

## EARTHWATCH INSTITUTE FIELD REPORT

### **SECTION I: UNEP- WCMC WEBLINK INFORMATION**

**Project Title:** Wild Dolphin Societies

**Principal Investigator (s):** Jason Allen<sup>1</sup>, Sue Hofmann<sup>2</sup> & Dr. Randall S. Wells<sup>3</sup>

**Position/Affiliations:** 1) Chicago Zoological Society, 2) Mote Marine Laboratory & 3) Chicago Zoological Society/Mote Marine Laboratory

**Research Site(s):** Our research site is located on the Central-West coast of Florida, USA. It includes Sarasota Bay and surrounding near-shore waters from Venice Inlet (27.09 N Lat.) to southern Tampa Bay, the Manatee River, and Terra Ceia Bay (27.57 N Lat)

**Local Management Status of the Research Site(s):** No special designations

**Scientific names of primary species being studied:**

Bottlenose Dolphins (*Tursiops truncatus*)

### **Key Research Objectives:**

Our primary research objective is to continue obtaining the level of year-around survey coverage necessary to provide continuity and consistency to our long-term dolphin sighting database and to support focused research projects being conducted concurrently by Sarasota Dolphin Research Program (SDRP) staff, visiting investigators, and graduate students. Current projects include:

- **Population Structure, Dynamics, and Stock Identification**
  - Sarasota Bay Dolphin Monitoring - Through long-term monitoring, we are able to establish the range of variability of population parameters within a wild population.
  - Stock Identification - We are continuing to obtain genetic samples from individuals in Sarasota Bay, Tampa Bay, Charlotte Harbor, Pine Island Sound, and the Gulf of Mexico through biopsy darting and capture-release efforts in order to refine our understanding of dolphin community and population structure, leading to the definition of biologically-meaningful management units.
- **Health Assessment and Biomarkers of Environmental Contaminants and Their Effects**
  - Health Assessment - The population dynamics data collected during this project are used to validate and refine a model for the health assessment of dolphin populations. The intent is to use measures of dolphin health as predictors of trends in dolphin populations. Though blood sampling for health assessment was initially accomplished with the assistance of EWI, subsequent sampling is continuing through the support of a variety of other entities.
  - Environmental Contaminants and Effects - Research in recent years has resulted in the collection of blubber, blood, and milk samples for measurement of environmental contaminant concentrations (especially PCBs and DDT and

emerging contaminants), and examination of a variety of potential biomarkers of contaminants and their effects.

- Feeding Ecology - A long-term goal of our research program has been to relate, quantitatively, dolphin distributions and movement patterns to prey abundance and distribution. EWI surveys will play a crucial role in defining dolphin distributions during this study, in conjunction with a concurrent study of dolphin prey fish distribution and abundance.
- Human Interactions - Studies of human interactions are ongoing in Sarasota Bay. Upon completion of analyses of boat distribution data collected during EWI surveys over the last few years, an appropriate program of continued monitoring will be established.
- Social Structure And Dynamics - Photographic identification surveys provide us with "snap-shots" of the composition of groups of dolphins. Over time, repeated sightings of individuals and members of different age and sex classes have led to the identification of patterns of social association.
- Mating System and Reproductive Success - EWI surveys provide an important perspective to our ongoing study of dolphin mating systems and reproductive success. Social association patterns recorded during EWI surveys during the breeding/calving season provide insights into the mating system when examined relative to the timing of birth (gestation is 12 months), and relative to genetic paternity tests.
- Education - Our program has become involved in distance learning, initially as a result of EWI-sponsored teachers joining our teams, and now as a result of federal funding to disseminate the information from our dolphin program to the Chicago area, Sarasota, and other venues as they develop. We expect to expand these capabilities over the next few years, and develop formal programming through the efforts of Mote Marine Laboratory and Chicago Zoological Society education staff.

## Data Collection and Results

- a) Give a concise account of the data you have collected during the past field season.
- b) What progress have you made towards achieving your original objectives?
- c) Please provide a summary of your results (even if they are preliminary).

Photo-identification surveys were conducted on 126 days from October 2003 through December 2004. During this time, we had 788 group sightings that totalled 2,656 dolphins (including resighted animals). Our average numbers of sightings per day and dolphins per sighting have remained fairly constant throughout the past several years (Figure 1). We averaged 6 sightings per day with almost 3.5 dolphins per sighting during the most recent year. During this same time period, our annual average of the number of dolphins sighted per day was slightly lower, at 21.1, than in the previous four years (which averaged 22.5 dolphins/day). Our highest number of sightings per day, dolphins per sighting, and dolphins per day were in July (8.8), August (3.8), and July (29.6), respectively (Figure 2). During 2003-2004, we had a high of 17 sightings in one day during a July '04 survey and a high of 71 dolphins during that same July day.

We were able to document the births of ten new calves during the spring/summer of 2004 while monitoring the Sarasota dolphin community (Figure 3). Big Shout and FB 55 had their second calves while Pecan Sandie and Claire had their fourth. Killer was both a new mother and new grandmother this year; she and her eight year old daughter, Lizzie, were both seen with new calves in early June. Other moms include FB 54, FB 79, FB 93, and Pi Look-a-like. Pi Look-a-like has been seen off and on in Sarasota Bay since 2001 She returned in June shortly before giving birth in July. All of these calves were doing well as of this writing except for FB54's. She has been seen several times during Fall 2004 without her calf and it is presumed lost.

Since January 2004, one of the 1999 and five of the 2002 calves have been caught, examined, sampled, and released. Moonfin look-a-like, FB 175, and FB 65 had sons while Saida Beth, Pumpkin, and Merrily had daughters. We also examined Fat Top, a female we have sighted since 1983, Fat Top's two-year-old calf, and another female initially sighted in 2001.

During the past year, we lost three Sarasota Bay community members. Bar Dot, a female seen since 1989, died following complications from a stingray barb puncture to her left lung. RP 27, a 13-year-old female, died in July 2004. RP 27 was orphaned at only 16 months and survived to have two calves of her own. Her first, Annie, is now 6 and doing well. Her second is only 2, but we hope that she will be as strong as her mother was in the same situation. Rose, a 14-year-old female, died in August 2004 and is also survived by a young calf (~15 months). We have seen her calf four times since orphaned and it appears to be doing well. Through our Earthwatch-sponsored surveys, we have accounted over 90% of the Sarasota community members. As of October 2003, the number of dolphins regularly using the surrounding waters stands at approximately 160 animals.

## **Significance/Benefits of Research**

a) What is/are the significance/benefits of your research at the following levels?

- local (in the area of the research site)
- national
- international

(For example, do your findings, or do you expect your findings will contribute to management strategies or biodiversity conservation action plans at any of these levels?)

Our desire with each research project, including our long-running Earthwatch Institute project, is to contribute to a better understanding of the structure and dynamics of populations of small cetaceans (dolphins, whales, and porpoises), as well as the natural and anthropogenic factors (factors of human origin) that impact them. We use an interdisciplinary and collaborative approach in conducting studies of bottlenose dolphins within a unique long-term natural laboratory. The primary goals of this program include (1) collecting biological, behavioral, ecological, and health data of importance to the conservation of small cetaceans, especially bottlenose dolphins, (2) providing requisite information for bottlenose dolphin conservation to wildlife management agencies, (3) disseminating the information generated by our program to scientific and general audiences in order to aid dolphin conservation efforts, (4) using our model program to develop and refine hypotheses regarding bottlenose dolphins in other parts of the species' range as well as other species of small cetaceans, (5) using the established natural laboratory to develop and test new research tools and methodologies of potential benefit to conservation efforts, (6) training cetacean conservation workers and students from around the world in the use of these techniques, (7) applying our unique program expertise to dolphin rescue operations and post-release follow-up monitoring, and (8) applying the information we

gather from free-ranging dolphins to improve the quality of care for dolphins in zoological park settings.

The data we collect during our EWI surveys supports the operations and related projects of our entire program. Knowledge of the composition, status, and trends of the local dolphin population in Sarasota Bay is basic to every other aspect of the research and educational programs. Our data are used by the National Marine Fisheries Service to identify and evaluate threats to bottlenose dolphins locally, and elsewhere because our long-term program provides a model. Our educational programs based on our long-term research train scientists and conservationists from around the world, as well as making local public and students more aware of their role as stewards of the coastal marine environment. During 2003 and 2004, co-PI Randall Wells was called upon to provide testimony and other information to a congressional subcommittee regarding potential changes to the Marine Mammal Protection Act, based in large part on the findings from the long-term dolphin research program in Sarasota Bay.

b) How do your findings contribute to issues of sustainability?

We are collecting and disseminating the information required by the management agencies to be able to provide the protective measures necessary for assuring sustainability of bottlenose dolphins in regions of increasing human pressures, as evidenced by the products of our program during the past year (below) and previously.

#### **Dissemination of Results:**

The following papers/presentations have resulted at least in part from EWI support:

#### **Peer-reviewed Journal Articles and Book Chapters**

- Wells, R.S. 2003. Dolphins (Delphinidae). Pp. 41-58 *In*: V. Geist, M. Hutchins, and M.C. McDade, eds., Mammals IV, Vol. 15 of Grzimek's Animal Life Encyclopedia. The Gale Group, Farmington Hills, MI.
- Wells, R.S., H.L. Rhinehart, L.J. Hansen, J.C. Sweeney, F.I. Townsend, R. Stone, D. Casper, M.D. Scott, A.A. Hohn, and T.K. Rowles. 2004. Bottlenose dolphins as marine ecosystem sentinels: Developing a health monitoring system. *EcoHealth* 1:146-254.
- Maresh, J.L., F.E. Fish, D.P. Nowacek, S.M. Nowacek and R.S. Wells. 2004. High performance turning capabilities during foraging by bottlenose dolphins (*Tursiops truncatus*). *Marine Mammal Science* 20(3):498-509.
- Cook, M.L.H., L.S. Sayigh, J.E. Blum, and R.S. Wells. 2004. Signature whistle production in undisturbed free-ranging bottlenose dolphins (*Tursiops truncatus*). *Proceedings of the Royal Society of London: Biological Sciences* 271:1043-1049.
- Watwood, S.L., P.L. Tyack, and R.S. Wells. 2004. Whistle sharing in paired male bottlenose dolphins, *Tursiops truncatus*. *Behavioral Ecology and Sociobiology*. 55(6): 531-543.
- Hansen, L.J., L.H. Schwacke, G.B. Mitchum, A.A. Hohn, R.S. Wells, E.S. Zolman, and P.A. Fair. 2004. Geographic variation in polychlorinated biphenyl and organochlorine pesticide concentrations in the blubber of bottlenose dolphins from the US Atlantic coast. *The Science of the Total Environment* 319:147-172.
- Buckstaff, K.C. 2004. Effects of watercraft noise on the acoustic behavior of bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science* 20:709-725.

## **Manuscripts In Press, In Revision, or In Review**

- Gannon, D.P., N.B. Barros, D.P. Nowacek, A.J. Read, D.M. Waples, and R.S. Wells. In press. Prey detection by bottlenose dolphins (*Tursiops truncatus*): an experimental test of the passive-listening hypothesis. *Animal Behavior*.
- Fripp, D., C. Owen, E. Quintana-Rizzo, A. Shapiro, K. Buckstaff, K. Jankowski, R.S. Wells, and P. Tyack. In press. Bottlenose dolphin (*Tursiops truncatus*) calves model their signature whistles on the whistles of community members. *Animal Cognition*.
- Tornero, V., A. Borrell, A. Aguilar, R.S. Wells, J. Forcada, T.K. Rowles, and P.J.H. Reijnders. In press. Effect of organochlorine pollutants and individual biological traits on blubber retinoid concentrations in bottlenose dolphins (*Tursiops truncatus*). *Journal of Environmental Monitoring*.
- Watwood S.L., E.C.G. Owen, R.S. Wells, and P.L. Tyack. In press. Signature whistle use by free-swimming and temporarily restrained bottlenose dolphins. *Animal Behaviour*.
- Owen, E.C.G., D.A. Duffield, and R.S. Wells. In revision. Cooperation between non-relatives: alliances between adult male bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Animal Behaviour*.
- Watwood, S.L. and Owen, E.C.G. In revision. Adult male bottlenose dolphins, *Tursiops truncatus*, use whistles to initiate reunions between alliance partners. *Journal of Comparative Psychology*.
- Wells, R.S., V. Tornero, A. Borrell, A. Aguilar, T.K. Rowles, H.L. Rhinehart, S. Hofmann, W.M. Jarman, A.A. Hohn, and J.C. Sweeney. In review. Integrating life history and reproductive success data to examine potential relationships with organochlorine compounds for bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. *The Science of the Total Environment*.
- Hall, A.J., B.J. McConnell, T.K. Rowles, J. Kucklick, L. Schwacke, and R.S. Wells. In review. Population consequences of polychlorinated biphenyl exposure in bottlenose dolphins – an individual based model approach. *Environmental Health Perspectives*.
- Sayigh, L.S., L.E. Williams, R.S. Wells, and A.A. Hohn. In review. Modifications of signature whistles in adult female bottlenose dolphins. *Animal Behavior*.
- Wetzel, D.L. J.E. Reynolds, III, J. Sprinkel and R.S. Wells. In review. Fatty acids in bottlenose dolphin (*Tursiops truncatus*) milk differ significantly from those in maternal and calf blubber: Evidence using picolinyl esters and gas chromatography-mass spectroscopy. *J. of Comparative Biochemistry and Physiology*.
- Martien, K.K., A.B. Sellas, P.E. Rosel, B.K. Taylor, and R.S. Wells. In review. A new approach to defining management units for Gulf of Mexico bottlenose dolphins. *Marine Mammal Science*.
- Owen, C.G., D.A. Duffield, and R.S. Wells. In review. Cooperation between non-relatives: alliances between adult male bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida.

## **Technical Reports**

- Wells, R.S. 2004. Small cetacean electronic tag attachment workshop, June 11-12, 2003. Report to the U.S. Marine Mammal Commission, Contract No. T03326587.
- Wells, R.S., Tornero, V., Borrell, A., Aguilar, A., Rowles, T.K., Rhinehart, H., Hofmann, S., Jarman, W., Hohn, A., Sweeney, J. 2004. Integrating life history and reproductive success data to examine potential relationships with organochlorine compounds for bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. International Whaling Commission Report SC/56/E19.

- Wilson, J. Wells, R.S., Aguilar, A., Borrell, A., Tornero, V., and Reijnders, P.J.H. 2004. Relationship between contaminants and immunohistochemistry CYP1A expression in upper and lower dermis tissue of bottlenose dolphins *Tursiops truncatus*. International Whaling Commission Report SC/56/E17.
- Tornero, V., Aguilar, A., Borrell, A., Forcada, J., Wells, R.S., and Reijnders, P.J.H. 2004. Effect of organochlorine pollutants and individual biological traits on retinoid blubber concentrations in bottlenose dolphins (*Tursiops truncatus*). International Whaling Commission Report SC/56/E16.
- Schwacke, L., Hall, A., Wells, R., Bossart, G., Hohn, A., Fair, P., Kucklick, J., Rosel, P., and Rowles, T. 2004. A 5-year plan for health and risk assessment for bottlenose dolphin populations along the southeast U.S. coast. International Whaling Commission Report SC/56/E20.
- Hall, A., Wells, R.S., Stott, J., Wilson, J., Aguilar, A., Borrell, A., Tornero, V., Donovan, G.P., O'Hara, T., Rowles, T., Siebert, U., Bjørge, A. and Reijnders, P.J.H. 2004. Biomarkers of contaminant exposure and relationships with blubber contaminant levels in bottlenose dolphins *Tursiops truncatus*. International Whaling Commission Report SC/56/E15.

### **Presentations at Professional Meetings**

- Wells, R.S., Tornero, V., Borrell, A., Aguilar, A., Rowles, T.K., Rhinehart, H., Hofmann, S., Jarman, W., Hohn, A., Sweeney, J. 2004. Integrating life history and reproductive success data to examine potential relationships with organochlorine compounds for bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Annual Meeting of the Scientific Committee, International Whaling Commission, 4 July 2004, Sorrento, Italy.
- Wells, R.S. 2004. Integrating life history, health, and reproductive success data to examine potential relationships with organochlorine contaminants for bottlenose dolphins in Sarasota Bay, Florida. National Water Research Institute, Environment Canada, Burlington, Ontario.
- Wells, R.S. 2004. Implications of bottlenose dolphin stock structure for health assessment on Florida's west coast. National Ocean Service, Charleston, SC.
- Wells, R.S. 2004. Health assessment of bottlenose dolphins in Sarasota Bay, Florida. Forum on "Estrategias para el Manejo y Aprovechamiento de Delfines (*Tursiops* spp.) en México. 1-2 May 2004, La Paz, Mexico.
- Bassos-Hull, K., R.S. Wells, C.A. Shepard, J.B. Allen, and B.C. Balmer. 2004. Bottlenose dolphin abundance, distribution, population structure, and health in the Charlotte Harbor ecosystem: update and findings 2004. 5-6 October 2004, Charlotte Harbor Conference, Mote Marine Laboratory, Sarasota, FL.
- Bassos-Hull, K., R.S. Wells, C.A. Shepard, J.B. Allen, and B.C. Balmer. 2004. Bottlenose dolphin abundance, distribution, population structure, and health in Charlotte Harbor, Florida. 26-28 March 2004, SEAMAMMS, Harbor Branch Oceanographic Institution, Fort Pierce, FL.
- Houde, M., T.A.D. Bujas, B.C. Balmer, G. Bossart, P.A. Fair, R.S. Wells, K.R. Solomon and D.C.G. Muir. 2004. Perfluorinated compounds in three free-ranging bottlenose dolphin populations from southeastern U.S. waters. Annual Meeting, Society for Ecotoxicology and Chemistry. (poster)
- Houde, M., T.A.D. Bujas, B.C. Balmer, G.J. Pacepavicius, M. Alae, G. Bossart, P.A. Fair, R.S. Wells, K.R. Solomon and D.C.G. Muir. 2004. Assessment of hydroxylated polychlorinated biphenyls (OH-PCBs) in plasma of free-ranging bottlenose dolphins. Annual Meeting, Society for Ecotoxicology and Chemistry. (poster)
- Gannon, J.G., D.P. Gannon, and R.S. Wells. 2004. Using GIS, relational databases, and application programming to improve ecological sampling design: an example involving

- bottlenose dolphins and their prey. Southeast and Mid-Atlantic Marine Mammal Symposium. 26-29 March 2004, Ft. Pierce, Florida, (poster presentation).
- Watwood, S.L. 2004. Social communication and behavior in marine mammals. MIT Alumni group, Woods Hole Oceanographic Institution.
- White, C.E., G. Tagliarini, L. Sayigh and S. Narayan. 2004. Automatic computer classification of dolphin signature whistles. Sigma Xi Spring Meeting, UNCW, 4/15/04.

### **Invited Participation in Legislative Activities**

- Wells, R.S. 2004. U.S. House of Representatives, Subcommittee on Fisheries Conservation, Wildlife and Oceans. Invited Participant, Stakeholder Meeting, Marine Mammal Protection Act Reauthorization, H.R. 2693. 20 January 2004.

### **Invited Public and University Lectures**

- Wells, R.S. 2004. Bottlenose dolphin conservation based on long-term behavior, ecology, life history, and health research. Biology of Marine Mammals, University of Miami.
- Wells, R.S. 2004. The secret lives of Sarasota Bay's bottlenose dolphins. MaST Research Institute, Sarasota High School, Sarasota, FL.
- Wells, R.S. 2004. Dolphin family values. Lowell Lecture Series, New England Aquarium, Boston, MA.
- Wells, R.S. 2004. Conservation Matters, Brookfield Zoo, Brookfield, IL.
- Cook, M.L.H. 2004. Hearing measurements in bottlenose dolphins. WV P.E.O. Chapter B fall meeting, Morgantown, WV.
- Wells, R.S. 2004. Bottlenose dolphin conservation based on long-term behavior, ecology, life history, and health research. SEAVET course, University of Florida.
- Wells, R.S. 2004. Caring for and caring about bottlenose dolphins – perspectives from 34 years of collaborative dolphin research. Invited Presentation, Marine Mammal Alliance Educator's Annual Meeting, Orlando, FL.
- Wells, R.S. 2004. Integrating life history, health, and reproductive success data to examine potential relationships with organochlorine contaminants for bottlenose dolphins in Sarasota Bay, Florida. Marine Mammal Toxicology, Woods Hole Oceanographic Institution.
- Cook, M.L.H. 2004. Hearing measurements in free-ranging bottlenose dolphins. Department of Social Sciences, New College of Florida, Sarasota, FL.
- Wells, R.S. 2004. Dolphins, manatees, and sea turtles from Osprey to Boca Grande: Current Mote Marine Laboratory research and conservation activities, and plans for the future. Gulf Coast Community Foundation of Venice, Venice, FL.
- Wells, R.S. 2004. Dolphin family values. Sarasota Boat Club, Sarasota, FL.
- Wells, R.S. 2004. CZS Sarasota Dolphin Research Program: Helping to make CZS a place where conservation, research, education, and animal programs intersect seamlessly. Board of Trustees Retreat, Chicago Zoological Society, Brookfield, IL.
- Wells, R.S. 2004. Discovering dolphins and manatees in our backyards. Brentwood Elementary School (two 5<sup>th</sup> grade classes), Sarasota, FL.
- Wells, R.S. 2004. Discovering dolphins and manatees in our backyards. Philippi Shores Elementary School (5<sup>th</sup> grade class), Sarasota, FL.
- Wells, R.S. 2004. Discovering dolphins and manatees in our backyards. Venice Elementary School (two 5<sup>th</sup> grade classes), Venice, FL.
- Watwood, S.L. 2004. Social communication and behavior in marine mammals. MIT Alumni group, Woods Hole Oceanographic Institution.

- Janik, V.M. 2004. Using acoustic playbacks to study signature whistles and their significance in dolphin communication. Invited plenary lecture presented at the 18<sup>th</sup> Annual Conference of the European Cetacean Society, Kolmarden, Sweden
- Janik, V.M. 2004. Vocal learning in marine mammals: mechanisms and functions. Invited lecture at the University of South Florida at St Petersburg, USA
- Janik, V.M. 2004. How do bottlenose dolphins encode identity in whistles? Invited lecture at Odense University, Denmark
- Sayigh, L.S. 2004. Bottlenose dolphins. Invited speaker at the Cape Fear Sierra Club meeting, March 2004
- Sayigh, L.S. 2004. Bottlenose dolphin signature whistles: fact and fiction. Invited talk at the Duke University Marine Laboratory, December 2004
- Bassos-Hull, K. 2004. Bottlenose dolphin abundance, distribution, population structure, and health in the Charlotte Harbor ecosystem. Invited speaker at Useppa Island Museum, Pineland, Florida, February 2004.
- Bassos-Hull, K. 2004. Bottlenose dolphin abundance, distribution, population structure, and health in the Charlotte Harbor ecosystem. Invited talk at the University of St. Andrews, Scotland, August 2004.

## Appendix

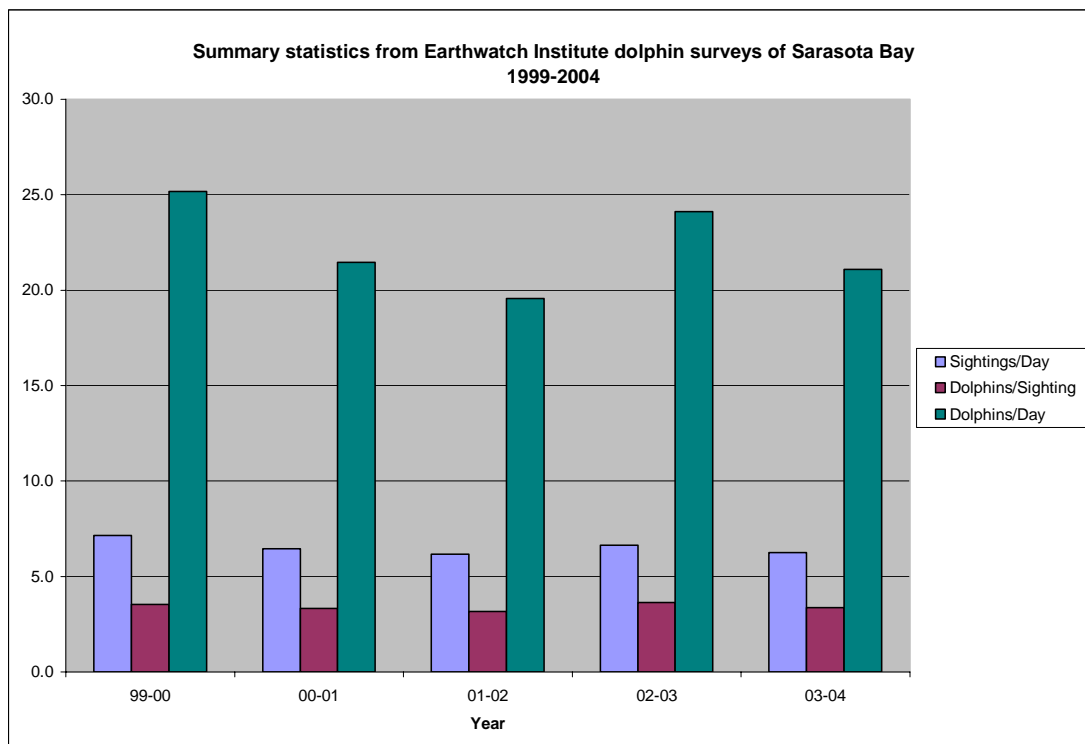


Figure 1: Summary statistics from Earthwatch Institute dolphin surveys of Sarasota Bay, 1999-2004. The number of sightings per day and dolphins per sighting have remain fairly constant over this time. The number of dolphins per day (21.1) was down slightly compared to 2002-2003 (24.1) as well as the average of the previous four years (22.5).

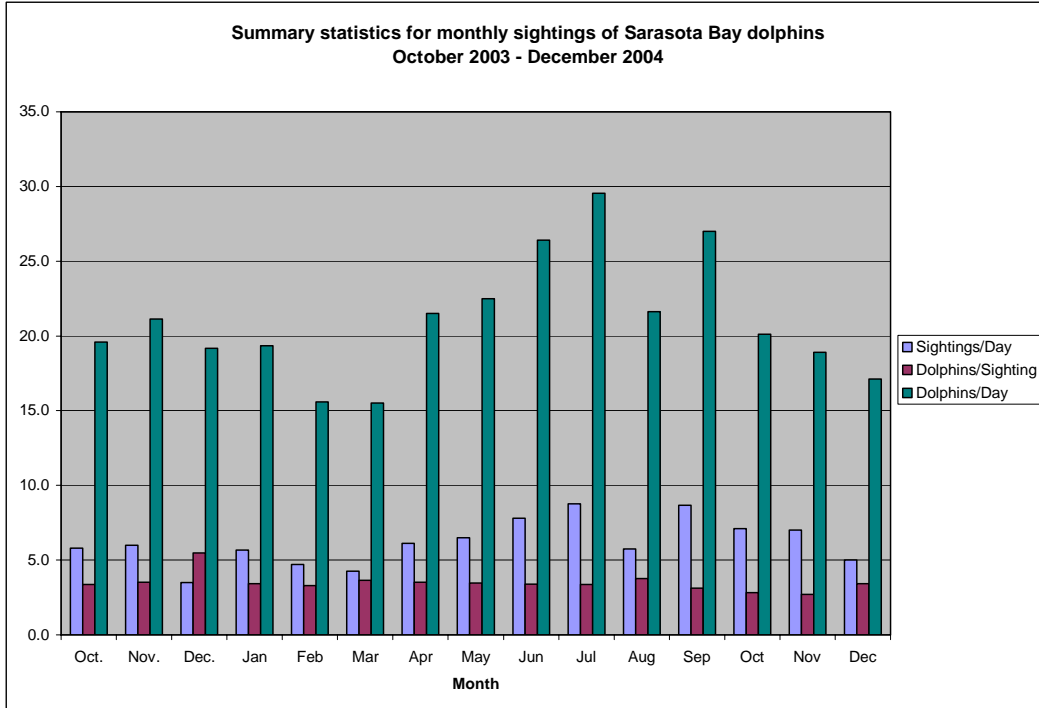


Figure 2: Summary statistics for monthly sightings of Sarasota Bay dolphins, October 2003-December 2004. The highest number of sightings per day, dolphins per sighting, and dolphins per day were in July (8.8), August (3.8), and July (29.6), respectively.

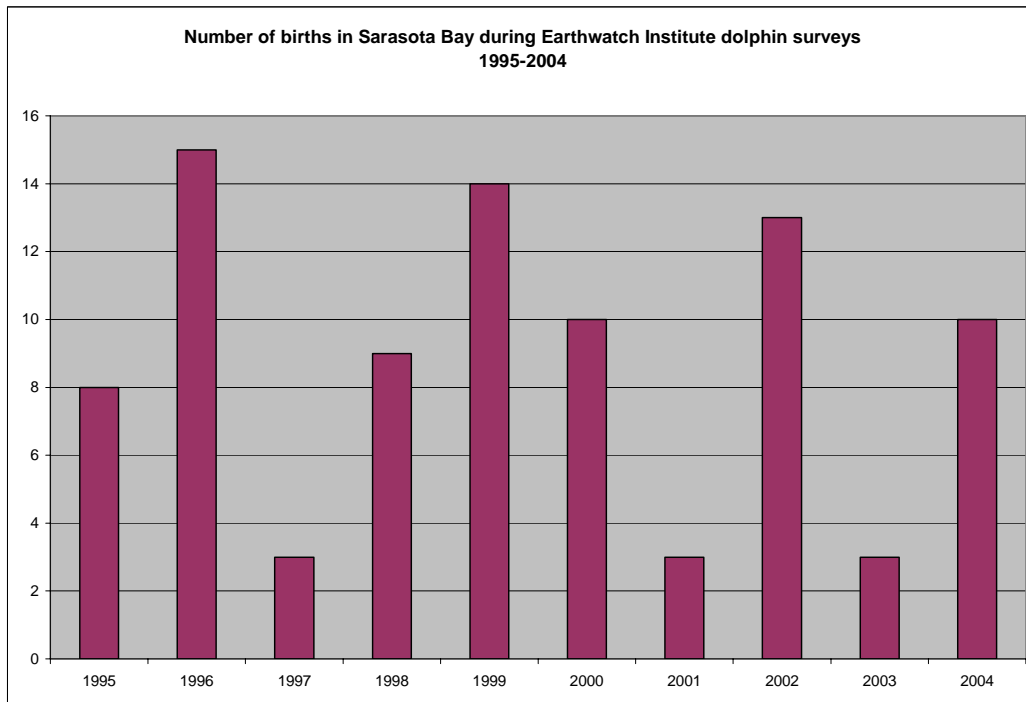


Figure 3: Number of births in Sarasota Bay during Earthwatch Institute dolphin surveys, 1995-2004. Though there were only three in 2003, we were able to document the births of ten new calves during the spring/summer of 2004 while monitoring the Sarasota dolphin community. As of this writing all but one have survived.