

Adaptations for living on the sea-

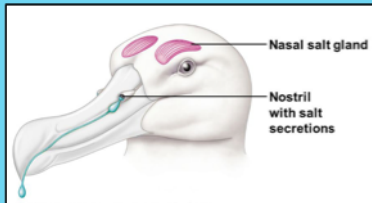
Seabirds have evolved many ways of surviving the challenges of living a life intimately tied to the sea. What adaptations help them find food and cope with excess salts? One group of birds, the **Procellariiformes**, evolved external tubular nasal passages, which describe their collective name “**tubenoses**.” Tubenoses include albatrosses, shearwaters, petrels, and storm-petrels.

All tubenoses have nostrils enclosed in a tube. The shearwaters, petrels (including the northern fulmar), and storm-petrels have one tube on top of the bill. Albatrosses have two tubes, one on each side of the bill. The tubular nostrils may help funnel scents, and tubenoses have an excellent sense of smell, which allows them to easily detect fish, squid, krill, and zooplankton. (Some species also feed on carrion.) Some species are nocturnal, and excellent olfaction is also important in finding nests on crowded nesting colonies.

Tubenoses drink seawater and have specially adapted nasal glands to cope with high salinity (approximately 3.5 percent). The nasal glands pump chloride and sodium ions out of the blood stream into secretions, which exit out of the nostrils and down along the grooves on the bill.



Northern fulmar
(Steve Brad)



Laysan albatross