centres procure raw fish directly from the fishing boats and send the pre-processed fishes to the Surumi plant while the waste generated is sent to fish meal plants, where it is converted to protein rich powder and used in the preparation of aqua feeds.

During peak fishing season, the Fish Cutting Centres have the capacity to produce 10-15 tonnes (t) of pre-processed fish daily. Availability of raw material used for the preparation of Surimi is maximum during September to December. The pre-processing centres generates enormous amount of waste, being approximately 20 - 30% of total fish weight, based on the species of fish being processed. The waste thus generated during the processing is transported to nearby fish meal plants. Majority of the fish cutting centres operate for about 6 - 8 months in a year, depending on raw material availability. Whenever there is no demand for the pre-processed fish from the Surimi plants or scarcity of a particular fish, these cutting centres procure oil sardine and process it for canning factories on request.

Each Fish Cutting Centre employs around 80-100 women and the 25 functional pre-processing sheds provide direct employment to around 2500 women living in the coastal area. They are initially trained in hygienic processing of the fish. The cutting tables and other equipments have been modified accordingly to facilitate a comfortable working environment for the women employees. While processing the fish the women squat down and cut fishes using sickles. To suit this method of cutting, the height of regular processing tables have been decreased and sickles mounted on the edges. Thereby the women can sit comfortably on special platforms above the wet floor and cut the fish with ease. The trained women can process around 100 - 150 kg of fish every day and are paid on a daily basis at the rate of ₹2 per kg of processed fish.

These centres thus provide direct employment to the fisherfolk by playing a crucial part during the pre-processing phase of Surimi production. These pre-processing centres are indirectly responsible for boosting the export earnings of the country from fisheries. Surimi is mainly exported to European countries, Japan and South-East Asian countries and annually about 10,000 to 12,000 t is being exported from India. In addition, oil sardine processed from these centres are being used along with other highly priced fishes for export.

On a small scale targeted fishery for White sardine and Goldspotted grenadier anchovy along the Maharashtra coast

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Marine fish landings of Maharashtra during 2014 were estimated at 3.44 lakh tonnes (t) with the pelagic resources contributing a major share (42%). Of this, more than 60% were small pelagics namely, Bombay duck, clupeids and anchovies. These fish have been targeted by coastal fishermen using
traditional fishing methods for their livelihood and sustenance since several decades. Fishing operations which are mainly in the near shore areas are declining due to the coastal pollution and developmental activities. Yet for many of these traditional small-scale fishermen, alternate livelihood options are limited.

In Maharashtra especially in the suburbs of Mumbai city (Versova, Cuffe Parade, Madh, Vasai, Alibaug) an exclusive targeted fishery exists for white sardine, *Escualosa thoracata*. This fishery has been in existence for the past four decades and is conducted by local fishermen. Locally this fish is called *Bhiljee* due to its silvery-white shiny appearance. Nearly 20-50 small motorized or non-motorized canoes (15-20 feet), small boats with inboard/outboard engines (16-26 feet, 1-2 cylinder) conduct fishing in the near shore areas (within 2-5 km) at depths of 2-8 m using special small meshed (18 - 22 mm mesh size) drift gillnets called “*Bhiljee jaal*”. Length of the net ranges from 40 -100 m with a height of 1.1 to 1.3 m. Each boat has a crew of 2 - 5 people. Each boat takes 8 -15 nets depending upon the number of crew. They venture into sea early in the morning around 0400 am and set the nets by 0500 am. Net is hauled after 2-3 hours and catch brought to the shore by 0930 am. Sorting of the fish catch is done at the beach and all family members including women and children participate in the process. Mostly the catch will be exclusively of *E. thoracata*. Occasionally catfishes, flying fishes, fullbeaks, halfbeaks, polynemids and clupeids are also caught which gives the fishermen higher returns. Length of *E. thoracata* landed ranges from 48 -114 mm in total length (TL). Catch depends upon season, area and tide. When the *Bhiljee* catch is low these fishermen use gillnets of mesh size 50, 90, 100 and 140 mm for other fishes. The *Bhiljee* fishery forms the main livelihood avenue for some fishermen during the monsoon season. On a good day, catch may be 30 -50 kg, which is sold at ₹ 100 -180 per kilogram. During monsoon season, the price obtained will be higher due to fishing ban and non-availability of other fishes.

In 2014, the Goldspotted grenadier anchovy *Colilia dussumieri* contributed 4.0 % (14,056 t) to the total marine fish landings of Maharashtra, showing a 43 % increase over the last year. Bag nets were the major contributor to this fishery followed by trawl nets and gillnets. Alibaug in the northern part of Mumbai has been a major hub for small pelagic fisheries since a very long time. *C. dussumieri* locally known as *Mandeli*
is a small engraulid with a maximum size of 21 cm TL. A targeted seasonal fishery is conducted by local fishermen of Alibaug with a special gillnet of 80 to 100 m length with a height of 2 m and mesh size of 25 mm. In peak season nearly 60 boats (18 to 25 feet) with inboard engines operate for fishing Mandeli. Fishermen venture into sea at 05:00 AM and conduct fishing for 3 hours after which they reach landing centre around 11:00 AM. More than 90% of the catch consists of C. dussumieri and by-catch includes Pellona ditchela, Sardinella spp. and other clupeids. According to the fishermen, winter season is good for Mandeli fishery. The catch is sorted on the beach by the fishermen’s family. Women exclusively deal with fish sales. Due to demand for fresh fish, most of the catch is sold off on the beach itself. In the landing centre Mandeli is sold in baskets each costing ₹200-300.

Two instances of gonadal abnormalities in Indian mackerel

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The Indian mackerel Rastrelliger kanagurta is known to be dioecious with male and female gonads in separate individuals. However, gonadal abnormalities such as hermaphroditism and other aberrations have been observed in a few instances. Gonadal abnormalities in mackerel observed during regular biological sampling from fish samples collected from the landing centre is reported here. For the histological analysis, the gonads were fixed in 10% neutral buffered formalin, dehydrated in ethanol series and the cleared samples were embedded in paraffin wax and made into blocks. Serial sections of 5 µm were taken using a Leica Microtome and stained with Harris’s Haematoxylin and Eosin.

A mackerel caught in a gillnet on 6th February 2014, had both male and female gonads which were separate. The total length and body weight of the hermaphrodite fish was 178 mm and 52 g respectively. The gonads consisted of separate testis and ovary and they were not interconnected (Fig. 1). The length of the right ovary was 33 mm while the left ovary was smaller at 22 mm. The total