

Bahan Ajar:

1. Respirasi hewan air

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Fisiologi Hwan Air dan Tingkah Laku Ikan (SKS: 3)



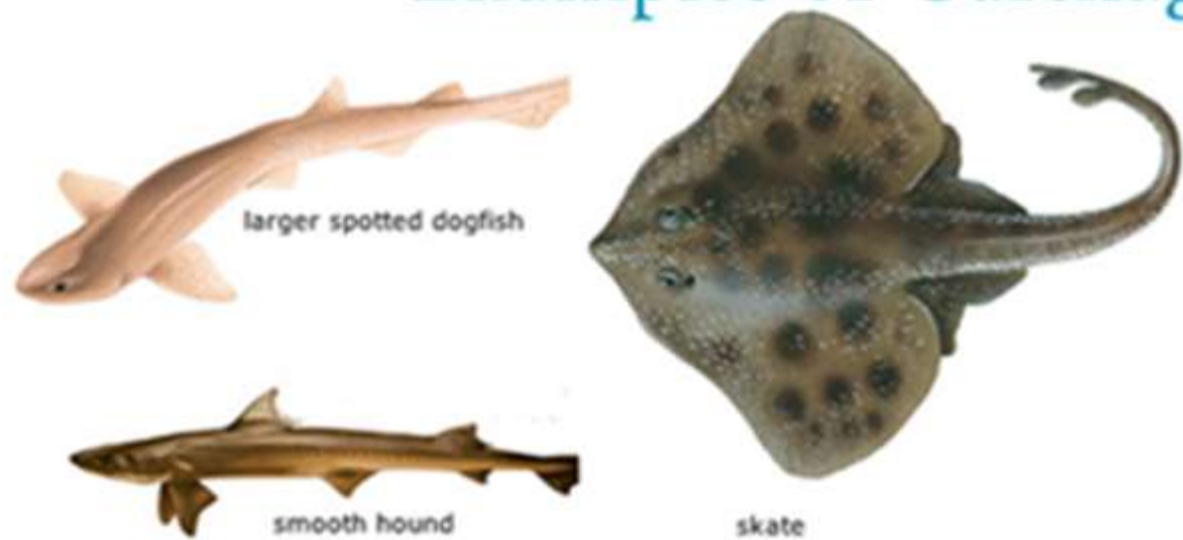
Pendahuluan

- Setiap makhluk hidup membutuhkan oksigen untuk bernapas
- Udara tersebut masuk kedalam tubuh melalui proses respirasi
- Respirasi adalah pergerakan oksigen dari udara ke dalam jaringan, dan transport karbon dioksida ke arah yang berlawanan.

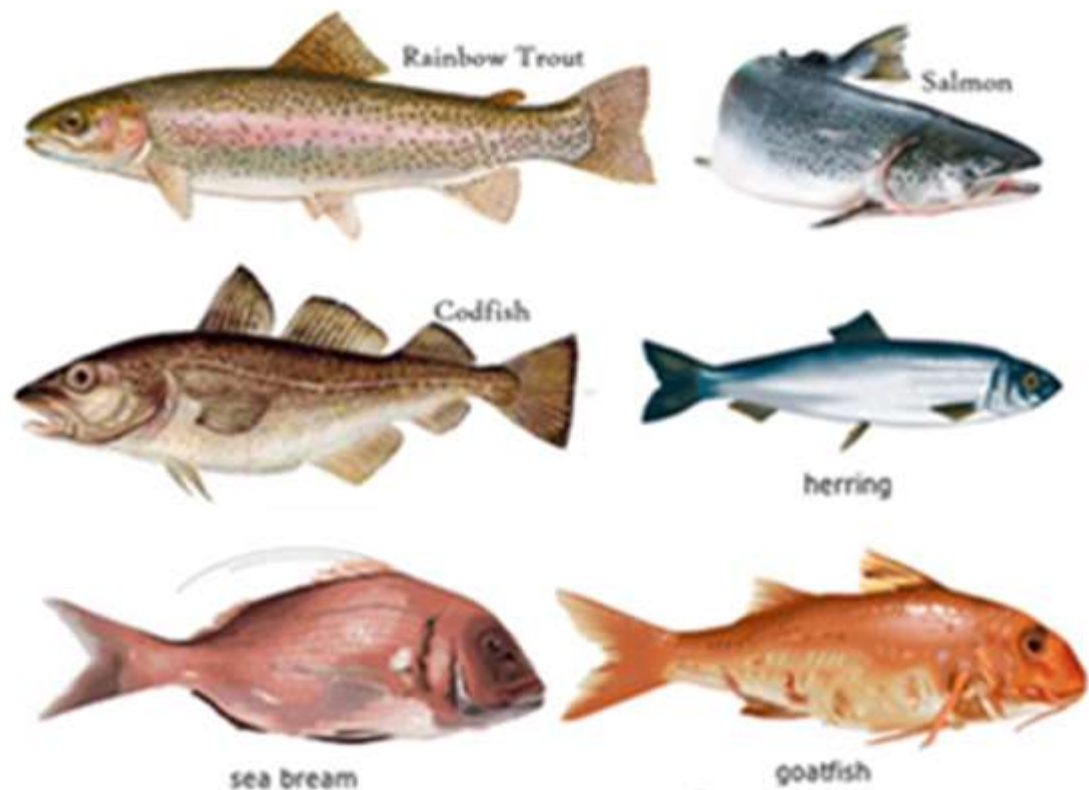
- Pada ikan bertulang sejati (*Osteichthyes*) insangnya dilengkapi dengan tutup insang (operculum), sedangkan pada
- ikan bertulang rawan (*Chondrichthyes*) insangnya tidak mempunyai tutup insang

<https://www.youtube.com/watch?v=XS97HWSPLUQ>

Examples of Cartilaginous and Bony Fishes



Cartilaginous Fishes



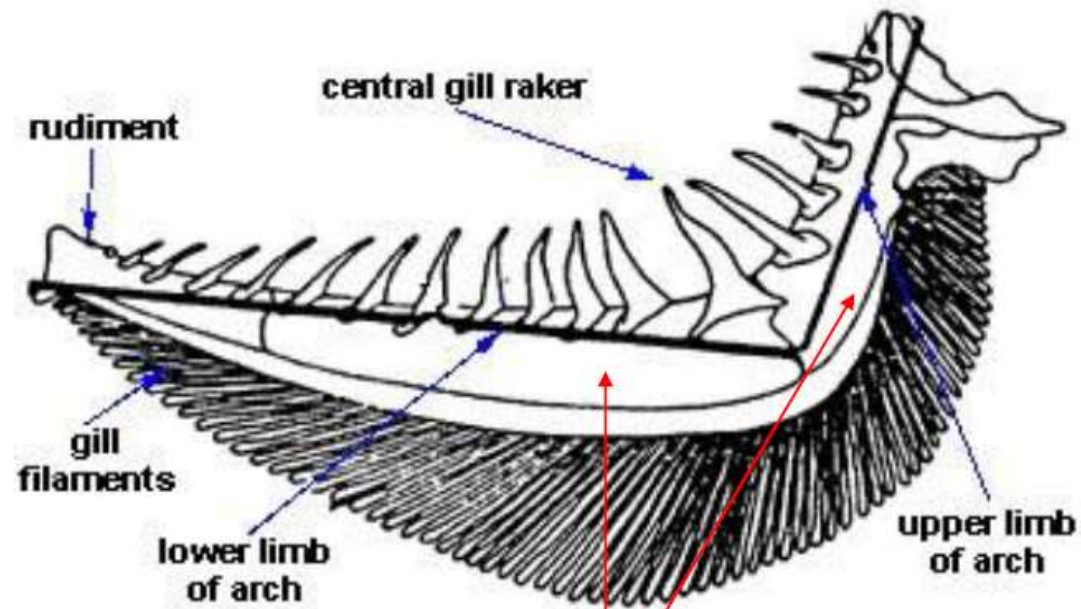
Bony Fishes

Kenyataan

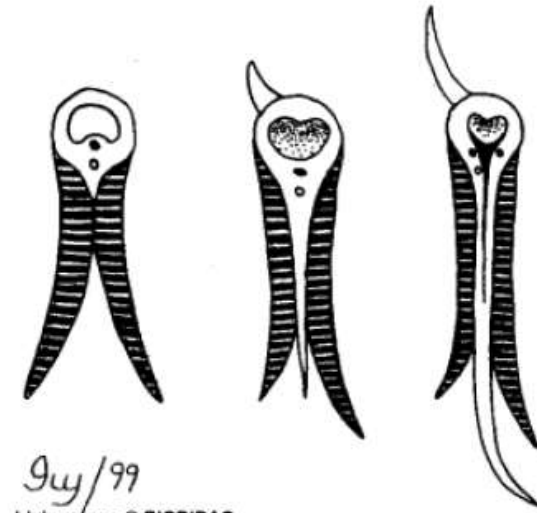
Respiration:

- Oxygen - aquatic vs air
 - a) Water 1% O₂ vs. Air 21%
- Water 800x dense and 50x more viscous;
 - a) energetically more difficult to move and breath (fish 10% energy to breath vs. 1-2% terrestrial)

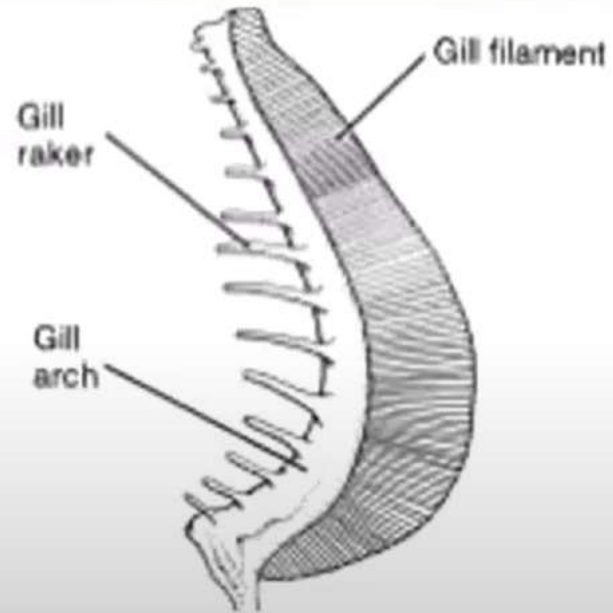
Bagian-bagian insang



Name those bones?
Hint: H-C-E-P Branchials

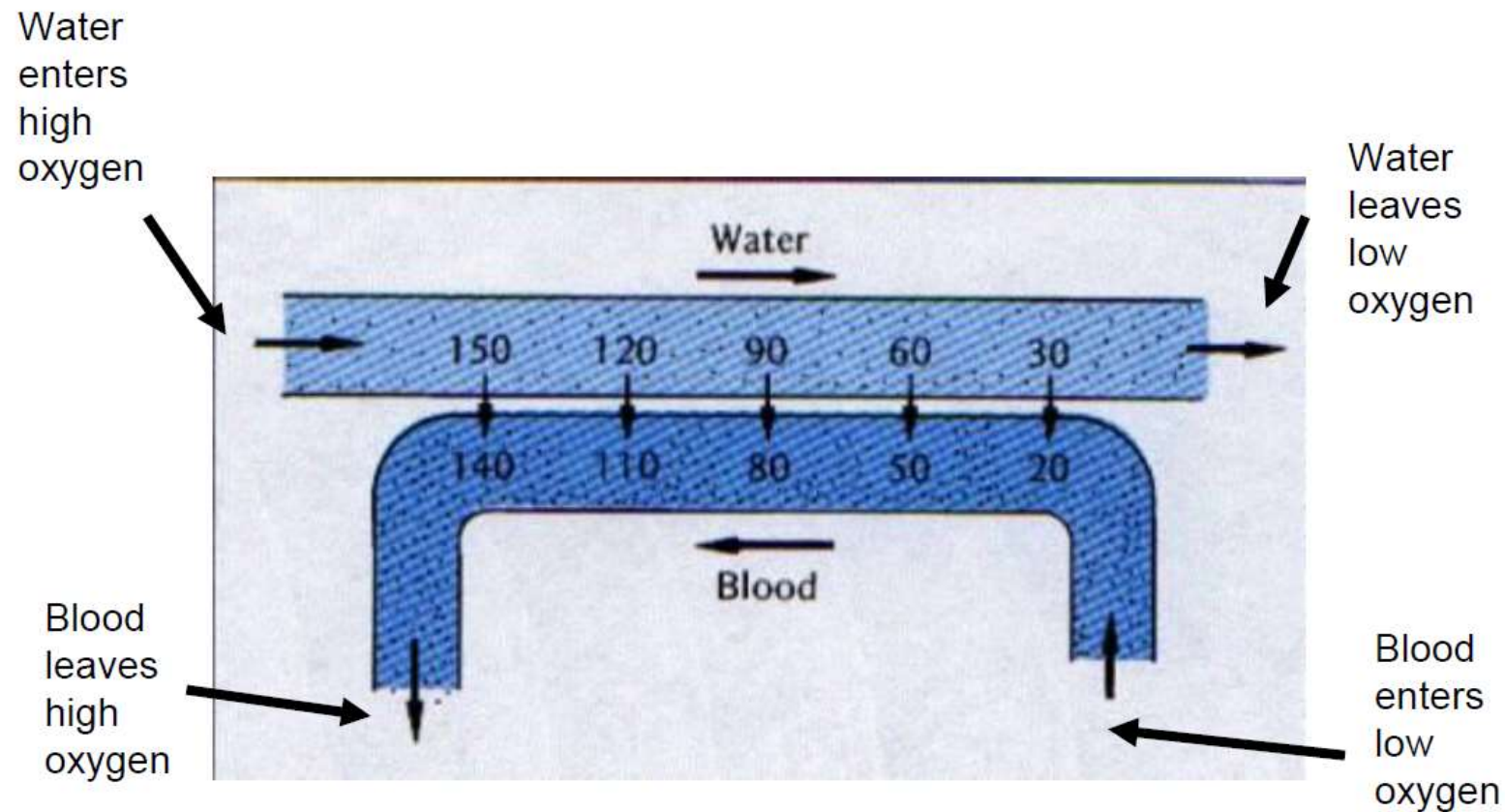


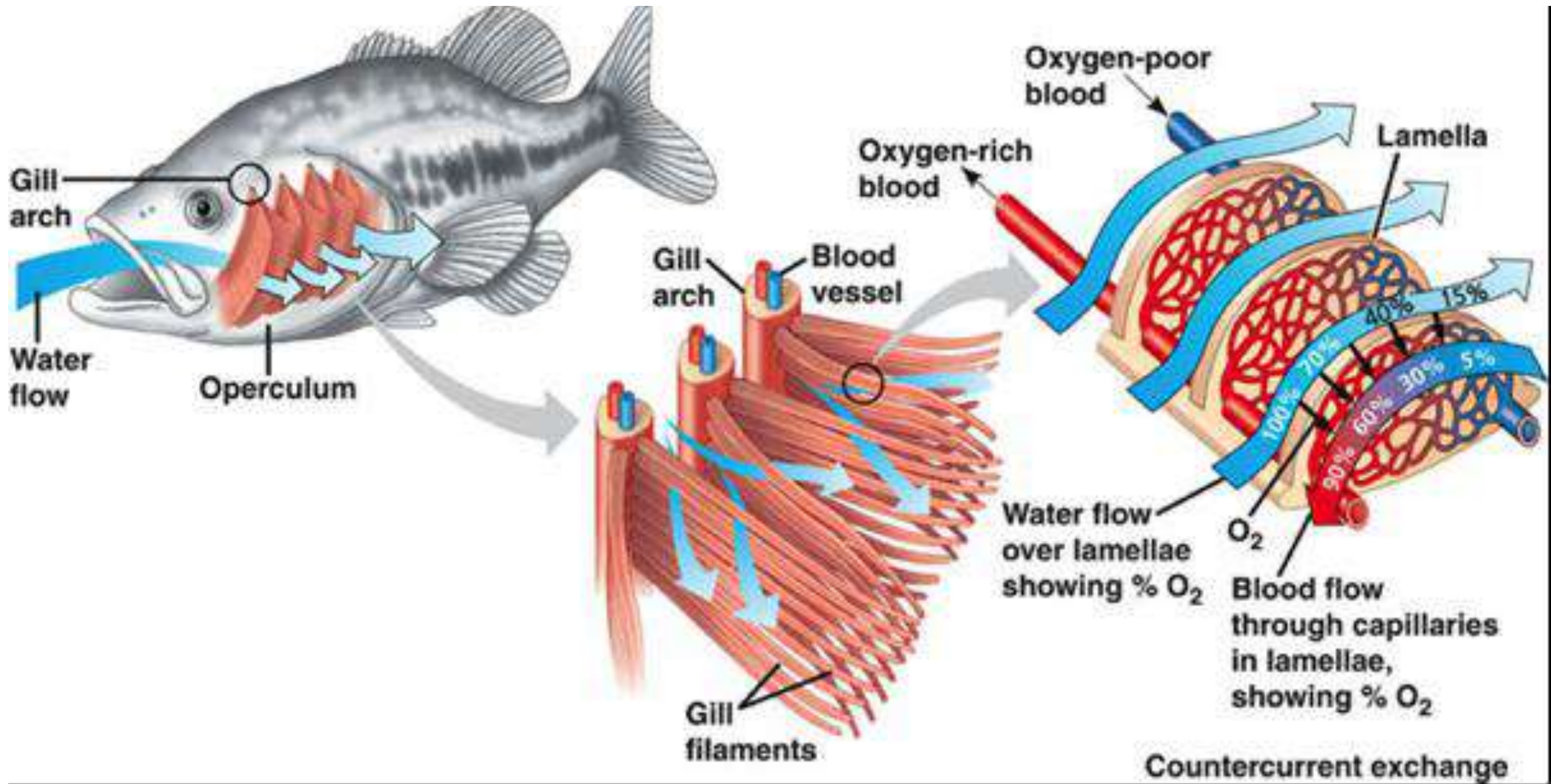
Shark, Chimera, Bony Fish

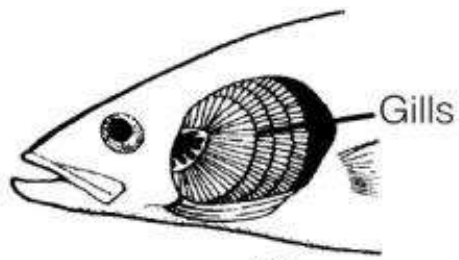


- Gill Arch – provides support
- Gill Filaments – gas exchange
- Gill Rakers – trap food, *helpful during filter feeding*

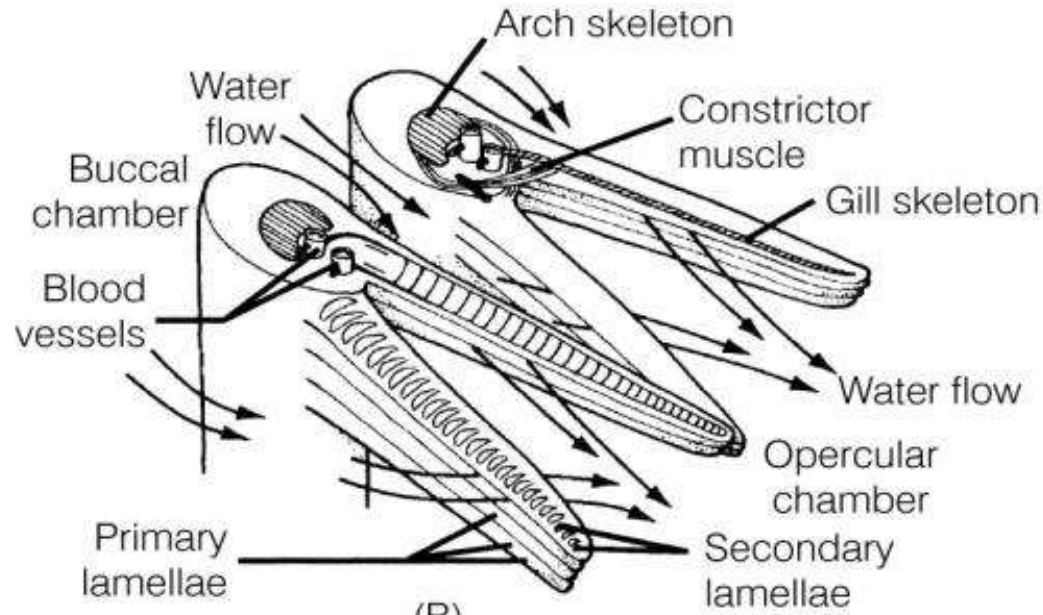
Counter Current Exchange System: darah dan air mengalir berlawanan



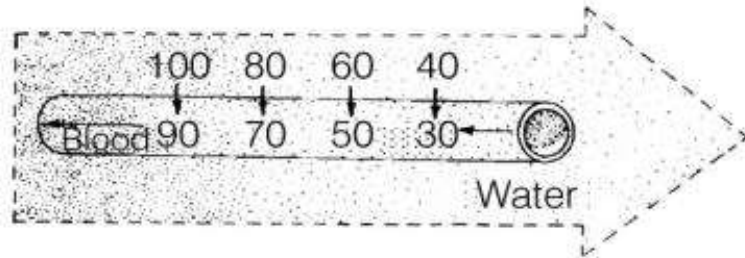




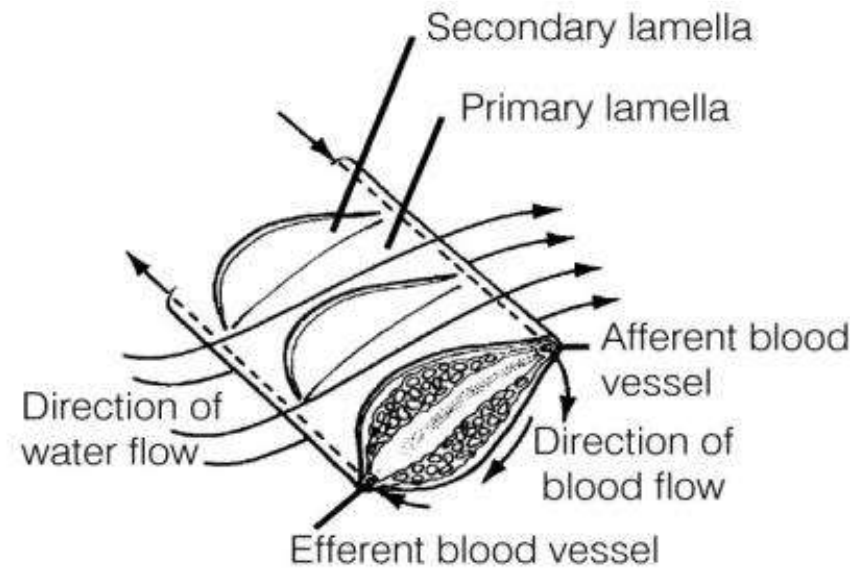
(A)



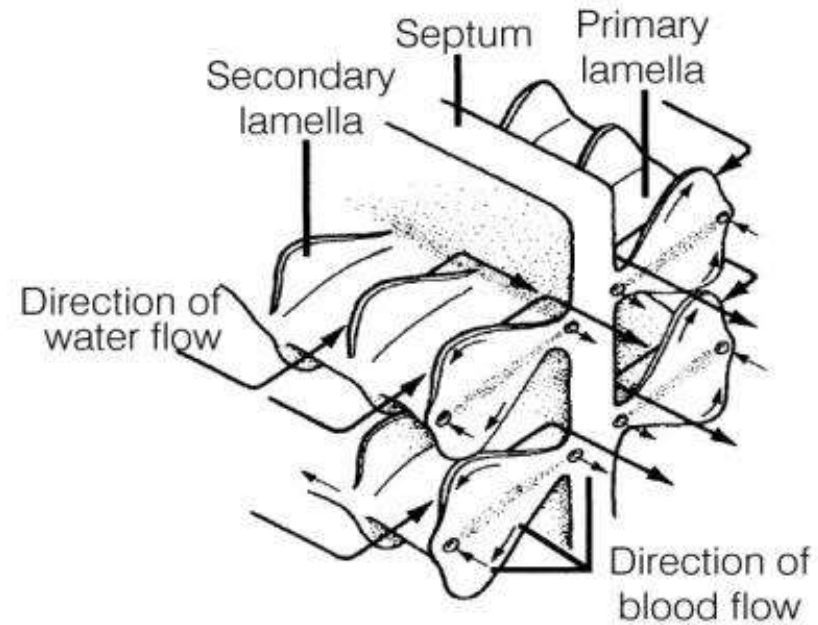
(B)



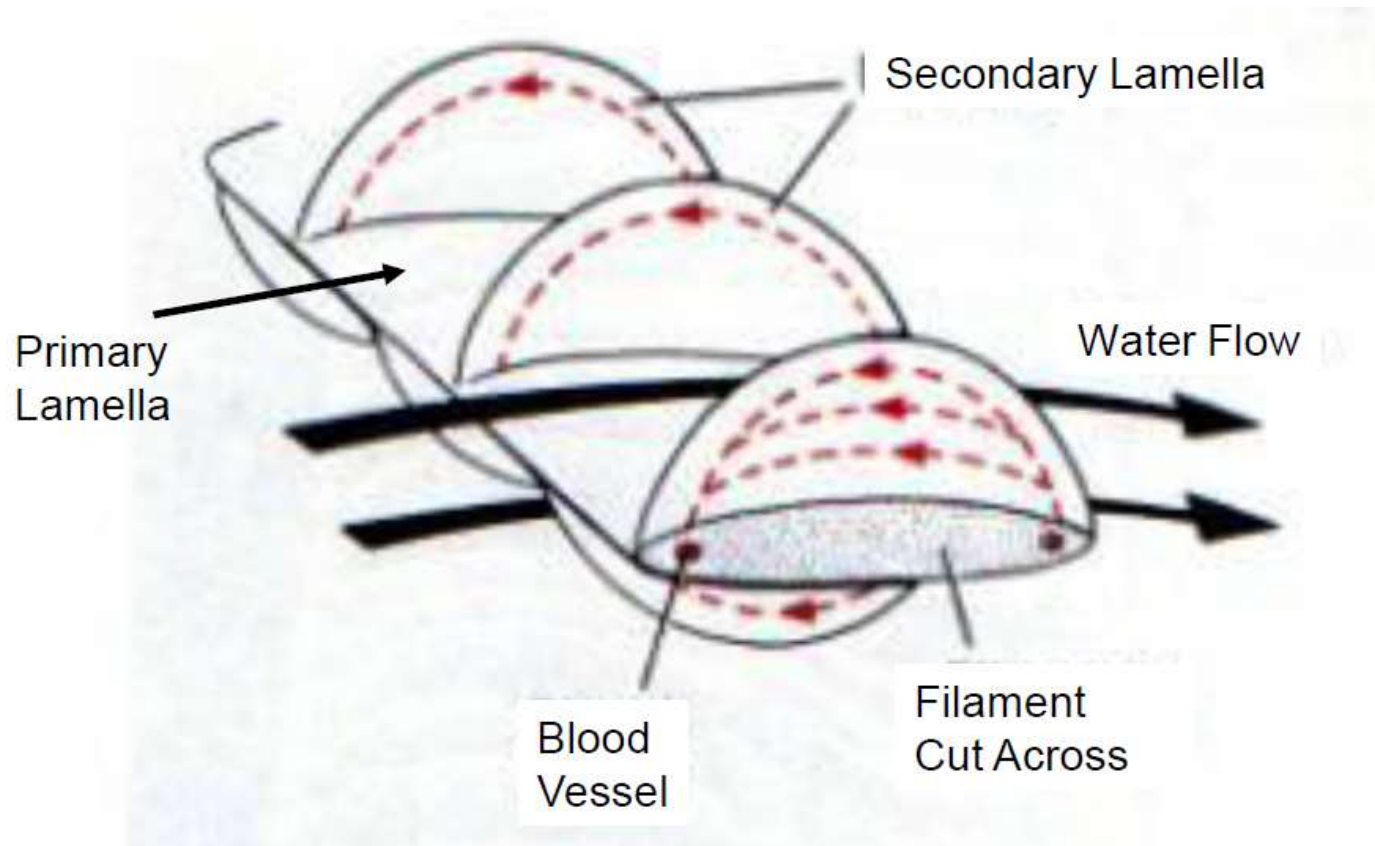
(E)



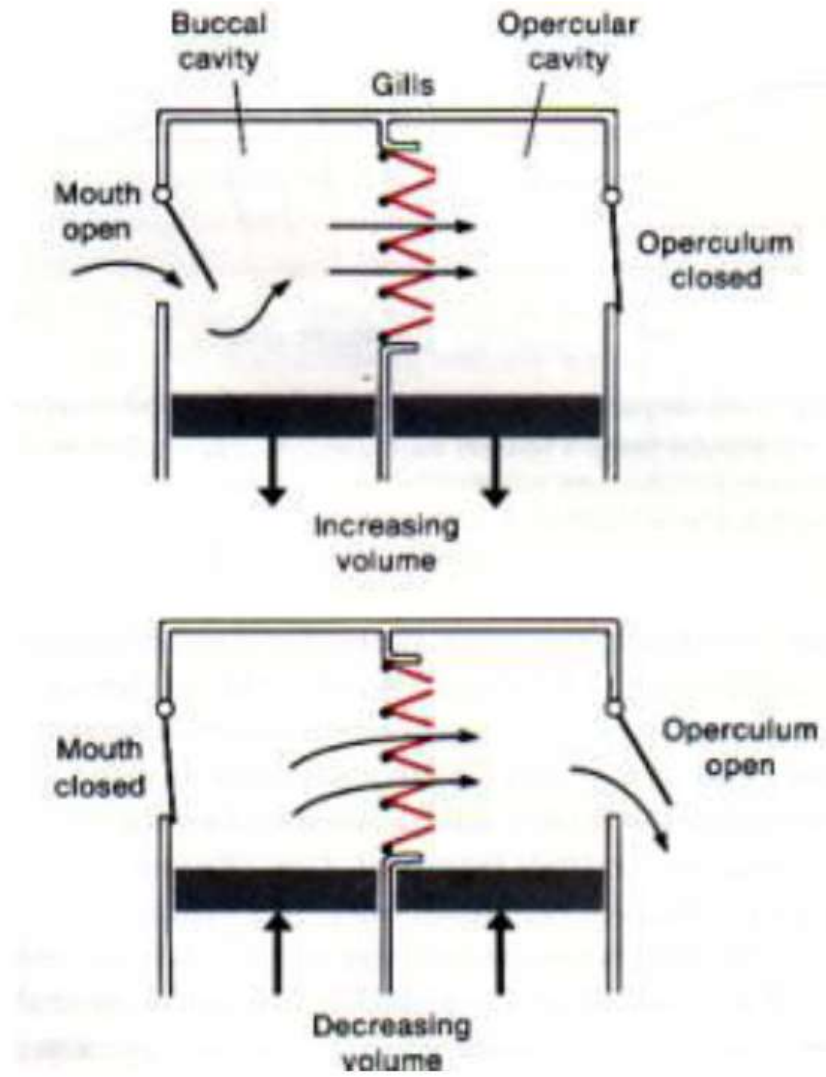
(C)

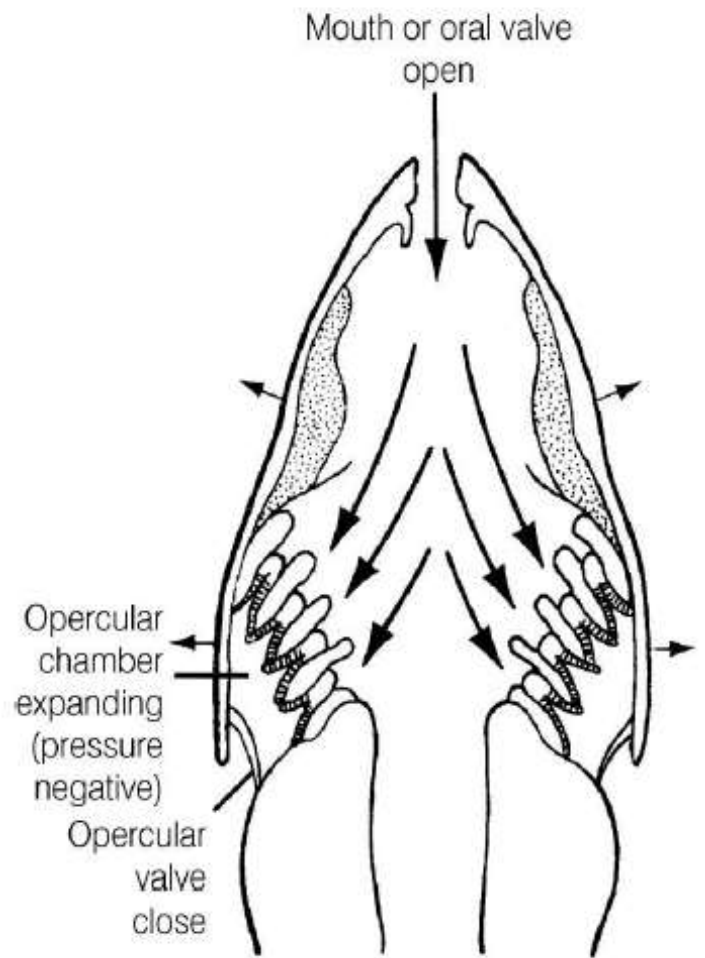


(D)

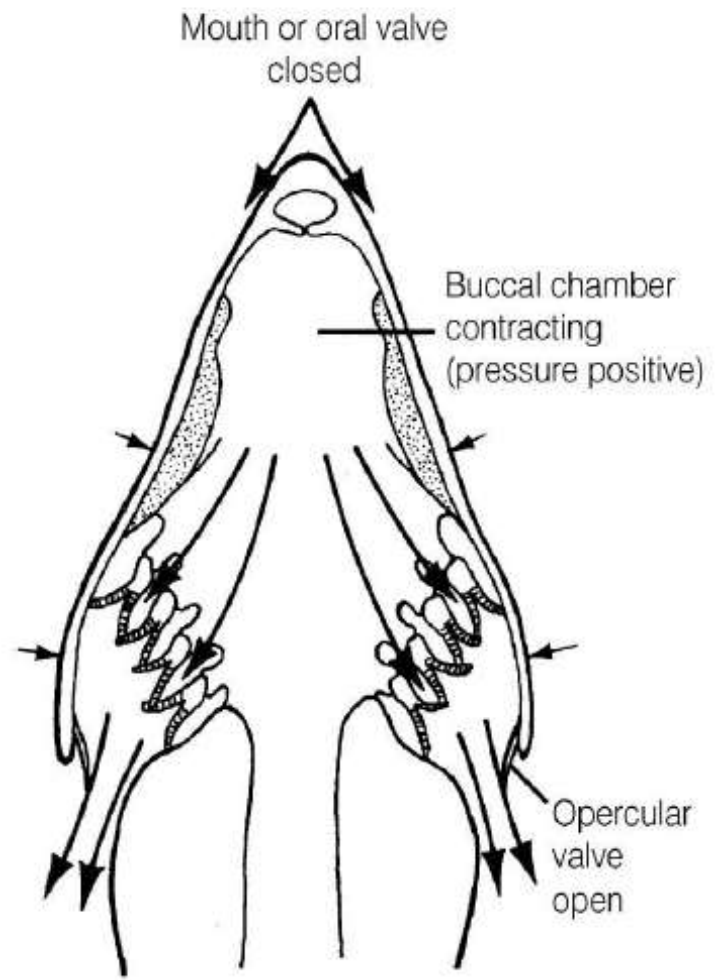


Perlu asupan oksigen secara terus menerus

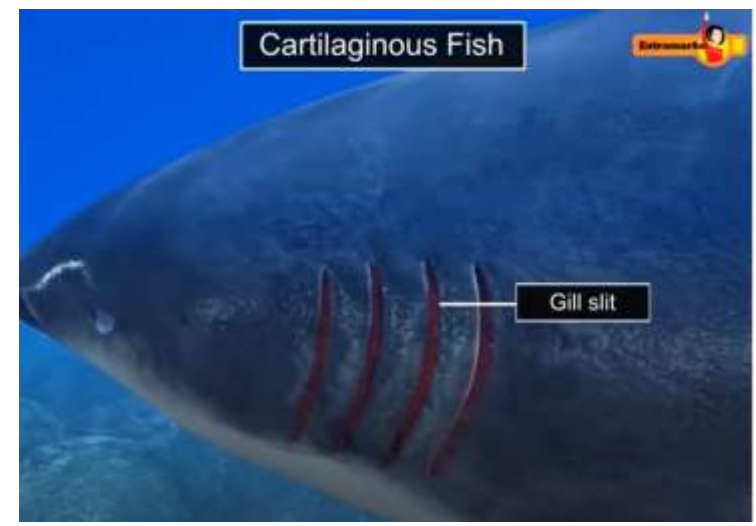




Suction pump phase

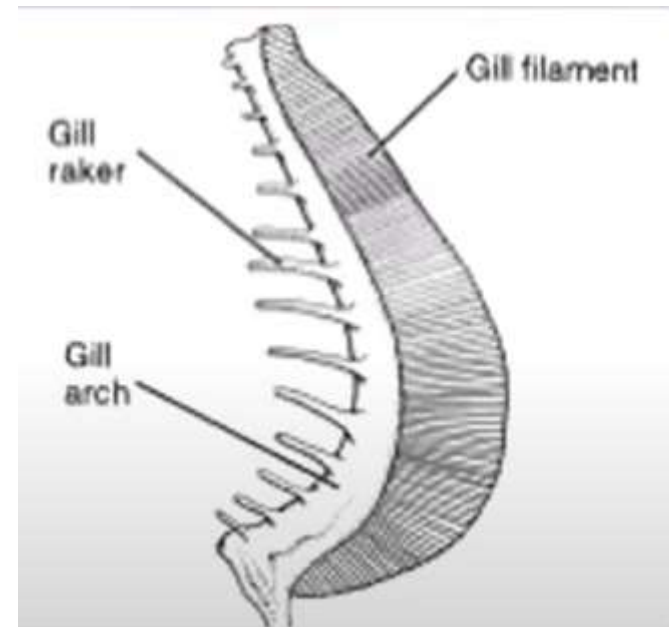


Pressure pump phase



Hal menarik: kenapa ikan tidak dapat bertahan di luar air

- Sistem insang pada kebanyakan ikan dirancang untuk bernafas mengambil oksigen terlarut dalam air
- Gill arch mengalami kerusakan (kolaps), sehingga tidak ada lagi pertukaran gas



Air Breathing Fish (See Table 5.1)

Organ used for respiration in air	Fish	Habitat	Comment
Gills	<i>Synbranchus</i>	South America, fresh water	An eel-shaped fish without any common English name
Skin	<i>Anguilla</i>	North America, Europe	The common eel; breeds in the sea; larva migrates to fresh water
Skin	<i>Periophthalmus</i>	Tropical estuarine beaches	A common fish, often called mud skipper
Mouth and opercular cavities	✚ <i>Electrophorus</i>	South America, fresh water	The electric eel
Mouth and opercular cavities	<i>Anabas</i>	Southeast Asia, fresh water	Called climbing perch, but not really a perch; related to betta, the Siamese fighting fish
Mouth and opercular cavities	<i>Clarias</i>	Southeast Asia, (Florida, introduced), fresh water	A catfish, known also as the walking catfish
Mouth and opercular cavities	<i>Gillichthys</i>	Pacific Coast of North America	Also called the mudsucker
Stomach	<i>Plecostomus</i>	South America, fresh water	A small catfish common in home aquaria
Stomach	<i>Anicistrus</i>	South America, fresh water	An armored catfish, protected by heavy spines and bony plates
Intestine	✚ <i>Hoplosternum</i>	South America, fresh water	An armored catfish
Swimbladder	* <i>Arapaima</i>	South America, rivers	The world's largest freshwater fish
Swimbladder	<i>Amia</i>	North America, fresh water	The bowfin; range extends north to areas where lakes remain ice-covered through winter; belongs to primitive group Holostei
Swimbladder	<i>Lepisosteus</i>	North America, fresh water	The garpike; belongs to the primitive group Holostei
Lung	<i>Polypterus</i>	Africa, fresh water	The bichir; has a lung, but is not a true lungfish (see text)
Lung	* <i>Lepidosiren</i>	South America, fresh water	A true lungfish
Lung	* <i>Protopterus</i>	Africa, fresh water	A true lungfish
Lung	<i>Neoceratodus</i>	Australia, fresh water, rivers	A true lungfish

* Obligatory air breathers