**Vertebrates**

- **Mammals**: monkeys, otter, and other land animals,
- **Birds**: few resident, many migrants and invaders from coastal forests
- **Reptiles**: crocodiles, monitor lizard, snakes
- **Amphibia**: *Rana cancrivora*

**Fishes**: intertidal (mudskippers, and other gobiid fishes)

- mangrove estuaries, channels and streams

**Crustaceans**

- **Prawns/shrimps**: in mangrove estuaries, channels and streams

by A. Sasekumar
Invertebrates: macrobenthos

- **Macrofauna**

  - **epifauna** (gastropods & bivalves) - live on lower tree trunks and sediment surface.

  - **infauna** (crabs & sipuncula) - burrowing within sediment, consist of crabs of the families Ocypodidae, Grapsidae & a sipuncula
- Habitat for gastropods and crabs
- Habitat for semi-aquaculture of blood cockle
- Low tide: feeding grounds for waders
- High tide: Feeding grounds for fish and prawns
Fifteen species of mudskippers occur on mangrove shores in Peninsular Malaysia.

**Periophthalmodon schlosseri** (20cm)
- amphibious & carnivorous fish living in mud burrows.
Boleophthalmus bodaerti (6cm) - herbivore, feeds on benthic diatoms
Encrusting fauna

Low shore, *Sonneratia* forest
Littorina melanostoma (2 cm)  L. scabra
Saddle oyster,

*Enigmonia aenigmatica*

Like other filter feeders such as barnacles, oysters and mytilids, saddle oyster feeds only at high tide.
Uca mani

Deposit feeder - on soft sediment containing diatoms and micro-organisms
*Uca dussumieri*
Deposit feeder
Crab burrows
Facilitate exchange of water between anoxic substrate and tidal water.
Telescopium mauritsi (8 cm)  T. telescopium
Rhizophora forest – High-shore fauna occurs from mid-shore upwards
*Uca triangularis*  (CW 1.5 cm)
High-shore fiddler crab, deposit feeder
Uca rosea (CW 2 cm)
Deposit feeder
Ellobiid gastropods

* Cassidula sp. 
* Pythia sp.
Nerita sp.  Murex capucinus

Cerithidea cingulata (3 cm)

C. obtusa
Sesarma sp.
Lives in deep burrows on high shore
Sesarma sp. (CW 5 cm) - detritus feeder
Sipuncula, *Phascolosoma arcuatum* (L:10cm)
Mud-lobster mound
Mud-lobster (L: 30 cm) 
*Thalassina anomala* - feeds on sediment
Functional role of macrobenthos

- Ingest **sediment**, burrow and modify it in many physical and chemical ways.
- **Crab burrows** - efficient mechanism for exchange of water between the anoxic substrate & overlying tidal water.
- **Crabs** – major predators, play important role in plant community structure.
- **Grapsid crabs** – consumers of mangrove leaf litter – produce large quantities of faecal material rich in nutrients & energy.
- **Macrobenthos** – animal biomass source of food for vertebrate predators & inshore fish that come in at high tide.
References:


Fish and Prawns

Habitat of many fish and prawn species
Sciaenid, jewfish

Feeds on prawns & other crustaceans
Spotted scat
Feeds on bottom sediment
Snapper, *Lutjanus johnii*
Feeds on prawns
Archer fish, *Toxotes jaculator* feeds on insects from mangrove branches hanging in waterways.
Catfishes - Feeds on benthic invertebrates & fish
Sea perch, *Lates calcarifer*
Mullet, *Liza sp.*

Feeds on sediment with diatoms and micro-organisms
Mud Crab, *Scylla* sp.

4 species of *Scylla* common in Indo-Pacific waters
White prawn, *Penaeus* sp.
RELATIONSHIPS ARE USED TO CONNECT MANGROVE AREA/COVER TO PRAWN CATCH

The relationship between prawn production and mangrove areal extent in three geographical regions: (a) Indonesia (from Martosubroto and Naamin, 1977); (b) Peninsular Malaysia (from Sasekumar and Chong, 1987); and (c) tropical Australia (from Staples et al., 1985).
MAJOR SHRIMPING AREAS MATCH THE DISTRIBUTION OF MANGROVES OF ASEAN
(Chong et al., 1994)

**Mangroves 7.45 mil ha**

**Shrimp: 400,000 tons (50% of world harvest)**
X-A - B - C-D → Towards landward margin or decreasing water depth

- Mangrove rehabilitation can bring back the prawns
  - More prawns under mature trees than young trees.
  - More prawns under trees than between trees.
  - More prawns in mangroves away from channel/river bank.

(Affendy & Chong, 2004)
Metapenaeus

Penaeus

Shallow water

FLOOD TIDE

Moves up into the mangrove forest

Shelter among roots

Turbid

A PLACE TO LIVE/ REFUGE HYPOTHESIS

Burrows into the mud

Metapenaeus
Fish community in Matang Mangrove Forest Reserve

138 species were recorded and 105 species were economically important (Chong, 2004)

Common fish families

- Ambassidae
- Ariidae
- Clupeidae
- Engraulidae
- Leiognathidae
- Scathophagidae
- Sciaenidae

(Sasekumar et al, 1994)

Some commercially important migrant fish families

- Carangidae
- Haemulidae
- Lutjanidae
- Polynemidae
- Serranidae

(Chong, 2004)
KLANG MANGROVES: NURSERY-GROUND VALUE FOR FISH AND SHRIMPS

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Fish</th>
<th>Shrimp</th>
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<tr>
<td>Channels</td>
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<td>Farshore</td>
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</tbody>
</table>

Chong et al. 1990
Sustainable aquaculture: Floating cages in mangrove estuary
Benefits of conserving mangrove forests in this era of depleting marine resources are:

- Sustain coastal fisheries
- Sustain the biological diversity in the mangrove ecosystem and adjoining shallow waters.

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