COWNOSE RAY WORKSHOP SUMMARY

Emilie Franke
ERT/NOAA Chesapeake Bay Office
Sustainable Fisheries GIT Meeting
December 14th, 2015

Background

Historical and present concerns about cownose ray predation on shellfish

2006 Virginia workshop to discuss predation concerns and discuss a possible fishery

Recent media attention on recreational bow-hunting tournaments

Workshop proposed to Sustainable Fisheries GIT to discuss new science

October 2015 Sustainable Fisheries GIT hosts scientific workshop

Chesapeake Bay Program
Science. Restoration. Partnership.

Workshop Objectives

- What do we know about cownose rays in the Chesapeake Bay (life history, diet, population, fishing interactions)?
- How can we determine population status?

Workshop Participants

Scientists

Lyndell Bade	Colby College; formerly East Carolina University
Tobey Curtis	National Oceanic and Atmospheric Administration
Drew Ferrier	Hood College
Bob Fisher	Virginia Institute of Marine Science, Marine Advisory Services
Dean Grubbs	Florida State University Coastal and Marine Laboratory
Tom Ihde	ERT/ National Oceanic and Atmospheric Administration
Jan McDowell	Virginia Institute of Marine Science, Department of Fisheries Science
Matt Ogburn	Smithsonian Environmental Research Center
Howard Townsend	National Oceanic and Atmospheric Administration

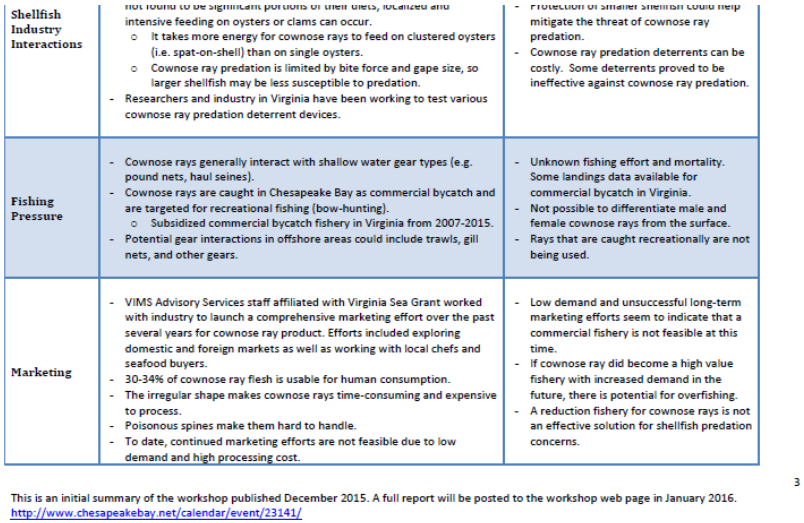
Sustainable Fisheries Goal Team Executive Committee

Bob Beal	Atlantic States Marine Fisheries Commission
Lynn Fegley	Maryland Department of Natural Resources
Marty Gary	Potomac River Fisheries Commission
Rob O'Reilly	Virginia Marine Resources Commission
Peyton Robertson	National Oceanic and Atmospheric Administration
Bruce Vogt	National Oceanic and Atmospheric Administration

Staff and Interested public

Workshop Summary

- Summary chart and recommendations compiled by the workshop scientists.
- Full workshop report will be available in January 2016.



Shellfish Industry Interactions	not found to be significant portions of their diets, localized and intensive feeding on oysters or clams can occur. ○ It takes more energy for cownose rays to feed on clustered oysters (i.e. spat-on-shell) than on single oysters. ○ Cownose ray predation is limited by bite force and gape size, so larger shellfish may be less susceptible to predation. - Researchers and industry in Virginia have been working to test various cownose ray predation deterrent devices.	- Protection of smaller shellfish could help mitigate the threat of cownose ray predation. - Cownose ray predation deterrents can be costly. Some deterrents proved to be ineffective against cownose ray predation.
Fishing Pressure	- Cownose rays generally interact with shallow water gear types (e.g. pound nets, haul seines). - Cownose rays are caught in Chesapeake Bay as commercial bycatch and are targeted for recreational fishing (bow-hunting). ○ Subsidized commercial bycatch fishery in Virginia from 2007-2015. - Potential gear interactions in offshore areas could include trawls, gill nets, and other gears.	- Unknown fishing effort and mortality. Some landings data available for commercial bycatch in Virginia. - Not possible to differentiate male and female cownose rays from the surface. - Rays that are caught recreationally are not being used.
Marketing	- VIMS Advisory Services staff affiliated with Virginia Sea Grant worked with industry to launch a comprehensive marketing effort over the past several years for cownose ray product. Efforts included exploring domestic and foreign markets as well as working with local chefs and seafood buyers. - 30-34% of cownose ray flesh is usable for human consumption. - The irregular shape makes cownose rays time-consuming and expensive to process. - Poisonous spines make them hard to handle. - To date, continued marketing efforts are not feasible due to low demand and high processing cost.	- Low demand and unsuccessful long-term marketing efforts seem to indicate that a commercial fishery is not feasible at this time. - If cownose ray did become a high value fishery with increased demand in the future, there is potential for overfishing. - A reduction fishery for cownose rays is not an effective solution for shellfish predation concerns.

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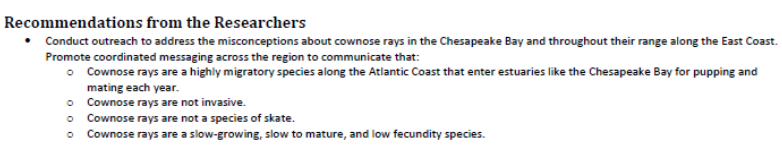
This is an initial summary of the workshop published December 2015. A full report will be posted to the workshop web page in January 2016.
http://www.chesapeakebay.net/calendar/event/23141/



Recommendations from the Researchers

- Conduct outreach to address the misconceptions about cownose rays in the Chesapeake Bay and throughout their range along the East Coast. Promote coordinated messaging across the region to communicate that:
  - Cownose rays are a highly migratory species along the Atlantic Coast that enter estuaries like the Chesapeake Bay for pupping and mating each year.
  - Cownose rays are not invasive.
  - Cownose rays are not a species of skate.
  - Cownose rays are a slow-growing, slow to mature, and low fecundity species.

Research Summary*

- Age, Growth and Reproduction
- Population Dynamics
- Diet
- Shellfish Industry Interactions
- Fishing Pressure
- Marketing
- Recommendations from the Researchers

Photo credit: Becky Gregory/Flickr

*Research Publications listed on slides 14-15

Age, Growth and Reproduction

- Slow-growing; late maturity (~7 years).
- Long gestation periods (11 months).
- Low reproductive potential (1 pup per mature female per year).
- Females gives birth once a year in June-July. Right after giving birth, mating occurs and females become pregnant again.
- Mature cownose rays and pups use the Chesapeake Bay for pupping and mating; juveniles (ages 2-4) are rarely observed in the Chesapeake Bay.

Photo credit: R. Dean Grubbs

References:
Fisher 2010; Fisher, Call & Grubbs 2013; Fisher, Call & McDowell 2014

Population Dynamics

- Mature cownose rays enter the Chesapeake Bay in May.
- Males leave the Bay in June-July after mating occurs.
- Females remain in shallow-water Bay habitats until October.
- Overwintering grounds off Florida coast.
- Chesapeake Bay cownose rays are part of a larger cownose ray population along the U.S. East Coast.
- Low rate of population growth.
- Ongoing research to track movements.

Photo credit: Dorothy Birch/Wikipedia Commons

References:
Carney et al. In Review; Fisher 2010; Fisher & McDowell 2014; Omori 2015

Diet and Shellfish Industry Interactions

- Cownose rays are opportunistic feeders.
- Chesapeake Bay diet studies:
  - dominant prey items include softshell, Macoma and razor clams.
  - oysters and hard clams not significant parts of the diet.
- Localized, intensive feeding on oysters and clams can occur.
- Predation is limited by bite force and gape size.
- Predation deterrent devices tested in Virginia.

References:
Fisher 2010
Fisher, Call, & Grubbs 2011
Fisher & Stroud 2006
Kolmann et al. 2015
Mann et al. 2014

Photo credit: Robert Fisher, Virginia Institute of Marine Science

Fishing Effort

- Interact with shallow water gear types (pound nets, haul seines).
- Caught in the Chesapeake Bay as commercial bycatch and targeted in recreational bow-hunting tournaments.
- Unknown fishing mortality (recreational; commercial bycatch/discards).
- Explored the potential for a cownose ray fishery in Virginia.
  - Landings data for Virginia's subsidized commercial bycatch.

References:
Fisher 2009; Fisher 2010;
Data: Virginia Marine Resources Commission

Photo credit: Robert Fisher, Virginia Institute of Marine Science

Marketing

- Cownose ray product development and market promotion to support exploration of a commercial product.
- Products investigated included meat for consumption (wings, fillets, loins), skin (leather), liver oil and bait.
- Public tastings, chef demonstrations, education, domestic and foreign markets.
- Labor-intensive processing, unfamiliar consumers, low demand, high waste volume.

Reference:
Fisher 2012

Photos courtesy of Robert Fisher, Virginia Institute of Marine Science

Research Implications

- Cownose rays are easily susceptible to overfishing due to their slow growth, late maturity, low fecundity, and low rates of population increase.
  - Interactions with pregnant females in the Chesapeake Bay.
- Intensive cownose ray predation can be a localized threat to commercial shellfish species, aquaculture operations and shellfish restoration. Need to work with the industry to address these interactions.
- Unknown population size and fishing mortality.
- Marketing efforts seem to indicate that a commercial fishery is not feasible at this time.

Recommendations from the Researchers

- Outreach to address misconceptions about cownose rays. Communicate:
  - Highly migratory species along the Atlantic Coast
  - Not invasive.
  - Not a species of skate.
  - Slow-growing, slow to mature, and low fecundity species.
- Explore development of citizen science efforts working with fisheries.
- Quantify all sources of fishing mortality (commercial bycatch and discards, recreational effort and discards).
- Work with the shellfish industry to develop predation deterrents and mitigating devices.
- Prioritize and support continued cownose ray research (population size, life history questions).
- Discuss cownose ray research and management at relevant fishery management forums and agencies on the U.S. East Coast.

QUESTIONS?

Photo credit: Becky Gregory/Flickr

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Workshop Web Page: Presentations, Summary, Report (Jan 2016)

http://www.chesapeakebay.net/calendar/event/23141/

Research Publications

Bade, L.M., C.N. Balakrishnan, E.M. Pilgrim, S.B. McRae and J.L. Luczkovich. 2014. A genetic technique to identify the diet of cownose rays, *Rhinoptera bonasus*: analysis of shellfish prey items from North Carolina and Virginia. Environmental Biology of Fishes 97(9): 999-1012. DOI: 10.1007/s10641-014-0290-3

Blaylock, R. A. 1989. A massive school of cownose rays, Rhinoptera bonasus (Rhinopteridae), in lower Chesapeake Bay. Copeia 1989:744–748. DOI: 10.2307/1445506

Blaylock, R.A. 1993. Distribution and abundance of the cownose ray, Rhinoptera bonasus, in lower Chesapeake Bay. Estuaries 16(2): 255-263. DOI: 10.2307/2F1352498

Carney, S.I., D.M. McVeigh, J.B. Moss, M.D. Ferrier, and J.F. Morrissey. In review. Preliminary investigation of mitochondrial genetic variation in the cownose ray Rhinoptera bonasus from the Chesapeake Bay and Gulf of Mexico. Submitted to the Journal of Fish Biology.

Fisher, R. (ed). 2009. Regional Workshop on Cownose Ray Issues Identifying Research and Extension Needs, Yorktown, VA, June 1-2, 2006. Virginia Sea Grant-09-06. VIMS Marine Resource Report 2009-06. Link

Fisher, R.A. 2010. Revised 2012. Life history, trophic ecology, & prey handling by cownose ray, Rhinoptera bonasus, from Chesapeake Bay. Final Report to NOAA Chesapeake Bay Office for (NA07NMF4570324) Grant No. 713031. Link

Fisher, R.A. 2012. Product Development for Cownose Ray. Final Report Submitted to the Virginia Marine Resources Commission. VIMS Marine Resource Report No. 2012-5. VSG-12-08. Link

Fisher, R.A., G.C. Call and R.D. Grubbs. 2011. Cownose Ray (*Rhinoptera bonasus*) Predation Relative to Bivalve Ontogeny. Journal of Shellfish Research 30(1): 187-196. DOI: http://dx.DOI.org/10.2983/035.030.0126

Fisher, R.A., G.C. Call and R.D. Grubbs. 2013. Age, Growth, and Reproductive Biology of Cownose Rays in Chesapeake Bay. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 5: 224-235. DOI: 10.1080/19425120.2013.812587

Research Publications (cont'd)

Fisher, R.A., G.C. Call and J.R. McDowell. 2014. Reproductive variations in cownose rays (*Rhinoptera bonasus*) from Chesapeake Bay. Environmental Biology of Fishes 97(9): 1031-1038. DOI: 10.1007/s10641-014-0297-9

Fisher, R.A and J.R. McDowell. 2014. Discrimination of Cownose Ray, Rhinoptera bonasus, Stocks Based on Microsatellite DNA Markers. Final Report to NOAA Chesapeake Bay Office for (NA11NMF4570215) Link

Fisher, R.A. and E.M. Stroud. 2006. An Evaluation of the Behavioral Responses of Rhinoptera bonasus to Permanent Magnets and Electropositive Alloys. VIMS Marine Resource Report No. 2006-12 VSG-06-14. Link

Grusha, D. S. 2005. Investigation into the life history of the Cownose Ray, *Rhinoptera bonasus*, (Mitchill 1815). Master's thesis. Virginia Institute of Marine Science, College of William and Mary, Gloucester Point. Link

Kolmann, M.A., D.R. Huber, P.J. Motta and R.D. Grubbs. 2015. Feeding biomechanics of the cownose ray, Rhinoptera bonasus, over ontogeny. Journal of Anatomy 227(3): 341-351. DOI: 10.1111/joa.12342

Mann, R, R.A. Fisher, M. Southworth, J. Wesson, A.J. Erskine and T. Leggett. 2014. Oyster planting protocols to deter losses to cownose ray predation. Final Report to NOAA Chesapeake Bay Office for (NA11NMF4570227). Link

Myers, R.A., J.K. Baum, T.D. Shepherd, S.P. Powers and C.H. Peterson. 2007. Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean. Science 315(5820): 1846-1850. DOI: 10.1126/science.1138657

Omori, K.L. 2015. Developing Methodologies for Studying Elasmobranchs and Other Data-Poor Species. Master's thesis. Virginia Institute of Marine Science, College of William and Mary, Gloucester Point. Link

Orth, R. J. 1975. Destruction of eelgrass, *Zostera marina*, by the cownose ray, *Rhinoptera bonasus*, in the Chesapeake Bay. Chesapeake Science, 16(3), 205-208. DOI: 10.2307/1350896