# TABLE OF CONTENTS

**OBJECTIVES (12.1)** ..... 2
**FISH CLASSIFICATION (12.1.1)** ..... 3
**ORIGINS AND ANCESTRY (12.1.2)** ..... 3
**THE EXTERNAL ANATOMY OF FISH (12.1.3)** ..... 4
**REPRODUCTION AND GROWTH (12.1.4).** ..... 12
**THE ECOLOGICAL ROLE OF FISH (12.1.5).** ..... 14
**COMMON FISH SPECIES IN THE OKAVANGO DELTA (12.1.6).** ..... 15

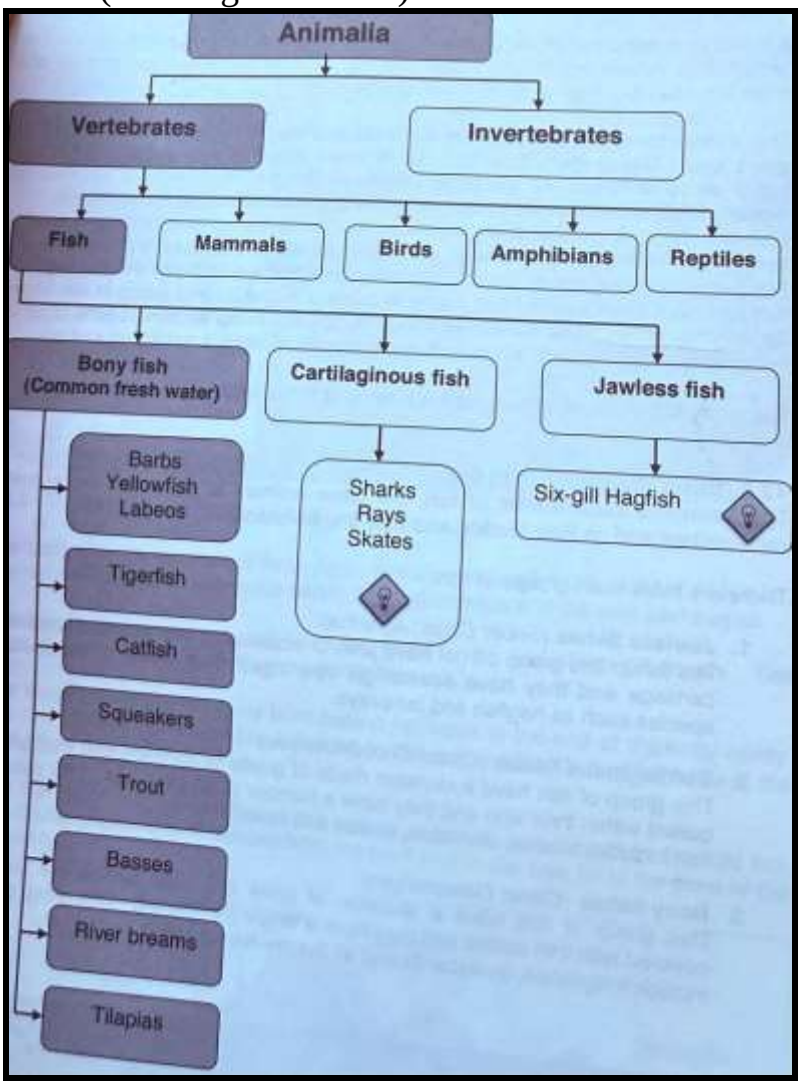
**PSG PROGRAMME (NCQF LEVEL 5)**
**MODULE 12**
**FISH – CLASS PISCES**

# OBJECTIVES (12.1)

- **On completion of this module you will:**
  - Know what a fish is.
  - Be able to label the external anatomy of a fish.
  - Understand the ecological importance of fish.
  - Be able to explain how fish reproduce and grow.
  - Know the different types of fish feeding behavior.
  - Understand how fish move through water.
  - Be able to identify common species of fish.

## FISH CLASSIFICATION (12.1.1)

(See diagram below):




## ORIGINS AND ANCESTRY (12.1.2)

- The ancient fishes are evidenced in the fossil records dating back some 530 million years ago during the Cambrian explosion, appearing as small jawless filter-feeders with primitive notochords and gills. Over time, these **ostracoderms** evolved bony armor and paired fins. The Devonian period saw the rise of jawed **placoderms** and diversified bony fish; while a later extinction event paved the way for **ray-finned fish**, the dominant group today.

- Fish are classified taxonomically based on their ancestral relationships, their feeding behavior and the way they breed. It is thought that the evolutionary development of fish began with the group known as **jawless** fish that evolved into the numerous and diverse group of fish known as the **bony fishes**. The number of living fish species make up almost 50% of all the living vertebrates on earth which include mammals, reptiles, amphibians and birds.
  **NB// ichthyology** is the branch of zoology devoted to the study of fish, including bony fish (**Osteichthyes**), cartilaginous fish (**Chondrichthyes**), and jawless fish

(**Agnatha**). This includes understanding their biology, systematics (how they relate to each other), biodiversity and taxonomy.

❖ **Basic Classification of Fish:**

- The taxonomic classification of fish, like other animals is based on the ancestral relationships and on their feeding and breeding behavior. There are three main groups of fish:
  - **Jawless Fishes** – (Super class: Agnatha) – the fish in this group do not have jaws or scales and their skeleton consists of cartilage and they have several gill openings. This group of fish includes species such as **hagfish** and **lampreys**.

  - **Cartilaginous Fishes** – (Class: Chondrichthyes) – this group of fish have a skeleton made of gristle or cartilage with their scales buried within their skin and they have a number of gill openings. This group of fish includes **sharks, chimaera, skates and rays**.

  - **Bony Fishes** – (Class: Osteichthyes) – this group of fish have a skeleton of bone and their bodies are usually covered with thin scales and they have a single gill opening. This group of fish includes **lungfishes, coelacanth** and all the **ray-finned fishes**.

❖ **What is a fish?**

- A fish is an **ectothermic** (cold-blooded) aquatic vertebrate animal that lives in water, breathes by means of gills, and possesses fins used for movement and stability, and most fish have skin that is covered with scales. Unlike the amphibians, fish are completely dependent on water (marine or fresh) for their survival, as their entire lifecycle is completed in this environment. Their heart is 2 chambered, they have no ear openings and they have no moveable eyelids.

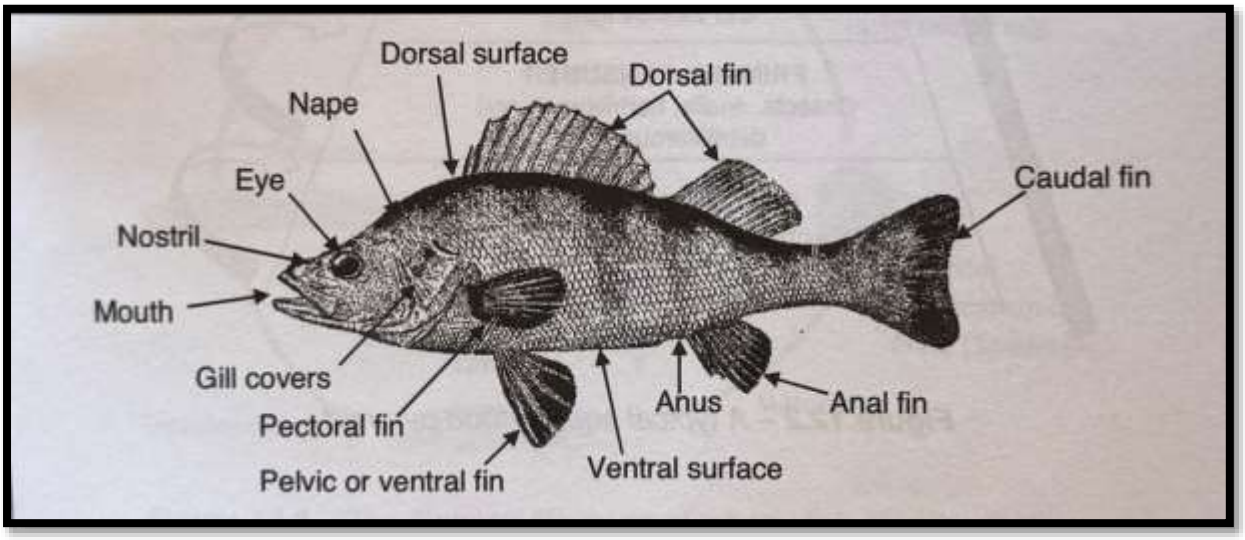
## THE EXTERNAL ANATOMY OF FISH (12.1.3)

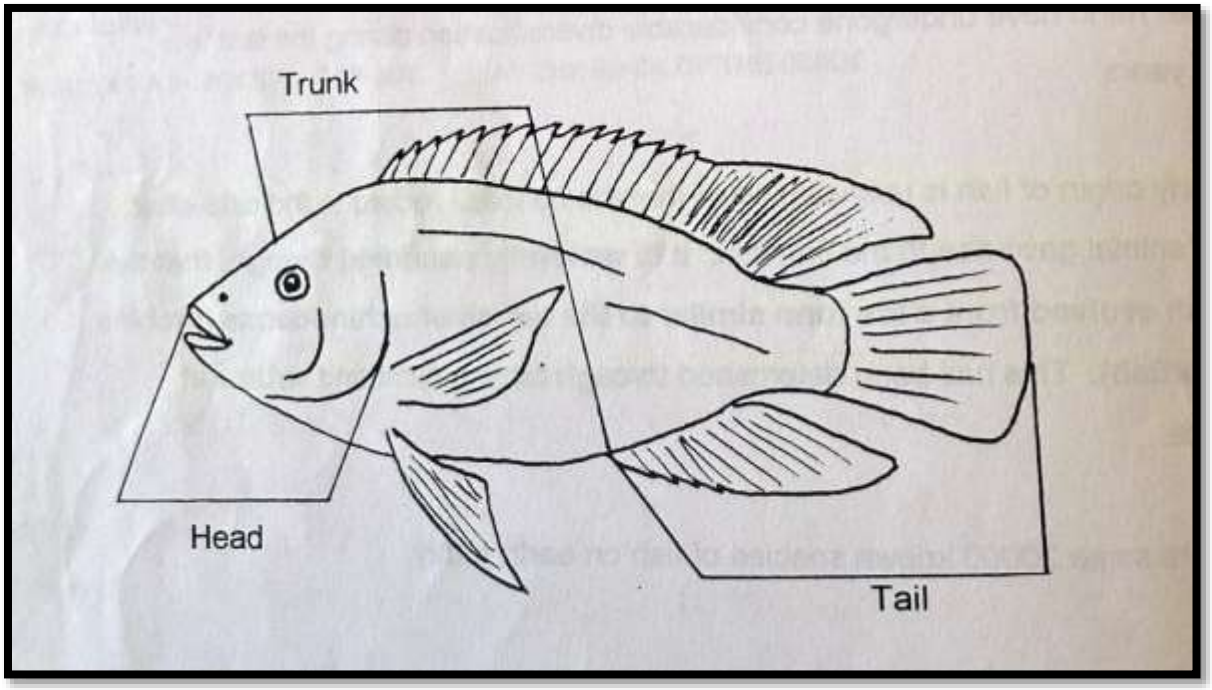
- A typical fish consists of three different body sections; **the head**, **trunk** and **tail**. These are normally not distinct from one another, but tend to blend into the same form, lending fish a streamlined appearance.

- **The head** – is measured from the tip of the snout to the end of the gill covers. The head bears the nostrils, mouth, eyes and gill covers.

- **The trunk** – consists of the body from behind the head to the end of the body cavity. The end of the body is normally indicated by the anus or the start of the base of the anal fin.

- **The tail** – region usually consists of the caudal peduncle and the tail fin (caudal fin). The caudal peduncle is measured from the back end of the anal fin to the base of the caudal fin. (See pictures below):



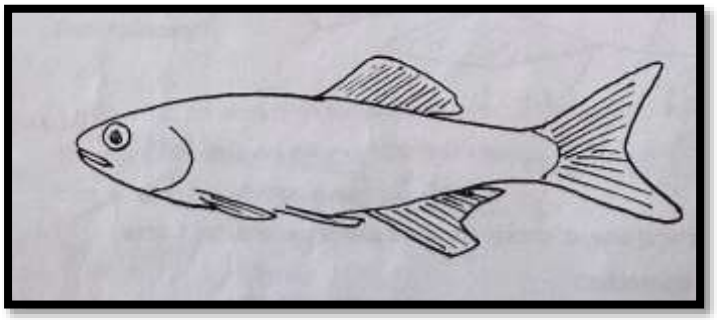




❖ **The Overall Shape Of Fish:**

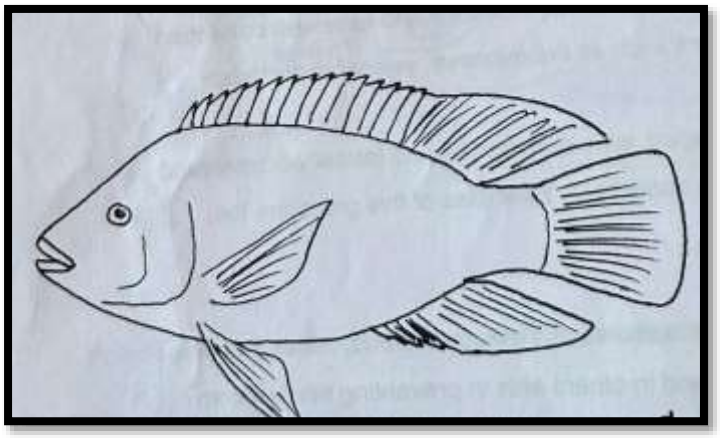
❖

- The overall shape that a fish takes on is determined by the habitat and ecology of the species. For example; a fish inhabiting swift flowing streams and rapids must be muscular and powerful swimmer. An eel, on the other hand, is well suited to life amongst tangled vegetation, foraging under rocks and in holes etc. The shapes that fish have are described by distinct terms:

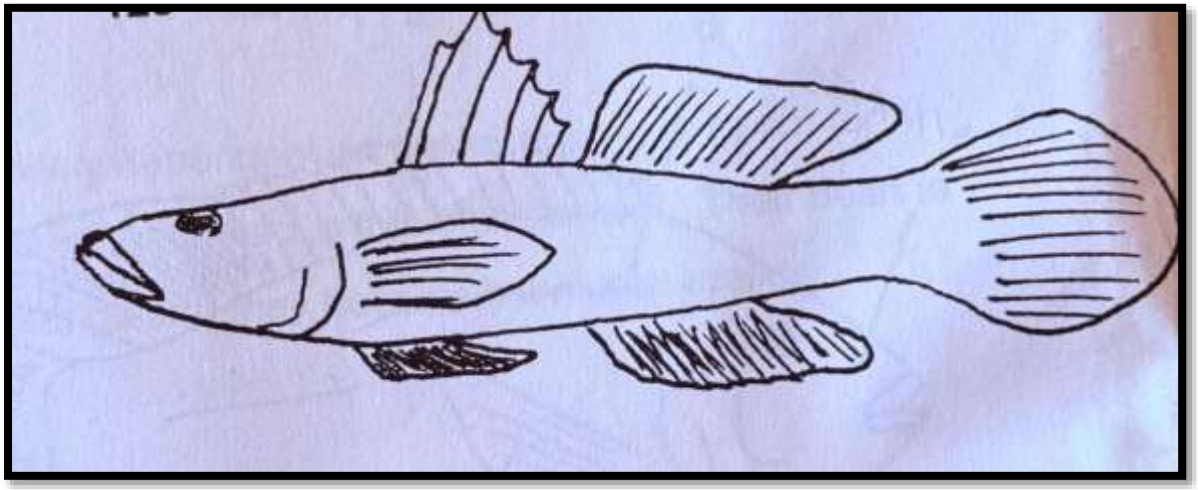
- **<u>Fusiform</u>** – these species are cigar shaped, cylindrical, muscular and have well developed fins. These are all active swimmers such as the **minnows, yellowfish** and **trout**. (See picture below):



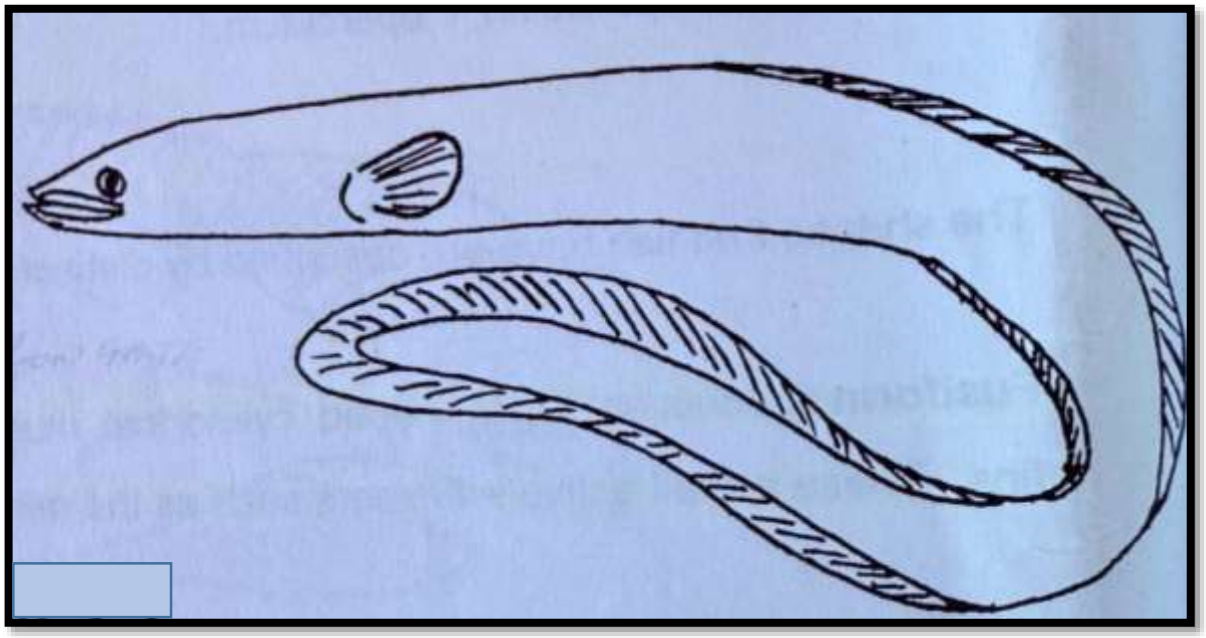
- **<u>Compressed</u>** – these species are disc-shaped, with deep bodies and laterally compressed sides. These fish are usually quite sedentary. Examples of this group are the kurpers and bream. (See pictures below):



- **<u>Depressed</u>** – these species are those with a dorso-ventrally fattened body. This shape is useful in entering restricted spaces and in others aids in preventing the fish from being swept away by strong currents. Mountain catfish are good examples of this shape. (See picture below):



- **<u>Elongate</u>** – these species are those with exaggerated lengthening of the trunk. Eels are all elongate fish species. (See diagram below):



❖ **Body Covering:**

- The scales of bony fish and those of cartilaginous fish differ quite considerably, but since only bony fish are found in the fresh water environment of Southern Africa, only those will be covered in this module.
- Scales are characteristic of most fish, although some species do not have them, relying for protection on a leathery skin instead. Scales perform the same function in fish, as they do in reptiles – **protection.** Fluid loss is prevented, the body is armored against penetration by diseases, there is resistance to impact, frictions reduced etc.
- Scales consist of a plate of bone that is covered by a thin layer of skin. The skin contains pigment cells (**chromatophores**) that give the fish its color. Overlying the skin layer is a thin secretion of mucus that serves to reduce friction in the water; provides an initial barrier to diseases or may be toxic to reduce the chances of predation. In many cases, removal of this mucus protection (by handling the fish incorrectly) leads to the death of the fish days later. For this reason, **anglers** (fisherman) should handle fish as little as possible if they intend to return them back to the water.

❖ **The correct way to handle the fish is as follows:**

- One must handle the fish as little as possible.
- Wet your hands first, only then you can handle the fish.

- Slip your hand, palm up under the belly and gently lift the fish.
- Once fish is out the water, do not put it down on to any surface, take a pliers and gently remove the hook. If the hook is barbless, the easier it will be to remove.
- Gently release the fish back into the water.

- The reason for **wetting** your hands is that all fish have a **protective layer** on their skin/scales. The protective layer has certain **anti-viral and anti-bacterial** properties that protect the fish from disease. If you handle the fish with dry hands, it rubs this layer off and increases the chances of the fish being infected. **Every bit helps for the conservation of this delicate environment we live and work in!!!**

❖ **Fins:**

- These appendages have a wide range of functions other than the normal use of causing and controlling movement. These uses include defense, display of territory, communications, reproduction, grasping and sensing etc. Fins are kept erect by two structures; **rays** and **spines**. Rays tend to be soft and divided, whereas spines are hard and single. Most species have the following fins:
  - Caudal fin – this is the tail fin and is used for swimming.
  - Dorsal fin – found on the back, these fins are used for stability.
  - Pectoral fin – used for balance, as brakes and for paddling backwards and forwards or as stabilizers for benthic (bottom dwellers) species.
  - Pelvic fin – is for stabilization; helping the fish maintain its balance, and prevent rolling from side to side while swimming.
  - Anal fin – is to stabilize the fish, helping it from rolling in the water.

❖ **Gills and Breathing:**

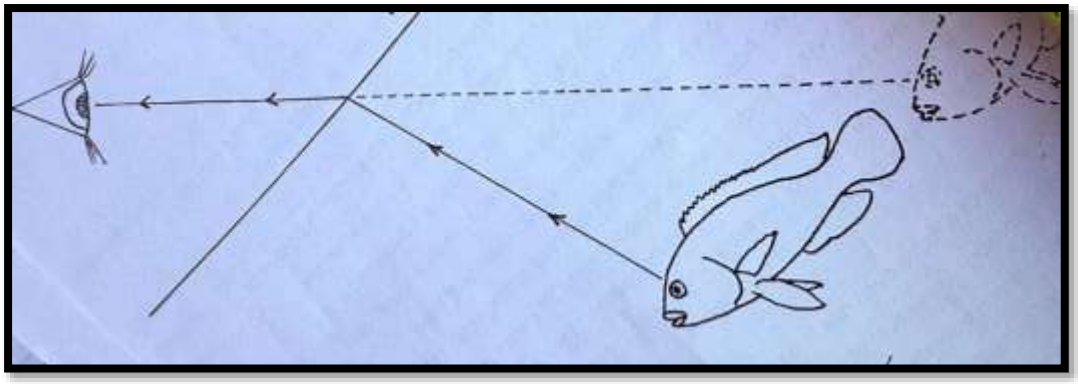
- Respiration in fish is not really much different in air-breathing animals. In order to breathe, fish must be able to filter out the oxygen that is found dissolved in water in large quantities. This is accomplished by the use of gills. Gills are very richly supplied with blood and consist of several 'plates' of filaments and rakers. To breathe a fish gulps into its mouth and passes this over the gill rakers in order to filter out any suspended particles in the water. The water then passes over the filaments of the gills which absorb oxygen into the blood. From here the water is passed out through the gill covers.
- Some fish species are capable of living in water that is not rich in oxygen. Their gill breathing is merely supplemented by the intake of mouthfuls of air, which are held in the mouth and gills until the available oxygen has been absorbed.

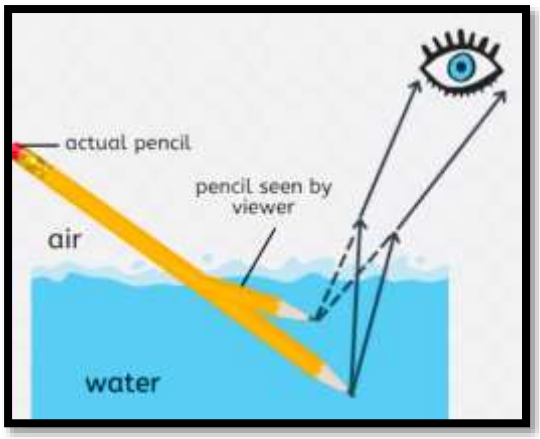
❖ **Fish Senses:**

- The medium in which fish live has given rise to a great variety of problems that they have had to overcome in order to analyze their surroundings adequately:
  - **Vision** – is an important sensory faculty for most fish since it plays a part in location of mates and predators as well as prey. The mechanics of seeing underwater are different to that of vision of air and this has given rise to special adaptations in the eyes of fish. The amount of available light in aquatic

environment is much less than that in air. Fish therefore have little need for a pupil capable of major **constriction** and **dilation**. Additionally, since their eyes are almost moist, they have no need for eyelids. Vision under water is limited to about 30 meters at most. Their eyeballs are thus spherical and rigid unlike those of terrestrial animals whose eyeballs are elastic to allow for focus at different distances.

- The spherical shape of fish`s eyes has to do with a phenomenon called **refraction** (occurs because light slows down when it moves from air into water, causing the light rays to bend or change direction). In air, light passing through a medium of different density (such as the lens of an eyeball) tends to bend a considerable amount. This allows images to be sharply focused on the retina of terrestrial animals. **Conversely**, light travelling through water will **refract** very little when passing through the lens of fish`s eyes. This results in an image that is poorly focused.. Refraction plays another important role in the lives of fish, this being the interface between air and water. Light entering water refracts, which makes it difficult to judge the exact position of food item above the surface, or the location of a predator. However, fish have long adapted to and overcome this problem. Fish have **monocular** vision since their eyes are situated on the sides of the head. (See picture of refracted light below):

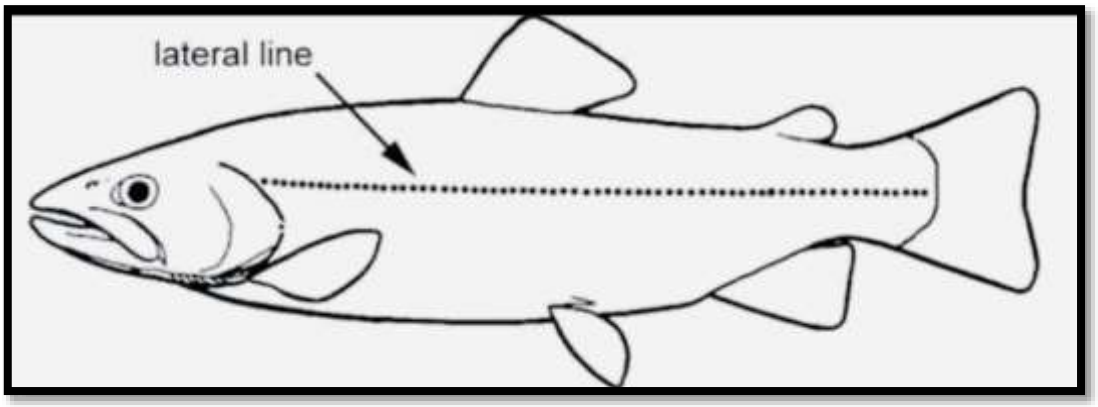





- The diversity in the coloration and patterning of body pigments are a clear indication of good color vision capabilities in fish. Most fish have color vision, but sharks and rays appear to see only black and white shades. Fish like catfish and snoutfish are mostly active at night and thus have small eyes. These fish are

not capable of focusing on objects, but are able to detect variation in light and moving objects.

- **<u>Hearing</u>** – fish have no external ears but do have a pair of inner ears, unlike mammals, that serve as organs of balance and hearing. The **lateral line system** (detects water movement and pressure gradients) is a specialized sensory organ to detect sound and pressured waves to which fish are extremely sensitive. Fish have a so-called sixth sense. This is a sensory ability afforded them by their lateral line. The lateral line consists of a longitudinally situated series of interconnected sensory cells which are filled with a special gel. These cells open to the exterior environment and serve to sense minute changes in water currents and vibrations. Using this organ, schooling fish (a group of the same fish species that swim together in a synchronized/coordinated manner) are able to maintain their positions without even seeing the other members of the school. (See picture below):




- In some species of fish, the inner ear is connected to the **swim-bladder** by the **Weberian apparatus.** The Weberian apparatus is a chain of ossicles (small bones) in otophysan fishes such as catfish and zebra-fish that connects the swim-bladder to the inner ear; enhancing vibrations from the bladder to the ear. Fish use sound to a considerable extent and it is therefore assumed that they must have the ability to hear, otherwise the signals would have no apparent use.
- **Smell** – the sense of smell is highly developed amongst fish and is probably their most important sense overall, and is used to detect familiar areas in their environment and as a means of communication through the use of pheromones. Some fish like Cyprinids (Barbs and Yellowfish) make use of an alarm substance of pheromone to rapidly alert other individuals to danger. Fish nostrils lead to the main olfactory organs placed in the chamber. These organ consist of a series of **lamellae** over which water currents pass. Each organ usually has a separate inlet and outlet; however, some species have only a single opening on each side.
- **Taste** – fish have no taste buds on their tongue, and therefore have no 'sense of taste' in the conventional meaning. They do however have specialized organs around their mouths which aids in the detection of certain chemical signals. Fish have an additional sense with which they analyze their surroundings. This is the **tactile sense or sense of touch or feel.** Fish such as catfish or barbel have feelers

with which they seek out food on the river bottom. These feelers are highly sensitive and allow fish equipped with them to find food in the muddiest of water conditions.

❖ **Food and Feeding Behavior:**

- Southern African fresh water fish show a wide range of food preferences, from carnivorous, to omnivorous and herbivorous. Within aquatic environments one finds that competition is minimized through specialization of feeding strategies and location of preferred feeding zones within the water column.
- Fish spend more time and energy eating or searching for food than anything else. Fish are grouped into carnivores, herbivores, filter-feeders, omnivores, scavengers and parasites. Though most fish are carnivores that prey on a diverse number of food types from zooplankton and insects larvae to large vertebrates. The herbivores eat flowering plants, algae, seeds and grasses. Although the plant eaters are relatively few in number compared to the carnivores they form a vital role as intermediate in the food chain in the freshwater habitat
- Most fish cannot chew their food like other animals do, because doing so would block the current of water that flows across the gills. Other fish that are able to grind their food make use of pharyngeal teeth in the throat. Most carnivorous fish swallow their whole, making use of sharp pointed teeth in their jaws and on the roof of the mouth to grip their prey. When the mouth of a large-mouthed fish is opened, a negative pressure is created that causes the victim to be swept into the mouth.
- What fish eat is reflected in their feeding anatomy. The mouths, lips, jaws and teeth have developed and are shaped according to the particular feeding functions they perform:
  - Predators – large often protruding mouths with sharp pointed teeth.
  - Omnivores – may have multi-cusped teeth.
  - Mormyrids – (snout-fish) have small mouths with small teeth for extracting insects from soft sediment.
  - Catfishes –have large mouths with sensory barbells suited for feeding on a range of live or inactive food.
  - Bottom Feeders – may scrape algae from rocks.

❖ **Locomotion (Movement):**

- Swimming is the most economical type of locomotion displayed by these animals. This is largely due to the support that water gives aquatic animals and the fact that little or no energy is needed to overcome the force of gravity. The movement of fish through the water almost creates no turbulence.
- Movement in fish varies from a very flexible side-to-side snake-like head and tail movement (as displayed in eels) to those fish that propel themselves only by means of caudal tail movements (fast moving fish). The mechanism for propulsion of a fish is the musculature of its trunk and tail. The muscles used for locomotion are composed of zigzag bands known as **myomeres**. Due to the shape and complexity

of the myomere bands, the amount of power and finer movement control is greatly increased. Each myomere band extends over a number of vertebrae and thus, the bending of body segments is due to the number of myomeres involved with each muscular movement.

- Most fish species can swim at a speed of roughly ten body lengths per second. Generally the larger the fish the faster it is able to swim. A 30cm fish can swim at around 10km`s per hour. The barracuda is the fastest fish that has been measured thus far swims at about 43km`s per hour.

❖ **Water Balance:**

- Fish have to deal with a unique problem that no terrestrial animals are faced with. This is the problem of water balance. A fish that lives in fresh water has got body fluids that are saltier than the surrounding water in which the fish lives. The result is that water is constantly trying to dilute the salinity of fish`s cells. This occurs through the process of **osmosis.** As a result, freshwater fish do not drink but rather rely on water that enters their bodies through the skin and gills to flush away waste products. This wastes are expelled with large quantities of urine.
- Marine fish have to contend with the opposite effect. The salinity of the ocean is higher than that of the fish`s cells and thus osmosis exerts a dehydrating force. These fish need to drink a lot so as to replace the body fluids lost through osmosis. Excess salinity is excreted or is forced out of the body through special salt excreting cells found in the gills. Marine fish seldom urinate.

## REPRODUCTION AND GROWTH (12.1.4).

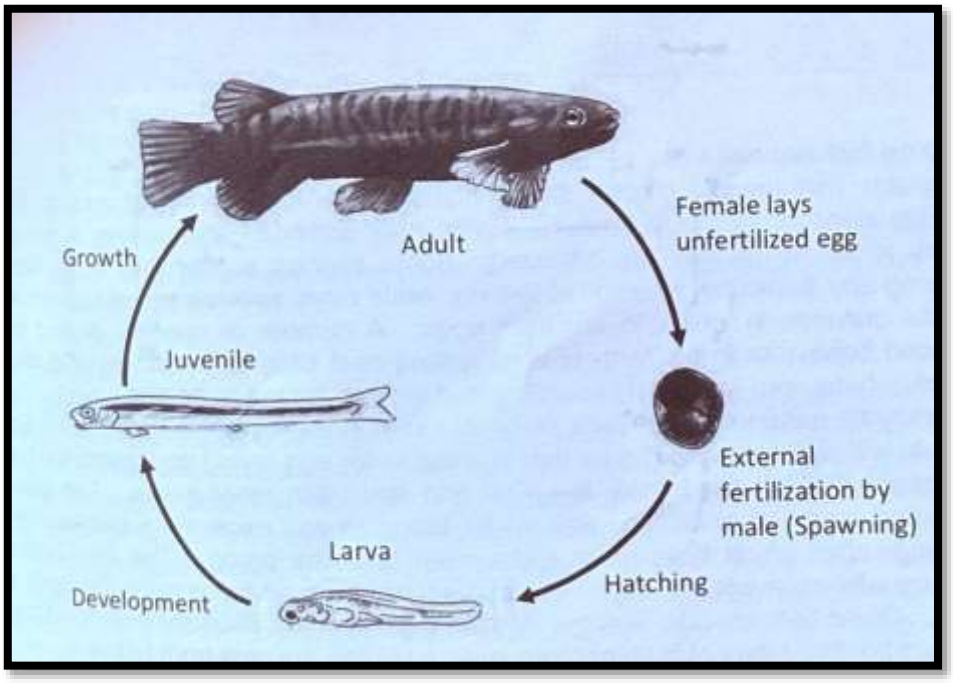
- The gonads (primary reproductive organs, which are called testes in males and ovaries in females) of both sexes are carried in elongated paired sacs which run lengthways above and behind the other internal organs. Eggs and sperm are discharged through a duct leading directly to the exterior for the gonads. Reproduction amongst freshwater fish in Southern Africa all involves external fertilization. In its simple form, male and female shed their sperm and eggs into the water and fertilization occurs. Many species have specialized nest-building behavior, others brood their young in their mouths, some migrate to the sea to mate and others return to rivers from sea to mate.

❖ **Sexual reproduction in freshwater fish is generally one of two types:**

- **Oviparous** (egg laying) – Most fish are oviparous and have male and female organs in separate individuals, with external fertilization and external development of the eggs and embryos.
- **Ovoviviparous** (live egg-producing) – These fish practice internal fertilization and bear their young alive after development in the ovarian cavity of the mother. Examples of fish with this type of reproduction are the Guppy (Poecilia reticulate) and Swordtails (Xiphophorus heller).

NB// **Diapause** – a period which the metabolism of some animals including fish or insects slows down, temporarily suspending their bodily development and growth. Such periods are linked to seasonal or environmental changes.

❖ **The general life-cycle of a bony fish - Egg-laying.** ( See diagram below):




❖ **Breeding Behavior:**

- Freshwater fish usually display elaborate form of territorial and ritualized courtship dance. In many species, males may establish and defend a breeding territory to which females are attracted. Some species scatter their eggs without preparing any particular area for spawning; while other species select specific sites such as crevices in which to lay their eggs.
- A number of species display more advanced behavior in the form of constructing nest sites for spawning and display protective behavior in actively guarding and tending for the eggs and larvae. These nests may be quite simple or fairly elaborate structures. In some species like Bass, the male will simply clear an area that is suitable for egg laying and guard the brood by himself, allowing the female to go off and mate with males. The Banded tilapia and many other cichlids pair up for breeding and excavate a depression for spawning, after which both male and female tend the brood.
- The Red-breasted tilapia usually excavates a large nest with separate brood tunnels for the eggs and larvae. Other species like African pike and Blackspot climbing perch construct floating nests of froth or foam while guarding the nest from below.`

❖ **Growth in Fish:**

- Growth in fish is temperature dependent.

- Fish that live in warmer regions grow quickly in summer when temperatures are high and there is abundance of food available. Fish in these areas will almost stop growing during the colder winter months.
- The seasonal growth of fish is, like rings, reflected in the annual rings in the scales.
- Once fish have reached reproductive maturity, they will continue to grow, unlike most mammals and birds.
- The life expectancy of fish varies from between 1 and 20 years. The average life span for large fish is between 5 and 10 years. Smaller fish like Killifishes and Topminnows are short-lived, surviving for only about a year or two.
- Minnows live for about 3 to 6 years whereas fish like yellow-fish species, Carp, Tench and Eels have been recorded living more than 10 years, some reaching 20 years of age.

❖ **The size of fish:**

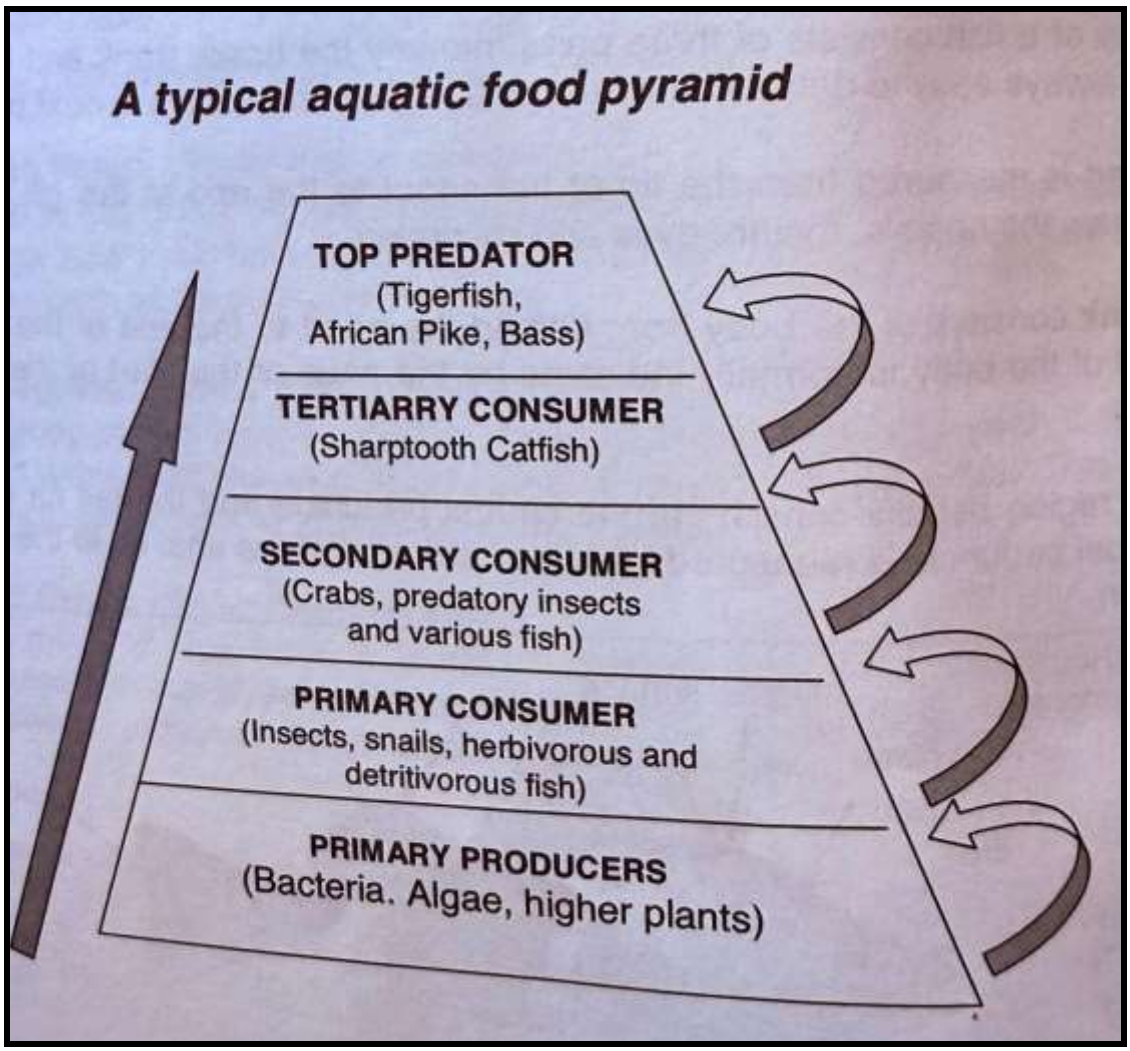
- The size of a fish is determined by genetics, age, water body size, and availability of food, general ecological and other biological factors. Fish continue to grow their whole life-time and large fish species a needs large area in order to reach its full potential size. Fish living in degraded habitats and fish that concentrate all their energy on breeding rather than on growth will never reach their potential size.

- The largest fresh water fish species found in Southern Africa are the Vundu (Heterobranchus longifilis) and the Sharp-tooth Catfish (Clarius gariepinus), vary in the size that they can potentially attain at maturity; but generally they can reach length at around 1.5m and weigh up to 50 – 60kg or more. The smallest freshwater fish, like Upjaw barb (Coptostomabarbus wittei), the Sicklefin barb (Barbus haasianus) and the Sand catlets (Leptoglanis Species) usually reach maturity when they attain a length of 20mm.

## THE ECOLOGICAL ROLE OF FISH (12.1.5).

- Fish are not often seen on the average guided experience, but the fact that there are fish in most aquatic environments, it is important for nature guides to have an understanding as to where and how fish fit into the ecology of the area of operation.
- In any aquatic system the energy enters in the form of sunlight and organic matter from plants and animals in the catchment, forming the nutrients for developing bacteria, algae and higher plants. Within this system they are primary producers upon which the rest of life in the aquatic environment depends.
- These organisms provide the food source for insects, snails and fish that are herbivores and detrivores such as labeos (fish) and red-breasted tilapia. These animals make up the primary consumers in the aquatic web. Carnivores and scavengers such as crabs, predatory insects and various species of fish feed on the primary producers and primary consumers.
- These are known as the secondary consumers, which are in turn eaten by generally larger and more specialized top fish predators, like Tigerfish, African pike and Bass.

The top predatory fish are usually preyed on by a number of terrestrial creatures such as birds (fish eagle, darters, cormorants & storks), the Nile crocodile and humans. (See the aquatic food pyramid below):



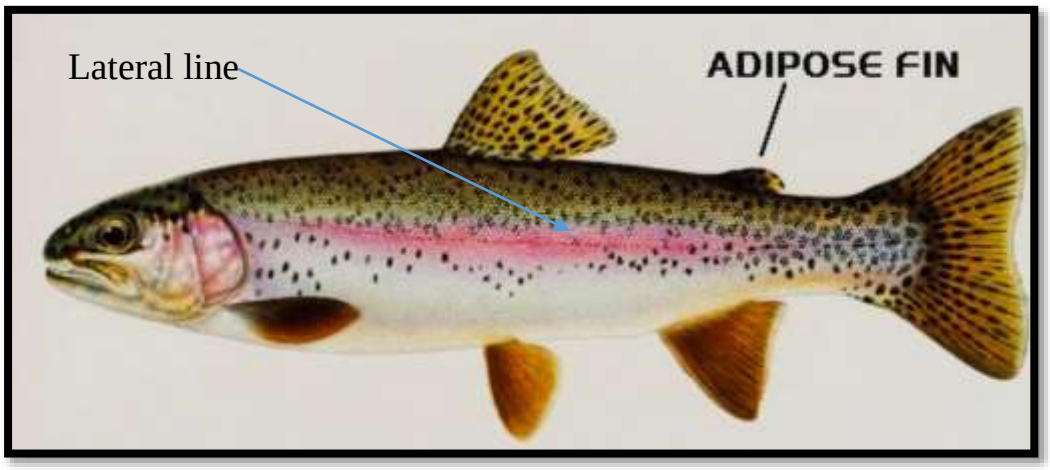

❖ **Threats to Fish:**

- Habitat destruction (by construction of dams, draining of wetlands and global warming etc.) is the most serious threat to our indigenous fish species. In addition, accumulation of pollutants in aquatic environments are having a similar effect.

## COMMON FISH SPECIES IN THE OKAVANGO DELTA (12.1.6).

- **African pike** (Hepsetus odoe):
  - **Description:** Body elongated, dorsal and anal fins set well back; caudal fin forked and adipose fin present. Head pointed and jaws with prominent unevenly protruding sharp canine teeth. Breeding fishes develop a fleshy flap on either side of the lower jaw. Basic color rich brassy olive with dark brown blotches and cream under parts; fins with black spots, adipose fin orange with black spots and

3 brown bands radiate behind eye. Females reach larger size than males, weighing about 2kg. Adipose fin, see picture below:




- **Distribution:** Cunene, Okavango, Upper Zambezi and Kafue systems.
- **Ecology:** Prefers quiet deep water, as in channels and lagoons of large floodplains. Not usually found with Tiger fish as their habitat and hunting strategies differ. Juveniles and fry inhabit well-vegetated marginal habitats. A top predator; the pike stalks and ambushes prey with swift, sudden rush. Juveniles prey on small invertebrates and fish and the adults eats mostly fish up to about 30 – 40% of their own size. A multiple spawner, which breeds over summer months. Breeding pairs construct a floating foam nest within the shelter of dense marginal vegetation of lagoons, backwaters or protected river channels. The eggs incubate in the nest, which is closely guarded and tended by both parents. On hatching, the fry drop to the water surface where they remain suspended beneath the nest until it disintegrates. Relatively short lived; only 4 – 5 years.

- **Sharp-toothed catfish** (Clarias gariepinus)
  - **Description:** Body strongly compressed towards caudal fin; dorsal fin entirely of soft rays extends from behind head nearly to the base of caudal fin. Head large and depressed, heavy boned and completely encased above; eyes small, mouth large and jaws with broad bands of fine pointed teeth. Color varies from almost black to light brown, often marbled in shades of olive green or grey. Under parts of head and abdomen are white, sometimes with red flush to the extremities of fins, especially when spawning (breeding).
  - **Distribution:** probably the most widely distributed fish in Africa; found throughout woodland-savanna zones of the Afro-tropical region from the Nile to as far as the Orange River.
  - **Ecology:** Occurs in almost any habitat but favors floodplains, large sluggish rivers, lakes and dams. Can endure harsh conditions and is frequently the last or only inhabitant of diminishing pools of drying rivers or lakes, where it may form burrows. Moves overland under damp conditions if necessary if necessary by extending the pectoral spines and crawling. Completely omnivorous, they can prey, scavenge or grub on virtually any available food source including fish, frogs, insects, reptiles and small mammals etc. They can also eat plant matter

such as seeds and fruits, and are even capable of straining fine plankton if necessary. Many hunt in packs, herding and trapping smaller fishes. Is preyed on by a wide variety predators including man, leopards, crocodiles and many birds, especially the fish eagle and marabou stork. Breeds in summer after the rains, when large numbers of mature fishes migrate to flooded shallow grassy areas of rivers and lakes. Eggs are laid on vegetation and hatch within 4 to 10 days, depending on water temperature. At the optimal temperature of 25 to 27 degrees Celsius they will hatch in about 4 to 6 days. Individuals may mature after a year but most take 2 or more years. Lives for about 8 to 10 years.

- **Nembwe (Tsungwa)** (Serranochromis robustus)
  - **Description:** Mouth large, with well- spaced large conical teeth. Olive to bright green with deep olive band along mid-body; fins olive with yellow/orange margins and anal fins of males with orange egg-spots. Attains about 3.5kg.
  - **Distribution:** Occurs in the Okavango, Zambezi, Kafue and Zambia/Congo systems.
  - **Ecology:** Larger specimens prefer deep main channels and permanent lagoons, whereas smaller fishes occur mainly in lagoons and secondary channels. Preys on fish; juveniles most often eat minnows but squeakers are favored by adults. Breeds I summer and nests along vegetated fringes of mainstreams. A major **angling** fish with bass-like (fish) qualities. Commercially valuable and subsistence fishery species.

- **Three-spot Tilapia** (Oreochromis andersonii)
  - **Description:** Adults blue-grey with light scale borders giving mesh effect; fins are blue-grey with light spots on soft dorsal fin and anal fin with bright red margins. Juveniles are silvery with 9 – 9 irregular thin bars on body and 3 – 4 mid-lateral spots. Breeding males blue-black with silvery mesh and maroon flush on top of head with outer dorsal and caudal fins intense red. Attains about 3.2kg.
  - **Distribution:** Cunene, Okavango, Upper Zambezi and Kafue systems.
  - **Ecology:** Hardy, tolerating fresh and brackish water, preferring slow-flowing or standing water such as in pools, backwaters and floodplains lagoons. Adults occupy deep open waters and juveniles remain inshore among vegetation. Males excavate large saucer-shaped nests, and female's mouth-brood the eggs, larvae and fry. Multiple broods are raised during the warmer months. Lives for about 7 – 8 years. Valued in aquaculture and fisheries, also a popular angling species.

- **Tiger-fish** (Hydrocynus vittatus).
  - **Description:** Head large with bony cheeks and strong jaws, each with a series of 8 large protruding sharp pointed teeth. Juveniles silvery and adults color striking body with silvery head, bluish sheen on back and a series of parallel longitudinal black stripes, adipose fin black, caudal fins varies from yellow to blood red with black trailing edges. Other fins also with yellow to red especially towards their bases. Males and females similar in form, but females are normally bigger (around 7kg) than males.

- **Distribution:** Okavango, Zambezi and lowveld reaches of coastal systems of Southern Africa.
- **Ecology:** Prefers warm well, oxygenated water, mainly in large rivers and lakes; tending to frequent the surface layers where it often falls prey to the swooping African fish eagle. Breeds during summer; adults migrating up or downstream to suitable spawning sites along flooded riverbanks and lakeshores. Males mature at 2 – 3 years of age and most breeding females exceed 400mm, and are generally older fish than the male group. Newly hatched Tiger fish attain lengths of 160 – 200mm in their first year and up to 300mm by the end of the end of the second year. Although the sexes have equal growth rates, males mature earlier and suffer higher mortalities. Larger fishes above 6oomm are most often females, which live for about 7 – 8 years, with a maximum of about 10 years. Tiger fish are predators throughout their life and newly hatched fry less than 10mm start feeding on small invertebrates or zooplankton; progressing taking larger insects and finally fish.
  Tooth development keeps pace with the changing diet and the whole set of teeth developing in trenches on the jaws below the functional teeth. Tiger fish feed on whatever prey most abundant at a particular time, but slender-bodied **shoaling** (when fish gather in social groups) fishes like robbers or minnows are favored.
  A major angling game fish, also an important commercial species in areas like Lake Kariba with a record of over 184 tones taken in 1977. Although widespread and still common in certain areas, tiger fish have declined in some rivers due to pollution, water extraction and obstructions like weirs and dams that prevent passage. Tiger fish have not yet been successfully bred in captivity.
  Okavango Delta breed: (Tiger fish)

