

RESULTS OF ANNUAL SURVEYS OF SASANHAYA BAY FISH RESERVE, ROTA: COMPARISONS OF 2010 AND 2011

FISHERIES RESEARCH PROGRAM,
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INTRODUCTION

Rota is a populated limestone island approximately 60km north of Guam and is part of the Commonwealth of the Northern Mariana Islands. A Rota Local Senate Bill created the Sasanhaya Bay Fish Reserve (SBFR) in 1994. The SBFR was not managed as intended under that bill until March 2000, when the Fisheries Research Section (FRS) of the Division of Fish and Wildlife (DFW) formally demarcated the boundaries of the SBFR with marker buoys, and conducted the first annual fish survey. The Sasanhaya is located on the southeast end of the island (Fig 1) where it is protected from the NE trade winds and open ocean waves. The reserve consists of many different benthic habitats and has been reviewed by Trianni and Moots (2000). Enforcement of the SBFR has not fully attained the desired level of protection for the marine resources that live within and/or utilize the SBFR during part of their life cycle. Local residents as well as dive shop operators have reported numerous accounts of poaching within the SBFR boundaries to the DFW central office on Saipan since 2000. During the 2006, 2007, 2010 and 2011 surveys, DFW personnel observed fishing activity from the shoreline within the boundaries of the SBFR.

METHODS

Belt transects (BLT) and stationary point counts (SPC) are conducted at the same time. The 25m transect tape is laid by the first diver, who at the end transect, swims to a point ~15m away from the tape and starts the 10 min SPC. At the same time the remaining diver on the transect starts the 10 min visual survey. The time that it takes the first diver to move away from the belt allows fish to reacclimate to the disturbed belt transect area.

During the BLT survey, a diver swims a constant height over the 25m belt and records all fish and their length within 2.5m on either side of the belt (total 125m²). Fish are allocated on 5cm length groupings. The SPC survey is conducted while the diver hovers and turns over a fixed point collecting information on fish above 20 cm within 10m of the diver's vision. For each BLT a complimentary SPC was performed. In both cases fish are identified to their lowest possible taxonomic level which is often to species. Data from the SPC and BLT provide information on size frequency, species composition and abundances of larger fish species. For the current report, results are provided at the family level to allow for greater sample sizes and stronger comparisons.

Surveys for 2010 were completed between March 6th and 11th. For 2011, sampling was conducted between April 4th and 7th. All sites are resurveyed in subsequent years unless extraneous circumstances exist (bad weather, in use).

RESULTS

For 2010 a 2011, a total of 38 individual surveys (38 BLT and 38 SPC) were completed within the SBFR.

Belt Transects

For total community composition (All Families, Fig.2), there was little difference seen between 2010 and 2011 in size classes. This was the case for all size classes besides the smallest (1-5cm), where the average observations for 2011 were nearly twice as high as 2010. There were no differences in the other size classes and observations of the larger sizes (>25cm) were rare.

For the Acanthurids, smaller size classes were more commonly observed in 2010 compared to 2011. In 2011 all size classes >10cm were higher than 2010 besides for classes >30cm which had no observations for either year. Butterflyfish (Chaetodontidae) had no differences in the observations between years besides for the smallest size class (1-5cm). This group averaged slightly more than zero observations per transect in 2010 while 2011 had roughly one. For both years, the next two size classes (6-10 and 11-15cm) were around 0.5 observations per transect but larger sizes were negligible. The Labrids were similar between years for all sizes except the 6-10cm where 2010 was much higher than 2011. Observations for the first two size classes were around four observations per transect, but greater sizes were much less (one observation per transect). The smallest size class of the Pomacentrids was one of the most abundant groups of all in both years; around 10 observations per transect in 2010 and 90 in 2011. Observations of individuals larger than this were rare for both years. For 2011, parrotfish (Scaridae) were one of the few fish groups that had more observations in the larger classes than the small. The 21-25cm and next two size groups had around one observation per transect while outside of this range was around 0.2. This differed from 2010 which had nearly no observed fish in the sizes above the 21-25cm, much higher counts in the 16-20 group than 2011, but non different counts for the smallest three groups.

Stationary Point Counts

There were large differences between years in the stationary point counts (SPC) between years when considering all families (Fig. 3). In all the size grouping from the smallest (21-25cm) to 41-45cm, the 2010 survey had many more observations than the 2011. The 2011 survey averaged slightly more than zero observations per transect beyond the 26-30cm group. Acanthurids were also more abundant in 2010 than in 2011 with approximately three times more in the smallest group. Observations above this size group were uncommon for both years. Labrids in the smallest size group were higher in 2011 than 2010, but the next size group up was much higher in 2010 than 2011. Few observations occurred in the size groups >30cm. Lethrinids were evenly distributed amongst the size groups. Only the smallest three size groups differed between years, although, this difference was minimal. Most size groups had one observation per transect. Lutjanids were similar to the Lethrinids and had similar observations amongst size groups. Also, there was a slight difference in the smallest three groups. All groups had around 0.5 observations per transect. The smallest Scarids (21-25cm) were more abundant in 2011 by approximately four times, while the reverse was true for the next size group (26-30cm). For 2011, observations above the 26-30cm group were minimal while 2010 had about 2 observations per transect for the 31-35, 36-40 and 41-45cm groups.

DISCUSSION

Surveys at Rota have been completed since 2000, and previous reports have indicated a positive trend in the overall abundances in the different families until the last report, 2008 (Trianni 2008). The current report indicates that there are few differences in the size structure of fish families between the 2010 and 2011 samplings. For the belt transect, abundance estimates for 2011 were consistently higher in the middle size classes than for 2010. This can be specifically seen in the Scaridae and Acanthuridae, where size classes >15cm were higher in 2011 than 2010. Also, in the Pomacentrid estimates, the 2011 data shows a dramatic increase in numbers of the smallest size class. There are few examples where estimates were higher in 2010 indicating either increases in the populations or possible bias in sampling. There were different people conducting the counts between years suggesting a possible bias. In the case of the Scarids and Acanthurids, it is possible that the change in size frequency indicates the passage of a cohort moving through the population without replenishing the smaller groups. Although, sampling bias would not be overcome if observer precision was better with fish of specific lengths. Clarification could occur if annual data could be analysed between years with the same observer. Other than the previous examples, little change seems to have occurred between years in the belt sampling. The large sample size has led to relatively small errors around the means, but the analyses might benefit from indicating community structures amongst different habitat so that population processes can be observed at greater resolution.

In the SPC data, four families showed greater abundances in specific size groups in 2010 than in 2011, while other size groups did not have a difference. Few groups showed the opposite trend, or higher abundances in 2011 than 2010, except for size group A of Pomacentrids, Chaetodontids and Scarids. Specifically, the Acanthurids, Lethrinids, Lutjanids and Scarids had greater numbers in 2010 with Scarids being the biggest difference. The smallest group of scarids (21-25cm) had much higher counts in 2011, but this was opposite in all the larger groups. To a lesser extent, this same pattern was seen in the first two size groups of the Labrids, Lethrinids and Lutjanids. As with the belt data, this could be a product of differences between observers between years. It is possible that observers were consistently off by a few centimeters creating a bias toward one size class as seen between the first two size classes. When the differences in the smallest size classes for all families is overlooked, very little has changed and the errors between most years indicate no differences. When making comparisons between the two sampling methodologies (belt and SPC), there seems to be a slight discrepancy in the Scarid data. Estimates from the belt transects indicate much lower abundances of the size groups that are also sampled in the SPC. For Scarids, this difference looks to be in the range of 2 to 4 times more in the SPC but the differences are minimal in the data of the other families. This could be an artifact of sampling methodology where parrotfish are more likely to enter the sampling area of an SPC as opposed to a belt transect.

Despite reports of poaching within the Sasanhaya reserve, it would seem that there is little evidence that populations for the most abundant fish families has changed between 2010 and 2011. Further analyses will include comparisons with previously sampled years. It should be noted that started with the latest sampling (2011), surveys will only be conducted on a bi-annual basis meaning the next will occur in 2013. This is because of restrictions on the budget and man power.

LITERATURE CITED

Trianni MS and KM Moots. 2000. An initial survey of the Sasanhaya Fish Reserve, Rota (CNMI). CNMI DFW Technical Report 00-03. 26 pp.

Trianni MS. 2008. Sasanhaya Bay fish reserve annual report. Technical report prepared for the US Fish and Wildlife Annual Report. 7 pp.

FIGURES AND TABLES

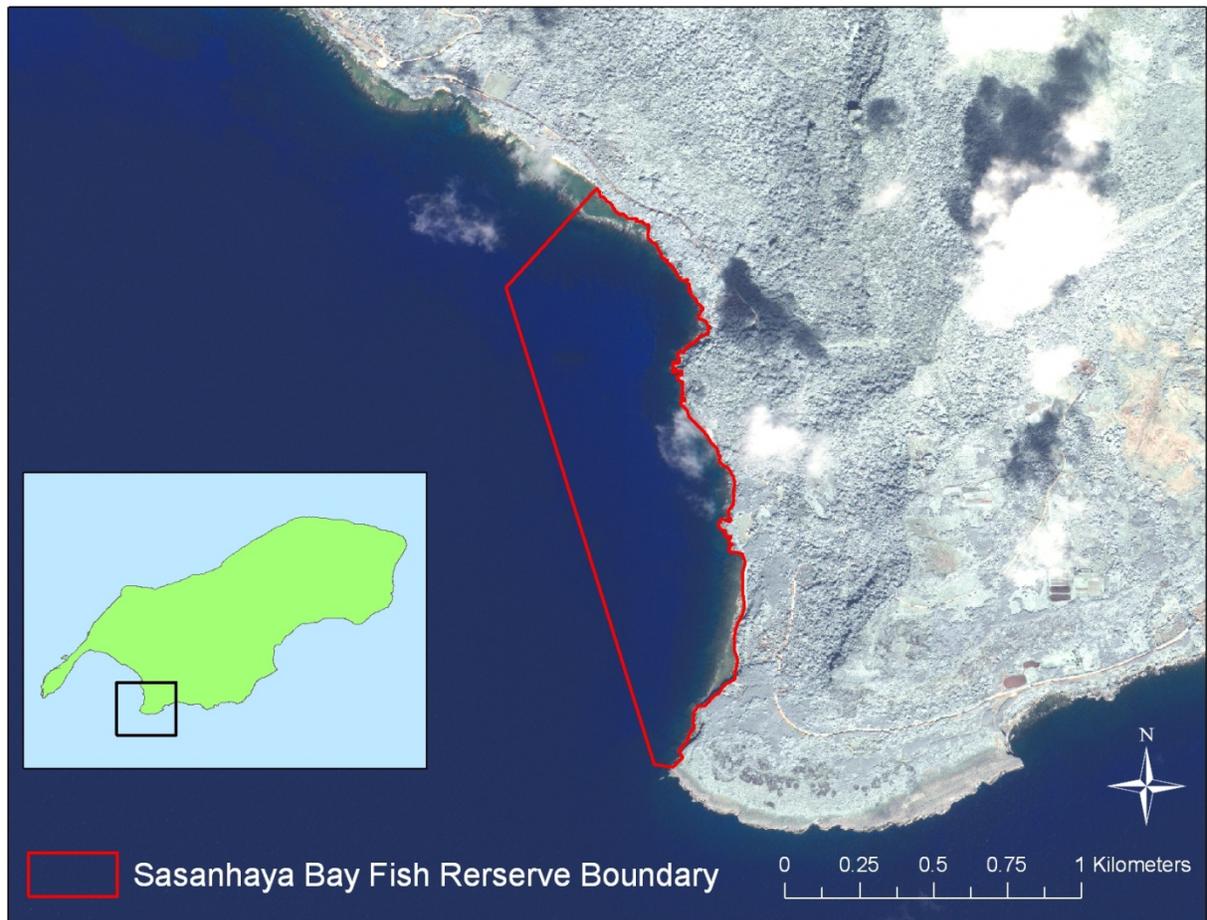


Figure 1. Sasanhaya Bay Fish Reserve, Rota.

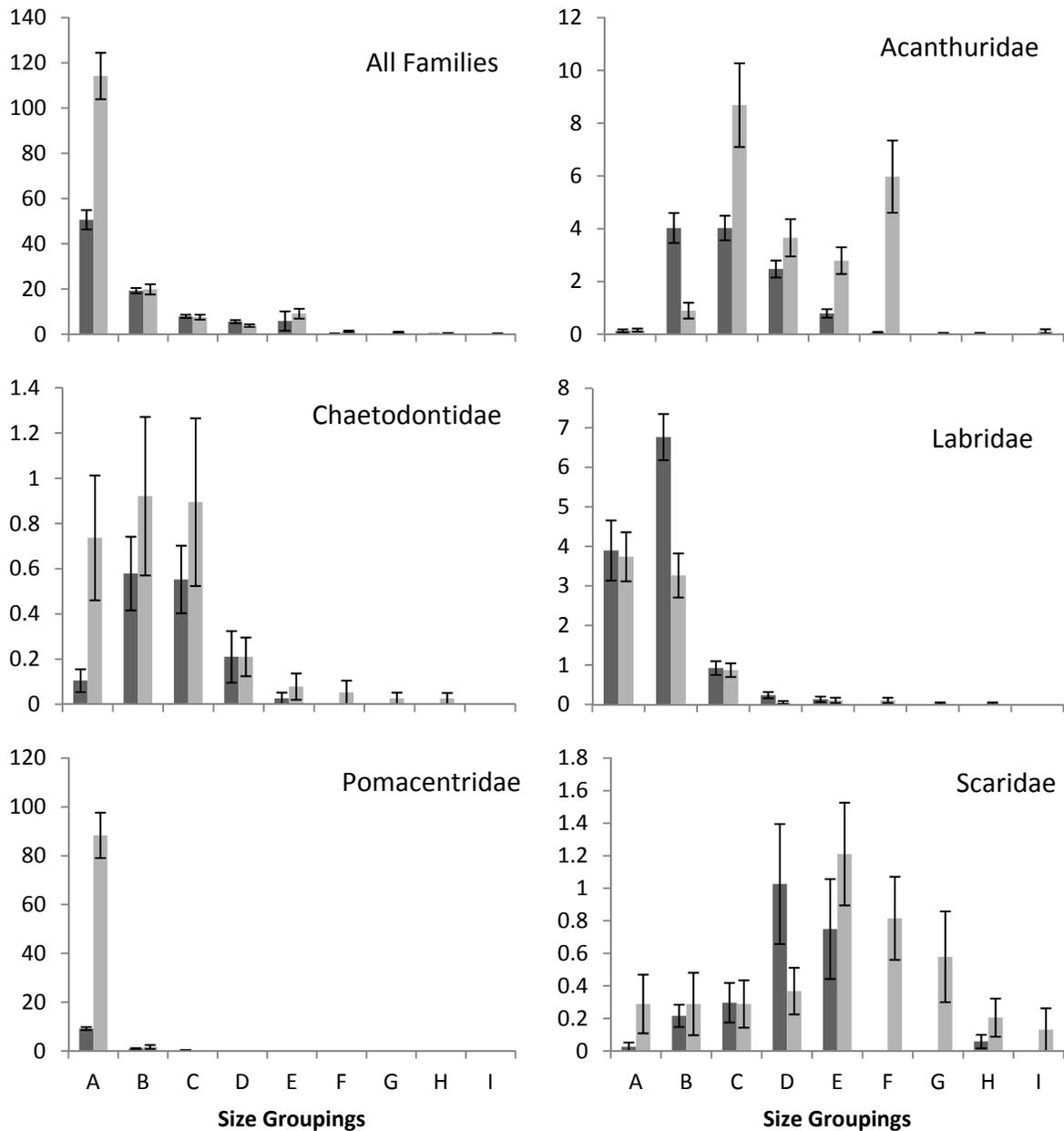


Figure 2. The average (\pm SE) number of observations per 125m² belt transect during a 10 minute survey for important fish families within the Sasanhaya Bay Fish Reserve, Rota. Size groupings are defined by letter: A = 1 -5cm, B = 6-10cm, C = 11-15cm, D = 16-20cm, E = 21-25cm, F = 26-30cm; G = 31-35cm; H = 35-40cm; I > 40cm. Dark gray is 2010 sampling and light gray is 2011 sampling. The All Family plot includes the families presented in the other plots and all other fish observations that are not in these families.

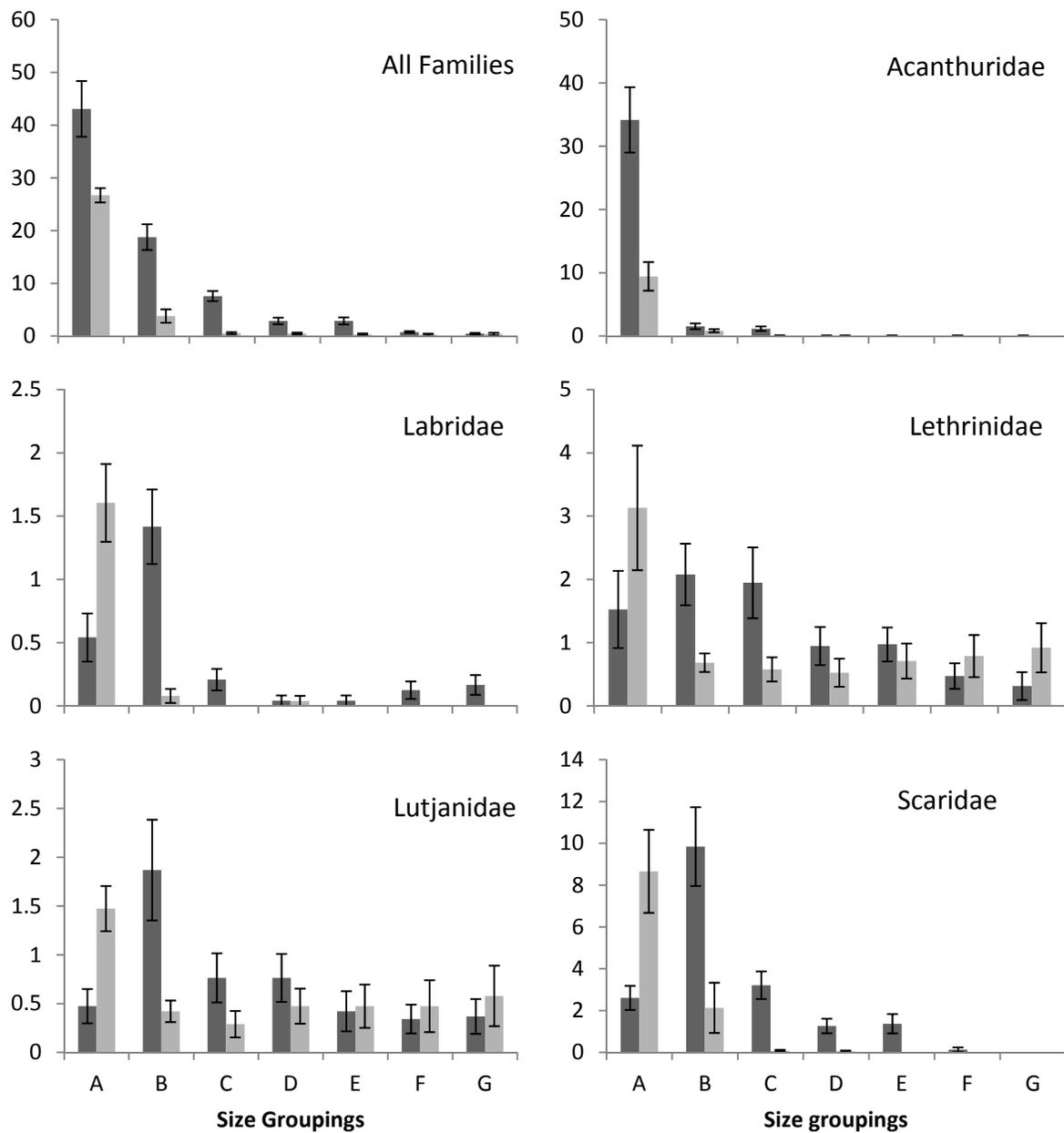


Figure 3. The average (\pm SE) number of observations per 314m² stationary point count (SPC) during a 10 minute survey for important fish families within the Sasanhaya Bay Fish Reserve, Rota. Size groupings are defined by letter: A = 20-25cm, B = 26-30cm, C = 31-35cm, D = 36-40cm, E = 41-45cm, F = 46-50cm, G >50cm. Dark gray is 2010 sampling and light gray is 2011 sampling. The All Family plot includes the families presented in the other plots and all other fish observations that are not in these families.