## Endothermy

Although most fish are exclusively ectothermic, there are exceptions. The only known bony fishes (infraclass Teleostei) that exhibit endothermy are in the suborder Scombroidei – which includes the billfishes, tunas, and the butterfly kingfish, a basal species of mackerel[49] – and also the opah. The opah, a lampriform, was demonstrated in 2015 to utilize "whole-body endothermy", generating heat with its swimming muscles to warm its body while countercurrent exchange (as in respiration) minimizes heat loss.[50] It is able to actively hunt prey such as squid and swim for long distances due to the ability to warm its entire body, including its heart,[51] which is a trait typically found in only mammals and birds (in the form of homeothermy). In the cartilaginous fishes (class Chondrichthyes), sharks of the families Lamnidae (porbeagle, mackerel, salmon, and great white sharks) and Alopiidae (thresher sharks) exhibit endothermy. The degree of endothermy varies from the billfishes, which warm only their eyes and brain, to the bluefin tuna and the porbeagle shark, which maintain body temperatures in excess of 20 °C (68 °F) above ambient water temperatures.[49]

Endothermy, though metabolically costly, is thought to provide advantages such as increased muscle strength, higher rates of central nervous system processing, and higher rates of digestion .