

Faculty of Science  
Department of Biology  
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قال تعالى:  
"وهو الذي مرج البحرين هذا عذب فرات وهذا ملح أجاج وجعل بينهما برزخا  
وحجرا محجورا".

53 الفرقان

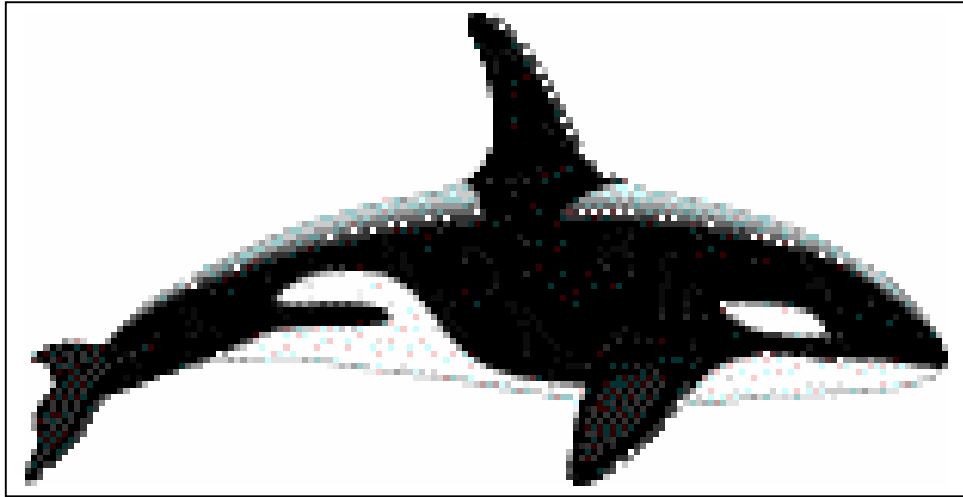
"ولقد أوحينا إلى موسى أن أسر بعبادي فاضرب لهم طريقا في البحر يبسا لا  
تخاف دركا ولا تخشى"

77 طه

## "Marine Biology Practical"

By/

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## Contents

- Practical No.1,2.** Meristic and morphometric Characters of Fishes.
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- Practical No.6.** Biological Study of a Fish (Reproduction).
- Practical No.7.** Abundance Estimates.
- Practical No.8. Plankton** Capture and Salinity Measuring
- Practical No.9.** Taxonomy of Gaza city Fishes and other localities.
- Practical No.10.** Fisheries and fishing gears.
- Practical No.11.** VIDEO SHOW (Tides, Fishes, Sharks, Wales, Sea birds, and Coral Reefs).

## Practical No. -1,2-

### **Meristic and Morphometric characters**

-Examine the specimen provided and carries out the morphological study required count, measurements, weights and calculations.

-Then compares and contrasts the finding and draws your conclusions:

#### **1. Morphological study:**

-Examine the external features and correlate their with the environment where the fish live.

- a. Colour of fish: that's meant it live in coastal region.
- b. Strong teeth: eat hard materials, scales, and shells.
- c. Soft fin: it has no protection for itself.
- d. Hard fin and spines in fins may used for protection and defense.
- e. Tail: help in movement, large or short.
- f. Eyes: large eyes mean that the fish live in the deep.

#### **2. Counts:**

- a. The spines and rays on each of the fins.
- b. The scales on the lateral line (LLS) if present.
- c. The scales along the perpendicular line above the lateral line (LLSU) if present.
- d. The scales along the perpendicular line below the lateral line (LLSB) if present.
- e. Teeth on the upper jaw (UJT)
- f. Teeth on the lower jaw (LJT).

#### **3. Measurements:**

- a. Total and standard length, (TL, SL).
- b. Body Depth (BD).
- c. Snout length (NL).
- d. Eye Diameter (ED).
- e. Interorbital Length (IO).
- f. Peduncle Length (PL).
- g. Peduncle Depth (PD).

#### **4. Weight:**



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TL Total Length

SL Standard Length

**Interorbital Width**

**Eye Diameter**

## Practical No -3-

### **Age Determination Studies**

#### **The aim of Age determination of Fishes:**

1. Select the kind of fish that have high growth rates and have filleted flesh. "Economic use".
2. Select type of fish for fish farming, by comparing between growth of all species.

#### **-The structure that used for Age determination of Bony fishes, There are five structure, as the followings:**

1. Scales, if present from the area just posterior to the operculum.
2. Otolith bone.
3. Operculum bone.
4. Vertebra from the abdominal region.
5. Dorsal spine, if present.

**The practical part:**

1. Examine the specimen provides and removes the following structures: scales, otolith bone, vertebra, dorsal spine and operculum.
2. Examine each of the above structures and observe the marks on it.
3. Observe the continuity and / or discontinuity of the circle, the discontinued ones are false rings while the others are true ones. **(Fig.4).**
4. Determine the age of yours specimen. Note that each circle represent one year.
5. Make drawing of the structures removed.

**Notes:**

-All fishes share in these structures “Bony fishes”

1. Vertebrae.
2. Otolith bone.
3. Operculum.

-Many species of fishes don't have scales, e.g. *Bagrus bayad*.

-A fish may have many determinations of age according to differences between circles in the different structures; the reason may be pathogenic.

-Broad circle means abundance of food.

-Maturity may show wide circles also.

## **Structures That Determine Age of Fishes**



## **Types of Scales**

## Practical No. -4-

### Standard Length/Weight Relations and Condition Factor.

I- Length/Weight Relationship:

1. The data given below have been collected from measuring and weighting specimens of *Oreochromis niloticus* from the white Nile.
2. You are required to illustrate graphically the relationship between the SL and Wt by using the actual figures for obtaining a curve and by using the logarithms of these figures to obtain a linear graph.

The equation is:

$$W = a L^b \qquad \text{Log } W = \text{Log } a + b \text{ Log } L, \text{ where}$$

W =weight

A + b = constants standing for slop and intercept.

3. Compare the following per sex.
4. The data are:

<b>Females</b>		<b>Males</b>	
<b>Wt (gm)</b>	<b>Length (cm)</b>	<b>Wt (gm)</b>	<b>Length (cm)</b>
97.5	13.7	115.8	16.9
100.5	13.5	225.4	18.5
148.5	16	240.5	18.5
150.5	15	747.4	20
158.5	16.5	878.2	28
252.5	18.5	912.6	26
291.5	18.5	1057.7	30
299.0	19.5	1155.5	29
309.5	19	1251.5	31
365.5	21.6		
370	21.5		
389.4	20.5		
557.3	24		
829.5	26		
855	28		
936	29		

1018.7	28		
1488.5	33		
1709.3	31		
1775.8	29		

5. Draw conclusions from your findings?

**II- Condition Factor:**  
(Well-being Factor).

1. Apply the equation:

$$K = W / L^3 \times 100 \quad \text{Where,}$$

K=condition factor

W=Weight of the individual

L=length of the individual

to the data given above.

2. Examine the results in each case and draw conclusions on the well being of each individual per sex.

## Practical No. -5-

### Food and feeding Habits

#### Objectives:

1. Determination the food type of provided fishes specimen.
2. Study about stomach and intestine forms of fishes.

The food type of any fish is determined by the study of the Alimentary canal stomach, intestine and mouth structures (teeth).

#### Stomach Forms:

- The shape, size and wall thickness differs between the different types of fishes according to the food type.
- The general shape of stomach may give indication of food type.

#### Types of stomach:

##### 1. Mixed food:

- Formed of two parts long and short parts.
- Omnivores. (Fig.5).

##### 2. Plant feeder:

- The stomach is formed of two long parts, due to long time of cellulose digestion.
- e.g. *Bolti* (*Tilapia nilotica*) and *Bori*.

##### 3. Animal Feeder:

- The stomach consists of one short part and fusiform part.
- e.g. Sharks, Cartilaginous fishes Dogfish.

##### 4. Grainy stomach:

- The stomach like gizzard in birds.
- The fish in this type feed on grains, hard structures, shells and most of the feeding on invertebrates.

#### Intestine forms:

Depends on the length of intestine.

1. THE long intestine means the fish is herbivorous. It needs long time for cellulose digestion.
2. Short intestine means that the fish is carnivorous. (i.e. the intestine is short, straight and consists of one twisting or two. **e.g.** Sharks and Cartilaginous fishes.
  2. The medium intestine mean that the fish is omnivorous, i.e. eats mixed food.

**Teeth Forms:**

- The strong teeth mean the fish grinding hard substances. The fish may be mixed food or animal feeder.
- The long teeth mean the fish grinding cellulose.

**-The practical part:**

1. Dissect the fishes provided.
2. Remove the alimentary canal, stomach and intestine.
3. Examine the morphology of the stomach and intestine and draw each of them.
4. Examine the food contents in both stomach and intestine and determine the nature of the food preference.
5. The results obtained have to be checked by examination of mouth structure and teeth.
6. Determine the food type of each specimen provided.

# **“Stomach Forms”**

**Mixed Food**

**Plant Feeder**

**Animal Feeder**

**Grain Hard  
Substances**

**Gill Chamber**

**Dense hairs**

**Carni-Herbivores**

**Plankton filter**

**Operculum**

## Practical No. -6-

### Reproduction

Decide on the stage of maturity of the gonad in accordance with the following description:

**Stage I: Immature**, tiny and thread-like gonads.

**Stage II: Maturing**, thread-like gonad extending to about one sixth (1/6) of the body cavity.

**Stage III: Ripening**, gonads occupy about one third of the body cavity. Contents opaque, not differentiated.

**Stage IV: Ripe**, gonads occupy two thirds of body cavity with internal contents seen but still opaque.

**Stage V: Running**, gonads filling the abdominal cavity, contents transparent, and liberated on slight pressure on belly.

**Stage VI: Spent**, gonads wrinkled and sac-like, almost empty.

**Stage VII: Dormant**, gonads look like those of immature stage. (This occurs in adult fish).

## **“Maturity Stages”**

**I**

**II**

**III**

**IV**

**V**

**VI**



## VII

### Practical No. -7-

#### Abundance Estimates

- 1. During a feasibility study of the Herring off the coast of Scotland attempts were made to determine absolute Abundance of the fish in question.**

-In the 1<sup>st</sup> season, 15000 individuals were tagged and set back in water, in the following season 500 individuals of the tagged small were rescued from a total catch of 10500 individuals.

-From this:

- (a). Calculate the absolute abundance in the area.
- (b). Comment on the accuracy of the methods used, and
- (c). If the method is defective give an alternative proposal.

-The above employs Peterseris Method where the equation:

$$N = nT/m$$

N= population required.

T= individual marked in the 1<sup>st</sup> occasion.

n=the individual captured in the 2<sup>nd</sup> occasion.

m= the number rescued of the tagged individuals.

**-The Defects of the method being:**

1. The distribution was organized in a typical way (pattern).

2. Doesn't take in consideration the loss in number through natural and induced mortality.
3. It has neglected the possibility of emigration and migration.

**Remedy:**

Remedy is to repeat the capture and recapture by further tagging.

**2. A pond measuring 100 cm x 100 m x 0.7 m**

Devoted for rearing *Oreochromis* was divided into 5 equal portions.

The extensive causal made in one gave 240,000 eggs and larvae.

You are required to e female brings more abundant.caluculate the absolute number of adults *Oreochromis* in the pond.

-It's worth-mentioning that the fecundity of the female is about 600 and the sex ratio was 51: 49 with the female brings more abundant.

## Practical No.-8-

### Plankton Capture and Salinity Measuring

Objectives:

1. to collect, identify and classify the different types of plankton.
2. To determine the salinity of seawater.

Introduction.

#### Plankton

Plankton includes plants and animals that float or drift with the movements of the water.

-Plant plankton is called **phytoplankton**, and animal plankton is known as **zooplankton**.

-**Nekton**, animals that swim freely and purposefully in the sea.

-**Benthos**, organisms that live attached to the bottom or in the bottom.

#### A glossary of terms used in describing marine organisms:

Term	Description
-Plankton	-Free-floating organisms with limited power of locomotion.
-Phytoplankton	-The plant, primarily algae, component of plankton.
-Zooplankton	-Animal component of plankton.
-Bacterioplankton	-Plankton bacteria.
-Holoplankton	-Permanent members of the plankton.
-Meroplankton	-Temporary members of the plankton e.g. many larval stages of benthic organisms.
-Neuston	-Small planktonic organisms inhabiting the ultra-thin sea surface layer.
-Nekton	-Organisms capable of swimming against water currents, e.g. fish, squid, whales.

### **-Plankton and Plankton Communities:**

-Planktonic organisms are animals and plants have such limited powers of locomotion that they are at the mercy of revealing water movements, and include all organisms that drift with the ocean currents. Plankton is usually collected by means of nets or filters. Since these have a standard mesh or pore size.

-The plankton includes layer animals and plants such as Jellyfish, slaps, and Sargassum, which are classified as macroplankton (1mm) and megaplankton (some feet's). Smaller microplankton (0.07-1 mm) can be captured in fine-meshed silk plankton nets. Nanoplankton (less than 75  $\mu$ ) include the smallest plants that are too small to be filtered from the water by a silk net and must be removed by other types of microfilters. This is in contrast to the *nekton*, which comprise the strong swimming animals of the open sea, capable of exercising movement against the prevailing water flow. Plankton may be further subdivided. Phytoplankton comprises the free-floating plants of the sea that are capable of photosynthesis. Zooplankton is the various free-floating animals. Bacterioplankton include the various minute bacteria and blue-green algae.

-Plankton is also classified according to what portion of their life cycle they spend within the plankton community. Organisms such as planktonic diatoms and copepods that spend their entire life in the plankton are holoplankton. Other organisms, the meroplankton, spend a portion of their life cycle as plankton.

### **-Also there is a functional classification of the plankton into autotrophic and heterotrophic species.**

#### **1-The phytoplankton (autotrophic plankton)**

-Phytoplankton is primarily single-celled organisms although they can occur as chains or small colonies of cells. The photoautotrophs (those that use sunlight as an energy source) are the principal primary producers in the sea and they can only grow when they have using energy obtained from a variety of simple compounds and elements, including ammonia, methane, iron and sulfur. This process, chemosynthesis, can occur in the absence of light. Both types of organism absorb carbon dioxide, water and essential nutrients, like nitrate and phosphate, from the water surrounding them.

-Traditionally, it has been the largest of autotrophic plankton, the microplankton, which have the most intensely investigated. The two most dominant members of this group -that is, those normally captured in nets- are the *diatoms* and *dinoflagellates*.

#### **2-Heterotrophic Plankton:**

-We can divide this group into zooplankton and microheterotrophs like bacteria and protozoa.

#### **-The zooplankton:**

In contrast to the phytoplankton, which consist of a relatively small variety of plants, the zooplankton are extremely diverse, consisting of a host of larval and adult forms representing most of the animal and many of the protistan phyla. As with the phytoplankton, two groups can be identified: the larger “net” zooplankton and the smaller microzooplankton (nanozooplankton and picozooplankton). Marine biologists have long considered this larger net zooplankton to be the most important grazers of the phytoplankton. Among the “net” zooplankton one group stands out as being more important than the others. The class Copepoda (subphylum Crustacean, phylum Arthropoda) is small holoplanktonic crustaceans that dominate the net zooplankton throughout the world’s oceans (**Fig- -**). These small animals are of vital importance in the economy of ecosystems in the oceans, because they are one of the primary herbivore animals in the sea. It is they who graze upon the aquatic pastures constituted by the larger phytoplankton, especially in coastal waters, and provide one of the links between the primary production of the plants and the numerous large and small carnivores. Some zooplankters spend their life in the plankton (holoplankton) while only the eggs and larvae of otherwise benthic animals may be planktonic (meroplankton).

-The zooplankton are either herbivore, grazing on the phytoplankton, or carnivores feeding on other members of the zooplankton. They may move vertically in the water column, but, like the phytoplankton, the currents also transport them. Zooplankton may reproduce three to five generations a year in warm water, where food supplies are abundant and higher temperatures accelerate life processes. At high latitudes, where the season for the phytoplankton growth is brief, the zooplankton may produce only a single generation in a year.

-**Foraminiferans** and **radiolarians** are single-celled microscopic members of the zooplankton; (**Fig- -**). The swimming snails are **pteropods**, modified **mollusks** that may or may not have a small shell, but they all have a transparent, gracefully undulating “wing” (**Fig- -**). Some pteropods are herbivores, and some are carnivores. Comb jellies or **ctenophores** (carnivores) (**Fig- -**) float in the surface water. True jellyfish resemble comb jellies, but they come from another unrelated group of animals, the Cnidaria or **coelentrates**. Sea animals produce larvae in enormous numbers, and so this meroplankton is an important food source for the zooplankton and other animals. Larvae often look very unlike the adult forms into which they will develop (**Fig- -**).

**-Importance of plankton:**

1-by using plankton, it’s possible to determine biomass and the harvesting, to be the base of food chain in oceans.

2-By determining the plankton quantities, it is possible to identify the most suitable one for fish farming.

3-The correlations of changes happen in plankton, may used to correlate with fish biology and migration.

4-It is possible to study changes in environment by studying the plankton.

5-By studying the biochemical of different species of plankton and factors affecting its growing, its possible to select some species of plankton to be used as food source in fish farming, where plankton consists of 40-50% protein + 20-40% carbohydrates + 20-25% fat.

### **The practical part:**

#### **Part –I–**

1. Try to collect 3–5 Lit of sea water according to the following periodical program:
  - a. at 7 morning
  - b. at 12 noon
  - c. at 5 p.m.
2. Prepare the specific net used for filtering the seawater.
3. Try to collect the plankton present.
4. By using Microscope try to differentiate between the Zooplankton and Hpytoplankton.
5. Draw what you can see.

Note: Remember that two factors affecting distribution of plankton:

1. Velocity of water.
2. Light intensity.

High density is found at early morning and in the evening.

#### **Part –II–**

- Try to collect 3 liters of sea water
- Separate one liter alone in a container.
- Boil sea water at boiling point.
- Weigh the remaining salt.**
- Determine the salinity of water.**



**Members of the meroplankton. All are larval forms of nonplanktonic adults.**

**Radiolarians**



## Zooplanktons

### Practical No.-9-

Taxonomy for Gaza City and other localities Fishes.

#### Classification of fishes

<p><b>1</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b></p> <p><b>Class: Osteochythes (Bony fishes)</b></p> <p><b>Example: <i>Uronoscopus scober</i></b></p> <p>عقربة الأعماق، لها غدة سمية وشوكة سمية، تعيش علي عمق 20-150 قامة بحرية أي 40-300</p>	<p><b>2</b> <b>Phylum: Chordata</b> <b>Subphylum: Vertebrata</b> <b>Class: Osteochythes (Bony fishes)</b></p> <p><b>Example: <i>Trachinus araneus</i></b></p> <p>السمكة المرقطة</p>
<p><b>3</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b></p> <p><b>Class: Osteochythes (Bony fishes)</b></p> <p><b>Family: Exocoetidae</b></p> <p><b>Example: <i>Hirundichthys rondeletii</i></b></p> <p>السمك العصافير الطول ما بين 15-25 سم</p>	<p><b>4</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b></p> <p><b>Class: Osteochythes (Bony fishes)</b></p> <p><b>Family: Carangidae</b></p> <p><b>Example: <i>Trachurus mediterraneus</i></b></p> <p>طرخونة البحر الأبيض المتوسط</p>

<p><b>5</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Arthropoda</b> <b>Class: Crustaceae</b> <b>Subclass: Malacostraca</b> <b>Order: Decapoda</b> <b>Suborder: Branchyura</b> <b>Example: Crab</b> السرطان</p>	<p><b>6</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b> <b>Class: Osteochythes (Bony fishes)</b>  <b>Example: Scombler</b>  سمك السكميلة</p>
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<p><b>7</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b>  <b>Class: Osteochythes (Bony fishes)</b>  <b>Family: Ostraciidae</b>  <b>Example: <i>Tetrasomus gibbosun</i></b> <b>(Thornback trunk fish)</b>  عائلة صندوق البحر (سمكة يونس)</p>	<p><b>8</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b>  <b>Class: Osteochythes (Bony fishes)</b>  <b>Family: Hemiramphoidae</b>  عائلة نصفية المنقار الطول 35-60 سم</p>
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<p><b>9</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b>  <b>Class: Osteochythes (Bony fishes)</b>  <b>Family: Scomberecocidae</b>  <b>Example: <i>Scomberso saurus</i></b>  أسماك طويلة المنقار العمق الضي توجد عليه 100 م</p>	<p><b>10</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b>  <b>Class: Raptlid</b>  <b>Order; Squanata</b>  <b>Family: Congridae</b>  <b>Example: <i>Sae snake</i></b>  ثعبان البحر</p>
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الطول: 150-60 سم	
<p><b>11</b>  <b>Phylum: Chordata</b>  <b>Subphylum: vertebrata</b></p> <p><b>Class: Osteochythes (Bony fishes)</b>  <b>Family: Diplodus</b>  <b>Example: <i>Sargus sargus</i></b></p> <p style="text-align: right;">سمك السرغوس</p>	<p><b>12</b>  <b>Phylum: Chordata</b>  <b>Subphylum: vertebrata</b></p> <p><b>Class: Osteochythes (Bony fishes)</b>  <b>Family: Spariidae</b>  <b>Example: <i>Lithognathus mormyrus</i></b></p> <p style="text-align: right;">سمك المرمير الطول يصل 55 سم</p>

<p><b>13</b>  <b>Phylum: Chordata</b>  <b>Subphylum: vertebrata</b></p> <p><b>Class: Chondrichythes</b>  <b>(cartilaginous fishes)</b></p> <p><b>Order: Pleronectifomes</b></p> <p><b>Example: <i>Usolea vulagaris</i></b></p> <p style="text-align: right;">سمكة موسى</p>	<p><b>14</b>  <b>Phylum: Chordata</b>  <b>Subphylum: vertebrata</b></p> <p><b>Class: Chondrichthytes</b>  <b>(cartilagenousfishes)</b></p> <p><b>Order: Ragiformes</b></p> <p><b>Example: <i>Raja radula</i> (rays and Skates)</b></p> <p style="text-align: right;">الشعاعيات</p> <p><b>-Bottom dwellers, need soft sand for burrowing, feed on crabs, shellfish.</b></p>
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<p><b>15</b>  <b>Phylum: Arthropoda</b></p> <p><b>Class: Crustacea</b></p> <p><b>Subclass: Malacostracea</b></p>	<p><b>16</b>  <b>Phylum: Chordata</b>  <b>Subphylum: vertebrata</b>  <b>Class: Mammalia</b></p> <p><b>Order: Cetacea</b></p> <p><b>Example: Baleen whales</b></p>
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<p><b>Order: Decapoda</b></p> <p><b>Suborder: Macura</b></p> <p><b>Example: <i>penaeus japnicus</i> الجمبري</b></p>	<p>الحوت</p>
<p><b>17</b></p> <p><b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b> <b>Class: Chondrichythes</b> <b>(Cartilaginous fishes)</b> <b>Order :Laminiformes</b> <b>Family:Sphyrnidae</b> <b>Example: Hammerhead shark</b> <b>سمك القرش (أبو مطرقة)</b> <b><i>Sphyrna lewini</i></b></p>	<p><b>18</b></p> <p><b>Phylum: Chodata</b> <b>Subphylum: vertebrata</b> <b>Class: Mammalia</b></p> <p><b>Order: Cetacea</b></p> <p><b>Family: Sphyrnidae</b></p> <p><b>Example: Toothed whales</b> <b>الحيتان ذات الأسنان</b></p>
<p><b>19</b></p> <p><b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b></p> <p><b>Class: Reptilia</b></p> <p><b>Order: Chelonia</b></p> <p><b>Example: <i>Sea turtles</i></b> <b>السلاحف البحرية</b></p>	<p><b>20</b></p> <p><b>Kingdom: Plantae</b></p> <p><b>Division: Chlorophyta</b></p> <p><b>Example: Green algae</b> <b>الطحالب الخضراء</b></p>
<p><b>21</b></p> <p><b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Part: Eumetazoa</b> <b>Phylum: Coelentrata</b> <b>Class: Anthozoa</b> <b>Example: Stony corals</b> <b>المراجين البحرية</b></p>	<p><b>22</b></p> <p><b>Kingdom: Animalia</b> <b>Subkingdom; Metazoa</b> <b>Phylum:Mollusca</b> <b>Class: Pelecypoda</b> <b>Example: <i>Bivalved molluscs</i></b> <b>ذات المصراعين</b></p>

<b>23</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Echinodermata</b> <b>Class: Asteroidea</b> <b>Example: Sea star</b> نجم البحر	<b>24</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Arthropoda</b> <b>Class: Crustacea</b> <b>Subclass: Cirripeda</b> <b>Order: thoracica</b> <b>Example: Lepas (Goose barnacle)</b>  الليس أو (برنقيل الوز)

<b>25</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Mollusca</b> <b>Class: Cephalopoda</b> <b>Order: Dibranchiata</b> <b>Suborder: Decapoda</b> <b>Example: Sepia</b> الحبار	<b>26</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Mollusca</b> <b>Class: Gastropoda</b> <b>Order: Stylommatopoda</b> <b>Example: Helix</b>  الصدفة
<b>27</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Metazoa</b> <b>Phylum: Mollusca</b> <b>Class: Cephalopoda</b> <b>Order: Dibranchiata</b> <b>Suborder: Octapoda</b> <b>Example: Octopus</b> الاخطبوط	<b>28</b> <b>Kingdom: Animalia</b> <b>Subkingdom: Parazoa</b> <b>Phylum: Porifera</b>  <b>Example: Spong</b>  الاسفنج

<p><b>29</b> <b>Kingdom :Animalia</b> <b>Order: Synathiformes</b> <b>Family: Syngnathidae</b> <b>Example: <i>Hippocampus hippocampus</i></b> <b>(Sea horse).</b></p> <p>حصان البحر الصغير</p> <p>-Very slow, Shelter is coral reefs, sea anemones sea fans. Feed on tiny food.</p>	<p><b>30</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b> <b>Class: Osteochythes (Bony fishes)</b> <b>Family: Sardinellae</b> <b>Example: <i>Sardina aurita</i></b></p> <p>سمك السردين</p>
<p><b>31</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b> <b>Class: Osteochythes (Bony fishes)</b> <b>Family: Sardinellae</b> <b>Example: <i>Sardina pilchardus</i></b></p> <p>سمكة السردين الكبيرة</p>	<p><b>32</b> <b>Phylum: Chordata</b> <b>Subphylum: vertebrata</b> <b>Class: Osteochythes (Bony fishes)</b> <b>Family: Sardinellae</b> <b>Example: <i>Engraulis encrasicolus</i></b></p> <p>سمك السردين (بذرة أم راس)</p>
<p><b>33</b> <b>Kingdom:Animalia</b> <b>Phylum:Chordata</b> <b>Subphylum: Vertebrata</b> <b>Class:Chondrichthyes</b> <b>Order:Rajiforms</b> <b>Family:Dasyatidae</b> <b>Example:<i>Trysonoptena testaceus</i></b></p> <p>سمك دهاني</p>	<p><b>34</b> <b>Kingdom:Animalia</b> <b>Phylum:Chordata</b> <b>Subphylum: Vertebrata</b> <b>Class:Chondrichthyes</b> <b>Order:Rajiforms</b> <b>Family:Rhinobatidae</b> <b><i>Rhinobatos productus</i></b></p> <p>سلفوح بحر</p>

## Practical No.-10-

### **Fisheries**

**-The concept of fisheries sciences:**

**-Science:** science is the manner of work and thinking that plans, and arranges programs of field observations, laboratory analysis, experimentation to obtain a kind of knowledge.

**-Fishery science:** Fishery science as to science is not distinguished as the above mentioned objectives, but is distinguished in term of the systems to which it is devoted.

-Fishery science is concerned with the natural resources.

-Natural resources are tackled along two major lines:

-Resources as an economic phenomenon or as an Ecological term.

-In the first, it means anything including man the organism can do to benefit. In the second the activity of man dropped.

**-Unit systems of fishery science:**

1-**Unit fishery:** Unit fishery is a natural grouping of boats, men, and gear for the exploitation of a defined resource in some more or less defined area engaged in the exploitation of one or more unit stocks.

2-**Fishing unit:** Fishing unit is that complex of equipment and manpower, which can operate autonomously in fishing industry.

3-**Unit stocks:** Unit stocks is a population of fish either of one or more species occupying a particular area and living independently of other populations where all biological parameters are followed.

**-Departments of fishery sciences:**

1-**Primary sector:** is that which is directly concerned with taking the material from the resource.

2-**Secondary sector:** is that which is concerned with the transformations of what is taken from the resource. i.e. processing.

3- **tertiary sector:** is the which is concerned with handling, storing, transporting, and selling.

**-For investment purposes in fish catching, it is might to know every thing about the fishery which take in account the following points:**

**1-Fishery biology:** The objectives:

1-To give answers to the decision-makers to the question...

What to fish?

Where top fish?

When to fish?

When to do that?

How to fish?

How much to be expected?

2-To give information on the distributions and fluctuations of fish abundance of the exploited fish on a prolonged period.

3-To indicates the level of catch that preserves the continuity.

4-To study the structure and dynamics of the exploited fish in relation to other species.

5-To provide data on Oceanography and Limnology as basis for knowledge of the environment.

6-To follows the behavior of the exploited species (migration).

7-To contribute towards the biology of processing, storage, handling, and spoilage combat.

**2-Fishery Technology:**

1-This is concerned with the fishing gear (Boats, Nets) construction and modification and the follow-up as the need arises.

2-Has a general responsibility as regard to fishery terminals and the design of landing spots.



3-Also concerned with the study of the methods of processing, storing, and transpiration.

### **3-Fishery Economy:**

-This is concerned with the institutional structure of industry and with the relation of the fishery itself, with the consider of the country's economy, business, management problems of man power, marketing, supply and demand costs and earning prices and all that determine prices.

### **Fishing Gear**

-Gear includes all equipments employed in the process of fishing with nets and boats being the main component.

**1-Nets:** Nets are basically made up of cotton, nylon, blended material (monofilament).

-Cotton is minimally and now in view of least durability and high cost, Nylon is not preferable in cases where injury is avoided in fresh stocks, Monofilament is widely used because of it comprise the best quality of the past alternative.

-Nets may be colored especially in stocks with sharp vision.

-Some nets are used of material other than mentioned earlier (e.g. wire, bamboo, straw etc.)

-Nets is grouped into fixed and moving nets. The utilization is dependent on the behavior of the fish, the location and exploitation policy.

-There is a wide range of sizes and shapes of nets. Variation is correlated with proper functioning (profitable catch and provision of fish replacement).

-Advantages of mesh sizes to collect a huge number of fish and in the same time permits fish (small) to back to water.

### **-Nets are placed into two categories:**

-Marine and Inland (fresh water) and further subdivisions occur in each in order meet the need of fishing from the varying levels along the vertical water column.

### **-Classification of Nets:**

#### **-Fresh water nets:**

**1-Cast nets (Taraha):** It is rounded diameter is up to 10 m. This is populated from bank and in sandy bottoms. It collects a varying species of small medium sizes. Of the fish collected by "Taraha" are *Hydrocynus*, *Alestes* that are important for "Fassekh" industry.

#### **2-Seine nets: (gill nets)**

-These nets are meant to catch fish through the entanglement of the operculum cover once fish try to pass through the upright net blocking its course.

- The length depends upon the need requirement the size of the exploitable resource is taken into account.
- They are grouped into bottom nets and also those used for surface and mid-water.

### 3-Trammel nets (canar net):

- It is composed of a set of three nets with the middle being of a small mesh and those on either side with bigger mesh.
- Not only that but the middle net is loose and long and its made so in order to entangle the fish that reach them. Once a fish is trapped here, it can hardly find its way out.
- The net is used for collection of big-sized fish and aggressive ones in lakes and artificial reservoirs.

4-**Long-lines:** This is a specialized method of collecting selected fish through baits and hooks.

- Used in across section starting from the shore.
- This method is widely used specifically for catching large carnivores fish like *lates niloticus* and *Bagrouis bayad*.

5-**Baskets:** This made up of palm tree products.

- Designed to be placed at the bottom seasonal water.
- It is spherical with an inlet through which fish find their way to the bait inside. These fish fail to escape and are thus caught.

### Marine nets:

- Nets used at sea belong to any of:
  - a-**Demersal nets** (in bottom watering.-longlines, trawls, Danish seines).
  - b-**Pelagic nets** (in surface and mid-waters e.g. handlines, mid-water trawls, purse seines and drift nets).
- The above mentioned at standard and internationally used.
  - 1-**Longlines:** demersal, used in coastal areas, to collect flat fish on the bottom. It is intended to catch fish in coral reefs areas----> fish are not normally caught by any of the other nets.
  - 2-**Otter trawler:** demersal, collect fish from the bottom deep columns of water. Used by small vessel for collection of flat fish. The lowered boards adjust the level.
  - The trickler chain disturbs fish at the bottom, which are tempted to enter the net.
  - 3-**Vigneron-Dahl trawl:** used for bottom fishing.

-Both boards and chain assist in adjustment and fishing.  
-Structurally, the otter and Vigneron-Dahl trawlers are built on similar plans, the difference between the two is the location of the otter boards which are attached to the wings of the first, and placed at a far distance in the second. In the latter, they secure better chances for collection of fish buried in the bottom.

4-**Danish seine:** demersal but intended to collect fish along the vertical water column with concentration on bottom fish in relatively deep water.

-We have a boat carries the line, head rope is attached to a flag, net is dropped, floats in the surface, give wall-like collect fish.

-The principle on which it is built is similar to traditional fresh water seine, except for the area of operation in the sloping bottom.

-The semi-circular movement of the boat or fisherman trap bottom dweller in the bag-like shape of the net.

**-The pelagic nets:**

1-**Purse seine:** pelagic for surface and mid-water collection.

-Two boats carry nets and sail, the boats set out messenger rope start to move in a circle, wait till fish enter, and collected, then move in a circle.

-It is a typical gill-net benefiting from catching fish through opercular entanglement added to more fish trapped during the circular operation of the net at the closure of the process.

2-**Drift net:** pelagic, used in open water and modified to extend activity to varying levels of the vertical water column.

-Used for collection of shoals of migrating fish.

-Set in upright position across the course of fish movement, which are collected by the opercular.

Adding more standard pieces horizontally and or vertically may increase -  
The production.

**Boats**

-The success of the fishery is completed by the overall knowledge of the boat structure and facilities.

-Boats are traditionally made of:

1-**Wood:** sun and neem wood is preferable for durability and least effected by alternate moisture and drying.

2-**Steel:** common in all over the world but in inland fisheries, there is the risk of quick damage by rust.

3-**Fiber-glass:** The best provided those not used in waters with bottom obstacles e.g. corals.

-Boats varies in size from small one to commercial fishing boats.

-The operating mechanisms vary from simple ones to inboard to outboard engines.

-Commercial boats may be furnished with sophisticated equipments such as Echo sounders and sonar's that help in detection of fish abundance and

distribution. Beside these equipment that help in storage and preservation may be added too.

### معدات الصيد في قطاع غزة ( Fishing Gear in Gaza ) ( أ ) المراكب

يوجد في قطاع غزة معدات صيد مختلفة متضمنة المراكب والشباك . ويبلغ عدد المراكب المستخدمة في الصيد في قطاع غزة 818 مركباً يعمل عليها حوالي 2646 صياداً ( انظر الجدول ) .

موقع الصيد	لنش جر	لنش	حسكة	حسكة مجداف	افلوكا مجداف	عجل	المجموع
غزة	18	33	250	2	88	-	319
دير البلح	1	2	55	12	6	-	76
خان يونس	-	10	56	3	26	-	103
رفح	-	10	56	3	33	8	123
بين الموانئ	-	-	-	111	-	21	111
ابرز	-	-	14	-	-	-	14
المجموع	19	55	431	131	153	29	818

وتعتبر لنشات الجر أكبر المراكب العاملة في مجال الصيد وهي مصنوعة من الخشب و متوسط طولها 15 متراً ، يليها لنشات الشانشولا بطول 13 متراً ، أما بالنسبة للحسكات فهي تصنع محلياً من الفبير جلاس بطول 5-7 متراً وتنتهي عملاً لحوالي 1200 صياداً في قطاع غزة ، وتعتبر المراكب الأكثر نشاطاً نتيجة لتعدد أغراض استعمالها ، أما مراكب الافلوكا وحسكات المجداف والعجلات فهي تعمل بدون مولدات وتمثل الفئة المتبقية من اسطول الصيد . ويضاف الى ماسبق وحسب آخر مسح ميداني (1997) أن حوالي 50 جهازاً ايكو ساوندر تستعمل في اسطول الصيد في قطاع غزة ( مشروع كبير / معاً 1997 )

### ( ب ) شباك الصيد

إن جميع شباك الصيد تصنع في قطاع غزة من مواد خام تستورد من الخارج وكثيراً ما تصدر شباك الجر الكاملة بعد تصنيعها الى اسرائيل حيث تبلغ تكلفتها من 1000 - 1300 دولاراً أمريكياً .

وتتنوع شبك الصيد في قطاع غزة من حيث مقاس خيوطها وفتحاتها ونوع جبالها لتتناسب مع نوع وكميات الأسماك المراد صيدها وتوجد الأنواع التالية من شبك الصيد :-

أ. **شباك الجر** : وهي ذات فتحات عيون من 30 - 80 ملم وتصنع بأكملها في قطاع غزة وتصدر الى اسرائيل .

ب . **شباك الشانشولا** : وتختلف فتحاتها من 45 - 72 ملم ولونها أخضر وتستخدم لصيد أسماك السردين والوطواط .

ج . **الشباك الثابتة ومنها :**

\* الشباك المبطنة وتكون عيونها بمقاس 44 ملم للشباك الداخلية و 24 ملم للشباك الخارجية .

\* الشباك الخيشومية السطحية ذات فتحات بمقاسات مختلفة حسب نوعية السمك المصطاد ، وتستخدم لصيد أسماك التونة ، والعصفور والسردين ، وأخرى .

\* الشباك الخيشومية القاعية وتستخدم لصيد أسماك الدنيس وبعض الأسماك الكبيرة الأخرى

\* شبك الطرح وذات فتحات عيون أقل من 20ملم وتأثيرها بسيط جداً على المصائد .

\* شبكة التحويلة الشاطئية وهي نادرة وأثناء مسح 1997 وجدت فقط واحدة منها .

\* الصنار وهي للأفراد والهوايات وتأثيرها لا يذكر على الصيد السمكي . ( مشروع كبير / معاً، 1997) .

## Practical No.-11-

VIDEO SHOW

Including  
(Tides, Fishes, Sharks, Seals,  
Wales, Sea birds and Coral  
reefs).

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**GOOD LUCK**