



Photo 3.33 Common kingfisher.



Photo 3.34 *Sonneratia caseolaris* near station M4.



Photo 3.35 Disturbed *Nypa fruticans* area at station M4.

### 3.4.3 Discussion

Based on mapping, the total mangrove area within the study area is approximately 15.7 ha. The mangroves is mostly dominated by nipah trees (*Nypa fruticans*) and frequently observed mangrove associates are *Acrostichum aureum* and *Glochidion littorale*.

The mangroves seemed to be disturbed either by extraction for local benefit or clearing for development due to its close proximity to other development such as housing. Despite such disturbances, vegetation at some areas are still dense and fauna still frequents this area as shown by the number of sightings in this survey.

## 3.5 Fish Fauna

### 3.5.1 Survey Methodology

Fish fauna survey was conducted to determine the species, abundance and diversity of fish fauna at the Project area. The survey was carried out on October 2, 2017 (neap) and October 4, 2017 (spring).

#### 3.5.1.1 Survey stations

Five fish fauna survey stations were established as indicated in Figure 3.25 and their coordinates are given in Table 3.10.

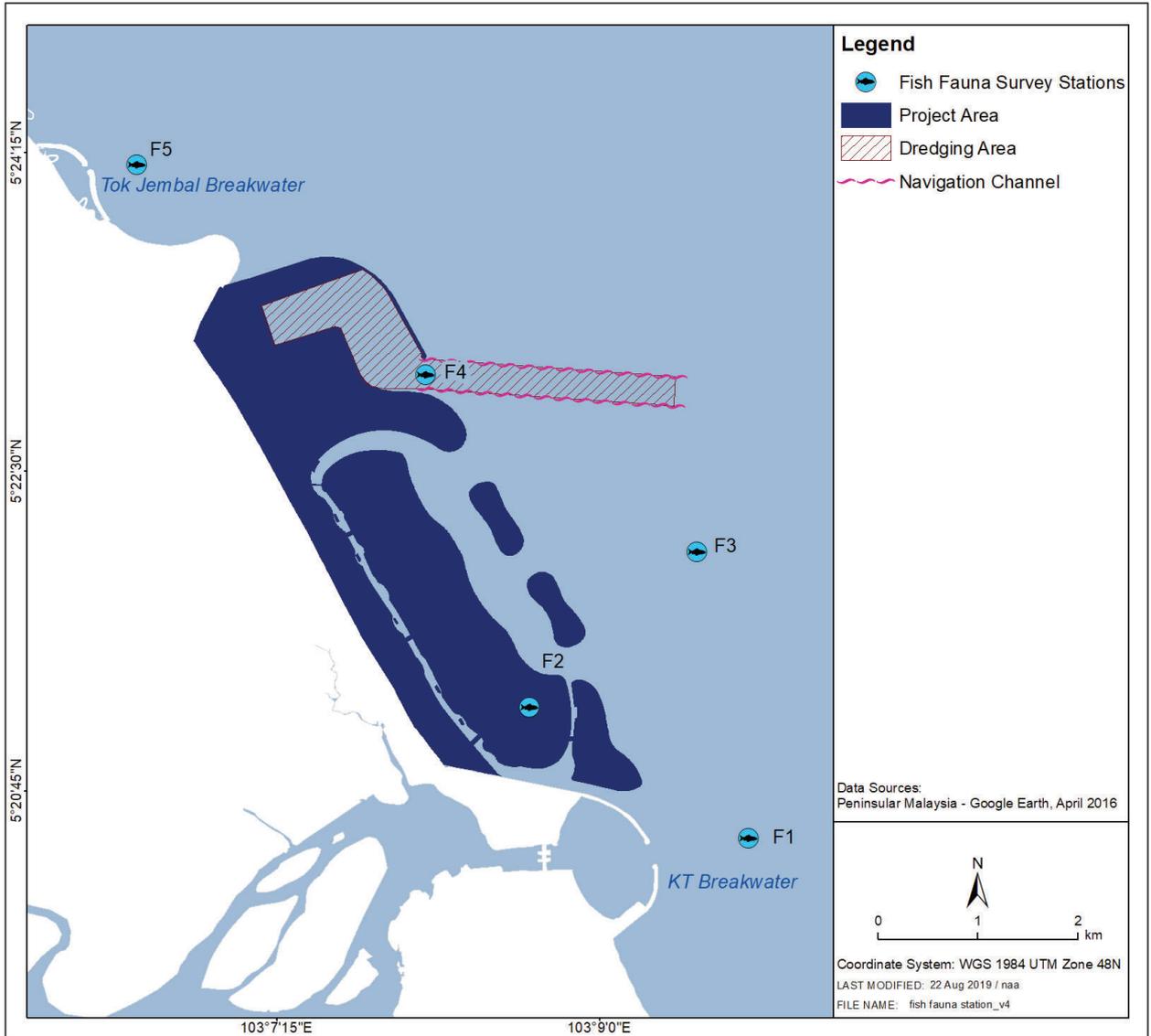


Figure 3.25 Fish fauna sampling stations.

Table 3.10 Coordinates of fish fauna sampling station.

Sampling Stations	Longitude (°E)	Latitude (°N)	Justification
F1	103.16351	5.34165	Near K. Terengganu breakwater
F2	103.14366	5.35356	Within Project area, south
F3	103.15875	5.36782	Reference station approximately 1.5 km offshore of the Project area
F4	103.13417	5.38397	Within project navigation channel (capital dredging area)
F5	103.10796	5.40312	Tok Jembal recreational beach

### 3.5.1.2 Sampling Method

At each station, trammel nets (three-layer netting) with inner net panel with a mesh size of 4.0 cm and two outer net panels with mesh size of 7.0 cm were used for sampling. Trammel nets were deployed for 1 hour at each station. All fish fauna sampled were separated and brought

back to the jetty for identification up to genus (or species) level, and measured, weighed and photographed.

### 3.5.2 Results

#### 3.5.2.1 Neap

Results of fish fauna caught during neap tide is represented in Table 3.11 below. A total number of 49 individuals of fish, five individuals of crabs and a single individual of squid were caught with a total of 55 individuals.

The highest abundance of fish fauna was recorded at Station F5, with 30 individuals followed by station F1 with 21 individuals. Station F2 and station F3 had the same number of fish fauna with only two individuals found. No fish fauna was sampled at F4.

In terms of maturity, there were juvenile fishes found at station F2, which was Ikan Cermin (total length of 12 cm) and Ikan Biji Nangka at station F5 (total length of 10.6cm).

The fishes, crabs and squid caught belonged to nine (9) families and comprised of ten (10) different species (Table 3.11 ). This comprised six species of fish, three species of crab and a single species of squid (Photo 3.36 to Photo 3.44). The Station with the most species sampled was station F1 (6 species) followed by station F2, F3 and F5 (2 species). As mentioned, no species was found at station F4.

Among the species caught, kekek (*Leiognathus brevirostris*) was the most dominant species, represented by 40 individuals (10 individuals at station F1, 1 individual at station F3 and 29 individuals at station F5). *Valenciennea puellaris* was the second most abundant species with five individuals (all five individuals were caught at station F1). All three individuals of Ketam Mancis (*Podophthalmus vigil*) recorded were also caught at stations F1. The remaining species represented by a single individual caught per species were Ikan Sebelah (*Pseudorhombus* sp.), Ketam Bawang (*Charybdis feriatus*) and Ketam Hantu (*Parthenope longimanus*) at station F1; Sotong Katak (*Sephia* sp.) and Ikan Cermin (*Carangoides armatus*) at station F2; while Ikan Selar (*Atule mate*) and Ikan Biji Nangka (*Upeneus moluccensi*) were found at stations F3 and F5 respectively.

Table 3.11 Fish fauna caught during neap tide.

Station	Family	Local Name	Scientific name	No	Length (cm)	Weight range (g)	Total weight per species (g)	Commercial value /24/	Demersal/ Pelagic
F1	<i>Paralichthyidae</i>	Sebelah	<i>Pseudorhombus</i> sp.	1	17	100	100	Low	Demersal
	<i>Leiognathidae</i>	Kekek	<i>Leiognathus brevirostris</i>	10	9.0-12.5	10-50	240	Low	Demersal
	<i>Gobiidae</i>	Unidentified	<i>Valenciennea puellaris</i>	5	12-13	20-40	120	Low	Demersal
	<i>Portunidae</i>	Ketam Bawang	<i>Charybdis feriatus</i>	1	9	10	10	High	Demersal
	<i>Parthenopidae</i>	Ketam Hantu	<i>Parthenope longimanus</i>	1	4	10	10	Low	Demersal
	<i>Portunidae</i>	Ketam Mancis	<i>Podophthalmus vigil</i>	3	6.7-10.5	40-100	220	Medium	Demersal
F2	<i>Sepiidae</i>	Sotong Katak	<i>Sephia</i> sp.	1	21	200	200	High	Demersal/ pelagic
	<i>Carangidae</i>	Ikan Cermin	<i>Carangoides armatus</i>	1	12	50	50	Medium	Demersal
F3	<i>Leiognathidae</i>	Kekek	<i>Leiognathus brevirostris</i>	1	10	20	20	Low	Demersal
	<i>Carangidae</i>	Selar	<i>Atule mate</i>	1	17	50	50	Medium	Pelagic
F5	<i>Leiognathidae</i>	Kekek	<i>Leiognathus brevirostris</i>	29	8.2-12.2	5-20	365	Low	Demersal
	<i>Mullidae</i>	Biji nangka	<i>Upeneus moluccensi</i>	1	10.6	20	20	Low	Demersal
Total				55			1405		



Photo 3.36 Ikan sebelah



Photo 3.37 Ikan kekek



Photo 3.38 Unidentified.



Photo 3.39 Ketam bawang



Photo 3.40 Ketam mancis



Photo 3.41 Ketam Hantu



Photo 3.42 Sotong katak



Photo 3.43 Ikan selar



Photo 3.44 Ikan biji nangka

### 3.5.2.2 Spring

Results of fish fauna caught during spring tide is represented in Table 3.11 below. A total of 12 individuals of fish and a single individual of crab were caught at the study area during spring tide with a total of 13 individuals. The highest abundance of fish fauna was recorded at Station F3 with eight individuals, followed by station F1 with three individuals while only 2 individuals were recorded from station F5. No fish fauna was found at F2 and F4.

The fishes and crab caught belonged to five families and comprised of five species (Table 3.12). There were four species of fish, and a single species of crab (Photo 3.45 to Photo 3.49). The station with the highest species richness was station F3 (three species) followed by both station F1 and station F5 (two species). As mentioned, no species were caught at stations F2 and F4.

Among the species caught, kekek (*Leiognathus brevirostris*) was the most dominant species, represented by eight individuals (one at station F1, six at station F3 and one at station F5). Duri (*Arius* sp.) was the second most abundant species with two individuals (both caught at station F1). The remaining species represented by a single individual from each species namely Kerisi (*Nemipterus* sp.) and Ketam Batu (*Charybdis lucifera*) were caught at station F3 while a single individual of Kapas (*Gerres* sp.) was found at station F5.

In terms of maturity, there was juvenile fish found at station F1, which was Ikan Duri (total length of 17.5 cm and 18 cm).

Table 3.12 Fish fauna caught during spring tide.

Stn.	Family	Local Name	Scientific name	No.	Length (cm)	Weight (g)	Total weight per species (g)	Commercial value /24/	Demersal/ pelagic
F1	Aridae	Duri	<i>Arius</i> sp.	2	17.5 -19	50	100	Low	Demersal
	Leiognathidae	Kekek	<i>Leiognathus brevirostris</i>	1	10.7	10	10	Low	Demersal
F3	Portunidae	Ketam Batu	<i>Charybdis lucifera</i>	1	10	190	190	Medium	Demersal
	Nemipteridae	Kerisi	<i>Nemipterus</i> sp.	1	21	100	100	Medium	Demersal
	Leiognathidae	Kekek	<i>Leiognathus brevirostris</i>	6	8-10.5	5-10	155	Low	Demersal
F5	Drepanidae	Kapas	<i>Gerres</i> sp.	1	12.5	20	20	Low	Demersal
	Leiognathidae	Kekek	<i>Leiognathus brevirostris</i>	1	9.5	5	5	Low	Demersal
Total				13			580		



Photo 3.45 Ikan Duri



Photo 3.46 Ikan kekek



Photo 3.47 Ketam Batu



Photo 3.48 Ikan Kerisi



Photo 3.49 Ikan Kapas

### 3.5.3 Discussion

The fish fauna recorded during neap tide sampling was higher (55 individuals) compared to spring tide (13 individuals) (Figure 3.26). In terms of species richness, the highest number of species was recorded at neap tide (10 species) compared to five species caught during spring tide. The majority of the fishes caught during both tides were consistent with the fish genera recorded in a previous 2011 study located at the coastal area of Kuala Terengganu /25/. It is noted that the majority of species caught during both occasions were mainly demersal (Table 3.11 and Table 3.12). The nets deployed during the survey is trammel nets which will submerge at the sea floor hence demersal fish fauna are expected during the survey.

However, pelagic fish can be expected too as this method is very effective for fish fauna sampling /26/.

The present survey was conducted on 2<sup>nd</sup> and 4<sup>th</sup> October 2017 during the end of the intermonsoon period. No fishermen were observed fishing during the survey period. This is possibly due to survey period being close to the North East monsoon (November to March) in which fish movement towards the south is influenced by the direction of the current flow and less fish are expected at the coastal area during this climatic condition /27/. This change of lesser fish fauna during the NE monsoon can be predicted by local fishermen which influence their decision not to fish during this period.

Fish diversity is higher at Station F1, which is located near to the estuary of Sg. Terengganu / the Kuala Terengganu breakwater entrance. Recreational fishers were observed fishing around the breakwater structure, which may indicate that the breakwater structure is inhabited by a high number of fish fauna as this structure provides shelter and surfaces for organisms to settle on /28/.

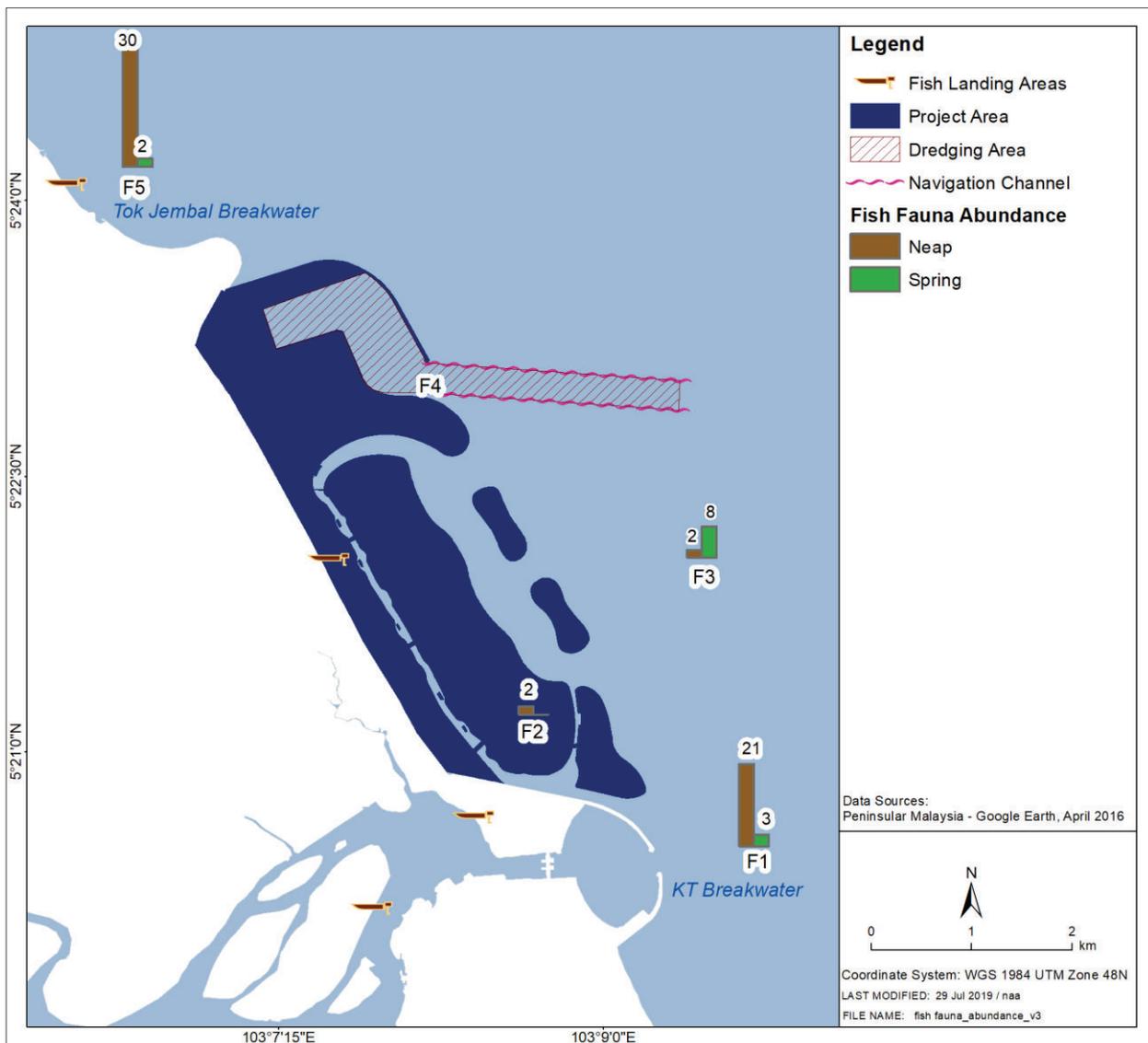


Figure 3.26 Fish fauna abundance during neap and spring

## 3.6 Terrestrial Vegetation

In general, approximately only half the coastal area is vegetated. Four vegetation community types are present along the coastline within 200 m from the Project, namely woodland, sparse woodland, shrubland and herbaceous. These vegetation types were identified using satellite imagery combined with site observations. Details of the methodology and field descriptions are described below.

### 3.6.1 Survey Methodology

Observation of terrestrial vegetation was conducted along the coastline, within 200 m from the Project site. Mapping was carried out using a combination of two methods; satellite image (Google Earth, April 2019) and ground truthing (site observation, September 2017) to confirm the observation of the satellite imagery. The site observations were conducted at four areas which were chosen based on the difference in canopy covers from the satellite images (Figure 3.27). A handheld GPS was used to record trackpoints and waypoints. At each site, the following observations were recorded:

- Vegetation type (see Section 3.6.1.1);
- Coverage;
- Fauna; and
- Type of landuse.

Photographs were taken throughout the site investigation and other notes and observations were also included (e.g. erosion, wildlife, etc.).