Combining the differences in collecting area and susceptibility, the flying locusts are thus about 2·4 times as vulnerable to sprays of 4 : 6-dinitro-*o*-cresol solution as are settled ones and about twice as vulnerable to diazinon. The difference is further enhanced when the application of these results to a particular spraying operation is considered, owing to the wind gradient near the ground which effectively reduces the path-length of the settled locusts through the spray and may also reduce their normal equivalent areas. In actual field operations with aircraft, this increased vulnerability is, at times, more than counterbalanced by the low densities of flying swarms with consequent very low kills per gallon of insecticide.

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Microscopic Structure of the Lungs of the Bottlenose Whale

One of the most remarkable structures in the lungs of Cetacea are the sphincters in the respiratory bronchioles. In a number of toothed whales (Odontoceti) the mucosa of these terminal bronchioles shows 8 to 40 consecutive ring-like folds with a circular layer of smooth muscle fibres acting as a sphincter. They may close the passage in the bronchiole completely. They divide the lumen in a number of small consecutive chambers. When the musculature relaxes the passage is re-opened by a system of radially directed elastic fibres, running from the muscular layer to the peripheral layer of cartilage. The sphincters have been described in the common porpoise (*Phocaena phocaena* (L.)), the bottlenose dolphin (*Tursiops truncatus* (Mont.)), the common dolphin (*Delphinus delphis* L.), *Prodelphinus caeruleo-albus* Meyen, the white whale (*Delphinapterus leucas* (Pallas)) and in *Berardius bairdii* Stejneger[1,4–9]. Several authors showed that these sphincters are not present in baleen whales (Mystacoceti)[2,6,7,9]. These animals show a very well-developed mass of muscular fibres in the tips of the alveolar septa. Probably these fibres are able to close the alveoles completely.

Murata[6] found a constriction in a respiratory bronchiole of the sperm whale (*Physeter macrocephalus* L.). This constriction was not found by other authors[2,9], and all agree that the typical system of consecutive sphincters is not present in the sperm whale. This fact suggests that the occurrence of the sphincters is not connected with the systematic position of the animals, but with functional aspects. The dives of whalebone whales and the sperm whale are deep and prolonged, and the animals have a lung capacity of about 50 per cent of that of the terrestrial mammals[3,7]. The other toothed whales do not dive very deep and very long. Their lung capacity is about 150 per cent of that of the land mammals.

To prove the above suggestion we studied the microscopic anatomy of the lungs of the bottlenose whale (*Hyperoodon ampullatus* (Forster)), a toothed whale characterized by deep and prolonged diving which has a very small lung capacity, like the sperm whale. Prof. J. T. Ruud kindly provided us with the lungs of an animal captured at the land station Steinshamn (Norway). The material was not very well preserved, but all essential characteristics could be determined.

As in all other Cetacea the connective tissue of the lungs was highly elastic. There was practically no lymphoid tissue. The bronchial epithelium and the glands contained almost no mucoid cells. These characteristics may be a result of the absence of dust in the aspired air[7]. The septa of the alveoles showed two layers of capillaries and many elastic fibres. As in Mystacoceti the tips of the septa contained a large amount of smooth musculature.

All bronchiæ showed a ciliary epithelium. At their outer side they were surrounded by a layer of irregularly shaped pieces of cartilage. This cartilage was also found in the terminal bronchioles as in all other Cetacea with the exception of *Berardius*[6]. On the inner side of the cartilage there is a layer of elastic connective tissue with a very distinctive plexus of anastomosing arteries. This arterial plexus is found even in the smallest bronchioles. The walls of the vessels are very elastic. *Delphinus* and *Phocaena* possess a venous or a capillary plexus[4,5]. The plexuses may act as shock-absorbers and they may also serve for heating the air.

At the inner side of the plexus is a very well-developed longitudinal layer of smooth musculature, as is the case in the terminal bronchioles. There are, however, no circular folds of the mucosa. Consequently the typical consecutive sphincters are absent in the bottlenose whale.

This phenomenon shows that the sphincters do not occur in animals characterized by deep and prolonged diving and of small lung capacity. They are found only in frequently breathing toothed whales with a large lung capacity. A system of consecutive cocks is used in technical constructions with great differences in pressure at either side of the cock. If the pressure must be regulated by opening the cock now and then, a series of consecutive cocks is preferable to a single one. It is highly probable that the system of sphincters must be considered as an adaptation to fluctuations of the air-pressure in the lungs during quick and frequent diving and emerging, and especially during the violent inspiration and expiration of Cetacea with a very large lung capacity.

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