Summary
The sciaenids constitute one of the major demersal fisheries of Uttara Kannada District. Of the twelve species of sciaenids occurring in these waters, *Johnius belangerii* (Cuvier) is the most dominant. Although an important food fish, virtually nothing was known about its biology and fishery. Hence, a comprehensive study was initiated and the results of the investigations carried out for a period of two years (April 1979 to March 1981) are presented in the thesis. The study is based on the examination of commercial fish catches at Majali, Karwar, Binga, Arga, Chendiye, Kodar, Harwada, Keni, Gannavali, Tadri, Kumta, Honnavar, Manki, Murudeshwar, Shirali and Bhatkal, the major fish landing centres of the district.

**Growth rate:**

a. Relationship between total length and other body measurements like standard length, snout length, head length, occular length, post-orbital distance, inter-orbital width, distance from the snout to first dorsal fin, distance from the snout to second dorsal fin, prepectoral length, pre-pelvic length, pre-anal length, distance from first dorsal to anal fin, distance from second dorsal to anal fin and depth were established
by statistical method. The equations describing these relationships are:

1. Standard length                 \[ Y = 0.5578 + 0.8514 X \]
2. Snout length                    \[ Y = 0.0302 + 0.0713 X \]
3. Head length                     \[ Y =-1.3698 + 0.2674 X \]
4. Ocular length                   \[ Y = -0.4043 + 0.0697 X \]
5. Post-orbital distance           \[ Y = -5.1905 + 0.1941 X \]
6. Inter-orbital distance          \[ Y = -3.0119 + 0.1272 X \]
7. Distance from snout to first dorsal fin \[ Y = 5.2969 + 0.2585 X \]
8. Distance from snout to second dorsal fin \[ Y = 7.6247 + 0.3732 X \]
9. Pre-pectoral length             \[ Y = 2.5332 + 0.2562 X \]
10. Pre-pelvic length              \[ Y = 5.0303 + 0.2378 X \]
11. Pre-anal length                \[ Y = 1.7804 + 0.5496 X \]
12. Distance from first dorsal to anal fin \[ Y = 4.7264 + 0.3496 X \]
13. Distance from second dorsal to anal fin \[ Y = -3.7992 + 0.3138 X \]
14. Depth                         \[ Y = 2.3937 + 0.2471 X \]

(X represents total length and Y variables)

It is concluded that the standard length has the highest rate of growth (0.8514 mm/mm total length) and the ocular length the lowest (0.0697 mm/mm total length).
b. Age and growth of the fish was assessed by the length-frequency method. In all, 2579 specimens were analysed during April 1979 to March 1980.

It is concluded that the fish attains average lengths of about 110 mm and 170 mm at the end of first and second years of its life respectively. The growth rate is high in the first year (9.16 mm/month) and low in the second year (5 mm/month). The polymodal nature of the polygons indicates that spawning in the fish is prolonged.

c. The length-weight relationship separately for the sexes is found to be:

Males: \( W = 0.00003127L^{2.7894} \)

Females: \( W = 0.00001600L^{2.9225} \)

As revealed from the analysis of covariance, the regression coefficients ('\( b \)') of males and females do not show any significant difference between the two. In both the sexes, the coefficients of correlation ('\( r \)') were significant which indicates a perfect relationship between total length and weight of the fish.

The males are slightly heavier than females during the first year and females heavier than males during the second year.
Reproductive biology:

Maturity stages were classified based on the macroscopic appearance of the gonads and microscopic study of the intra-ovarian eggs.

The ova' diameter studies indicate the gradual, continuous and sequential maturation process in the species.

A study of the gonads in each stage of maturity in relation to size of fish suggests that males attain first maturity at a size of 81-90 mm and females at 91-100 mm.

The determination of spawning period and the frequency of spawning was based on the ova-diameter studies monthwise occurrence of fish in various stages of maturity and progression of the average size of the largest eggs. The fish appears to spawn during the months of November to March with peak spawning taking place during December or January. The maturation process indicates that the fish releases eggs in batches over a prolonged period.

The study of gonado-somatic index (GSI) reveals that the females have higher values of GSI than males. The GSI increases gradually with the increase in length of both the sexes. The seasonal variation in the gonado-somatic index suggests that it is high in both the sexes during the spawning months.
The sex ratio studies show that sexes are not equally distributed as the females exceeded males in the commercial catches in most of the months with the cumulative ratios of males to females standing at $1:1.2$. However, during the spawning season, males and females probably congregate and segregate soon after.

The fecundity values are found to vary from 4265 to 29833 in specimens ranging in size from 131 to 195 mm.

The relationships of fecundity ($F$) with total length ($L$), weight of fish ($W$) and ovary weight ($G$) have been studied. The equations describing these relationships are found to be,

\[
\begin{align*}
\text{Total length and fecundity} & \quad Y = -6.3942 + 3.4707 X \\
\text{Weight of fish and fecundity} & \quad Y = -0.9360 + 1.2696 X \\
\text{Weight of ovary and fecundity} & \quad Y = 0.7039 + 1.2731 X
\end{align*}
\]

Various indices like relative fecundity or comparative fecundity, number of ova per gram ovary weight, coefficient of maturity and gono-somatic index are found to vary with the length and weight of the fish.

The results of studies on relative condition factor ('$K_n$') in relation to length in both the sexes show an inflexion at 91–95 mm which incidentally is the minimum size of maturity of females.
The monthwise study of relative condition factor indicates that condition is at its peak during the spawning season (December to February) when a rise in gonado-somatic index also occurs.

**Food and feeding habits:**

The food of *J. belangerii* was studied from the stomach contents of the fish with a size range 71 to 200 mm. The fish feeds on a wide ranging variety of macrobenthic invertebrates and nektonic and planktonic forms. Fishes and prawns form by far the most important components of food.

The feeding habits of the fish are found to change with age. Smaller fishes of less than 110 mm size feed mainly on copepods, prawns, stomatopods, lucifers, fishes, amphipods and mysids, whereas larger individuals of more than 110 mm prefer bottom living organisms such as fishes, prawns, crabs and echiurids. The feeding intensity is associated with sexual maturity.

From the qualitative and quantitative study, it can be concluded that *J. belangerii* is a carnivore feeding on a mixed diet of prawns, fishes, stomatopods, echiurids, bivalves, amphipods and sipunculids.
Fishery:

The sciaenid fishery is of varying magnitude in different maritime states of India. It accounted for 4% of the marine fish catch during the period 1971-1980. It is an important fishery along the Uttara Kannada coast forming 2.5% of the total catch of the district. Twelve species of sciaenids occur along the Uttara Kannada coast of which J. belangerii is most dominant. Sciaenids are captured in gears such as trawls, shore seines and cast nets.

The commercial fishery consists of 0 and 1+ Yr old fish. Local marketing, and upghat transportation and marketing of sciaenids are two important ways of disposal of the catch. Curing is the most traditional way adopted to preserve sciaenids during periods of abundance.