

Aetobatus narinari (Spotted Eagle Ray)

Family: Myliobatidae (Eagle and Manta Rays)

Order: Rajiiformes (Rays and Sawfish)

Class: Chondrichthyes (Cartilaginous Fish)

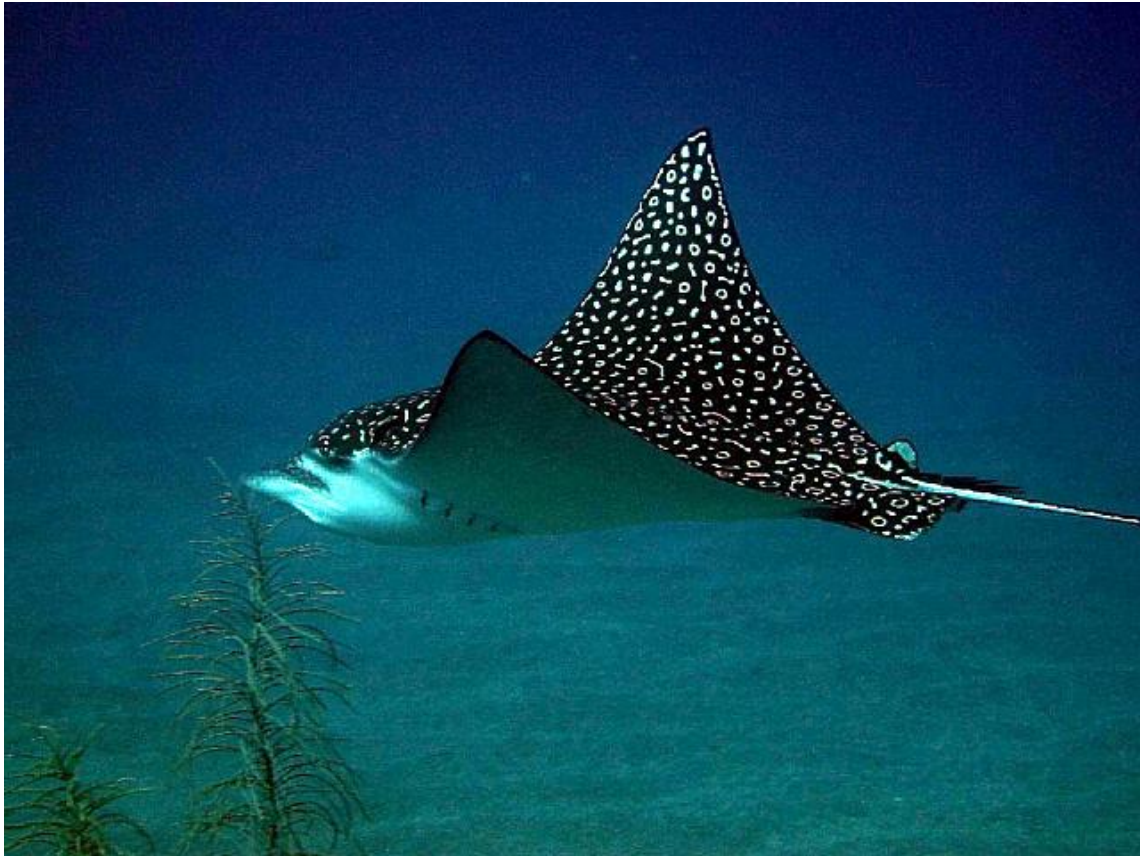


Fig 1. Spotted eagle ray, *Aetobatus narinari*.

[<http://www.montalegre-do-cercal.info/gallery/var/resizes/Tiere/Fische/Batoidea/Aetobatus/Aetobatus%20narinari.jpg?m=1307089433>, downloaded 12 November 2012]

TRAITS. *Aetobatus narinari* are easily identifiable by the numerous white spots and rings against their dark blue or black body, and bright white underside. They have large, pointed fins that allow them to swim, making them look as though they are flying underwater. These rays can grow up to 9 m in length and 3-4 m in width (MarineBio 2012). The spotted eagle ray has a large head, and its nose is elongated, resembling that of a duck's bill (MarineBio 2012). They have very sharply serrated tails that measure 60-78 cm in length, with approximately 110 serrations, and contain venom, which are used in defense (Schwartz 2007). The eagle rays have several rows of specialized (plate-like) teeth within their large mandibles (Silliman n.d.). Sexual dimorphism exists, where the females are slightly larger than the males (Schluessel 2009). *Aetobatus narinari* are a long-living species, and take long to mature (Schluessel 2009).

ECOLOGY. *Aetobatus narinari* dwells in the warmer waters of the Atlantic and Pacific Oceans. Unlike those benthic ray species, the eagle rays are pelagic, and swim in open water (Schwartz 2007). They can be seen swimming in large schools (Cuevas-Zimbron 2011) and are highly associated with coral reefs (Richards 2009). They contribute significant amounts of energy in the marine food web, from consuming benthic organisms, and they themselves being preyed on by hammerhead sharks, lemon sharks, tiger sharks and bull sharks (Silliman n.d.).

FORAGING AND FEEDING BEHAVIOUR. The *Aetobatus narinari* diet consists of various gastropods, bivalves, crustaceans and their main food of choice – the queen conch (Silliman n.d.). Their preference for these food items tends to change through development – bivalves are preferred in the earlier life stages while crustaceans are preferred in the later life stages as the rays increase in size (Schluessel 2009). *Aetobatus narinari* can be seen nearer the intertidal zones twice daily, where they forage for food, therefore suggesting that their foraging behaviour is closely linked to the oceanic tides. They usually forage at high tide, swimming slowly in circles while looking for prey (Silliman n.d.). The rays use their long, bill-like snouts to dig into the sediment, actively eliminating sediment particles through their gills (Silliman n.d.). The rays use their powerful mandibles and specialized rows of teeth to crush the shells of their prey (Jory n.d.).

SOCIAL ORGANIZATION. *Aetobatus narinari* usually swim in schools of up to 50 individuals (Fig 2.) These schools include both male and female rays of all different sizes (Silliman n.d.). In deeper waters, the Rays are loosely aggregated, and individuals occasionally swim in and out of the group, interacting with the other members of the group, and this usually occurs at low tide, when the rays are in their resting period (Silliman n.d.). Larger schools of the spotted eagle rays may swim together at the same speeds and orientation in the deeper waters (Silliman n.d.). The rays tend to form any one of three schooling patterns at a time. They may create one single line, meeting head-to-tail while swimming; or line up horizontally, meeting fin-to-fin; or form a large diamond-shape school (typical of larger groups).

ACTIVITY. At low tide, *Aetobatus narinari* stay in one general area (home range) where they will rest (Silliman n.d.). As the low tide approaches, the eagle rays go back to their home ranges to rest. They typically return to the same general areas over and over again at each high tide, as well as each low tide (Silliman n.d.) While swimming in the open water, *Aetobatus narinari* exhibit different swimming patterns. While swimming in large schools, the rays may show behaviour known as “pelvic thrusts”, in which each individual ray swims upward into a vertical position, then quickly resumes normal swimming behaviour (Silliman n.d.). Another type of swimming behaviour includes deep “dips”, in which the rays each make a sharp diversion downward, then swimming back up to their previous position (Silliman n.d.). One other type of swimming behaviour exhibited by the spotted eagle ray is above-water “jumps”, in which the rays jump out of the water, above the surface, either vertically or at a 45-degree angle, then falling back into the water (Silliman n.d.). These different swimming behaviours would fall under the category of “events” as these behaviours occur 4 to 5 consecutive times at different intervals.

SEXUAL BEHAVIOUR. Fertilization takes place internally, therefore the *Aetobatus narinari* reproduces sexually. The mating behaviour of rays in general are very similar in different

species, including abdomen-to-abdomen copulation (Yano 1999). Typically, the male ray (slightly smaller in size) chases the female ray (larger in size). The female is chased for a period of about 30 minutes, then the male uses his teeth to grasp the fin of the female in order to position itself under the female for copulation (Yano 1999). The male attempts this multiple times until the female accepts and allows the male to swim under. The male then inserts the clasper into the female's cloaca for about 60-90 seconds (Yano 1999), and then releases his hold on the female's fin and releases her after copulation (Yano 1999). Mating wounds (from biting) are left on the fins of the female, concentrating on the posterior fins (Kajiura 2000). The gestation period of the spotted eagle ray is highly temperature-dependant (Mahon 2004). Each individual female can produce between 1-4 pups per year (Cuevas-Zimbron 2011).

ANTI-PREDATOR BEHAVIOUR. When *Aetobatus narinari* are approached by a predator, or it feels threatened by a nearby organism, it moves its whip-like tail in the direction of the organism (Thomas 1997). The serrated tail is inserted into the predator, where the venom is released into the organism. The nature of the ray's venom is one of heat-sensitive protein, which directly affects the cardiac muscle (Thomas 1997). The venom can cause the victim to feel immense pain, and sometimes lead to paralysis of the victim (Thomas 1997). On occasion, part of the ray's tail or skin breaks off and is left in the wound of the victim (Thomas 1997). The barbs on the ray's tail are bent backward so that upon pulling the tail out of the wound, the serrations on the ray's tail tears tissue and flesh, further damaging the victim (Thomas 1997). This stabbing action itself may immediately kill the victim, or severely injure the victim, but if the wound is beyond treatable or too large to heal before infection takes over, the victim will die after a period of time (Thomas 1997).

COMMUNICATION. *Aetobatus narinari* use olfactory systems in communication (Schluessel 2008). They have a well-developed olfactory system (Schluessel 2008), that is used in deep water-communication as chemical signals are able to travel long distances (Schluessel 2008). Olfactory communication is used by *Aetobatus narinari* in activities such as reproduction, feeding and evasion of predators (Schluessel 2008). As their main predators – sharks – use olfactory communication, it can be used for the *Aetobatus narinari* as a signal to flee or hide even when the shark is a good distance away. This allows the successful development of the *Aetobatus narinari* from juvenile to adult (Schluessel 2008). The olfactory organ of the *Aetobatus narinari* is large, and juveniles have the same number of olfactory organs as the adult, therefore the olfactory system plays a significant role in protection of both juveniles and adults from predators (Schluessel 2008).

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Fig 2. School of *Aetobatus narinari*.

[http://images.nationalgeographic.com/wpf/media-live/photos/000/178/cache/rays01-spotted-eagle-ray_17857_600x450.jpg downloaded 13 November 2012]