## Abstract

The lung of the African lungfish Protopterus aethiopicus has been investigated by morphometric techniques. The volume of the lung was strongly correlated with body mass. The exchange tissue made up about 50% of the lung. The intrapulmonary air constituted 73% of the volume of the lung, the rest being made up of the interalveolar septa (22%) and the blood capillaries (5%). The surface area of the blood--gas (tissue) barrier per unit body mass was 14.3 cm$^{2}$ g$^{-1}$ and the harmonic mean thickness of the tissue barrier 0.370 $\mu $m. The total morphometric pulmonary diffusing capacity per unit body mass was 0.0024 ml O$_{2}$ s$^{-1}$ mbar$^{-1}$ kg$^{-1}$ (1 bar = 10$^{5}$ Pa) Of the three existing genera of lungfish, the general structure of the lung of Protopterus was similar to that of Lepidosiren and much unlike that of Neoceratodus. This could be attributed to the fact that both Protopterus and Lepidosiren are obligate air-breathers while Neoceratodus is an obligate water-breather. A comparison of the pulmonary morphometric data on Protopterus with those of the gas exchange apparatus of other groups of vertebrates has been made and pulmonary morphometric and design specializations in the evolution of the air-breathing vertebrates from the lungfishes (some of the initial air-breathers) to reptiles through to birds are apparent