the Statistical Package for the Social Sciences (SPSS version 26), and results were considered statistically significant at $P \leq 0.05$.

Results

Panel Sample Demographics and Fishing Characteristics

All 1000 anglers in our study had completed at least one saltwater fishing trip within the past two years. Compared to the general population of each state, the survey panel sample was generally similar for household income, education, and race. However, as is common in panel surveys, our dataset was overrepresented by female participants. Using a self-classification measure for Recreational Fishing Specialization (Needham et al. 2009), 37.8% of anglers were generalist / casual, 33.7% intermediate, and 28.5% specialist / veteran. In the context of all saltwater fishing, offshore fishing for reef fishes was considered extremely important by 25.5%, very important by 25.3%, moderately important by 27.7%, slightly important by 11.2%, and not at all important by 10.3%. Among a list of 32 reef fishes, Red Snapper was considered the most important reef fish species with 65.6% of anglers considering it at least "important" for their fishing, and among these 49.7% considering it the single most important species.

We calculated crosstabs and created a Sankey plot to visualize the relationship between recreational fishing specialization and Red Snapper importance (Figure 2). Among anglers who considered Red Snapper as their single most important target species, 26.6% self-classified as specialist / veteran, 39.8% as intermediate, and 33.6% as generalist / casual anglers. From the sorting direction of recreational fishing specialization, Red Snapper was considered the single most important target species among 46.3% of specialist / veteran, 58.8% of intermediate, and 44.2% of generalist / casual anglers.

Awareness of GRSC and Satisfaction

Overall, our results indicate that roughly 60% of anglers were aware of the GRSC prior to taking the survey, with 18.8% stating they were very familiar (Figure 3a). Among the four core GRSC components, overall awareness of the tagging and rewards program was the highest at 35.2%, followed by habitat characterization (21.5%), visual and camera fish counts (21.2%), and fish depletion experiments (17.7%). Overall GRSC awareness generally increased with recreational fishing specialization, with 76.1% of specialist /veteran anglers at least somewhat familiar with the program and 31.2% very familiar. However, awareness across categories of Red Snapper importance was more

217 complex, with the lowest familiarity existing among the group of anglers that considers
218 Red Snapper as their most important target species.
219 Two other core questions in our survey measured angler satisfaction with current
220 Red Snapper populations and current regulations. To assess overall patterns of
221 satisfaction, we looked at responses among anglers within the control treatment (i.e.,
222 respondents who did not view any videos during the survey). We found that most of
223 these anglers were satisfied with both current populations and regulations; moreover,
224 these factors were significantly related (X^2 = 202.991, df = 16, P < 0.001; Figure 4).
225 Overall, our results show that angler awareness of the GRSC was positively
226 associated with higher satisfaction with both Red Snapper populations (Figure 5; n =
227 333, H = 36.751, df = 2, P < 0.001) and current management (Figure 5; n = 333, H =
228 11.535, df = 2, P = 0.03). For satisfaction with Red Snapper populations, there were
229 large differences across categories, with 62% of individuals very familiar with the GRSC
230 reporting that they were very satisfied with Red Snapper populations, compared to only
231 21% of individuals who had never heard of the GRSC. Likewise, for satisfaction with
232 current regulations, there were also substantial differences across awareness levels,
233 with 46% of individuals very familiar with the GRSC also very satisfied with current
234 regulations compared to only 19% of individuals who had never heard of the program.
235
236 *GRSC Stakeholder Engagement Video Experiment*
237 Our survey design involved an experiment to assess potential influences of the GRSC
238 angler engagement videos on angler knowledge and satisfaction. Among survey
239 participants who were somewhat or not at all familiar with the GRSC prior to taking the
240 survey, our analyses found that respondents in video treatments self-rated their
241 knowledge of scientific processes significantly higher (n = 812, H = 11.734, df = 2, P =
242 0.003) and their knowledge of management processes marginally higher (n = 812, H =
243 5.428, df = 2, P = 0.066) than respondents in control treatments (Figure 6).
244 We also compared satisfaction levels across treatments in our video experiment.
245 In this context, video experiment treatment was associated with satisfaction with current
246 regulations (n = 812, H = 7.362, df = 2, P = 0.025) but not satisfaction with population
247 levels (n = 812, H = 0.293, df = 2, P = 0.864) (Figure 7). When comparing patterns

248 across the specific component videos, some additional trends were visible. For
249 instance, satisfaction with Red Snapper populations was qualitatively highest among the
250 group of individuals presented a short video about the habitat characterization
251 component of the GRSC at 74.6%, compared to 58.2% among those not shown a video
252 as part of the control treatment. Similarly, the four component video treatments
253 qualitatively aligned as having the highest levels of satisfaction with current regulations.
254
255 **Discussion**
256 As one of the most socially important and economically valuable fisheries in the
257 Gulf of Mexico, Red Snapper poses many challenges for scientists and managers
258 (Cowan et al. 2011; Powers and Anson 2016; SEDAR-52 2018). Consequently, the
259 overarching goal of the GRSC was to reduce public uncertainty on the status of Gulf of
260 Mexico Red Snapper populations. A top priority of our study focused on understanding
261 how these issues, and the GRSC initiative, were perceived by Gulf of Mexico anglers. In
262 particular, the video experiment component of our study presented a unique opportunity
263 to test how specific stakeholder engagement materials influenced self-assessed angler
264 knowledge and satisfaction. From our survey results, we identified a series of key
265 findings relevant to the current management of Gulf of Mexico Red Snapper.
266 Awareness of the GRSC was generally associated with higher satisfaction with
267 Red Snapper fisheries. As expected, GRSC awareness was highest among the most
268 avid and specialized anglers who consider fishing to be their primary outdoor activity.
269 Given the widespread use of social media among this subset of the fishing community
270 (e.g., fishing forums), high awareness among this group wasn't particularly surprising.
271 Conversely, however, the lowest awareness of the GRSC was among anglers who
272 considered Red Snapper to be their most important target species. One plausible
273 explanation for this pattern is that many casual anglers only saltwater fish a few times
274 per year, for example during summer vacations to coastal areas, yet many of these
275 individuals consider Red Snapper as very important for their fishing satisfaction. Given
276 the diverse constituency of the Red Snapper fishery, adequately engaging all of these
277 stakeholders presents a substantial challenge. However, our results highlight the need
278 to understand and connect with these individuals.

Another key finding of our study emerged from the video experiment. We found that anglers presented a video on specific GRSC project components reported higher scientific knowledge and higher management satisfaction than individuals presented an overview video or no video. While the project overview video provided the most comprehensive project description, one potential explanation for this pattern is that anglers may desire both in-depth yet understandable insight on the scientific methodologies for assessing fish populations. For instance, while modern stock assessments are generally transparent (e.g., the SEDAR process), the assessments themselves are incredibly complex and focus on data analyses.

A number of other studies have also shown that educational videos can be effective tools for promoting management support and conservation objectives (Giglio et al. 2018; Jacobson et al. 2019). For instance, Giglio and colleagues (2018) conducted a video experiment with recreational SCUBA divers and found that divers who were shown an educational video were more likely to implement conservation-oriented diving behaviors than a control group. In another study, Jacobsen and colleagues (2019) used short 1-2 minute videos in a large experiment of college students and found that positively-framed messages were more effective at motivating willingness to donate money to conservation organizations than negatively framed videos. In our study, it is worth noting that the overview video was more negatively framed than the component videos as it highlighted the general landscape of angler dissatisfaction.

Angler engagement and participation have been widely described as key components of satisfaction (Arlinghaus 2006; Hutt and Bettoli 2007; Beardmore et al. 2015; Crandall et al. 2019). Considering that the tagging and rewards component of the GRSC had the highest awareness, it is important to recognize that the GRSC is a short-term program built upon many previous and ongoing fisheries-independent research studies (Scott et al. 1990; Sackett and Catalano 2017; Grüss et al. 2018). For instance, the fishery for reef fish in the Gulf of Mexico has a long history of engaging and relying on anglers for the success of tagging programs (Szedlmayer and Shipp 1994; Patterson et al. 2001) and other management strategies that provide relatively high buy-in through angler participatory opportunities (Scyphers et al. 2013; Crandall et al. 2017). However, satisfaction is most common when angler engagement or input in management

processes is followed by meaningful action (Crandall et al. 2019), as well as when the expected benefits of proposed management adjustments are clear and realistic (Seeteram et al. 2019).

One important consideration for interpreting our study is understanding our survey methodology using Qualtrics Panels, which has several key strengths but also a few known limitations. For instance, the overarching strength of our approach was the ability to rapidly and cost-effectively survey diverse anglers engaged in Red Snapper fisheries in the Gulf of Mexico across multiple states. For instance, when compared to email-based surveys, our study was not limited to anglers who met licensing criteria, which vary across states and many saltwater anglers are not required to purchase licenses. Moreover, when compared to address-based mail sampling, our approach targeted a similarly broad population of coastal anglers yet was significantly faster and more cost-effective. Some criticism of non-probability survey panels, such as Qualtrics Panels, focus on their representativeness (Zack et al. 2019); however, recent studies have increasingly shown that effective panel design and sampling can lead to robust and representative samples, with many of these studies involving Qualtrics Panels (Harlan et al. 2019; Boas et al. 2020; Miller et al. 2020).

In summary, recreational fishing satisfaction is complex, multidimensional, and generally defined as “the difference between the outcomes an angler desires or thinks should be received and the perceived fulfillment of the desired outcomes” (Fedler and Ditton 1986; Graefe and Fedler 1986). The GRSC was designed and implemented to reduce public consternation on the population size and sustainability of Red Snapper. Our survey results indicate that the program may have had ancillary benefits for fisheries management by increasing satisfaction among anglers, at least initially, independent of those biological outcomes. However, it is also important to consider that recently increased season lengths and high catch rates are likely also underpinning the currently high satisfaction with Red Snapper populations and regulations. In the broader perspective and longer-term, angler satisfaction is likely to continually evolve with perceptions of management and access to the fishery.

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Conflicts of Interest: SBS is an appointed member of the Gulf of Mexico Fishery Management Council's Standing Scientific and Statistical Committee. JMD is an extension professor with Mississippi-Alabama Sea Grant. GWS is an appointed member of the Gulf of Mexico Fishery Management Council.

References

Arlinghaus, R. 2006. On the apparently striking disconnect between motivation and satisfaction in recreational fishing: the case of catch orientation of German anglers. North American Journal of Fisheries Management 26(3):592–605.

Beardmore, B., L. M. Hunt, W. Haider, M. Dorow, and R. Arlinghaus. 2015. Effectively managing angler satisfaction in recreational fisheries requires understanding the fish species and the anglers. Canadian Journal of Fisheries and Aquatic Sciences. 72(4):500–513.

Boas, T. C., D. P. Christenson, and D. M. Glick. 2020. Recruiting large online samples in the United States and India: Facebook, Mechanical Turk, and Qualtrics. Political Science Research and Methods 8(2):232–250.

Cowan, J. H. 2011. Red Snapper in the Gulf of Mexico and U.S. South Atlantic: Data, Doubt, and Debate. Fisheries 36(7):319–331.

Cowan, J. H., C. B. Grimes, W. F. Patterson, C. J. Walters, A. C. Jones, W. J. Lindberg, D. J. Sheehy, W. E. Pine, J. E. Powers, M. D. Campbell, K. C. Lindeman, S. L. Diamond, R. Hilborn, H. T. Gibson, and K. A. Rose. 2011. Red Snapper management in the Gulf of Mexico: science- or faith-based? Reviews in Fish Biology and Fisheries 21(2):187–204.

Crandall, C. A., M. Monroe, J. Dutka-Gianelli, and K. Lorenzen. 2019. Meaningful action gives satisfaction: Stakeholder perspectives on participation in the management of marine recreational fisheries. Ocean & Coastal Management 179:104872.

371 Crandall, C., T. Garlock, and K. Lorenzen. 2017. Patterns and determinants of
372 barotrauma mitigation tool use in reef fisheries in the Southeastern United States:
373 The power of subjective norms. North American Journal of Fisheries Management,
374 38(2), 271-280.
375 Farmer, N. A., J. T. Froeschke, and D. L. Records. 2019. Forecasting for recreational
376 fisheries management: a derby fishery case study with Gulf of Mexico Red
377 Snapper. ICES Journal of Marine Science 77(6) 2265–2284,
378 Fedler, A. J., and R. B. Ditton. 1986. A framework for understanding the consumptive
379 orientation of recreational fishermen. Environmental Management 10(2):221–227.
380 Giglio, V. J., O.J. Luiz, N.E. Chadwick, and C.E. Ferreira. 2018. Using an educational
381 video-briefing to mitigate the ecological impacts of scuba diving. Journal of
382 Sustainable Tourism, *26*(5), 782-797.
383 Graefe, A. R., and A. J. Fedler. 1986. Situational and subjective determinants of
384 satisfaction in marine recreational fishing. Leisure Sciences 8(3):275–295.
385 Grüss, A., H. A. Perryman, E. A. Babcock, S. R. Sagarese, J. T. Thorson, C. H.
386 Ainsworth, E. J. Anderson, K. Brennan, M. D. Campbell, M. C. Christman, and
387 Others. 2018. Monitoring programs of the US Gulf of Mexico: inventory,
388 development and use of a large monitoring database to map fish and invertebrate
389 spatial distributions. Reviews in fish biology and fisheries 28(4):667–691.
390 Harlan, S. L., M. J. Sarango, E. A. Mack, and T. A. Stephens. 2019. A survey-based
391 assessment of perceived flood risk in urban areas of the United States.
392 Anthropocene 28:100217.
393 Hutt, C. P., and P. W. Bettoli. 2007. Preferences, Specialization, and Management
394 Attitudes of Trout Anglers Fishing in Tennessee Tailwaters. North American Journal
395 of Fisheries Management 27(4):1257–1267.
396 Jacobson, S. K., N.A. Morales, B. Chen, R. Soodeen, M. Moulton, and E. Jain. 2019.
397 Love or loss: Effective message framing to promote environmental
398 conservation. *Applied Environmental Education & Communication*, *18*(3), 252-265.
399 Miller, C. A., J. P. D. Guidry, B. Dahman, and M. D. Thomson. 2020. A Tale of Two
400 Diverse Qualtrics Samples: Information for Online Survey Researchers. Cancer
401 epidemiology, biomarkers & prevention: a publication of the American Association

for Cancer Research, cosponsored by the American Society of Preventive Oncology 29(4):731–735.

Needham, M. D., L. J. Sprouse, and K. E. Grimm. 2009. Testing a Self-Classification Measure of Recreation Specialization Among Anglers. Human Dimensions of Wildlife 14(6):448–455.

Patterson, W. F., J. C. Watterson, R. L. Shipp, and J. H. Cowan. 2001. Movement of Tagged Red Snapper in the Northern Gulf of Mexico. Transactions of the American Fisheries Society 130(4):533–545.

Powers, S. P., and K. Anson. 2016. Estimating recreational effort in the Gulf of Mexico Red Snapper Fishery using boat ramp cameras: Reduction in federal season length does not proportionally reduce catch. North American Journal of Fisheries Management 36(5):1156–1166.

Sackett, D. K., and M. Catalano. 2017. Spatial heterogeneity, variable rewards, tag loss, and tagging mortality affect the performance of mark--recapture designs to estimate exploitation: an example using Red Snapper in the northern Gulf of Mexico. North American Journal of Fisheries Management 37(3):558–573.

Scott, E. L., E. D. Prince, and C. D. Goodyear. 1990. History of the cooperative game fish tagging program in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, 1954--1987. Pages 841–853 American Fisheries Society Symposium.

Scyphers, S. B., F. J. Fodrie, F. J. Hernandez, S. P. Powers, and R. L. Shipp. 2013. Venting and reef fish survival: perceptions and participation rates among recreational anglers in the northern Gulf of Mexico. North American Journal of Fisheries Management 33(6):1071–1078.

SEDAR-31. 2013. SEDAR 31: Gulf of Mexico Red Snapper stock assessment report. SEDAR North Charleston, South Carolina.

SEDAR-52. 2018. SEDAR 52 Stock Assessment Report: Gulf of Mexico Red Snapper.

Seeteram, N., M. Bhat, B. Pierce, K. Cavasos, and D. Die. 2019. Reconciling economic impacts and stakeholder perception: A management challenge in Florida Gulf Coast fisheries. Marine Policy 108:103628.

Szedlmayer, S. T., and R. L. Shipp. 1994. Movement and Growth of Red Snapper, Lutjanus Campechanus, from an Artificial Reef Area in the Northeastern Gulf of

Mexico. Bulletin of Marine Science 55(2-3):887–896.

Zack, E. S., J. Kennedy, and J. S. Long. 2019. Can nonprobability samples be used for social science research? A cautionary tale. Survey Research Methods 13(2):"215-227

Zhang, C., and F. Conrad. 2014. Speeding in Web Surveys: The tendency to answer very fast and its association with straightlining. Survey Research Methods 8(2):127-135.

Figure Captions

Figure 1. Schematic showing the core sections, survey flow, and experimental design of our study. The example video image shows one of the videos developed as part of the stakeholder engagement activities of the Great Red Snapper Count.

Figure 2. Sankey diagram showing relationships between recreational fishing specialization (left) and importance of Red Snapper as a target species (right). Line width represents the numerical crosstabs between these two survey questions.

Figure 3. Awareness of the Great Red Snapper Count by recreational fishing specialization (a) and importance of Red Snapper as a target species (b).

Figure 4. Sankey diagram showing relationships between satisfaction with current Red Snapper populations (left) and satisfaction with current Red Snapper regulations (right). Line width represents the numerical crosstabs between these two survey questions.

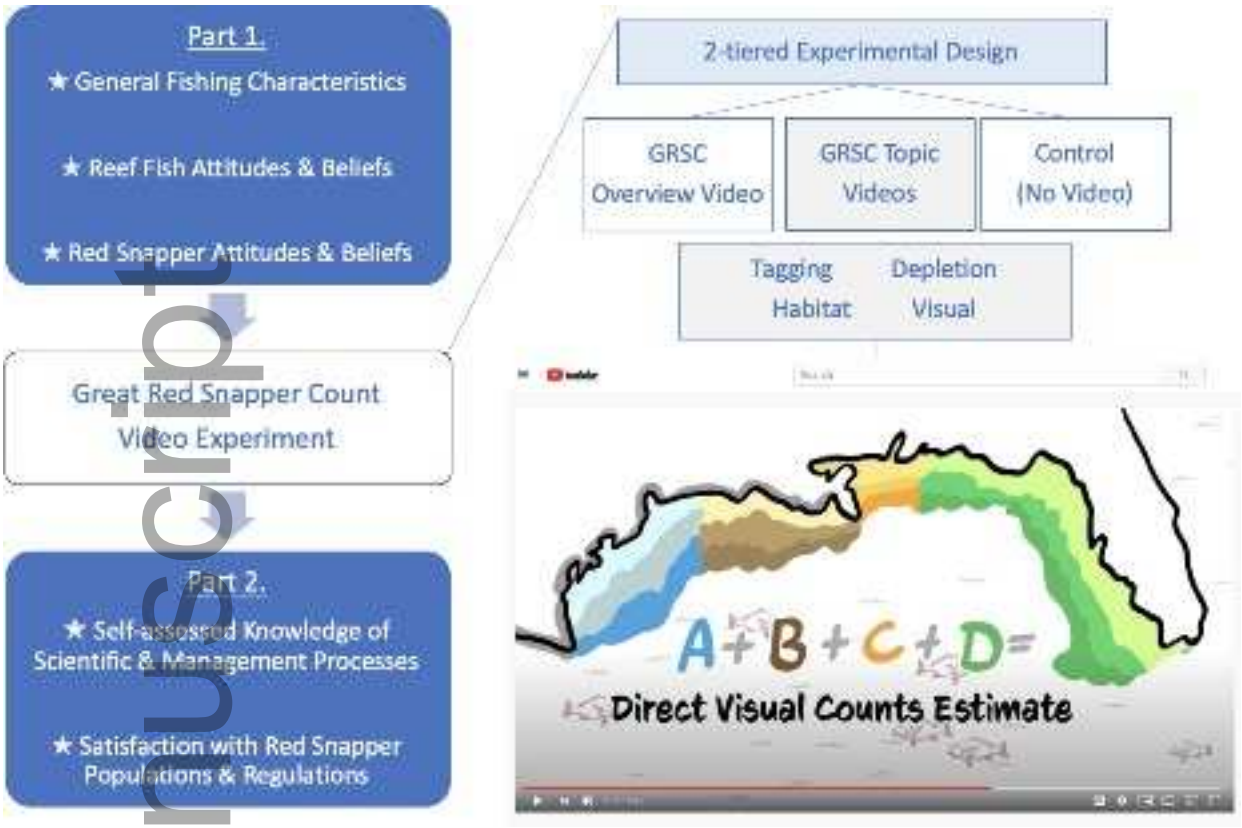
Figure 5. Funnel plots showing the categorical response to survey questions measuring angler satisfaction with Red Snapper populations (above) and current regulations (below) across categories of awareness of the Great Red Snapper Count.

Figure 6. Categorical response to survey questions measuring self-assessed angler knowledge of scientific processes (a) and management processes (b) across video treatments.

Figure 7. Categorical response to survey questions measuring angler satisfaction with Red Snapper populations (a) and current regulations (b) across video treatments.

Concept	Question	Responses
Satisfaction with Red Snapper Populations	How would you describe your overall level of satisfaction with Red Snapper ***population levels***?	Very Dissatisfied (1) to Very Satisfied (5)
Satisfaction with Red Snapper Regulations	How would you describe your overall level of satisfaction with ***current fishing regulations*** for Red Snapper?	Very Dissatisfied (1) to Very Satisfied (5)
Self-Assessed Scientific Knowledge	How would you describe your overall level of knowledge on the ***scientific processes*** *involved in assessing Red Snapper populations*?	Not Knowledgeable (1) to Extremely Knowledgeable (5)
Self-Assessed Management Knowledge	How would you describe your overall level of knowledge on the ***management processes*** *involved with setting regulations for Red Snapper fisheries*?	Not Knowledgeable (1) to Extremely Knowledgeable (5)

Table 1. Key concepts and associated questions included in the survey. The survey instrument with all questions described in the paper is provided in Appendix 1.



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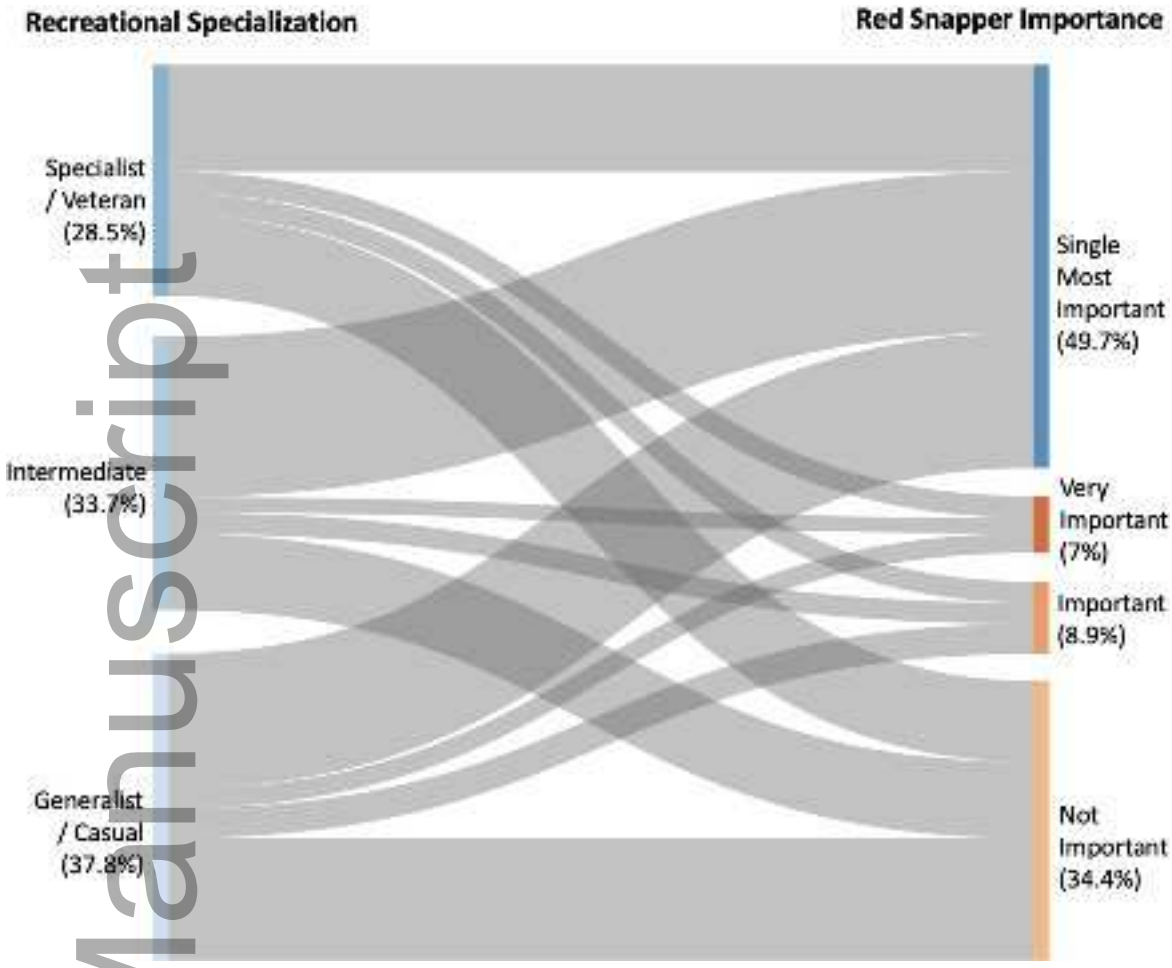

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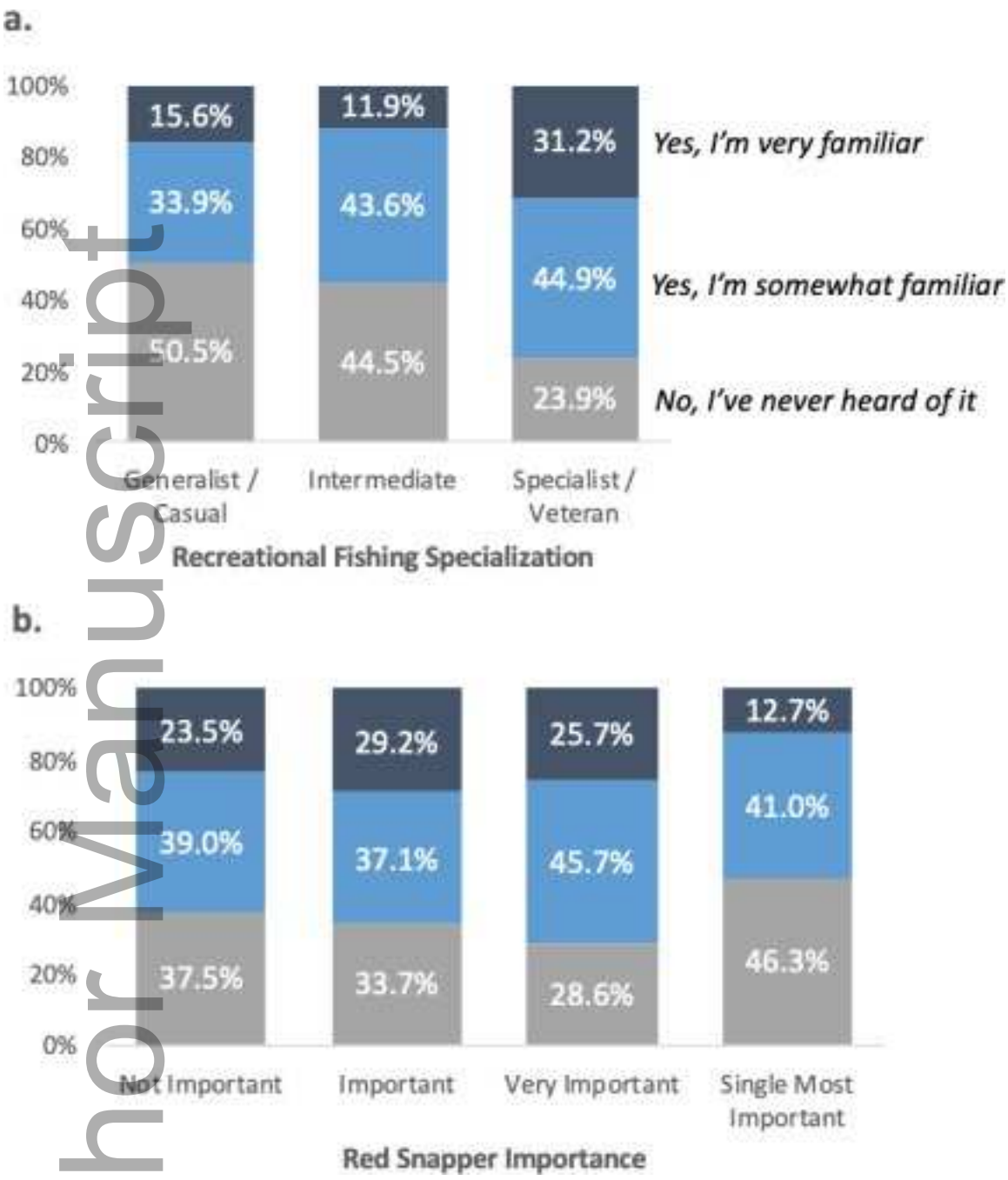

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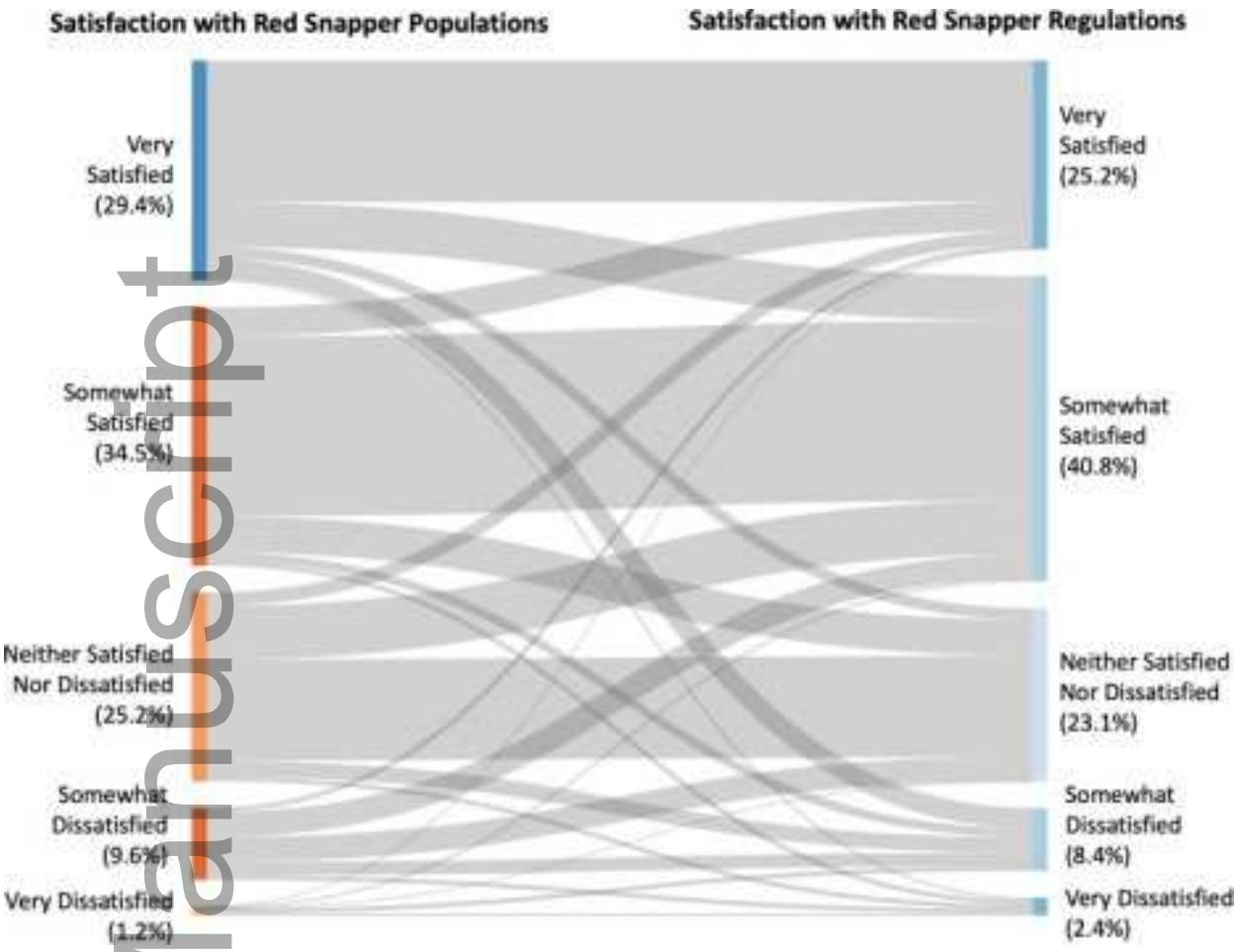

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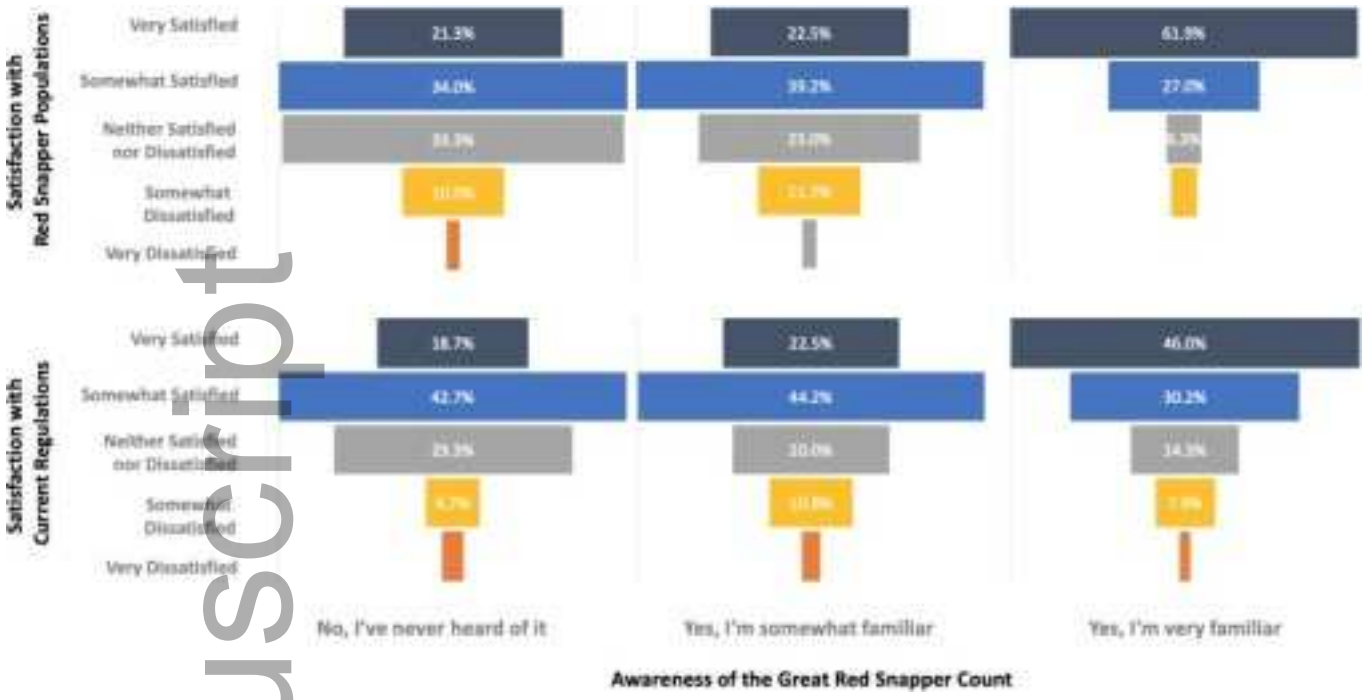

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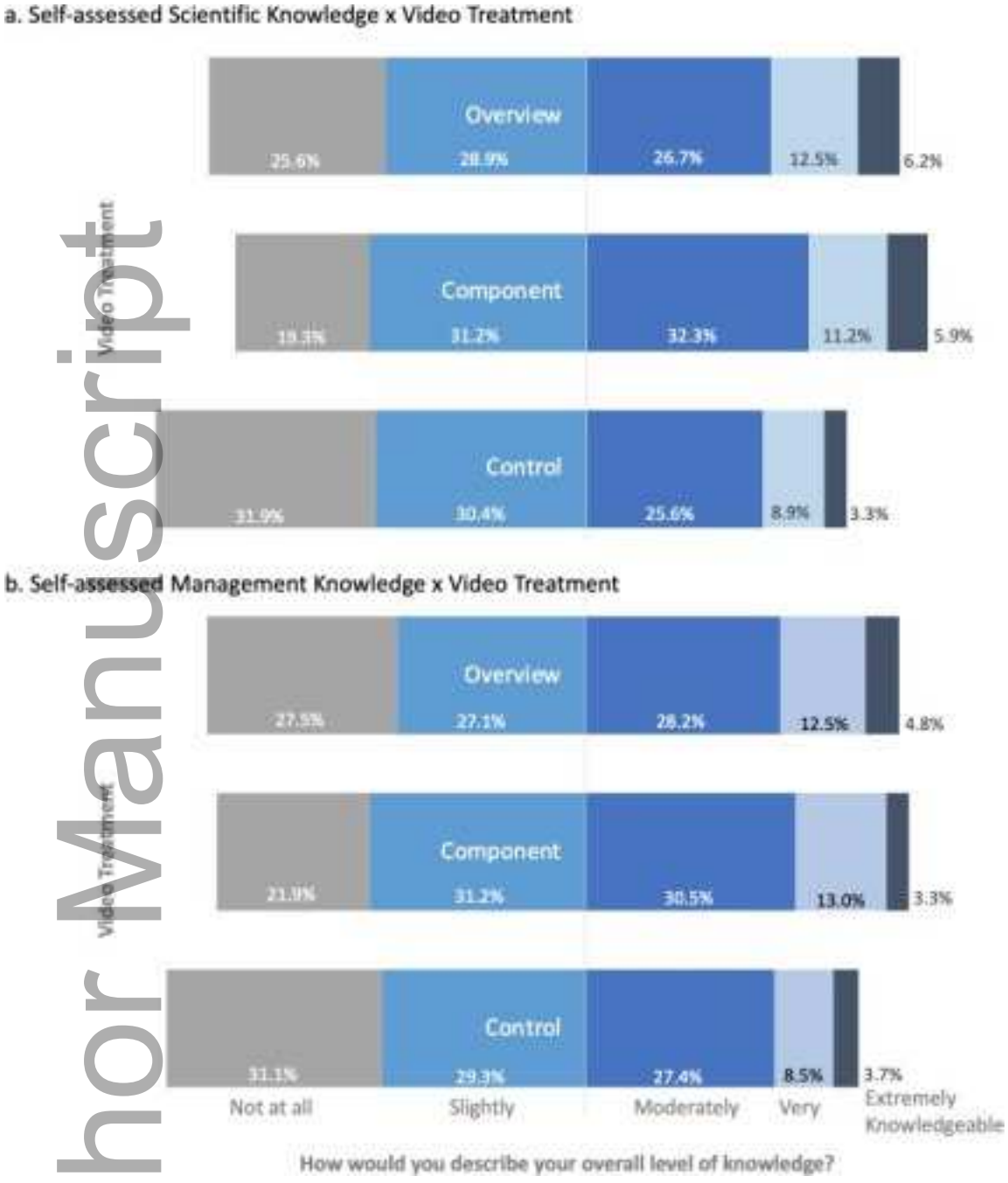

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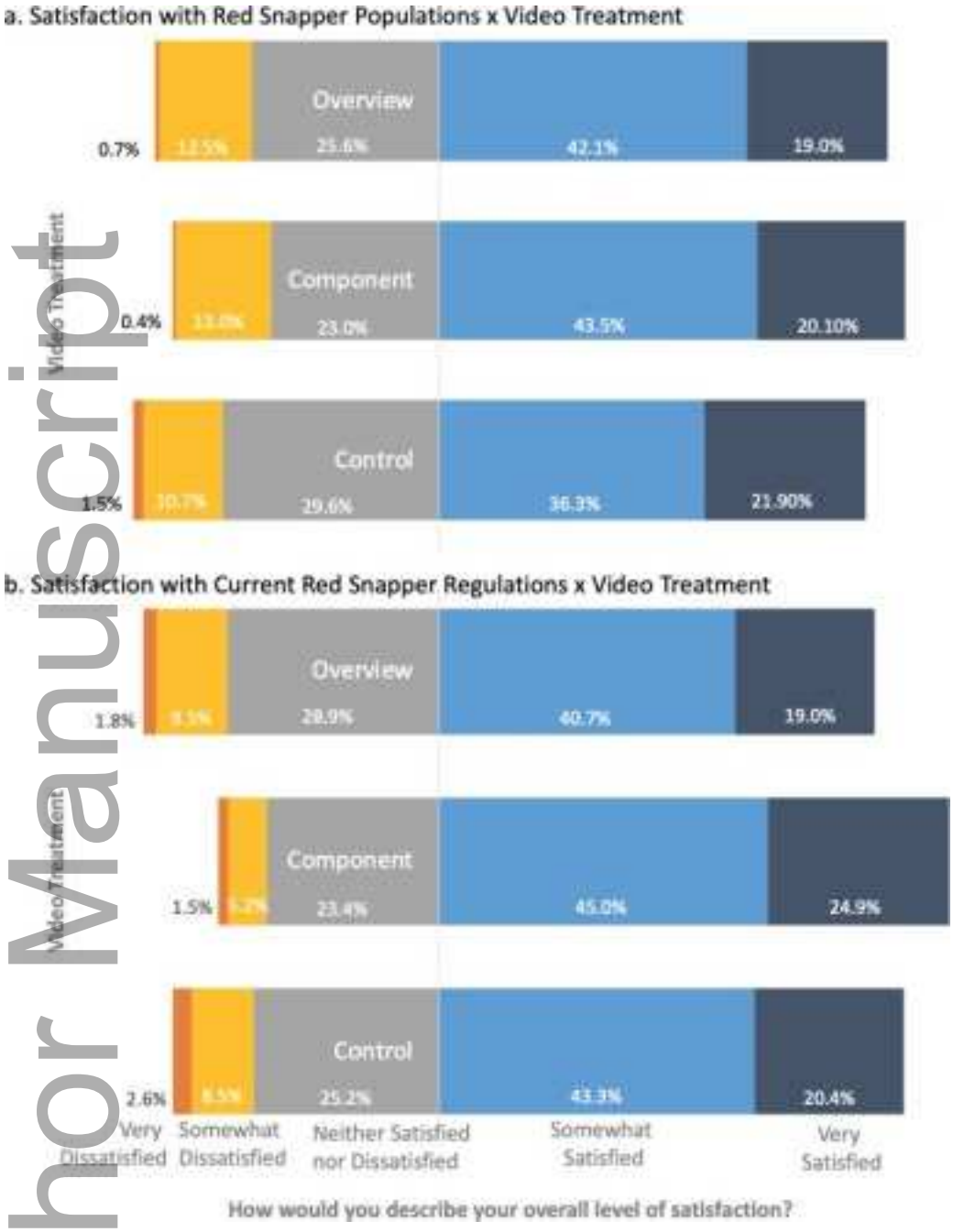

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