Species Richness

- Significant E→W Gradient

- Greater water availability means:
  - Greater Resource Availability
  - Less Competition
  - Physicochemical Stability

Maxwell (2013)
Endemic Species

- Endemic Species – restricted to a particular locality or region
- Opposite of species richness map
- Greater water availability means greater connectivity resulting in fewer endemics

Maxwell (2013)
Identifying Made Easier
Know your basin & what to expect

Thomas et al 2007

http://txstate.fishesoftexas.org/

Hubbs et al 2008

THE TEXAS ACADEMY
OF SCIENCE

AN ANNOTATED CHECKLIST
OF THE FRESHWATER FISHES
OF TEXAS, WITH KEYS TO
IDENTIFICATION OF SPECIES

CLARK HUBBS
ROBERT J. EDWARDS
GARY P. GARRETT

Cite as:
http://www.texasacademyofscience.org/
How to identify a fish:

• Chromatophores vs melanophores
• Mouth position
• Fin type, placement, counts
• Scale counts and type
• Measurements
• Concrete morphological characters (tooth patches, barbels, pharyngeal teeth, intestines)
Fish Basics

- Occiput
- Nape
- Dorsal fin
- Caudal peduncle
- Shoulder
- Operculum
- Pectoral fin
- Pelvic fin
- Anal fin
- Lateral line
- Caudal fin
Fish Basics

Terminal mouth position

Subterminal mouth position

Inferior mouth position
## Fish Basics

<table>
<thead>
<tr>
<th>Forked</th>
<th>Emarginated</th>
<th>Square</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Forked Fish Tail" /></td>
<td><img src="image2.jpg" alt="Emarginated Fish Tail" /></td>
<td><img src="image3.jpg" alt="Square Fish Tail" /></td>
<td><img src="image4.jpg" alt="Round Fish Tail" /></td>
</tr>
</tbody>
</table>
Lepisosteidae

- Long, cylindrical body
- Ganoid scales
- Dorsal and anal fin opposite and set very far back on body
Clupeidae

Gizzard Shad
- Shoulder spot is larger than eye
- Subterminal mouth (fingernail test), below eye level

Threadfin Shad
- Shoulder spot is smaller than pupil
- Terminal mouth (fingernail test), even with eye level
Mexican Tetra
Characidae

- Black stripe extending from caudal peduncle into caudal fin
- Adipose fin
- Laterally compressed slab
- Very small mouth

Adipose fin
Ictaluridae

Madtom Catfish - *Noturus*

Bullhead Catfish - *Ameiurus*

True Catfish - *Ictalurus*

Flathead Catfish - *Plyodictis*
Ictaluridae

No

Adipose fin and caudal fin connected?

Yes

Madtoms

Flat head?

Not flat head?

Caudal fin shape?

Square/emarginated

Forked

Ictalurids

Bullheads
Madtom Catfish

Tadpole Madtom
- Terminal mouth

Freckled Madtom
- Subterminal mouth
Flathead Catfish

- Adipose fin and caudal fin are clearly separated
- Compressed head
- Square caudal fin
Bullhead Catfish

Black Bullhead
• Brown/black chin barbels

Yellow Bullhead
• White/yellow chin barbels
Ictalurids

- Channel Catfish
  - Black spots on young
  - Rounded anal fin
- Blue Catfish
  - Straight or angled anal fin
  - Humped back
Are the adipose fin and caudal fin clearly separated?

- NO

  What is the mouth position:
  - Subterminal
  - Terminal

  Freckled Madtom Noturus nocturnus

- YES

  Is the head compressed?
  - NO
    - What is the shape of the caudal fin?
      - Square / Emarginated
      - Forked
  
  - YES
    - Flathead Catfish Plyodictis olivaris

  What shape is the anal fin?
  - Straight / Angled
  - Rounded

  Channel Catfish Ictalurus punctatus

  Blue Catfish Ictalurus furcatus

What color are the chin barbels?
- Black / brown
- Yellow / white

Tadpole Madtom Noturus gyrinus

Black Bullhead Ameiurus melas

Yellow Bullhead Ameiurus natalis

Black Bullhead Ameiurus melas

Freckled Madtom Noturus nocturnus

Channel Catfish Ictalurus punctatus

Blue Catfish Ictalurus furcatus

INSPIRING ACTIONS FOR HEALTHY CREEKS & RIVERS
Loricariidae

Suckermouth Catfish
*Hypostomus plecostomus*
- Typically spotted
- Fewer than 9 dorsal fin rays

Sailfin Catfish
*Pterygoplichthys* spp.
- Vermiculations
- More than 10 dorsal fin rays
Fundulidae

- Dorsally flattened
- Caudal fin rounded

Rainwater Killifish
Coastal & Rio Grande

Western Starhead Topminnow
Brazos north to Red

Golden Topminnow
Lavaca northeast to Sabine

Blackstripe Topminnow
San Antonio northeast to Red

Blackspotted Topminnow
San Jacinto northeast to Red

Plains Killifish
Pecos to the Red

Gulf Killifish
Brazos, Rio Grande, Pecos
Atherinopsidae

**Inland Silverside**
Statewide distribution
Prominent crosshatching dorsally

**Brook Silverside**
East TX distribution
Much smaller scales
Longer snout

**Rough Silverside**
Coastal distribution
4 rows of spots dorsally
Ctenoid scales
Poeciliidae

Gambusia
• Dorsal fin set behind anal fin
• Distinct gonopodium on males

Mollies
• Dorsal fin origin anterior to anal fin
• Amazon Molly
  • Crosshatching more distinct
  • Dorsal fin behind pelvic fins
• Sailfin Molly
  • Lines of spots more distinct
  • Dorsal fin even or in front of pelvic fins
Centrarchidae
Centrarchidae

- How many anal fin spines?
  - 3
    - Bass-like (elongate)
      - Largemouth, Spotted or Guadalupe Bass
    - Not bass-like (round)
      - Toothpatch?
        - Yes
          - Warmouth
        - No
          - Other Lepomis
  - Not 3
>3 anal fin rays

White Crappie
• “Balding”
• Pigment forms vertical bars
• 6 dorsal fin spines
• 6 anal fin spines
• Nearly Statewide

Black Crappie
• Dorsal origin further forward
• Pigment forms blotching
• 7-8 dorsal fin spines
• 6 anal fin spines
• Central TX and eastward

Flier
• Symmetrical appearance
• 11-13 dorsal fin spines
• 7-8 anal fin spines
• East Texas

Rock Bass
• 11-13 dorsal fin spines
• 6 anal fin spines
• San Marcos and Comal Rivers
Largemouth Bass
• 1<sup>st</sup> & 2<sup>nd</sup> dorsal fin narrowly joined
• “Deep V”
• No toothpatch.

Spotted Bass
• 1<sup>st</sup> & 2<sup>nd</sup> dorsal fin more broadly joined.
• “Shallow V”
• Toothpatch
• Rows of spots underneath main lateral band.
Spotted Bass:
Dark band running down side is generally shallower with less gaps.

Guadalupe Bass:
Dark band running down side is generally taller with larger gaps.
Warmouth

- Eye reddish
- "War Paint"
- Large Mouth
- Tooth patch
Long or Short Pectoral Fin?

- Long
  - Stiff or Flexible Ear?
    - Stiff
      - Black spot on the back of the dorsal fin?
    - Flexible

- Short
  - Stiff
  - Stiff or Flexible Ear?
    - Stiff
      - Black spot on the back of the dorsal fin?
    - Flexible
      - White around the margin of the ear?
Bluegill Sunfish

- Long pectoral fin
- Short, flexible ear
- Black spot on posterior end of dorsal fin
- Vertical bars on side
Orangespotted Sunfish

- Long pectoral fin
- No dark spot on dorsal fin
- Can be brightly pigmented
- Flexible ear
Redear Sunfish

• Long pectoral fin
• No black spot on dorsal fin
• Stiff ear
• Small red dot on ear
Green Sunfish

- Short, round pectoral fin
- Stiff ear
- Huge mouth
- Black spot on posterior end of dorsal fin
Redspotted Sunfish

- Short pectoral fin
- Stiff ear
- No black spot on dorsal
- Smaller mouth
- Spots form rows on side of body
Longear Sunfish

- Short pectoral fin
- Flexible ear
- White all the way around the margin of the ear
- Can be extremely vibrant colors
Redbreast Sunfish

• Short pectoral fin
• Extremely long, flexible ear
Long or Short Pectoral Fin?

Stiff or Flexible Ear?

Black spot on the back of the dorsal fin?

Stiff or Flexible Ear?

White all the way around the margin of the ear?

Redear Sunfish
*Lepomis microlophus*

Orangespotted Sunfish
*Lepomis humilis*

Stiff

Flexible

No

Yes

Redbreast Sunfish
*Lepomis auritus*

Redspotted Sunfish
*Lepomis miniatus*

Green Sunfish
*Lepomis cyanellus*

Bluegill Sunfish
*Lepomis macrochirus*

Longear Sunfish
*Lepomis megalotis*
Moronidae

Yellow Bass:
Dorsal fins joined
2nd and 3rd anal spine about equal
9-10 soft anal rays

White Bass:
Dorsal fins separated
2nd and 3rd anal spine different length
11-13 soft anal rays
Single tooth patch

Striped Bass:
Dorsal fins broadly separated
Elongated body (BD >3x SL)
Two tooth patches
Percidae
Ammocrypta

**Scaly Sand Darter**
- Body depth >7x in body length
- East Texas

**Western Sand Darter**
Percina
The Logperch

Texas Logperch
• Medially constricted, vertical bars of alternating length
• 9-10 full length bars
• Primarily Edwards Plateau

Logperch
• Extremely long snout
• Northeast portions of the Red River only

Bigscale Logperch
• Vertical bars are more narrow and around the same length
• 15-20 full length bars
The Darters

River Darter
- Bigger body (*Percina*)
- Faint dusky blotches
- Two dark spots on the first dorsal fin (posterior spot much more prominent)

Greenthroat Darter
- Smaller body (*Etheostoma*)
- Barring more prominent on anterior half of body than Orangethroat
- Green/blue throat in breeding males
- More spring associated

Orangethroat Darter
- Smaller body (*Etheostoma*)
- Only dashes prominent on anterior half of body
- Orange/red throat in breeding males

Thomast, Driscoll, and Whaley 2007
Long and skinny (BD >7x SL), pale in color?

- Yes: Sand Darters
  - Blotches along body
    - Scaly Sand Darter
  - Dashes along body
    - Western Sand Darter

- No: Large, deep body, conical snout?
  - Yes: Logperch
    - Vertical Bars of equal length?
      - Yes: Bigscale Logperch
      - No: Logperch
  - No: Darter
    - Large black blotches on side of body?
      - Yes: Percina
      - No: Etheostoma
        - Barring present on the anterior half of the body?
          - Yes: Texas Logperch
          - No: Logperch
          - Greenthroat Darter
        - Guadalupe
          - Heart-shaped blotches?
            - Yes: Guadalupe Darter
            - No: Guadalupe

Colorado, eastward

Dusky Darter

River Darter
Rio Grande Cichlid

- 5-6 anal spines
- Typically more brightly colored with iridescent spotting
  - Large dark spot on side of body
- Vertical barring more prominent on posterior half of body
Catostomidae
Long Dorsal Fins

River Carpsucker
- Blunter nose
- Triangular subopercle
- Statewide

Smallmouth Buffalo
- Deeper body
- Rounded subopercle
- Statewide except panhandle

Not mentioned: Blue Sucker, Bigmouth Buffalo, Black Buffalo
Catostomidae
Short Dorsal Fins

Spotted Sucker
- Long slender body
- Rows of spots down side of body
- Brazos, northeastward and Llano River

Gray Redhorse
- Long slender body
- Rounded subopercle
- Rio Grande, Nueces, Pecos / Brazos, Colorado, Guadalupe, San Antonio

Not mentioned: Creek Chubsucker Lake Chubsucker, Golden Redhorse, Blacktail Redhorse
Cyprinidae
Campostoma

- Intestine wound around the swim bladder
- Chisel-like bottom jaw
- Deciduous scale replacement causes speckling

Central Stoneroller
- Larger scales
- Swim bladder fully wrapped
- Central Texas, Devils, Pecos

Mexican Stoneroller
- Smaller scales
- Swim bladder partially wrapped
- Rio Grande
Cyprinella

Terminal mouth:
Blacktail Shiner
Rio Grande northeast to Red

Subterminal mouth:
Proserpine Shiner
Rio Grande, Pecos, Devils

Red Shiner
Statewide except Nueces

- Shoulder patch
- Decurved lateral line
- Diamond shaped mid-lateral scales

Plateau Shiner
Nueces

- Deeper bodied, thick
- Pigmentation in-between fin rays
Dionda

- Flat coiled intestine
- Midlateral stripe extends through eye and around nose
- Very localized:
  - Manatial Roundnose – Devils, Pecos
  - Devils River - Devils
  - Roundnose – Pecos
  - Guad Roundnose – Colorado, Guad
  - Nueces RN – Nueces
- Can have dark peritoneum
Macrhybopsis

- Ventrally flatted body
- Maxillary barbels
- Very localized, only overlap between Silver & Shoal; Shoal is speckled.
Pimephales

Bullhead Minnow
- Caudal spot

Fathead Minnow
- No caudal spot

- Crowded pre-dorsal scales
- Pigment on anterior of dorsal fin
Notropis

• Catchall group for the rest of the minnows in Texas

• If your minnow does not apply to any of the other rules it likely falls into the Notropis group
Mimic Shiner

- Subterminal mouth
- Elevated lateral line scales (2x depth along lateral line than rest of body)
- Much more pigment surrounding scales (vs. N. buchanani)
- Double dashes along lateral line
- Posterior dorsal bar much longer than the gap
- Pelvic fins do not reach anal fin
Ghost Shiner

- Subterminal mouth
- Elevated lateral line scales (2x depth along lateral line versus rest of body)
- Pigment very scarce
- Has 2 dorsal bars. Posterior dorsal bar is much longer than the gap between the two bars.
- Pelvic fins just reach anal fin.
Sand Shiner

- Subterminal mouth
- Non-elevated lateral line scales (all scales equal depth & width)
- Much more pigment surrounding scales
- Double dashes along lateral line
- Has 2 dorsal bars. Posterior dorsal bar is about the same length as gap between the two
Weed Shiner

- Terminal mouth
- A lot of pigment, pronounced mid-lateral stripe
- Pigment on lower lip
- Eye smaller than *N. amabilis* (contained ≈4x in body depth)
- Origin of dorsal fin in front of origin of pelvic fin
Texas Shiner

- Terminal mouth
- Eye extremely large (contained 2.5 – 3x in body depth)
- Origin of dorsal fin behind origin of pelvic fin