UNIVERSITY
OF MIAMI

R.J. DUNLAP MARINE
CONSERVATION PROGRAM

2013

ANNUAL REPORT

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This document is a report summarizing the achievements and progress of the University of Miami's RJ Dunlap Marine Conservation Program (RJD) in 2013.

UNIVERSITY OF MIAMI
ABESS CENTER for ECOSYSTEM SCIENCE & POLICY

UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL of MARINE & ATMOSPHERIC SCIENCE

RJD is a joint initiative of the Rosenstiel School of Marine & Atmospheric Science (RSMAS) and the Leonard and Jayne Abess Center for Ecosystem Science and Policy at the University of Miami.

A LETTER FROM THE DIRECTOR

Dear RJD Friends, Colleagues and Supporters,

This past year was our most successful yet. We were able to generate a plethora of scientific data on a variety of important topics in marine conservation, present this work at various international conferences as well as publish our research in several scientific journals. We significantly expanded our impact by developing and using new virtual learning tools, including creating a new app for mobile devices (Musingo). We also expanded our citizen science program, bringing hundreds of individuals and groups from around the world with us out in the field to participate in our research. Most importantly, we were able to expose over a thousand students, especially under served and at-risk youth, to marine conservation science through our practical hands-on field research trips in the Florida Keys. I couldn't be prouder of our 2013 accomplishments, which could not have happened without the hard work and generous support of many special individuals and organizations.

Thank you.

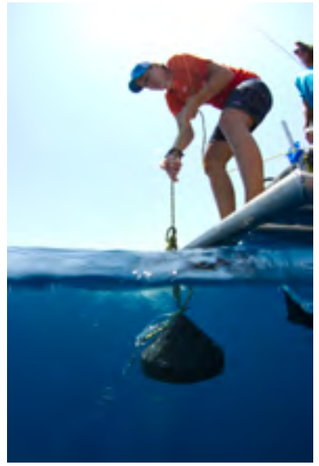
Neil Hammerschlag, Ph.D.

Director, RJ Dunlap Marine Conservation Program
Research Assistant Professor,
Rosenstiel Marine School (RSMAS) - Abess Center (CESP)

The mission of the University of Miami's RJ Dunlap Marine Conservation Program (RJD) is to advance ocean conservation and scientific literacy by conducting cutting edge scientific research and providing innovative and meaningful outreach opportunities for students through exhilarating hands-on research and virtual learning experiences in marine biology. Focusing primarily on the study and conservation of sharks, the Program's full-immersion approach allows students to actively grow as future scientists.

1

Advance marine conservation through cutting edge science and education projects



2

Increase student acquisition of scientific skills, especially related to marine ecology

3

Encourage the development of marine conservation awareness, attitudes, and behaviors in youth and the general public

2013 HIGHLIGHTS

Musingo: Mobile Game to Benefit the Oceans

In Fall 2013, RJD in partnership with Good World Games launched a new app in the iTunes store called Musingo, a mobile music trivia game that includes ocean conservation facts. The game was also supported by the Guy Harvey Ocean Foundation. In its first week, Musingo debuted at #4 in the Music category of the iTunes Store. Available for free download now! Visit: https://itunes.apple.com/us/app/musingo/id597576596?mt=8

Great White Shark in the Florida Keys!

On May 13, 2013, RJD researchers caught a great white shark estimated 10-11 feet in length in 100 feet of water during the course of ongoing shark population surveys in the Florida Keys. As the shark was reeled into the boat, it bit through the line and swam away. No samples or measurements were taken and no tag was attached. But it's safe to say all interns and students onboard have come away with a story of a lifetime!

Music Festivals

RJD hosted educational booths at two local music festivals: Rock the Ocean's Tortuga Music Festival and Friends of Nature Music Festival. Research Interns discussed current research projects, citizen science opportunities, and shark conservation information.

Mass Media Coverage

RJD had the opportunity to welcome many TV and film crews aboard this year. Highlights include: NBC's Today Show, BBC America, National Geographic's Monster Fish, Popular Science Magazine, and NPR.

2013 HIGHLIGHTS

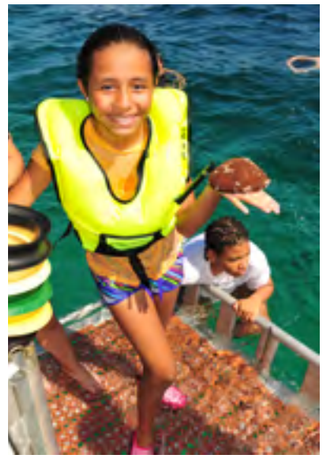
CITIZEN SCIENCE

In 2013, the Citizen Science initiative at RJD reached new heights. From corporate custom-tailored expeditions to tri-generational family reunions, hundreds of members of general public engaged in hands-on shark research with the RJD team. Some highlights include trips with DiveBar, Aimia, Toyota, the Tompos family, Jon Oh, the Kellogg School of Management Executive MBA Class of 2013, the Weintraub Family, Disney Worldwide Conservation Fund, and the Bank of Montreal. We are so grateful to all of the individuals and groups that joined us in the 2013 shark season!

> *Still in awe and grinning from this **unbelievable experience.** Thank you for making my dream come true of seeing and touching a tiger shark! Your team of amazing researchers **marry passion and excitement into the conservation** of the world's most misunderstood and necessary of creatures!! These beautiful animals are going extinct the world over but I'm optimistic and hopeful that all your amazing hard work and **enthusiastic outreach** is righting this course and I'm just so very proud I got to witness and participate in a minute snippet of a part of a day of your life's work! Thank you for an experience of a lifetime!!*
>
> *Kai-Wei Chung, Zoetis*

ScienceOnline Oceans Conference

*ScienceOnline Oceans brought together nearly **200 marine scientists, conservationists, educators and communicators** from around the world. RJD served as a host organization for the meeting, and RJD students and staff led three sessions focusing on our outreach model, our shark tracking website, and the use of cinematography as a science communication tool. After the conference, 50 participants joined us for a day of shark tagging in Biscayne Bay.*



Big Brothers Big Sisters

We are excited to welcome a new partner program onto the water - Big Brothers Big Sisters! The first trip out of Miami in Fall 2013 was a big success, introducing several young students to the ocean for their first time! We look forward to growing this partnership over the coming years.

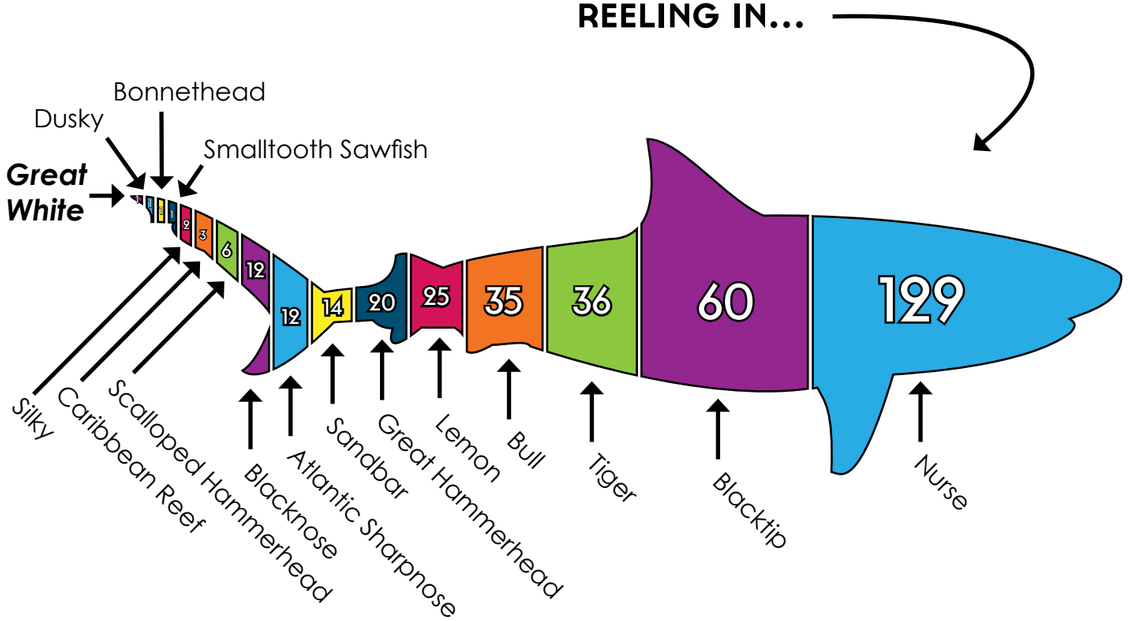
RESEARCH

Go Fish!

2,264 **Baits Deployed**

across 71 **Research Trips**

REELING IN...



FOR A TOTAL OF 363 **FISH CAUGHT IN 2013**

White Sharks Scavenging on Whales

*While many terrestrial animals are frequently observed scavenging on other animals - such as hyenas stealing a lion kill - rarely do scientists have the chance to see such behavior in marine animals. In a new **PLOS ONE study**, white shark expert Chris Fallows teamed up with RJD scientists to describe and analyze the behaviors of great white sharks scavenging on whales in South Africa. They observed a **clear size-based pecking order** among sharks as well as a preference for eating the **higher calorie areas** of the whale carcass. Additionally, they hypothesize that as white sharks mature, scavenging events may become more **prevalent** and **significant** than previously thought.*

Read the Publication: Fallows C, Gallagher AJ, Hammerschlag N (2013) White Sharks *(Carcharodon carcharias)* Scavenging on Whales and Its Potential Role in Further Shaping the Ecology of an Apex Predator. *PLOS ONE* 8(4): e60797. doi:10.1371/journal.pone.0060797.

Multimedia BONUS:

Did you know that the RJD produced video abstract for this study received **over 14,200 plays** on Vimeo in 2013? Watch the video at: http://vimeo.com/rjdunlap/WhiteShark

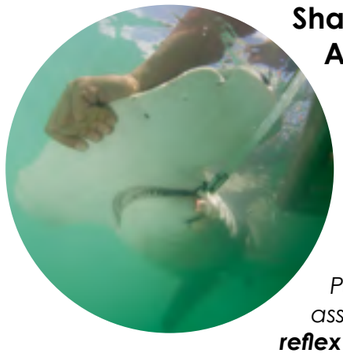
The Role of Twitter in the Life Cycle of a Scientific Publication

*Some may love Twitter for the latest in celebrities and gossip, but can Twitter also serve an important role in scientific research? In June 2013, Ph.D. Candidate David Shiffman along with colleagues at Simon Fraser University and Columbia University published a paper on **how scientists can use Twitter** at each step of a scientific publication. Twitter can act as a **virtual forum** for colleagues to rapidly share ideas. It can be used as an informal arena for the **pre-review** of a manuscript. And once a study is published, Twitter can **amplify** the s**ocial and scientific impact** through broad, online dissemination.*

Read the Publication: Darling E, Shiffman D, Drew J, and Cote Isabelle (2013) The role of twitter in the life cycle of a scientific publication. *Ideas in Ecology and Evolution* 6, 32-43.

RESEARCH

Shark Satellite Track Spotlight



Shark Stress Physiology and Post-Release Survival in Angling

In recreational catch-and-release fishing, when a fish is released alive in seemingly good condition, it's often assumed that it will survive upon release. Though previous research supports this assumption with many sport fish, shark post-release survival has not been thoroughly investigated. This study takes a closer look.

Ph.D. Candidate Austin Gallagher utilized three measures of health to assess the stress levels and survival of sharks: (1) ***blood*** *chemistry; (2)* ***reflex*** *tests; and (3)* ***satellite telemetry****. Using RJD's standardized shark fishing methodology, he was able to* ***compare the reactions of multiple shark species*** *to the stressors of fighting a fishing line. Upon analyzing the data, Gallagher ranked the vulnerability of these species to fishing pressure (from least to most vulnerable): (1) tiger; (2) lemon; (3) bull; (4) blacktip; and (5) great hammerhead.*

The Takeaways:

- *Visual observations of post-release vitality in sport fish could underestimate mortality.*
- *Additional or alternative conservation measures should be considered for* ***Great Hammerheads.***
- *Great conservation insight can be gained through* ***tracking fitness*** *in wild animals.*

Read the Publication: Gallagher, AJ, Serafy, JE, Cooke, SJ, Hammerschlag, N (2014) Physiological stress response, reflex impairment, and survival of five sympatric shark species following experimental capture and release. *Marine Ecology Progress Series* doi:10.3354/meps10490.

Watch the video abstract at: http://vimeo.com/rjdunlap/SharkStress

Additional 2013 Scientific Publications:

Hammerschlag N, Gallagher AJ, Carlson JK. (2013) A revised estimate of daily ration in the tiger shark (*Galeocerdo cuvier*) with implications for assessing ecosystem impacts of apex predators. *Functional Ecology* 27 (5): 1273-1274.

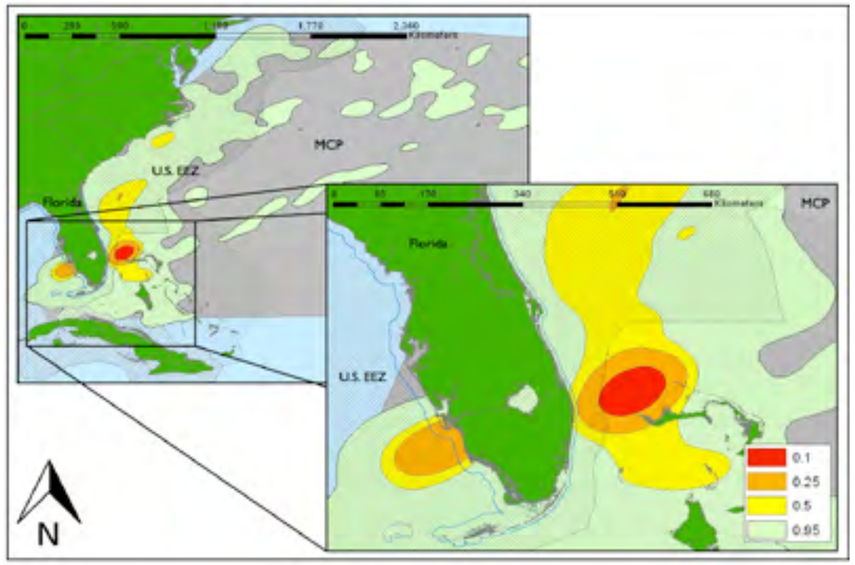
Carr, LA, Stier, AC, Fietz, K, Montero, I, Gallagher, AJ, Bruno, JF. (2013) Illegal shark fishing in the Galapagos Marine Reserve Marine Policy 39: 317-321.

Explore more RJD research information, photos, video, and infographics on our website: ***SharkTagging.com.***

RESEARCH

Why is Satellite Tracking of Threatened Shark Species Important?

Figure (right): These maps show the core areas used by our satellite tagged tiger sharks overlapped with management zones. The warmer the color, the more likely a tiger shark would be found in that area.



The data that RJD has been able to collect by deploying satellite tags has been extremely useful in gaining insight into the movements and habitat use of the tagged sharks. Fiona Graham, a recently graduated RJD Masters student has spent considerable time analyzing this satellite telemetry data in order to determine **key habitat areas** for three wide-ranging shark species - **the tiger shark, great hammerhead and bull shark** - in both South Florida and The Bahamas. Once she was able to determine which areas these sharks spend the most time in, she then compared them to existing management zones and quantified the level of potential habitat protection that is offered to these species. These zones included areas such as Florida state waters, which prohibit the landing of tiger sharks and all species of hammerheads, The Bahamas Exclusive Economic Zone (EEZ), which has recently been declared a shark sanctuary, US National Parks, the U.S. EEZ, and various other relevant regions. Fiona also looked at habitat preference, specifically the water column depths that these sharks spend the most time in and their average distance from shore. Results from the study show that habitat protection is currently low for all three species. If the United States were to add protection to their EEZ, however, **100% of tagged tiger shark critical habitat would be protected**. Additionally, habitat protection for the endangered great hammerhead would increase from 17.88% coverage of their critical habitat to 91.57%. Finally, since bull sharks are much more of a coastal species, 95.93% of the tagged shark's critical habitat was within Florida state waters, where they are currently unprotected.

A Field Note from Tiger Beach, Bahamas

October 2013

It is always a pleasure being able to travel to Tiger Beach to conduct research and interact with one of the **largest year-round aggregations of predatory sharks in the world.** Our October 2013 trip was our fourth expedition in two years to this sandy, shallow bank just north of Grand Bahama Island. Every time we go there, I learn something new about the animals, and on this trip we were trying to find more pieces to fit into the puzzle of tiger shark life history and ecology in the Atlantic Ocean. Armed with some new tools such as **acoustic telemetry equipment** and a new ultrasound, we **tagged and released 21 sharks** (20 tigers and one great hammerhead) in just three days. Data for this project adds to our growing body of research on the reproduction and movement of these apex predators. The experience was incredible, but adding new dimensions into our research is always exciting, and it was exhilarating implanting the massive tiger sharks (some pushing 13 feet) with acoustic transmitters. We also had an **incredible team of citizen scientists** of all ages who became immediately savvy of our research protocols and helped out immensely on the boat. We all arrived back at the dock bruised from a hard week's work, but it was not in vain. We collected the most information and data to date on this trip, and are that much closer to figuring out this awe-inspiring ecological system and species.

Austin Gallagher
Ph.D. Candidate, Abess Center for Ecosystem Science and Policy

Photo (above): Dr. Neil Hammerschlag deploys an underwater hydrophone that will be used to detect tiger sharks tagged with acoustic transmitters.

EDUCATION

RJD staff and interns work closely with local educators to give high school students a chance to experience scientific research in marine biology. These experiences both promote environmental stewardship and foster scientific career pathways. Additionally, face-to-face teaching builds relationships between high school and college students.

Student Field Trips

One of the core components of the RJD Program is providing experiential learning opportunities to young adults. RJD offers empowering and inspiring educational experiences to groups of high school students throughout the year. Classes take an active role in research projects, learn the scientific method, and assist in protecting some of the world's most threatened animals. Within the 2013 season, the team was able to embark on ***71 research trips*** *bringing* ***over 1,100 people*** *on the water to participate in hands-on science.*

Public Presentations

RJD scientists and educators gave over 20 public presentations in 2013 to 800+ audience members ranging from elementary school children to leading marine scientists and communicators. RJD research was presented at the American Elasmobranch Society Meeting, Society of Conservation Biology, the International Congress for Conservation Biology, Benthic Ecology, and the ScienceOnline Oceans Conference.

Undergraduate and Graduate Internships

The RJD Internship Program offers shark field research, data management, field photography, interactive media and conservation writing internships. Students are exposed to a variety of disciplines within marine conservation and given the opportunity to learn hands-on with experts. In 2013, RJD hosted ***28 undergraduate and graduate interns****.*

"*I have been an intern for nearly two years, and it has been* ***one of the best experiences of my entire life.*** *The basic format of the internship includes a variety of training sessions in topics ranging from boat safety to fish ID to social science to outreach initiatives such as blogging. As an intern, I have managed the RJD shark satellite tracking database, presented (as an undergrad) at my first scientific conference, witnessed ultrasounds performed on massive tiger sharks, and worked alongside some of the most intelligent and dedicated people in the field. To me, RJD has been so* ***much more than just an internship****; it has taught me advanced skill sets that I will use for the rest of my career and has given me experiences I never could have imagined.*"

- Emily Nelson
Undergraduate Shark Research Intern

Virtual Learning

To impact an even larger audience from across the globe, RJD continues to use a variety of online education tools, including **virtual expeditions***, satellite tracking of sharks, webinars, podcasts, blogs, online curricula and social media. 2013 highlights include a new mobile music trivia game called Musingo that benefits the oceans, an educational activities on mercury in the marine food web utilizing a subset of shark tissue data, science education videos reaching 16K+ viewers, outstanding, diverse blog content, and an MPA Twitter Teach-In event featured in Nature.*

OUTREACH

2013 Participant Summary

51 countries of origin were represented.

1622 individuals participated in RJD shark trips during the 2013 season.

19 universities were represented among the RJD Internship Program at the University of Miami.

45 states of origin were represented.

Student Follow-Up

*"As a student interested in science and nature, I was thrilled to be part of a marine science program for all four years of high school. But nothing compared to the experiences provided by Dr. Neil and his team at RSMAS doing **real, hands-on field research.** At the ripe old age of fourteen, I dove right into the heart of field ecology and wildlife conservation-- an experience that has stayed with me through my university education, and certainly will stay with me my whole life. Sharks are a charismatic icon of the ocean: a strong, powerful, and bold image in any and all media. But working with them face-to-face, **that paradigm was totally shattered and replaced with reality;** they are elusive, fragile, respectful, incredible creatures who need our help. My experience brought another realization to me-- that **I could BE that help**. The problems faced by our oceans and the life therein are no longer abstract concepts; they are real, accessible and understandable thanks to Dr. Neil's shark program, and **inspire me to pursue my own path** toward ecological field science."*

Tallulah Orcel, South Broward HS 2011

Q: You say RJD's shark tagging trips incorporate experiential learning. What are some examples of hands-on activities that students do onboard?

A: Students work side-by-side with the scientists from beginning to end. They help bait the hooks, deploy the fishing gear, reel the gear back in, take shark measurements, test shark reflexes, take muscle and cartilage samples, and attach ID tags. And throughout the whole process, scientists engage students in open dialogue about the scientific process and over arching conservation context.

SUPPORT

Donations

Established through a founding dontation from Marian Dunlap in honor of her late husband Richard James Dunlap, the RJD Program is largely supported through the generosity of its donors. Thanks to this support, we have been able to reach thousands of students and individuals to educate and inform them on the oceans and shark conservation. All support for this work is greatly appreciated.

Donations were made by individuals such as: D Bashyam, M Caletti, T Dolan, E Nelson, L Nelson, B Franklin, S Glosserman, J Gross, S He, S Hoffner, M Klancnik, T Li, J Martinez, G McArdle, M Mohlke, J Mora, J Oh, M O'Malley, C Oseland, A Perni, V Ramirez, J Richards, P Rojas, F Santeiro, B Seagriff, O Sellar, S Sharma, M Spital, K Strange, S Tompos, K Uustal, B Weintraub, and J Weber.

Donations were made by organizations, institutions and corporations including: Aimia Proprietary Loyalty, Airbus, **Batchelor Foundation, Inc.**, Davis and Dow, Desert Sage Productions, **Disney Worldwide Conservation Fund**, Dive Bar, Dive Shop Kissimmee, Kellog Consulting Group, **Guy Harvey Ocean Foundation,** McDonald's Corporation, Microsoft, New Affinity Concept, Palmer Trinity School, and **Wells Fargo Foundation**.

New to the Online Store: Citizen Science field shirts!

ShopForSharks.com

ShopForSharks.com is a collaboration between designers, researchers, and the B1self clothing company to create an **online store of RJD-branded gear.** 20% of profits come back to support RJD. Our team of scientists and interns proudly wear the RJD field shirts during each trip!

Adopt a Shark

Researching these apex predators is neither easy nor cheap. So to ensure RJD's satellite tracking study of sharks continues, the program accepts donations in the amount of $2,500, which covers the cost to purchase one **new satellite tag.** In return, donors are given the opportunity to name the adopted shark and **follow the shark's movements on our website** using an interactive Google Earth map. Classes and entire schools are also welcome to collectively adopt sharks. The University of Miami is a Florida not-for-profit corporation and all donations are tax deductible as appropriate by law.

In 2013, RJD partnered with Dr. Diego Lirman's Coral Restoration Research Lab at RSMAS to launch the Rescue a Reef initiative. With a $1,000 donation, **100 staghorn corals** will be planted onto a local reef and you will have the opportunity to name that new patch of reef. Learn more at **RescueAReef.com**.

To pledge your support for RJD, visit the "Donate" section of our website: ***SharkTagging.com.***

CREDITS

The 2013 RJD Annual Report has been a collaborative effort between these primary contributors:

Christine Shepard

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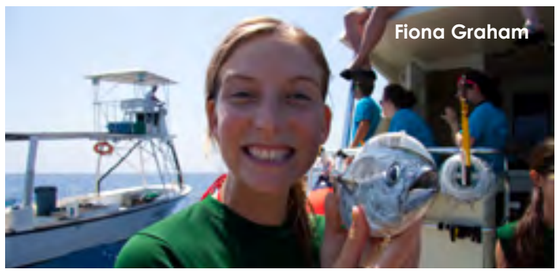
Austin Gallagher

Emily Nelson


Fiona Graham

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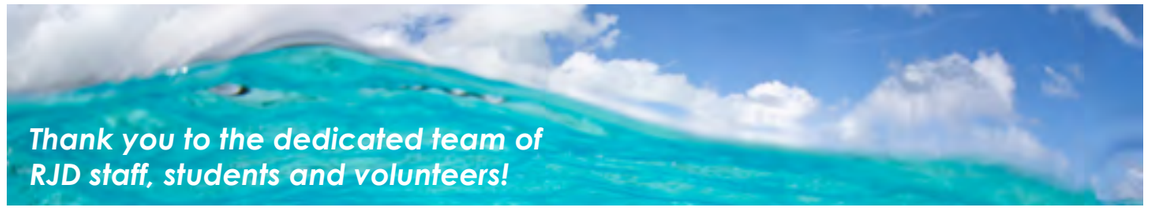
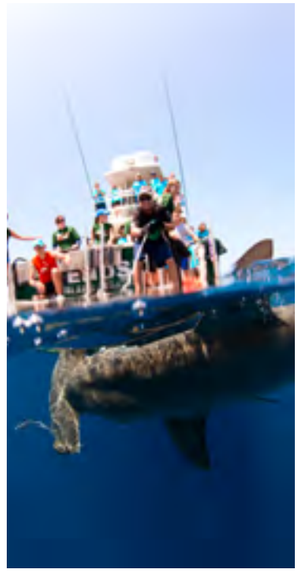

Thank you to the dedicated team of RJD staff, students and volunteers!



TOGETHER, WE ARE

www.SharkTagging.com