(i) **I b** : when the organism is able to make its own light

(ii) **E b** : when the light is made by symbiotic bacteria. Bioluminescence is the creation of a spontaneous exergonic chemical reaction involving the oxidation of a Lucifer in catalyzed by a luciferase which produces a transitory excited state that nally relaxes by producing a photon with oxyluciferin as the nal product [2].

Luminous capability is mainly seen in speci c types of bacterium, cnidarians, echinoderms, and sh and o en exists in from coastal, shallow waters to the deep abyss. Luminous creatures found in the 200-1000 m depth in mesopelagic zone. Luminous systems have either separate components of luciferase and Lucifer in or a composite molecule called “photo protein” that contains a peroxidase Lucifer in and a luciferase activity. Luciferins are found across a wide range of taxa, whereas luciferases are assumed to be species-speci c.

Despite the fact that studies of shark luminescence have been documented for over two centuries shark luminescence research has, with detailed phylogenetical, ecological, and physiological studies now available for numerous species, this article is providing view of shark luminescence [3,4].

D D S a B S a : In cartilaginous shes, only sharks have evolved the ability to emit light. Bioluminescence in sharks appears restricted to Squaliformes, for now, only these three families *Dalatiidae, Somniosidae,* and *Etmopteridae* have luminescent ability .Indeed, although bioluminescence has once been suggested for the speci c supralabial white band of the mega mouth shark, Megachasma pelagios, but this is a form of symbiosis relation-ship and cannot be true bioluminescence.

Fossil studies estimate the *Etmopteridae* are evolved around 90

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and *Etmopteru*
Isistius, Mollis
and *Heteroscym*
shark known
luminescence h

Capacity fo
granulosus), th
smooth lanter
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(*Etmopterus lu*
the taillight sh
(*Dalatias licha*)
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Even though, shark photophores are mostly situated on the ventral surface area 16 and produce a light that has a color (wavelength) that is alike to that found in coastal. Even though, shark photophores are mostly situated on the ventral surface area (Figure 1) and produce a light that has a color (wavelength) that is alike to that found in coastal which are blue-green and oceanic blue environments (Table 1).

Some etmopterid species living in the same deep environment have greater swimming speeds and muscular enzymatic processes than their non-luminous cousins, according to studies [10, 11]. *Somniosidae and Dalatiidae* produce "simple" luminous patterns on the ventral surface of etmopterid sharks, complex luminous photophore aggregations can be seen, as well as on the anks, ns, tail, around the eyes, spiracles, gills and the epidermal tissue covering dorsal spines [12-14] (Figure 2).

Because photophores cover male claspers of all species, luminescence could be employed as a mating aid, allowing males to detect females from afar. Visualize their cloaca and pectoral ns (etmopterid's are brighter) the fourth luminescence function is aposematism, which is a method by which an animal uses warning light patterns to frighten predators away. ey trick the predators by the light patterns to make them think they are poisonous thus saving their life.

Etmopterid sharks (contrary to *dalatiid* and *somniosid* species) have large sharp defensive spines connected with their dorsal ns which also have luminous capability (*E. spinax*) it can occur because of the tissue around the spikes which has photophores acting as a warning sign to predators [15]. Etmopterid and dalatiid sharks show a unique set of physical changes (in the eyes) which is not found in non-

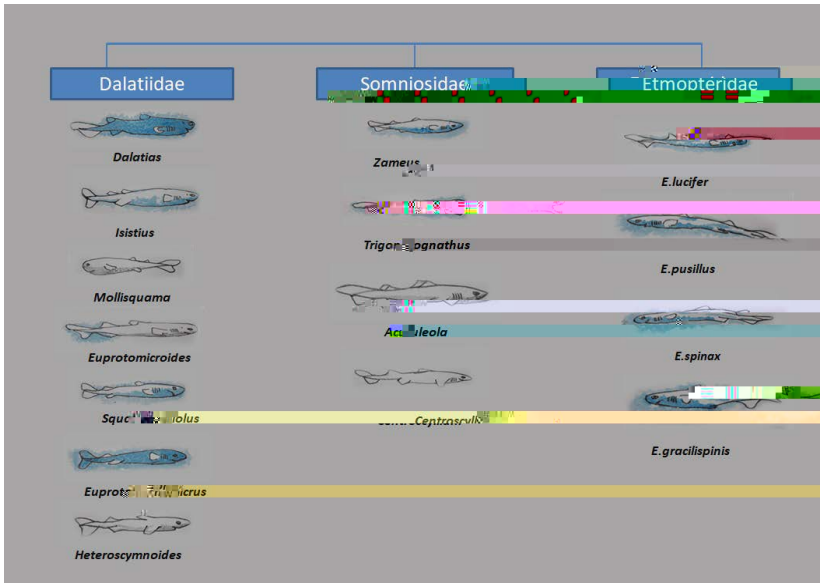

Figure 1: Biolumnicant Shark specis list in *Dalatiidae,somniosidae,Etmopteridae.*

luminous species. It seems that when bioluminescence evolved in these sharks that live in the deep, their eyesight coevolved with the ability to produce light. is may help in better vision in the murky depths and may also help in nding prey a mate each other or maybe even potential predators (Table 1) (Figures 1and 2).

C

Bioluminescent sharks have interested humans for almost two centuries. Research on these elusive deep sea creatures involving spectrophotometry, luminometry, pharmacology, light/electron microscopy, biochemistry, molecular analyses, and transcriptomics began only 2 decades ago. From a key function of camou age in *Dalatiidae*, *Somniosidae*, and *Etmopteridae*, shark bioluminescent patterns steadily became an intra- and interspeci c communication tool in found etmopterid sharks.

It clearly appears that the future of shark bioluminescence research will also be driven by new molecular data and techniques. ese studies paved the way for future transcriptomic, proteomic, and genomic studies on luminous sharks. Among an in nite number of fascinating questions, these studies could focus on the identi cation of the light-emitting molecular toolkit (luciferase, photoprotein, etc.) in luminous sharks.

Even though recent research allowed us to understand a clear