= Velvet belly lanternshark =

The velvet belly lanternshark (or simply velvet belly , Etmopterus spinax) is a species of dogfish shark in the family Etmopteridae . One of the most common deepwater sharks in the northeastern Atlantic Ocean , the velvet belly is found from Iceland and Norway to Gabon and South Africa at a depth of 20 ? 2 @,@ 490 m (66 ? 8 @,@ 169 ft) . A small shark generally no more than 45 cm (18 in) long , the velvet belly is so named because its black underside is abruptly distinct from the brown coloration on the rest of its body . The body of this species is fairly stout , with a moderately long snout and tail , and very small gill slits . Like other lanternsharks , the velvet belly is bioluminescent , with light @-@ emitting photophores forming a species @-@ specific pattern over its flanks and abdomen . These photophores are thought to function in counter @-@ illumination , which camouflages the shark against predators . They may also play a role in social interactions .

Young velvet bellies feed mainly on krill and small bony fish , transitioning to squid and shrimp as they grow larger . There is evidence that individuals also move into deeper water as they age . This species exhibits a number of adaptations to living in the deep sea , such as specialized T @-@ cells and liver proteins for dealing with the higher concentrations of heavy metals found there . Velvet bellies often carry a heavy parasite load . It is ovoviviparous , giving birth to litters of six to 20 young every two to three years . This species has virtually no commercial value , but large numbers are caught as bycatch in deepwater commercial fisheries . Although it has been assessed as of Least Concern by the International Union for Conservation of Nature , the heavy fishing pressure throughout its range and its slow reproductive rate are raising conservation concerns .

= = Taxonomy = =

The velvet belly was originally described as Squalus spinax by Swedish natural historian Carl Linnaeus , known as the " father of taxonomy " , in the 1758 tenth edition of Systema Naturae . He did not designate a type specimen ; the specific epithet spinax is in reference to the spiny dorsal fins . This species was later moved to the genus Etmopterus via the synonymy of Constantine Samuel Rafinesque 's Etmopterus aculeatus with Squalus spinax .

The velvet belly is grouped with the Caribbean lanternshark (E. hillianus) , fringefin lanternshark (E. schultzi) , brown lanternshark (E. unicolor) , broadbanded lanternshark (E. gracilispinis) , combtooth lanternshark (E. decacuspidatus) , and dwarf lanternshark (E. perryi) in having irregularly arranged , needle @-@ shaped dermal denticles . Its common name comes from this shark 's black ventral surface , which is sharply delineated from the rest of its body like a patch of velvet .

= = Distribution and habitat = =

The range of the velvet belly is in the eastern Atlantic , extending from Iceland and Norway to Gabon , including the Mediterranean Sea , the Azores , the Canary Islands , and Cape Verde . It has also been reported off Cape Province , South Africa . This shark mainly inhabits the outer continental and insular shelves and upper slopes over mud or clay , from close to the bottom to the middle of the water column . It is most common at a depth of 200 ? 500 m (660 ? 1 @,@ 640 ft) , though in the Rockall Trough , it is only found at a depth of 500 ? 750 m (1 @,@ 640 ? 2 @,@ 460 ft) . This species has been reported from as shallow as 20 m (66 ft) , and as deep as 2 @,@ 490 m (8 @,@ 170 ft) .

= = Description = =

The velvet belly is a robustly built shark with a moderately long , broad , flattened snout . The mouth has thin , smooth lips . The upper teeth are small , with a narrow central cusp and usually fewer than three pairs of lateral cusplets . The lower teeth are much larger , with a strongly slanted , blade @-@ like cusp at the top and interlocking bases . The five pairs of gill slits are tiny , comparable in

size to the spiracles . Both dorsal fins bear stout , grooved spines at the front , with the second much longer than the first and curved . The first dorsal fin originates behind the short and rounded pectoral fins ; the second dorsal fin is twice the size of the first and originates behind the pelvic fins . The anal fin is absent . The tail is slender , leading to a long caudal fin with a small lower lobe and a low upper lobe with a prominent ventral notch near the tip .

The dermal denticles are thin with hooked tips , arranged without a regular pattern well @-@ separated from one another . The coloration is brown above , abruptly transitioning to black below . There are thin black marks above and behind the pelvic fins , and along the caudal fin . The velvet belly possesses numerous photophores that emit a blue @-@ green light visible from 3 ? 4 m (9 @.@ 8 ? 13 @.@ 1 ft) away . Varying densities of photophores are arranged in nine patches on the shark 's sides and belly , creating a pattern unique to this species : photophores are present along the lateral line , scattered beneath the head but excluding the mouth , evenly on the belly , and concentrated around the pectoral fins and beneath the caudal peduncle . The maximum reported length is 60 cm (24 in) , although few are longer than 45 cm (18 in) . Females are larger than males .

= = Biology and ecology = =

Along with the blackmouth catshark (Galeus melastomus) and the Portuguese dogfish (Centroscymnus coelolepis) , the velvet belly is one of the most abundant deep @-@ sea sharks in the northeastern Atlantic . It is found individually or in small shoals . Samplings in the Mediterranean have found females outnumbering males across all ages ; this imbalance increases in the older age classes . In the Rockall Trough and the Catalan Sea , large adults are found in deeper waters than juveniles , which may serve to reduce competition between the two groups . However , this pattern has not been observed at other sites in the eastern Mediterranean .

The velvet belly 's liver accounts for 17 % of its body mass , three @-@ quarters of which is oil , making it nearly neutrally buoyant . To deal with the higher concentrations of heavy metals in the deep sea , the velvet belly has T @-@ cells in its bloodstream that can identify and mark toxic compounds for elimination . These T @-@ cells are produced by a lymphomyeloid gland in its esophagus called a " Leydig 's organ " , which is also found in some other sharks and rays . In its liver , specialized proteins are also capable of detoxifying cadmium , copper , mercury , zinc , and other toxic contaminants . The velvet belly 's bioluminescence is thought to function in counter @-@ illumination , which eliminates the shark 's silhouette and camouflages it from upward @-@ looking predators . Its bioluminescence may also serve a social function , such as finding mates or co @-@ ordinating groups , as the pattern is species @-@ specific . The velvet belly is an important food of larger fishes such as other sharks ; a major predator of this species is the longnosed skate (Dipturus oxyrinchus) .

Numerous parasites are known for this species , and both juveniles and adults often carry heavy parasite loads . Known internal parasites include the monogenean Squalonchocotyle spinacis , the tapeworms Aporhynchus norvegicus , Lacistorhynchus tenuis , and Phyllobothrium squali , and the nematodes Anisakis simplex and Hysterothylacium aduncum . Some of these parasites use the velvet belly 's prey as intermediate hosts and are acquired via ingestion , while others use the shark itself as an intermediate host . The barnacle Anelasma squalicola , an external parasite , attaches to the shark 's dorsal spine socket and penetrates deeply into the muscle , in the process often providing an attachment site for a second (and rarely a third) barnacle . Infestation by this barnacle reduces its host 's fecundity by impairing the development of the reproductive organs .

= = = Feeding = = =

As generalist predators , velvet bellies feed on crustaceans (e.g. pasiphaeid shrimp and krill) , cephalopods (e.g. ommastrephid squid and sepiolids) , and bony fishes (e.g. shads , barracudinas , lanternfishes , and pouts) . Sharks off Italy also eat small amounts of nematodes , polychaete worms , and other cartilaginous fishes . Studies of velvet bellies off Norway and Portugal , and in the

Rockall Trough , have found small sharks under 27 cm (11 in) long feed mainly on the krill Meganyctiphanes norvegica and the small fish Maurolicus muelleri . As the sharks grow larger , their diets become more varied , consisting mainly of squid and the shrimp Pasiphaea tarda , as well fishes other than M. muelleri . It has been speculated that smaller velvet bellies may be too slow to catch fast @-@ moving cephalopods . The cephalopod diet of adults overlaps with that of the Portuguese dogfish ; the latter species may avoid competition with the velvet belly by living in deeper water . The bite force exerted by the velvet belly is only around 1 N.

= = = Life history = = =

The velvet belly is ovoviviparous , with the embryos hatching inside the uterus and being sustained by a yolk sac . The reproductive cycle may be two to three years long , with ovulation occurring in early autumn , fertilization in the summer (or possibly in the winter if females are capable of storing sperm) , and parturition in late winter or early spring . The gestation period is under one year . The litter size is six to 20 , with the number of young increasing with female size . At birth , the young measure 12 ? 14 cm (4 @.@ 7 ? 5 @.@ 5 in) long . The shark 's bioluminescence develops before birth ; the yolk sac is fluorescent before any photophores have formed , suggesting the mother transfers luminescent materials to her offspring . The first luminous tissue appears when the embryo is 55 mm (2 @.@ 2 in) long , and the complete pattern is laid down by the time it is 95 mm (3 @.@ 7 in) long . At birth , the young shark is already capable of counter @-@ illumination with 80 % of its ventral surface luminescent .

The growth rate of the velvet belly is slow , though faster than some other deep @-@ sea sharks , such as the leafscale gulper shark (Centrophorus squamosus) or the shortspine spurdog (Squalus mitsukurii) . Males mature sexually at 28 ? 33 cm (11 ? 13 in) long and females at 34 ? 36 cm (13 ? 14 in) long . The average age at maturity is 4 @.@ 0 years for males and 4 @.@ 7 years for females , though four @-@ year @-@ old mature individuals of both sexes have been caught in the wild , along with immature females over eight years old . Males and females eight and 11 years old , respectively , have been caught in the wild ; the potential lifespan of this species has been estimated at 18 years for males and 22 years for females .

= = Human interactions = =

Throughout their range , substantial quantities of velvet bellies are caught as bycatch in bottom trawls meant for shrimp and lobsters , and deepwater longlines meant for other fish . Lacking commercial value , these sharks are almost always discarded with extremely high mortality , though occasionally they are dried and salted or made into fishmeal . The IUCN has listed the velvet belly under Least Concern overall , as its population remains stable across much of its range , and it is afforded some protection in the Mediterranean from a 2005 ban on bottom trawling below 1 @,@ 000 m (3 @,@ 300 ft) . However , in the northeastern Atlantic it has been assessed as Near Threatened , as its numbers have declined by almost 20 % from 1970 to 1998 ? 2004 . The slow reproductive rate of this species limits its capacity to recover from population depletion .