

Fish Reproductive Biology



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

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Fish Facts

- 32,500 estimated species of fish in the world
- More than 15,000 freshwater fish species
- Freshwater may constitute less than 0.3% of available global water



Wormmouth



Pumpkinseed



Spotted Sunfish



Shiner



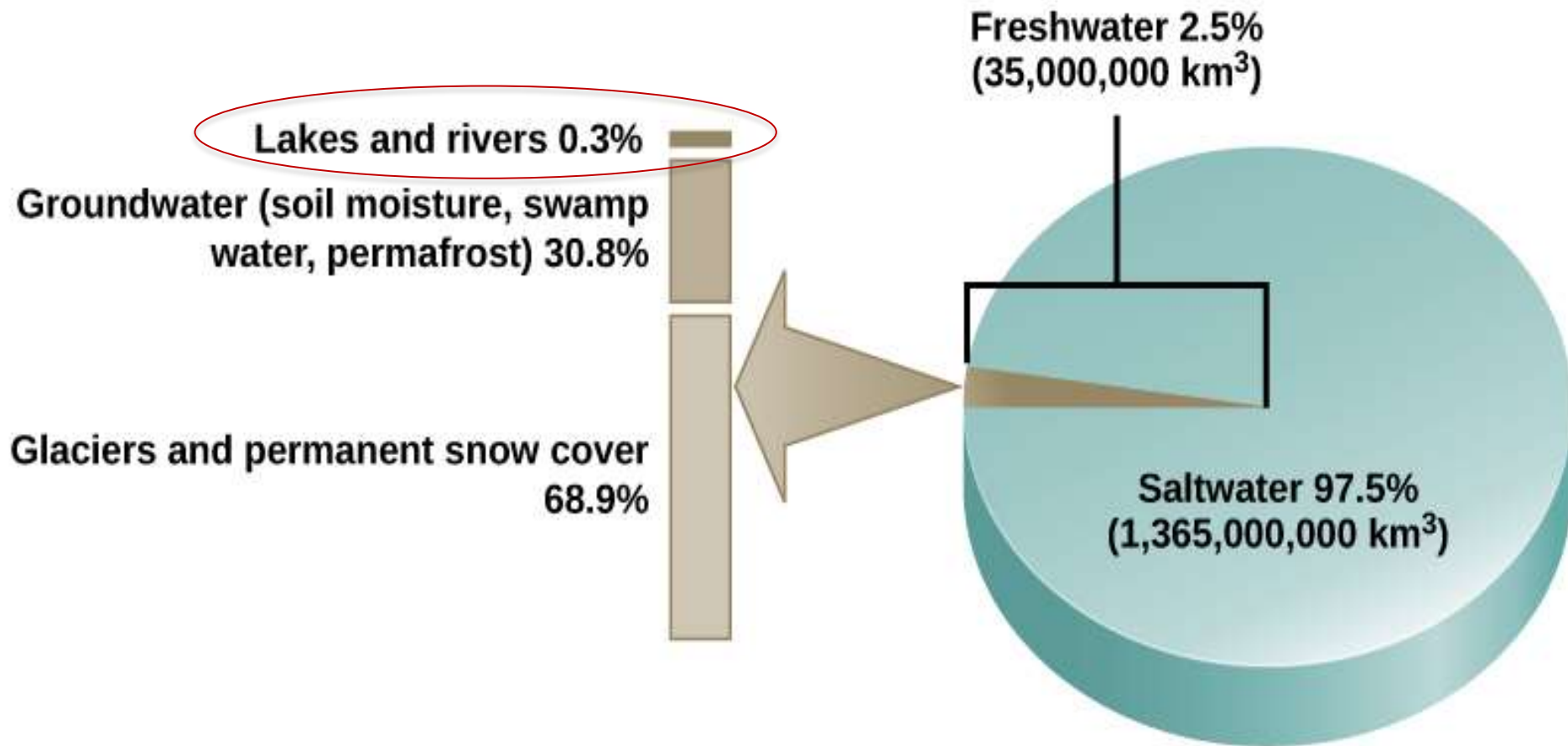
Rock Bass



Black Crappie



White Crappie



Types of Reproduction

- **SEXUAL REPRODUCTION**

- Combination of genetic material contributed by two different gametes, usually i.e. two different individuals, male and female

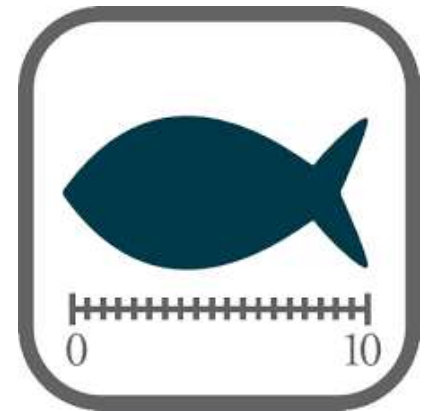
- **ASEXUAL (PARTHENOGENESIS)**

- New individuals are produced from a single parent without the formation of gametes or need of a partner (*Amazon Molly*)

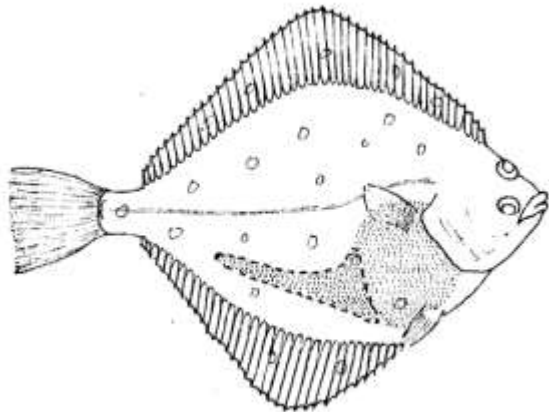
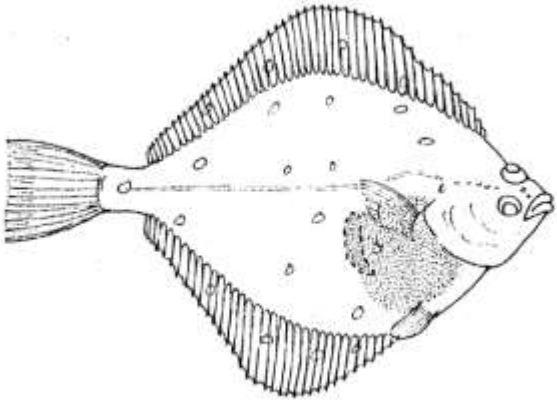


Sexual Maturity

- Fishes can become sexually mature at various ages, depending on species
- Several factors influence sexual maturity
 - Nutritional state of the fish
 - Physiological factors (hormones)
 - Ecological factors



Sexual Maturity



- Most bony fishes become sexually mature between one and five years
 - Sturgeon may take up to 15 years
- Most bony fishes are in excess of 8 cm (3 in.) before reproducing
- Age and associated size are major factors
 - Species of small size begin reproduction sooner than species of large size

Sexual Dimorphism

- In most species of fish the females are larger than the males (sexual dimorphism)
 - Not normally more than a difference of about 10% to 15% percent by length
 - Difference in color, size, or characteristics



Sexual Differentiation

- Males are generally smaller than females and slower growing – Sexual dimorphism
- In late Winter/Spring, females abdomen swollen; ovopore swollen and extended



Modes of Sexual Reproduction

- There are three primary ways that fish reproduce
- **Ovoparity**- Lay undeveloped eggs, external fertilization (90% of bony fish)
- **Ovoviviparity**- Internal development- without direct maternal nourishment from female- Rely on yolk for nourishment
- **Viviparity**- Internal development- direct nourishment from mother-Fully advanced at birth (some sharks, surf perches)

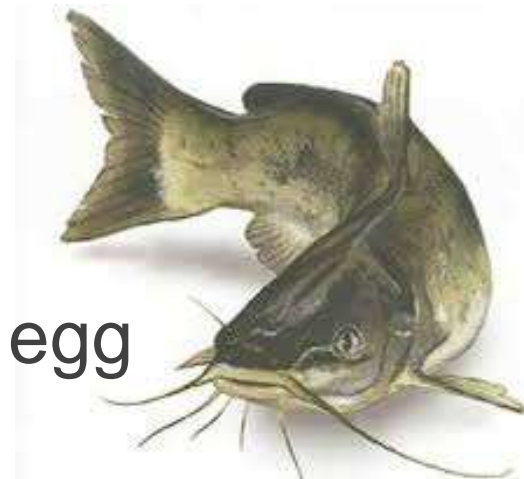
Courtship

- **Courtship** is a complex set of behaviors in animals that leads to mating
- Normally short and usually involves the male swimming around the female showing off until she releases eggs
 - Quickly moving fins
 - Rubbing against female
 - Some cases, male becomes aggressive

Types of Spawning

- **Broadcast**- pairs or in groups
 - Males and females release milt and eggs into the water at the same time
 - Mix together, fertilizing the eggs
 - Fertilized eggs are broadcast into the plankton column and float away in the current or sink to the bottom
 - No parental care is given, so large amounts of eggs are produced

- **Depositor**- lay eggs on a flat surface, like a stone or plant leaf or may even place them individually among fine leaved plants
 - Parents usually form pairs and guard the eggs and fry (young fish) from all danger
 - Cichlids such as Koi are the best known species for this
 - Catfish and Rainbow fish are also egg depositors



- **Nest Builder**- Many fish species build nests
 - Might be a simple pit dug into gravel (trout do this) or an elaborate bubble nest
 - When they are ready to spawn, the fish may construct a nest by blowing bubbles, and they often use vegetation to anchor the nest
 - The male will keep the nest intact and keep a close eye on the eggs



- **Mouth Breeders**- eggs are fertilized externally, but raised internally
 - Females lay eggs on a flat surface where they are fertilized by the male
 - Female picks up the eggs and incubates them in her mouth
 - Broods tend to be small and suffer minimal losses



- **Egg Buriers**- Annual Killifish

- As the pools they live in dry out, the fish spawn, pressing their eggs into the mud
- Pools eventually dry out completely, killing the adults, but the eggs remain safe in the dried mud
- When it rains and the pool refills the eggs hatch and the cycle is repeated



Protection of Young

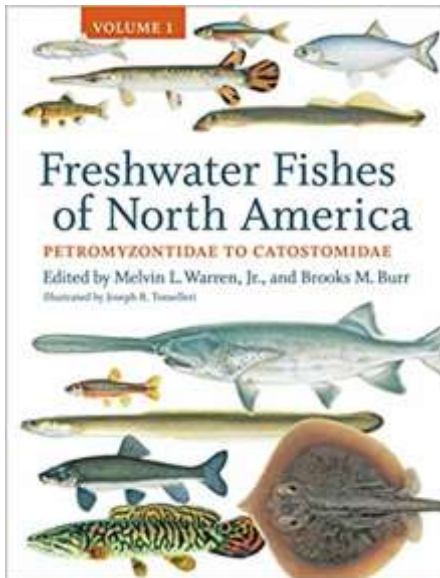
- Fish have evolved a diverse selection of strategies to protect their eggs after fertilization
- These strategies include a variety of methods of external incubation as well as different ways of hiding or protecting the eggs from casual predators
- External brooding used by a few species is gill brooding. As the name suggests, the eggs are brooded in the gill cavity of the adult

Yellow Perch

- Spawn once a year: Mid-Late March in So. Ohio
- Males smaller than female
- Eggs produced in ribbon structure –requires little parental care
- Fry (juveniles) need small live organisms for first few weeks' feeding – 6 week culture period in open ponds



Do Your Research



▼ BASS



LARGEMOUTH
(*Micropterus salmoides*)
World Record 22 lbs. 4 oz. State Record ____ lbs. ____ oz.
Montgomery Lake, Georgia, June 2, 1932



SMALLMOUTH
(*Micropterus dolomieu*)
World Record 10 lbs. 14 oz. State Record ____ lbs. ____ oz.
Dale Hollow, Tennessee, April 24, 1969



SPOTTED
(*Micropterus punctulatus*)
World Record 10 lbs. 4 oz. State Record ____ lbs. ____ oz.
Pine Flat Lake, California, April 21, 2001



STRIPED
(Landlocked)
(*Morone saxatilis*)
World Record 67 lbs. 8 oz. State Record ____ lbs. ____ oz.
Los Banos, California, May 7, 1992



STRIPED BASS HYBRID
(*Morone saxatilis* x *Morone chrysops*)
World Record 27 lbs. 5 oz. State Record ____ lbs. ____ oz.
Greens Ferry, Arkansas, April 24, 1997



WHITE
(*Morone chrysops*)
World Record 6 lbs. 13 oz. State Record ____ lbs. ____ oz.

▼ CRAPPIE



BLACK
(*Pomoxis nigromaculatus*)
World Record 4 lbs. 8 oz. (Tie) State Record ____ lbs. ____ oz.
Otoe County, Nebraska, June 15, 2003
Kerr Lake, Virginia, March 1, 1981



WHITE
(*Pomoxis annularis*)
World Record 5 lbs. 3 oz. State Record ____ lbs. ____ oz.
Enid Dam, Mississippi, July 31, 1957

▼ CATFISH



BLUE
(*Ictalurus furcatus*)
World Record 121 lbs. 8 oz. State Record ____ lbs. ____ oz.
Lake Texoma, Texas, January 16, 2004



CHANNEL
(*Ictalurus punctatus*)
World Record 58 lbs. 0 oz. State Record ____ lbs. ____ oz.
Santee-Cooper, South Carolina, July 7, 1964



FLATHEAD (*Pylodictis olivaris*)
World Record 123 lbs. 0 oz. State Record ____ lbs. ____ oz.
Independence, Kansas, May 4, 1938

▼ PIKE



MUSKELLUNGE (*Esox masquinongy*)
World Record 67 lbs. 8 oz. State Record ____ lbs. ____ oz.
Hayward, Wisconsin, July 24, 1949



NORTHERN (*Esox lucius*)
World Record 55 lbs. 1 oz. State Record ____ lbs. ____ oz.
Lake Grefern, West Germany, October 16, 1986

▼ SALMON



CHINOOK
(*Oncorhynchus tshawytscha*)
World Record 97 lbs. 4 oz. State Record ____ lbs. ____ oz.
Kenai, Alaska, May 17, 1985



COHO
(*Oncorhynchus kisutch*)
World Record 33 lbs. 4 oz. State Record ____ lbs. ____ oz.
Pulaski, New York, September 27, 1989

▼ TROUT



BROWN
(*Salmo trutta*)
World Record 40 lbs. 4 oz. State Record ____ lbs. ____ oz.
Heber Springs, Arkansas
May 2, 1992



LAKE
(*Salvelinus namaycush*)
World Record 72 lbs. 0 oz. State Record ____ lbs. ____ oz.
North West Territories, Canada, August 19, 1995



RAINBOW
(*Oncorhynchus mykiss*)
World Record 42 lbs. 2 oz. State Record ____ lbs. ____ oz.
Bell Island, Alaska, June 22, 1970

▼ WALLEYE



World Record 25 lbs. 0 oz. State Record ____ lbs. ____ oz.
Old Hickory Lake, Tennessee, August 2, 1960

For more information about world records, visit www.igfa.org.
IGFA World Records as of August 1, 2005.
Photography by Tim Knepp.



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