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## Research Summaries

### **Title**

Life History Studies of California Chondrichthyans: Essential Biological Information for Management of Bycatch and Emergine Fisheries

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# Life History Studies of California Chondrichthyans: Essential Biological Information for Management of Bycatch and Emerging Fisheries

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*Bathyraja kincaidii*



*Bathyraja abyssicola*



*Bathyraja aleutica*



*Bathyraja microtrachys*

## SUMMARY

Like sharks, skates are vulnerable to overexploitation because they reproduce relatively late in life and have relatively low reproductive output.

Beyond this, not much is known about the basic biology of many native skate species. The goal of this project was to fill the gap by collecting skate age, growth, diet and reproductive data.

As of this writing, this project has led to nine research articles and two master's theses. Because it is impossible to summarize such a wealth of information in a one-page document, the interested reader is encouraged to obtain the full journal articles listed on the back page.

## METHOD

Skate specimens were obtained from NOAA Fisheries groundfish trawl surveys off California. Age and growth estimates were determined via banding patterns in skate vertebrae. Caudal thorns were also examined. When present, egg cases were removed and preserved, and a variety of reproduction-related statistics, from weighing gonads and livers to counting ovarian eggs, were collected. Analyses of stomach contents formed the basis of feeding ecology studies.

## AGE AND GROWTH

Age and growth statistics were calculated for sandpaper (*Bathyraja kincaidii*), roughtail (*B. trachura*), California (*Raja inornata*) and longnose (*R. rhina*) skates.

The estimated age at 50 percent maturity (the age at which 50 percent of the population is full-grown) was 6.8 years for female sandpaper skates and 7.3 years for males; 9 years for

female roughtail skates, 10 years for males; 8 years for female California skates, 7 years for males, and 16 years for female longnose skates, 14 for males. Studies on the starry skate (*R. stellulata*) and white-spot chimaera (*Hydrolagus colliciei*) are ongoing.

## REPRODUCTION

The lead researcher, staff and graduate students at the Pacific Shark Research Center at Moss Landing Marine Laboratories studied the reproductive biology of roughtail, sandpaper, California, longnose and big (*R. binoculata*) skates, as well as the brown, longnose and filetail catsharks (*Apristurus brunneus*, *A. kampae* and *Parmaturus xaniurus*, respectively.)

Key measurements include total length at first, 50 percent and 100 percent maturity for males and females of all three catshark species. Among the patterns to emerge: At higher latitudes, brown and filetail catsharks reach sexual maturity at larger sizes; brown and filetail catsharks reproduce year-round. Gravid longnose catshark females were found from July through December. The egg case of the longnose catshark has been described and its morphology compared to the egg cases of the brown, filetail and other *Apristurus* species.

## DIET AND FEEDING ECOLOGY

The main prey items for the following four species are as follows:

- Sandpaper skates feed primarily on shrimps, euphausiids and mysids, followed by polychaetes, teleosts (*Sebastes* spp.) and cephalopods, based on stomach content analyses of 493 specimens.
- Longnose skates: teleosts, crangonid shrimps and euphausiids, based on 618 specimens.
- Big skates: demersal teleosts, crustaceans and cephalopods, based on 205 specimens.
- California skate: benthic shrimp, crabs and demersal teleosts, based on 287 specimens.



Egg cases of California skates. It is possible to speciate skates via their egg cases.

## TOOLS

This project has led to the development of a key for identifying skates based on their egg cases.

A life history data matrix for 106 chondrichthyan species from the tip of Baja California to the eastern Bering Sea has been made available to the public through the Pacific Shark Research Center at <http://psrc.mlml.calstate.edu>.

## APPLICATIONS

About 268,212 pounds of “unspecified” skate were landed in California in 2006, according to the California Department of Fish and Game. Almost 10 times this amount was landed in 1989. The lead biologist of this project estimates that for every ton of skate landed another ton is discarded as bycatch. Species-specific information, such as that gathered in this project, is essential for ensuring that fishing and other human activities do not imperil the continued health of these marine animals.

## STUDENTS

Christopher Rinewalt, Master’s Thesis  
Lewis Barnett, Master’s Thesis

## COLLABORATORS

NOAA Fisheries Northwest Fisheries Science Center  
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## PUBLICATIONS

Ebert, D.A. & Bizzarro, J.J. 2007. Standardized diet composition and trophic levels in skates. *Env. Bio. Fishes*, 80: 221–237.

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