

Ontogenetic Habitat Use & Spatial Resource Partitioning Between Two Sympatric Stingrays

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INTRODUCTION

Stingrays belong to an ancient lineage of cartilaginous fishes, evolving over 450 million years ago. With over 600 extant species, stingrays inhabit every bioregion on earth (McEachran and Dunn 1998; McEachran and Fechhelm 1998; Frisk 2010; O'Shea *et al.* 2012) and typically characterize shallow and near shore environments of the tropics.

Stingrays are demersal mesopredators known for determining and influencing the biological, physical and chemical characteristics of their habitat by excavating via feeding (Eggleston *et al.* 1992; O'Shea *et al.* 2012). Due to this, it is hypothesized that rays could be considered a keystone species (O'Shea *et al.* 2012) meaning that they provide functions critical to ecosystem health and possibly, diversity. They are also an indicator of overall ecosystem health (e.g. Tilley *et al.* 2013) and need to be considered when decisions regarding management of coastal ecosystems are made. Although their importance is becoming more apparent, there is still very little known about these animals. This research aims to address these needs.



Figure 3: A. Ray in barrier net; B. Escorting ray to shore in hand net; C. Working ray up on shore; D. Newly released ray after workup

METHODS

1. Rays were caught from eight sites across two locations - inshore and offshore.
2. Fourteen morphometric data were recorded to the nearest mm
3. Disc width (Fig. 4) data were sorted into two size classes for sexually maturity according to Grubbs and colleagues (2006).
4. Size classes between and among species were then tested statistically using pairwise T-tests.

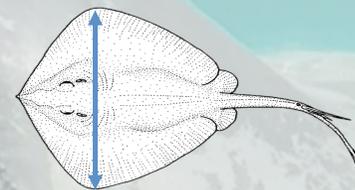


Figure 4: Disc width measurement on a dasytid stingray.

DISCUSSION

The significant difference between larger mean disc widths of female rays of both species at offshore locations supports our hypothesis that rays are partitioning space according to life-history stage (ontogeny). These data support the notion of mature individuals occupying habitats that differ from juveniles, in order to avoid competition. Furthermore, these data suggest inshore sites may be acting as nursery grounds for juvenile and sub-adult individuals of both species. The singularity of *H. schmardae* sampled offshore compounded with the higher abundances of *D. americana* at the offshore location supports the hypothesis that the two sample species are avoiding competition by occupying different habitats.

These data have provided much needed information to better understand populations of these important mesopredators on Cape Eleuthera, but also provide frameworks in a wider Caribbean context.

CONCLUSION

This study has demonstrated that *D. americana* and *H. schmardae* segregate themselves and partition their resources. Also juvenile and mature *D. americana* and *H. schmardae* do indeed segregate across multiple spatial scales, likely in order to avoid competitive exclusion.



Figure 1: Southern stingray (*Dasyatis americana*) post release at The Schooner Cays

RESULTS

The mean disc width of female *D. americana* and *H. schmardae* was found to be statistically greater at offshore locations when compared to inshore (Figure 6) which was determined by a t-test resulting in a significance level of $P < 0.001$. The mean disc width of males at inshore versus offshore locations tested non-significant to a level of $P = 0.264$

Table 1. Demographic pertaining to *H. schmardae* and *D. americana*.

	<i>H. schmardae</i>	<i>D. americana</i>
Males sampled	10	15
Females sampled	11	74
Weight range	49 kilograms	49 kilograms
Mean disc width	585.7 mm	711.6 mm
Standard error	18.9 mm	50.8 mm
Mature males sampled	1	14
Mature females sampled	1	37
Immature males sampled	9	1
Immature females sampled	10	37
Size range by W_D	1035 mm	768 mm

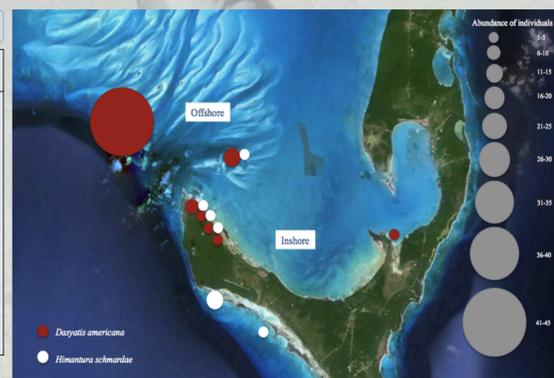


Figure 5: Species partitioning of two rays across two locations and multiple sites.

OBJECTIVES

1. To determine if southern stingrays (*D. americana*) and whiptail stingrays (*H. schmardae*) partition spatial resources.
2. Understand how juvenile and adult Southern stingrays stingrays, including differences in sex abundance and possible seasonality and site fidelity
3. Assess basic demographic information for these subpopulations.



Figure 2: A juvenile southern ray during a capture event.

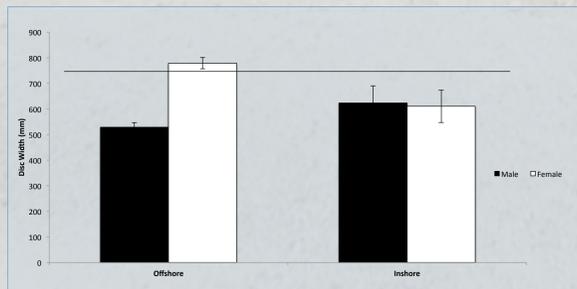


Figure 6: Mean disc width of males and females at inshore and offshore locations. The solid line represents the threshold for maturity in female *D. americana*, 750 mm.



Figure 7: A southern ray demonstrating the sometimes cryptic nature of their habitat selection

FUTURE DIRECTIONS

This study has provided baseline data that could be expanded upon through a final scale study possibly utilizing satellite and acoustic tagging to assess the fine scale resolution of their habitat use. In addition since spatial segregation of the rays has been confirmed it would be interesting to understand how rays are partitioning other resources such as nursing grounds or food using stable isotopes.

References

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