



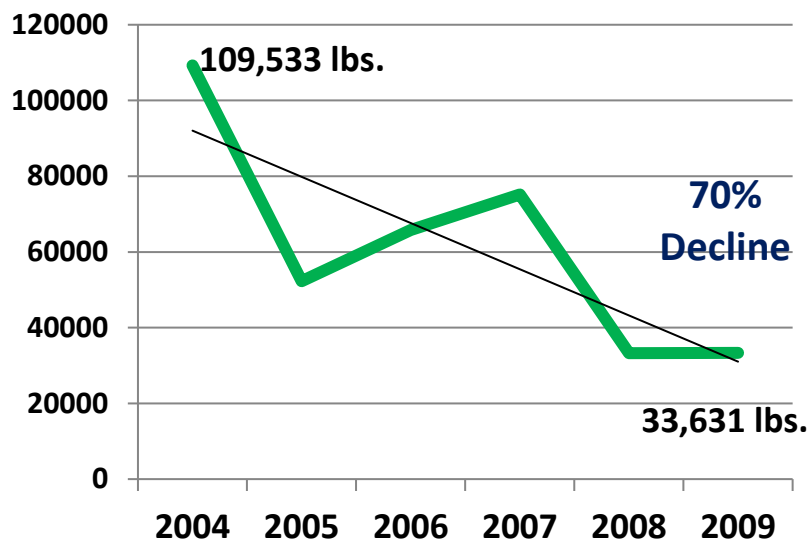
The Status of Turneffe Atoll's Fishery

There is consensus among Turneffe stakeholders as well as fisheries experts that the Turneffe Atoll fishery has declined significantly. The Fisheries Department assimilates yearly catch data for Turneffe, as well as other fishing locations in Belize, largely through information provided from Belize's Fishing Cooperatives. This data has been challenged as being incomplete or inaccurate. Skepticism about the Fisheries Department data focuses on the potential for mixing fishing products from Turneffe and elsewhere, as well as the potential sale of Turneffe's fishing products outside of the Coops to local fish markets and restaurants. This paper looks at the data from the Belize Fisheries Department noting a sharp decline in Turneffe's fishery and largely confirms the validity of this data based upon information provided by Turneffe's commercial fishermen through a detail survey of Turneffe Fishermen.

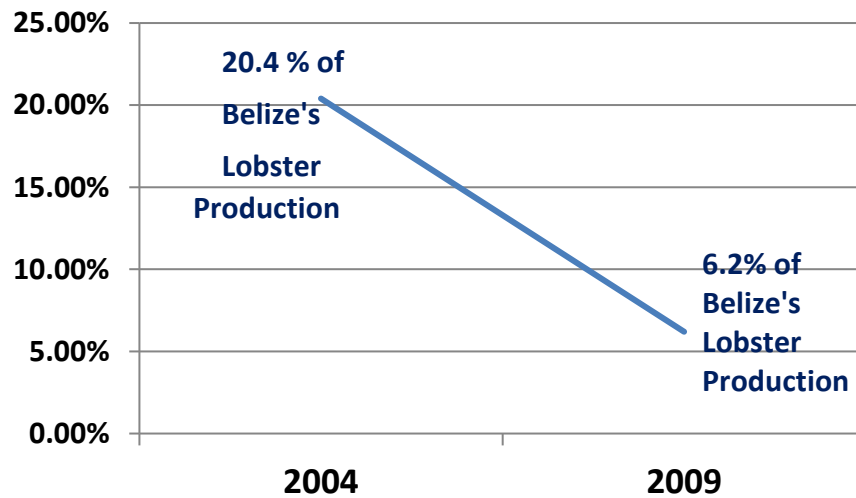
Introduction

Commercial fishing has been a center piece of Turneffe's society and economy for generations. Lobster, conch and finfish have been the primary capture-fishery products at Turneffe and the Atoll has long been one of the Belize's major producers.

According to Fisheries Data, the production of lobster and conch from Turneffe has declined sharply as has the percentage of Belize's total lobster and conch production coming from Turneffe. According to Fisheries data, lobster tail from Turneffe Atoll sold Cooperatives decreased from 109,533 pounds in 2004 to approximately 33,381 pounds in 2009, a 70% decline. Over this period, the nation's lobster production remained relatively stable resulting in the percentage of Belize's lobster production from Turneffe declining from 20.4% in 2004 to 6.2% in 2009.

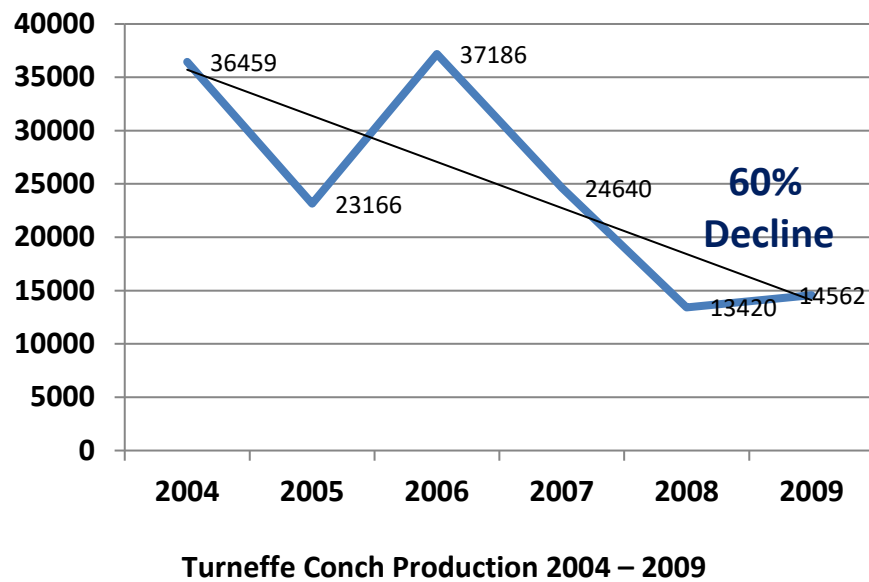


Turneffe Lobster Production 2004 – 2009



Percentage of Belize's lobster production from Turneffe

Over this same period from 2004 and 2009, Turneffe's conch production decreased by 60% from 36,459 pounds to 14,562 pounds. This resulted in a similar decline in the percentage of Belize's conch production originating from Turneffe, from 5.4% in 2004 to 2.0% in 2009.



These statistics are alarming and to better evaluate the status of Turneffe’s fishery, and determine the validity of the Fisheries Department statistics, we undertook an extensive survey of Turneffe’s fishermen. This involved the sampling of a statistically significant number of both camp fishers and sailboat fishers who fish at Turneffe. The purpose of the survey was to obtain a valid information about how the fishermen at Turneffe view the decline in the fishery and also to address some of the rational that have been put forth for not trusting the Fisheries Department data. When this survey was combined with the Fisheries data it provided us with a clear understanding of the status of the Turneffe Atoll fishery.

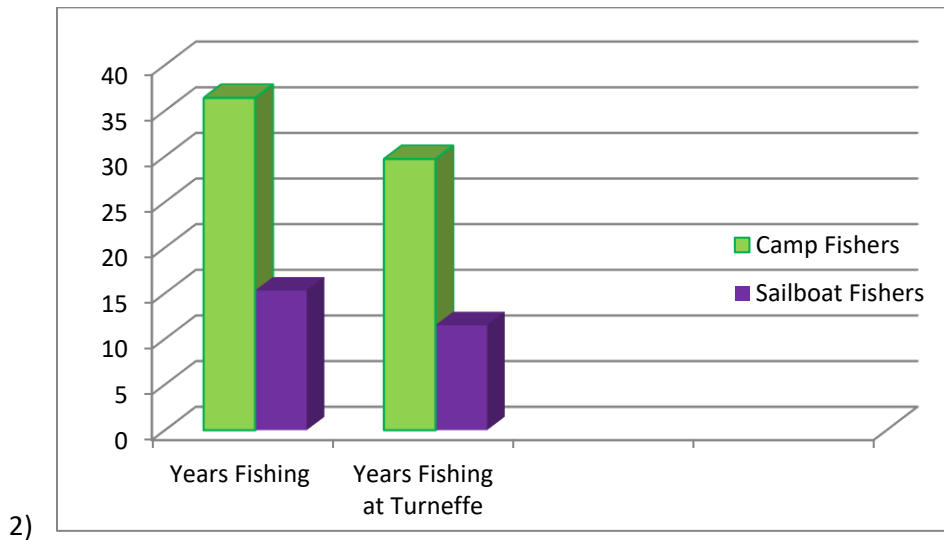
Survey of Turneffe Fishermen:

Standardized questionnaires were developed for interviews with Turneffe fishermen. The questionnaires included questions about fishing techniques, estimates of production, the status of the fishery and the needs of the fishery. Because camp fishers and sailboat fishers use different fishing techniques, slightly different questionnaires were developed for each. Both groups were asked identical questions when relevant and copies of both questionnaires are included.

A list of potential fishers was developed from information received from the Fisheries Department and from discussions with fishers. Names were then randomly selected from the list and all selected fishermen were actively fishing at Turneffe. The survey included 11 of 23 camp fishers (48%) and 8 of 12 sailboat captains (75%) who regularly fish Turneffe.

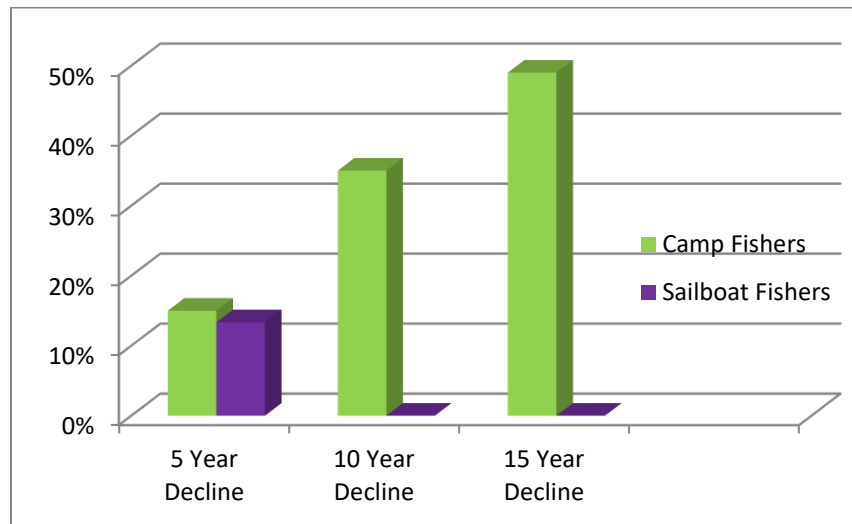
Survey Results:

- 1) Survey results indicate that Turneffe’s Camp Fishers have generally fished longer than Turneffe’s Sailboat Fishers and they have also fished longer at Turneffe.



Tenure of Turneffe Fishermen (Camp vs. Sailboat Fishers)

- 3) Turneffe’s Sailboat Fishers and Camp Fishers agree that the Turneffe fishery has declined over the last 5 year. Most Sailboat Fishers surveyed had not fished long enough at Turneffe to comment on a 10 or 15 years decline but Camp Fishers have observed a 10 year decline of greater than 30% and a 15 year decline of nearly 50%.



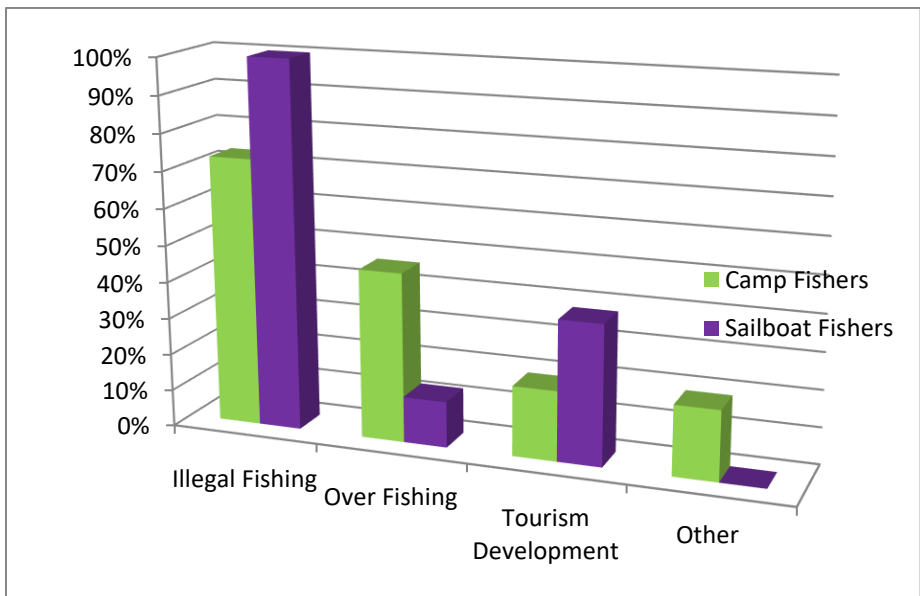
Observed decline in Turneffe’s Fishery

(Note: Most Sailboat Fishers have not fished at Turneffe for 10 years)

- 4) As would be expected, Turneffe’s Camp Fishermen spend 100% of their fishing effort at Turneffe. Interestingly, Sailboat Fishermen at Turneffe spend approximately 90% of their time at Turneffe and only a small portion of their fishing time at Lighthouse or Glovers. When combined, Turneffe Fishermen spend 96% of their time fishing at Turneffe.
- 5) Nearly 100% of lobster and the conch harvested by both Camp Fishermen and Sailboat Fishermen are sold to cooperatives with Camp Fishermen primarily utilizing National Cooperative and Sailboat Fishermen using both

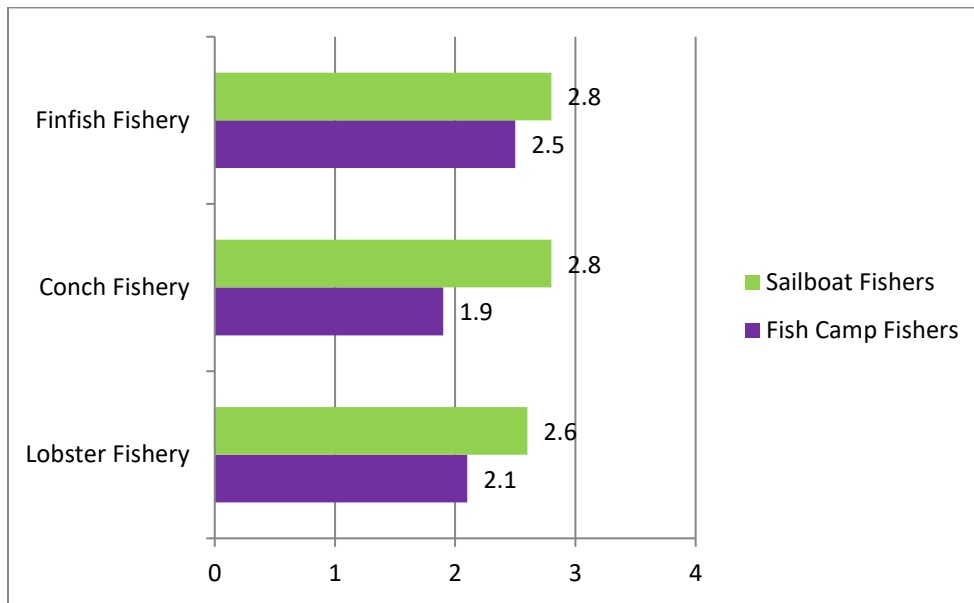
Northern Cooperative and National. Finfish from Turneffe are largely sold through markets in Belize City, San Pedro and elsewhere.

6) Although the reasons for Turneffe’s declining fishery are not addressed in this analysis, this finding from our survey emphasizes the fact that fishers feel the fishery is declining. Illegal fishing was overwhelmingly noted by both Camp and Sailboat Fishermen as the major issue facing Turneffe’s fishery. Several fishermen, in fact, felt that as much as 50% of Turneffe’s lobster and conch is harvested illegally.



What things are most likely to damage Turneffe’s fishery?

7) Both sectors of Turneffe Fishers rate the fishery as between “Fair” and “Good” although Sailboat Fishers consistently rating it better than Camp Fishers.



Weighted Rating of Turneffe Fishery
 (1 = Poor, 2 = Fair, 3 = Good, 4 = Excellent)

Conclusions:

Commercial fishing at Turneffe Atoll has clearly experience an alarming level of decline as is noted in the Belize Fisheries Department *Fisheries Statistical Report of 2009* which notes a 70% decline in lobster tail sales to Cooperatives and a 60% decline in conch sales. This level of decline appears to be confirmed through our survey of Turneffe fishermen who independently estimated declines of 50-70% over the past 15 years.

We were attempted to address the validity of the Fisheries/Cooperative data for Turneffe and it appears to be very relevant. Not only do long term fishermen note similar levels of decline, but the two major reasons for disregarding the Fisheries data appear to be ill-founded. Our survey confirmed that 96% of Turneffe Fishermen sell all of their legal lobster and conch through the cooperatives and none through local markets or to restaurants refuting the theory that the Fisheries data does not reflect the full extent of Turneffe’s fishery. We acknowledge that a significant amount of illegal product is sold outside of the Cooperatives which remains a separate issue. Our survey also found that Turneffe Fishermen spend very little time fishing elsewhere with. Again, this appears to a non-issue as Turneffe’s Fishermen spend an average of 96% of their fishing time at Turneffe.

One important factor in understanding the condition of the fishery is the number of fishermen utilizing the resource and the fishing effort being put forth. The *Belize Fisheries Department Statistical Report of 2009* indicates that licensed fishers increased from 1,872 in 2000 to 2,759 in 2009, an increase of 32%. Although the exact number of fishers utilizing Turneffe is not known, it is safe to say that the fishing effort at Turneffe has increased as it has throughout Belize.

Recommendations:

1. Before an action plan can be formulated to address the decline in Turneffe fishery, the issue must be recognized as valid. Presumably the Fisheries Department information combined with the opinions of Turneffe's fishermen in our survey confirm that there is a substantial problem.
2. To reverse the decline in the Turneffe fishery, modern and effective fisheries management methods should be instituted in the near future. This will require the full cooperation of Turneffe Fishermen. As they recommend, it should begin with a more vigorous enforcement program.
3. The impending Turneffe Atoll Marine Reserve will hopefully provide the required structure for improving enforcement and effectively managing Turneffe's fishery.

Survey Results:

Sailboat Fishermen Sailboats (n = 8)

1. a) **How long have you been a commercial fisherman?** _____ Yrs.
 b) **How long at Turneffe?** _____ Yrs.
 Sailboat fishers have been fishing in Belize between 7 and 33 years with a mean of 16 years. They have fished at Turneffe between 3 years and 33 years, however, only three have fished at Turneffe for more than 10 years. (See chart)
2. **Where else do you fish besides Turneffe?**
 Five of eight Sailboat Captains fish only at Turneffe and the others fish an average of 90% of their time at Turneffe while spending a small portion of their time at Lighthouse or Glovers.
3. **What percentage of your fishing time is spent at Turneffe?** _____ %
 Five of eight sailboats spend 100% of their time at Turneffe. The three remaining boats spend 90% of their time in the atoll. In all, the sailboat fishers interviewed spend more than 96% of the fishing time at Turneffe.
4. **How many fishermen are usually on your boat?** _____
 There is an average of eight fishers on each boat with a minimum is 7 and a maximum of 10.
5. **What are the main species are you targeting?**
 The main species targeted were lobster and conch. However, most fishers explained that they were opportunistic and would take small amounts of fish for their consumption or local sale.
6. **What have your catches been for the past 3 years?**
 This question was asked in an attempt to gather information on changes in production, however, data was very speculative and not felt to be particularly helpful as most Boat Captains could not remember the total production for the vessel.
7. **How does this year's catch compare with 5, 10, 15 years ago?**
 Most sailboat fishers felt that there had been a decline in the fishery with the mean decrease at five years estimated at 13%. Very little comment was made by sailboat fishers regarding the change for 10 years and 15 years ago as only 4 had fishing at Turneffe for 10 years and only 2 for 15 years.

8. Where do you sell your products?

Sailboat fishers sell all of their lobster and conch at the fishing cooperatives while the finfish is sold wherever the market exists.

9. What Types and quantities of fishing gear currently being used and changes from the past?

Sailboat fishers primarily use hook sticks for lobster with an average of 10 hook sticks per boat. The next most used gear is the spear gun with 6.87 or 7 spear guns per boat. Hand lines were also used.

10. How do you rate the condition of Turneffe's fishery?

With regards to the condition of the fishery in Turneffe, five respondents thought that it was in good condition while three thought that it was in fair condition. (See chart)

11. What things do you think are likely to damage Turneffe Fishery? (can be more than one)

62.5% of respondents felt that illegal fishing was the thing that was most likely to damage the fishery. Two respondents felt that tourism and illegal fishing were most likely while one respondent felt that overfishing, tourism and illegal fishing were the biggest problems. As a result 100% of respondent felt that illegal fishing would cause damage. (See chart)

12. Is there adequate fisheries enforcement at Turneffe?

Seven of the eight respondents (87.5%) felt that the enforcement in Turneffe was not adequate. (See related chart)

13. What suggestions do you have to help the fishery?

Five of the eight respondents felt that increased enforcement would help the fishery in Turneffe. One respondent felt that fewer fishers would help. One fisher felt that a Special License similar to Glovers Reef should be introduced for Turneffe. One respondent felt that fishers needed to start caring for the resource. (See related chart)

14. Who manages Turneffe's fishery now?

One hundred percent of respondents did not know who manages the fishery in Turneffe.

15. How do you rate the current management of Turneffe's fishery?

62.5% rated the current management of the Turneffe fishery as fair. 25% rated it as good and 12.5% rated it as poor.

16. Do you feel that you understand what a Marine Reserve is? Yes _____, No _____

What _____

Five respondents said that they knew what a Marine Reserve was while three said that they did not know. Of the five who said that they knew, all respondents said that it was for protection, only one respondent said that it was a place where fishing was allowed.

17. Do you think a Marine Reserve would be a good way to manage Turneffe' fishery?

Seven sailboat respondents (87.5%) thought that a Marine Reserve would not be a good way to manage the Turneffe fishery. One respondent did not know if it was a good way to manage.

18. If there is a Marine Reserve, who should be in charge of it?

One hundred percent of respondents felt that fishers should be in charge of a Marine Reserve.

19. What concerns do you have about a Marine Reserve at Turneffe?

Six respondents (75%) indicated that the loss if area to fish was their major concern. One felt that the fishing area was already too small and the other felt that fishers would not benefit.

20. Should any no-take zones be set up at Turneffe?

50% of those surveyed felt that no-take zones should be set up in Turneffe and the other 50% felt otherwise.

Camp Fishermen Surveys (n = 11)

1. How long have you been a commercial fisherman? _____ Years

Camp fishers indicate that they have fished a mean length of time of 36.4 years, with a minimum of 23 years and a maximum of 55 years.

2. How many years have you been fishing Turneffe? _____ Years

The average length of time that camp fishers have been fishing in Turneffe is 30 years, with a minimum of 10 years and a maximum of 40 years.

3. How long have you had your fish camp? _____ Year.

The average length of time that fishers have owned a camp in Turneffe is 22.4 years, with a minimum of 7 and a maximum of 35 years.

4. Is the land where you have your camp?

Six of the respondents (55%) were squatting on the land where their camps are located, while three (27%) owned their land and two (18%) had leases.

5. What do you fish for Lobster ____, Conch ____, Finfish ____, Other

Six respondents (55%) fished for lobster, conch and fish, while three (27%) fished for lobster and conch, one fished for lobster and fish and one fished for lobster only. Therefore, all fishers surveyed fish for lobster, most fish for conch as well and only a few fish for finfish.

6. What areas do you fish?

Three respondents fished the entire atoll; three fished only in the Central Lagoon; two fished the Northern Reef, patch reefs and reef; two fished the western reef only; and one fished the northern lagoon, northern and western reefs.

7. Has the size of area that you fish changed?

Eight respondents (72%) said that the size of the area they fish remained the same while two respondents said that it had decreased and one said that it had increased.

8. What have your catches been for the past 3 years?

For lobster the mean annual production was estimated to be 15,750 pounds in 2011, 22,950 in 2010 and 21,550 in 2009. For conch the mean annual production was 2,390, 2,057 and 2,242 pounds respectively.

9. How does this year's catch compare with 5, 10, 15 years ago?

Camp fishers felt that there was a decline in the fishery. While numbers varied, the mean decrease from five years ago is estimated at 21%, while the mean estimated decline was 32% over 10 years and 50% between over 15 years ago. Estimated decreases range as high as 70%. (See related chart)

10. Where do you sell your products – lobster, conch, finfish?

Respondents sell 100% of their lobster and conch to the cooperatives and their finfish at various local markets, primarily Vernon St.

11. What types and quantities of fishing gear currently being used and changes from the past?

Camp fishers interviewed primarily utilize shades, traps and drums for fishing. All respondents use shades with a mean of 191 per camp. A total of 2,160 lobster traps were owned by five respondents, giving a mean of 432 traps per fisher. One respondent owned 200 drums and three respondents had a total of eight deep water reels.

12. How do you rate the condition of Turneffe's fishery?

Responses to this question are:

For lobster: Excellent – 0, Good – 3, Fair – 6, Poor – 2 (n = 11)

For conch: Excellent – 0, Good – 2, Fair – 4, Poor – 3 (n = 9)

For finfish: Excellent – 1, Good – 4, Fair – 4, , Poor – 1 (n = 10)

13. What do you feel are things likely to damage Turneffe's fishery? (can be more than one answer)

Illegal fishing was the most prominent concern followed by over fishing and then a variety of less-mentioned items including tourism and natural disasters. (See chart)

14. Is there adequate fisheries enforcement at Turneffe?

Of the 11 responses only one respondent felt that the enforcement was adequate.

15. What suggestions do you have to help the fishery?

More enforcement was by far the top suggestion followed by fewer fishers. Several other things were also mentioned including giving fishers more power and stiffer penalties. (See chart)

16. Who manages Turneffe's fishery now?

Nine of eleven respondents had no idea who managed the Turneffe fishery, while one respondent thought that it was the Coastal Zone Management Authority and Institute and one felt that it was the Fisheries Department.

17. How do you rate the current management of Turneffe's fishery?

Eight of eleven rated the management of the fishery as poor, one rated it fair and one respondent felt that there was no management.

18. Do you feel you understand what a Marine Reserve is?

What? _____

Ten respondents said that they knew what a Marine Reserve was but gave a variety of conflicting responses when asked to explain. One respondent said that they did not know what a Marine Reserve is.

19. Do you think a Marine Reserve would be a good way to manage Turneffe' fishery?

Seven respondents (63%) felt that a Marine Reserve was not a good way to manage the Turneffe fishery while four (37%) felt that a Marine Reserve would be a good way to manage the fishery.

20. If there is a Marine Reserve, who should be in charge of it?

All respondents felt that fishermen should be involved with the management of the Marine Reserve. Four respondents felt that the fishers and the Government of Belize should manage the Marine Reserve. Three respondents thought that only fishermen should manage the Reserve. Three thought that all stakeholders should manage the Reserve and one felt that fishers and Fisheries Department should manage it.

21. What concerns do you have about a Marine Reserve at Turneffe?

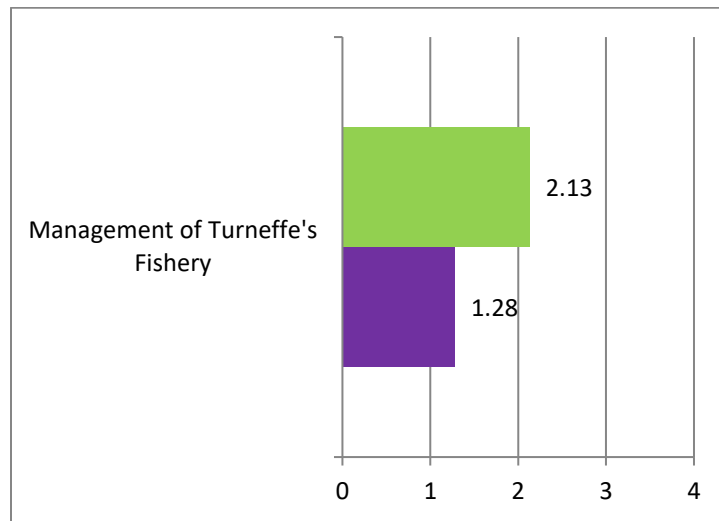
The major issue for fishers with the Marine Reserve was loss of area to fish. Lesser numbers expressed concerns about a lack of proper management, too many regulations and no enforcement.

22. Should any no-take zones be set up at Turneffe?

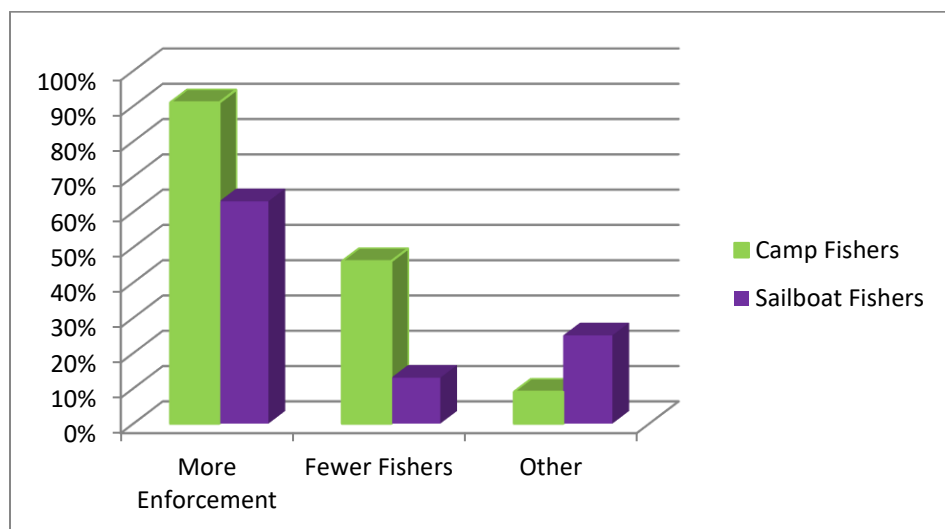
Eight respondents (73%) felt that there should not be any no-take zones at Turneffe while three (28%) felt there should be no-take zones.

- 4. Additional work needs to be done to sensitize the fishers to such management tools as managed access and resource partitioning, which may become necessary for the management of Turneffe in the future.
- 5. Turneffe Fishers should be encouraged to participate in efforts to develop more effective management of their fishery focusing on a Turneffe Atoll Marine Reserve.

8) Nearly all of Turneffe’s fishers indicate that they do not know who presently manages Turneffe’s fishery although there is agreement among both sectors that management of Turneffe’s fishery is lacking.

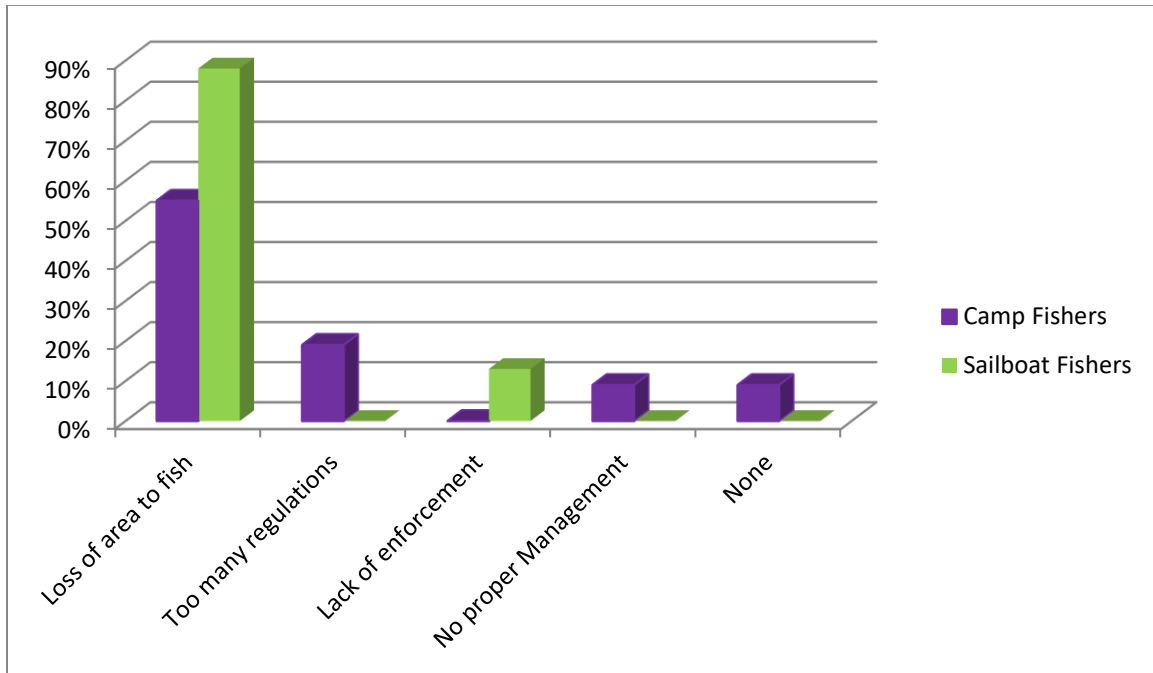


Rating the management of Turneffe’s Fishery



Fishers suggestions for helping the fishery

- 1) Fishers concerns about a Marine Reserve are charted below. Loss of area to fish is clearly the major concern with too many regulations a distant second.



Fishers Concerns about a Marine Reserve

- 2) Significant support exists for a Turneffe Atoll Marine Reserve, and/or the Reserve's its related functions. 37% of Camp Fishermen indicated that they support a Marine Reserve and 50% of Sailboat Fishermen support no-take areas. Additionally, there is overwhelming support for improved enforcement with all but two fishermen indicating that improved enforcement is there major concern.
- 9) Sailboat Fishermen and Camp Fishermen utilize different fishing techniques with Sailboat Fishermen relying on hook sticks and spear guns and Camp Fishermen primarily utilizing traps and shades.
- 10) Our survey indicated that Camp fishermen and Sailboat Fishermen overwhelmingly feel that more enforcement is the most important thing needed to improve the fishery. A smaller percentage feels that fewer fishers would help.
- 11) While both Sailboat and Camp Fishermen target lobster and conch, however, Sailboat Fishermen focus more on conch and Camp Fishermen focus primarily on lobster.
6. Ongoing educational programmes about Marine Reserves directed at Turneffe's Fishermen are essential for their buy-in in establishing a Marine Reserve as well as their support going forward.
7. Improved fisheries enforcement for Turneffe Atoll must be instituted through the implementation of a Marine Reserve.

- Although Turneffe fishers do not have a clear understanding about who manages the atoll's commercial fishery, they feel that the current management is inadequate. They point to illegal fishing as their major concern and nearly all feel that improved enforcement is needed.
- Turneffe fishermen lack a clear understanding of how Marine Reserves function and they are generally suspicious of Marine Reserves. In spite of these realities, more than one-third of Camp Fishermen feel that a Marine Reserve is a good idea. Only one Sailboat Captain indicated that he favors the establishment of a Marine Reserve but half of the Sailboat Captains indicated that no-take zones should be established at Turneffe.
- Both sectors of Turneffe Fishermen feel there is a need for improved management of the Turneffe fishery and a significant number of Fishermen either express support for a Marine Reserve or for the management tools related to a Marine Reserve – such as no-take zones.
-