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SYNGNAYHIDAE WITH EMPHASIS ON SEAHORSES

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ABSTRACT

The order syngnathiformes consists of an assemblage of unique, fascinating, delicate, decorative, and elusive fishes belonging to the families Syngnathidae (seahorses, pipehorses, seadragons, pipefishes), solenostomidae (ghost pipefishes) and Pegasidae (seamoths). Syngnathids are found in shallow tropical and warm termperate waters, living in seagrass beds, estuaries, coral reefs or mangrove areas. They possess thick plates of bony armour covering their bodies. Depending on the environment, syngnathids can be highly variable in colour and shape, with some having the ability to change colour in minutes or grow additional skin to mimic sea grasses and sea weeds they inhabit. After sybngnathid females lay their eggs the males fertilize and carry the eggs during incubation using several methods. In sea horses reproduction in contrary to norm: The female deposits her eggs inside the male's brood pouch where they are incubated for several weeks. Eventually, the male goes into labour and gives birth to a brood of babies. Report incidates that the number of seahorses is declining worldwide due to over exploitation for medicinal use and as ornamental items, despite CITES trade regulations.

KEYWORD: Syngnayhidae, Seahorses

INTRODUCTION

Fishes of the families Syngnathidae, Solenostomidae and Pegasidae are collectively known as Syngnathiformes and consist of fascinating, unique, delicate, decorative, and elusive fishes, comprising over 300 marine and estuarine fish species, including seahorses (Hippocampus spp.), pipefishes, and sea dragons (Lourie, Vincent, & Hall, 1999; Foster & Vincent, 2004). These fishes are widely recognized for their elongated bodies, armor-like exoskeletons, tubular snouts, and unique reproductive strategies, particularly male pregnancy—a phenomenon almost exclusive to this family (Wilson et al., 2001) This group of fishes includes seahorses, seadragons, pipefishes, pipehorses, ghost pipefishes and Seamoths (Sara, et al., 1999). Unlike most other bony fishes which have internal bones and scales for support and protection respectively, 'syngnathiformes' have long, semi-flexible, stiff-body covered with bony plates and rings. Syngnathids have specialized tubular snouts with small mouths at the tip which help them to catch their prey, mainly small crustaceans. They are mostly found in coral reefs, mangrove habitats and sea grass of tropical, subtropical and warm temperature areas. Currently, about 300 hundred species of syngnathids, that is, seahorse, pipehorse, seadragon and pipefish, four (4) solenostomids (ghost pipefish). Lourie et al. 2016). The white seahorse *Hippocampus Whitei,* Coleman's Seahorse *hippocampus colemani* and the pigmy pipehorse Idiotropiscessp keep on recurring in New South Wales waters. The increasing overseas demand and overfishing of these groups of fish make them vulnerable and so there is need for their protection against commercial harvesting. Hence the enlistment of all species of syngnathiformes as protected under the NSW. Some of the most decorative and elusive fish in waters belong to the families Syngnathidae, Solenostomidae and Pegasidae. These unique and delicate groups of fish include seahorses, seadragons, pipefishes, pipehorses, ghost pipefishes and seasmoths, known collectively as Syngnathiforms. The name is derived

from Ancient Greek, syn meaning together, gnathos meaning jaws and forms derives from latin which indicates similar form (http://www.Fishbase.org,2005). Jaw trait is something the entire family has in common. Syngnathids inhabit shallow coastal ecosystems such as coral reefs, mangroves, and seagrass beds, where their ability to camouflage offers both protection and predatory advantage (Foster & Vincent, 2004). Seahorses, the most iconic representatives of the family, are slow swimmers and rely on their prehensile tails to anchor themselves to vegetation, minimizing energy expenditure in high-current environments (Lourie, Pollom, & Foster, 2016). Syngnathiforms are not like most other bony fish; instead of having internal bones for support and scales to protect, they have a variety of specialized tubular snouts with a small mouth at the tip, fused jaws and absence of pelvic fins and thick plates of bonny armour covering their bodies. The armour gives them a rigid body so they swim by rapidly fanning their fins. They are mostly slow compared to other fish, but control their movements with great precision including hovering in place for extended periods. The most distinctive biological trait in Syngnathidae is male brood care, where females deposit eggs into a specialized brood pouch on the male's abdomen or tail, depending on the species. The male then fertilizes, nourishes, and oxygenates the developing embryos until live young are expelled during parturition (Wilson et al., 2001; Koldewey & Martin-Smith, 2010). This form of sex-role reversal has sparked extensive research into sexual selection, parental investment, and evolutionary biology (Foster & Vincent, 2004). Uniquely, after a syngnathid female lays her eggs, the male fertilizes and carries the eggs during incubation using several methods. Male sea horses have specialized ventral pouch to carry the eggs with exception of ghost pipefish which females retain care of eggs and has a large ventral fin to form a pouch to brood eggs. Depending on the environment, syngnathiforms can be highly variable in colour and shape; some have the ability to change colour in minutes or to grow additional skin to mimic sea grasses and sea weeds they inhabit. It is the major defence and feeding strategy since the small fins restrict them to slow movement, giving them little opportunity to escape from predators or actively chase their prey when feeding (http://www.dpi.nsw.gov.au, 2008). Syngnathids are found in temperate and tropical seas across the world. Most species inabit shallow coastal waters, but a few are known from the open sea especially in association with sargassum mats (orr and pietsh, 1998). The length of the mouth varies among sybgnathiform families; those feeding on crawling type of invertebrates from the sea floor generally have shorter snouts while longer snouts are used for more intense suction to draw swing crustaceans from the water column (Van, 2008).

The following constitutes the various types of syngnathids:

- **Seadragons/pipehorses:** Seadragons are distinct from the seahorses by their longer and unusually shaped bodies with spines and many leaf-like appendages. They have long prehensile tails that cannot be bent and longer snout. Weed sea dragon can be observed along reefs with kelp or along the edge of sand areas feeding on very small shrimp like mysids and other small crustaceans mostly found in Australia (Martin and Vincent, 2006). They grow up to 45cm long.
- **Pipe fish:** They look like long, slender and Dory rhamphus cory thoichthys straight bodies seahorse with tiny mouths. A wide variety of body forms exist among this large family where some have worm-like bodies that creep along the seafloor while others have stiff bodies and are free swimming. They inhabit sheltered areas in coral reefs, sea grass beds, and sandy lagoons. They use their tube-like mouths as a vacuum to draw in prey and some glean crustaceans from the scales of other fish. Most species of pipefish are less than 20cm in length. Some have special skin that supports growth of algae similar to their surrounding environment. It is able to camouflage very well and make a meal out of small crustaceans that feed on algae (Tami Weiss http://fusedjaw.com, 2009).
- **Ghost Pipefish (solenostomidae):** Ghost pipefish are closely related to the seahorse, seadragon, pipefish and pipe horses but differ in that all ghost pipefish fins are well developed and large. They are also called false pipehorse or Tubemouth. Ghost pipefish are perhaps the most spectacular of the syngnathiformes in appearance, which displays elaborate colours and bony spines; others are

robust or are less elaborate. They live in muddy open bottoms of reef with rich invertebrate life, usually in sheltered coastal or estuarine waters and feed on crustaceans. They are mostly longer that 15 centimetres in size (http://www/FishBase.org, 2014).

- **Seamoths:** These curious creatures from the pegasidae family are found, lying flat or crawling on sandy or muddy bottoms with flatters bodies, pectoral fins held out to their sides and modified ventral fins for walking. Seamoths feed primarily on tiny crustaceans and other small invertebrates, which they suck in whole with their protrusible mouths called rostrum. Seasmoths can change their colour from grey brown to black on flecks to mimic the texture of the substrate. They grow in length up to 8.5 and 14cm (orr and Pietsch, 1998).

SEAHORESES

This work, will dwell specifically on SEAHORSES, focusing on their reproductive behavior including courtship, gestation (pregnancy period) and birth, habitat, feeding habits, uses, and threats of extinction. Seahorse in Latin is called Hippocampus; translated in English it means "Horse Caterpillar" (http://www.theseahorsetrust.org, 2010). It has spines on top of the head called coroncls necaise it looks like a crown (Sweat, 2009). It does not have caudal fins but has a dorsal fin and pectoral fins. The seahorse uses the pectoral fins to steer and for stability. Seahorses are slow moving fishes. In fact the slowest moving fish in the world is one of its species called *Hippocampus zosterae* (dwarf seahorse), swimming at a top speed of 'about 5ft (1.5m) per hour (Guinness book of world record, 2009). Seahorses are very poor swimmers and are often found resting with their prehensile tails wound around a stationary object. Holding on to stationary objects helps them to survive currents that otherwise would have swept them away (Zalohor *et al;* 2009). By wrapping themselves around the sea grass fronds, etc., they can comfortably feed properly.

- **Body Morphology:** Unlike most other fish, seahorses have an exo-skeleton. Their bodies are made up of hard, external, bony plates that are fused together with a fleshy covering. They do not have scales. Seahorses grow fleshy "appendages" on their bodies. These appendages are called cirri. Cirri give the seahorses a weed-like appearance that helps with camouflage. There are between 30 and 40 species of seahorses worldwide. But scientists have difficulty in identifying individuals of the same species because they vary greatly in appearance as new species are constantly found (Lourie et al; 2004).
- **Habitat and Distribution**: Seahorses are predominantly found in shallow tropical and warm temperate zones throughout the world. They love living in sea grass beds, estuaries, coral reefs or mangroves. The common seahorse lives in Australia as well as Indonesia. During the winter, seahorses prefer to move to deep water where they overwinter to avoid the sever winter storms. Four (4) species live in Pacific water that is in the North and South America. In the Atlantic Ocean, *H. erectus* are found and could be located from Nova Scotia to Uruguay. *H. zosterae,* otherwise called the dwarf seahorses, are found in the Bahamas. Three (3) species are found in the Mediterranean Sea; they are H. *guttulatus* (the long-snouted seahorse), *H. hippocampus* (the short-snouted seahorse) and *H. fuscus* (the sea pony). These species form colonies or territories – males live within eleven (11) sq ft. of habitat; the females 'range about one hundred time that (J. Evol. Biol 13 (6): p 882-886).

There are two species around British coastline and these are (a) Spiny seahorse called *Hippocampus guttulatus)* (b) the short snouted seahorse known as *Hippocampus hippocampus.* These British seahorses live in Shetland Isles down to the west coast of United Kingdom and around Ireland including the south coast of England and the east coast.

- **Behaviour:** The familiar seahorse is very common along coral reef areas, using their tails to lock on to it. This allows them to be able to remain the place in spite of the current around them. The males

become aggressive towards each other when it is time to find a mate and from a high level of stress when there is lack of food, or the habitat gets too small. When seahorses are hungry, they move and hunt freely. Most of the time they stay attached by their tails to sea weed. They swim in pairs linked by their tails (Hunter, 1931). Their swimming is weak because they are only able to use one of the small dorsal fins in an undulating motion. They compensate for their slowness by blending into their environment very well (Kuiter, Rudie 2000). Adults swim erect in upright manner, juveniles swim like pipe fish in horizontal manner with head stretched forward and tail behind them (Garrick, 1998). It is interesting to note that seahorses swim vertically unlike pipefish which swim horizontally. It is only razor fish that swims vertically just like the seahorse (Vincent and Amanda, 1994).

- **Feeding:** Their location strongly influences what they eat. The main items are very small guppies and small brine shrimp. Others include Daphnia, Cyclops, larval insects or mysids that float on water. They hunt in ambush style and have an increasing success in capturing their preys with increasing habitat complexity (http://www.newswatch.nationalgeographic.com, 2009). Apart from feeding on small crustaceans that float in the water, they can go down the seabed to feed on those crawling at the bottom of the sea. Seahorses utilize a feeding strategy known as pipette feeding, enabled by their elongated snouts and rapid head movement. They remain motionless, anchored by their prehensile tails, and use a sudden pivot of the head to suck prey into their mouths by generating a powerful suction force through buccal expansion (Bergert & Wainwright, 1997). This method allows them to feed with precision and efficiency, especially in habitats with dense vegetation. Seahorses range from 1.5cm to 35.5cm (0.6-14.0 inches) in size. They have long thin snouts which help them to diligently search into nooks and crannies for their food these long thin snouts also enable them suck up their prey into their mouth. The snouts expand if the prey is bigger than the snout (http://www.fusedjaw.com, 2005). Unlike some other fishes, scahorses are not able to chew but have to disintegrate the food as they eat it. Seahorses can change colour at will to suit their surroundings either to deceive their prey in order to catch them for food or to escape being captured by the enemy. Their eyes work independently of each other and this helps them to look forwards and backwards at the same time; and this is particularly helpful in their search for food to live on and they have digestive tract without differentiated stomach (http://www.Newswatch.nationalgcographic.com, 2014).
- **Predators and Parasites:** Diseases that reduce their numbers include bacteria, cestodes, microporidians fungi, ciliates, nematodes and marine leeches (The biology of seahorses, 2007). There are quite a few different predators out there they include penguins, fish a anthropogenic factors such as target fishes and by –catch (Kate, 2012). There are many parasites and infections known to affect the life of seahorses including ciliates, nematodes, fungi, microporidians (Sweat, 2009). Humans though, are the biggest problem.

REPRODUCTION

Reproduction in sea horses is contrary to the norm. After an elaborate courtship ritual, the female deposits her eggs inside the brood pouch, where they are fertilized and incubated for several weeks. Eventually, the male goes into labour and gives birth to a brood of babies.

- **Courtship:** Seahorses also exhibit subtle forms of communication. In addition to visual cues, some species produce clicking sounds by rubbing parts of their skull together. These sounds are believed to function in mating rituals, distress signaling, or territory defense (Colson et al., 1998). Time of the breeding season and length is influenced by environmental factors such as light, temperature and food availability. Before breeding, seahorses court for a few days. During this period, they (male and female) do almost always change colour, swim side by side and holding their tails together (Kvamemo

et al., 2000). If not, they are seen gripping the same strand of sea grass with their tails and wheel around in unison (Foster and Vincent, 2004). This is usually turned the "predawn dance". After this, the make and the female will then engage themselves in a true courtship dance for a duration of about 8 hours (Connor and Steve, 2007). During this process the male will pump water through the egg pouch on his trunk which expands and opens to display its size. When the eggs become mature, both the male and female will leave the object they were hanging onto and drift upward "snout-to-snout" many times spiraling as they arise (Duvernoy, 2005).

- **Pregnancy:** The female inserts her ovipositor into the male's brood pouch and deposits dozens to thousands of eggs. The male becomes "Mr. big belly" while the female becomes "Mrs. Slim fit". They will sink again into the sea grass and the female then swims away. The eggs become fertilized by the male after he has released his sperms. It is interesting to not that it is the male that carries the pregnancy and not the female. Seahorses are renowned for their unique mode of reproduction, where the male becomes pregnant. The male undergoes muscular contractions to release fully developed miniature seahorses into the water. This phenomenon represents a rare example of male pregnancy in the animal kingdom. The male carries the eggs for 9-45days until the young seahorse emerge fully developed but very small (Foster can Vincent, 2004). The eggs are embedded in the pouch wall of the male which are then being surrounded by a spongy tissue. The make supplies the eggs with prolactin, the same hormone responsible for milk production in pregnant mammals (Amanda and Vincent, 1990). The pouch provides oxygen and a controlled environment incubator (Lourie et al., 2004). The eggs are hatched in the pouch and in the pouch the salinity of the water is regulated (Milius and Susan, 2000). During the period of pregnancy or gestation, the female pays her man a daily visit for morning greeting, a process or routine that lasts for between two weeks and four weeks. Such daily visits lasts for about 6 minutes, reminiscent of courtship. After that, the female swims away while the male goes to suck up food for the unborn children (Amanda and Vincent, 1995). This pair bond no doubt brings them quite close together and is ready to re-mate for the next gestation period (http://www.petseahorse.com).
- **Birth:** The male puts to birth up to 100-1000 young ones for bigger species but atimes they can be as low as 5 (five) for smaller species (Foster and Vincent, 2004). This number can go as high as 2,500 young ones depicting the wonderful works of God. The newborns are called fry and when they are about to be born, the male seahorse expels them out through muscular contractions (http://www.news.nationalgcographic.com., 2009). Many atimes the male gives birth at night and ready to carry another pregnancy when his mare returns in the morning with another set of eggs. Just like other fish species, seahores do not nurture their young after birth. Infants are susceptible to predation or ocean currents which wash them away from feeding grounds or into temperatures too extreme for their delicate bodies. Less than 0.5% of infants survive to adulthood. Despite this fact, 0.5% is regarded as a fairly high survival rate when compared to other fish whose eggs are abandoned immediately after fertilization (The biology of seahorses, 2007). *H. zosterae* appears to mature at 3 months, whilst other species are believed to reach maturity at 6 months 10 1 years.

USES OF SEA HORSES

- **Ornamental:** Their trade takes approximately 1 million seahorses from the wild, along with shells and starfish mostly left to die in the boiling sun, and then sold as souvenirs or given as sad or sorrowful reminders or sometimes put into bottle of liquor to drink (Kate, 2012). In Senegal some are used as ornaments of beautification such as necklace or key ring or hung outside the home, some given to small children to play with, and most times as a means of Europeam exchange and sold to visitors who come on vacation (Martin et al., 2006). Seahorses that are collected from the wild do

poorly in survival in home aquaria. This is so because they are always poorly fed. Seahorses only live on live foods such as brine shrimp, and hobbyists who are unaware of this would definitely damage the fish immune system and so the fist would fall sick. The good news is that presently the live foods which seahorses eat are available at aquarium stories where they could be purchased and the fish properly fed. Apart from its feeding, the seahorses should only be kept with low flow and placed without tank mates. Seahorses are slow feeders/ fast and aggressive feeders should not be kept along with seahorses otherwise they would die of hunger since they are slow eaters, but eat 30-50 times a day (http//www.Fusedjaw.com, 2009). Aquarium keepers should take note that their tank mates are gobies and shrimps among others, but they must avoid keeping'eels, tangs, triggerfish, squid, octopus and sea anemones" with seahorses in the same tank. Additionally, water quality is very essential for the survival of seahorses in an aquarium since they (seahorses) are very delicate. The parameters are recommended to be as follows: Temperature 23-28^{0}C; pH: 8.1-8.4; Ammonia: 0mg/1 (0.01mg/1 may be tolerated for short periods), Nitrote: 0 mg/1 (0.125mg/1 may be tolerated for short periods; S.G. (specific gravity): 1.021-1.024 at 22-24^0. A water quality problem will affect fish behairour and can be shown by clamped fins, reduced feeding, erratic swimming and gasping at the surface. Seahorses swim up and down as well as using the length of the aquarium. Therefore, the tanks should ideally be twice as deep as the length of the adult seahorse (http://www/Fusedjaw.com. 2009).

- **Medicinal and food Purposes:** It is generally believed that seahorse populations have become endangered because of overfishing and due to the destruction of their habitat, (Still, 2003; Stephen, 2013). Consumption of seahorses for medicinal purposes is rife in China. Their gill rakers are used in traditional Chinese medicine, mainly for the treatment of impotence, wheezing, nocturnal enuresis, pain etc (Still, 2003; Hilton, 2009). It is claimed that as many as 20 million seahorses are caught yearly to be sold for such uses. The preferred species are *H. kellogii, H. histrix, H. kuda, H. trimachulatus and H. mohnnekei* (bensky et al., 2004).

CONCLUSION

Records show that the number of seahorses is declining worldwide. Impact and export of seahorses have been regulated or controlled under CITFES since May 15, 2004. But it is very sad to see that countries like Indonesia, Japan, Norway and South Korea have opted out of these trade rules. The reason is simple, to fish indiscriminately. This is a sure threat of extinction of seahorses (Kate, 2012).

There is need for CITES to put in more effort in countries where syngnathiforms are found so as to curb their ever increasing demand overseas and overfishing ion order to save them from extinction, fishermen must be forced to obey CITES trade regulations. Even though protection is now being given to syngnathiforms by law, the penalties are not stringent enough. Stiffer penalties including fines and long prison terms should be `\put in place to deter these offenders from indiscriminate fishing. Finally, researchers in Aquatic Environmental Management should not rest on their oars. They need to come together to prove and affirm to the world why male seahorses play the role of the female seahorse by becoming pregnant and giving birth to the young ones. This is yet to be proven.

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