9. SUMMARY

1. Description of *Rastrelliger kanagurta* with keys to the identification of genus and species are given at the outset.

2. An analysis of the production in India, and the maritime states are given amply illustrated and the status of mackerel in the marine fish catches touched upon.

   Localities of high catches in each state are identified and details given.

3. Seasonal distribution of mackerel along Indian coasts is studied and presented. Maximum catches in east coast occur in March in its north and April in south. On west coast, around southern most part it peaks in April-May. To its north; from central part of Kerala it peaks during September-October, Karnataka and Goa in October and Maharashtra in November. In Gujarat in the northwest, as in Orissa of east coast, the maximum occurs in March.

4. The fishery and biology of mackerel landed by *Thangu vela* at Cochin during 15 seasons falling between July 1965 and June 1980 were studied. Though the catches fluctuated widely from season to season the effort did not change much. Fluctuations in catches hence depend upon fishery independent factors.
5. Utilizing the data collected for 15 seasons at Manassery and for another one collected during July 1980 to June 1981 at Fisheries Harbour, Cochin the length-weight relationship (LWR) were computed and found them to vary from one season to another within a range of

\[ \log W = -6.6417570 + 3.7351815 \log L \]

and

\[ \log W = -4.8357030 + 2.9336164 \log L. \]

The pooled value for the 16 seasons as a unit is

\[ \log W = -5.6738829 + 3.2995842 \log L. \]

Exponential equations of the LWR and equations for L in cm were also worked out and given for comparisons.

6. The values of \( b \) in each season tested against the pooled one of 3.2995842 showed them with \( \pm 0.2158 \) difference to be in tolerance limits, beyond which the variations become significant. Against 3.0, around 11.5\% of variations on it are within tolerance limits.

7. Between males and females the relations were worked out independently for 4 seasons between 1977-’78 and 1980-’81 and also for the period as a whole. The pooled value for 1977-’81 period is
\[ \log w = -5.3256977 + 3.1511524 \log L \]

for male and

\[ \log w = -5.2462069 + 3.1172780 \log L \]

for female. Tested against each other, variation between sexes was found insignificant. The 'b' value of females in all 4 seasons were slightly lower than that of males.

8. The LWR between indeterminate and determinate fish were found for some seasons from pooled data respectively as

\[ \log w = -5.6652489 + 3.3064783 \log L \]

and

\[ \log w = -5.2462069 + 3.1172780 \log L. \]

Tested against each other, variation between them was highly insignificant.

9. A regression,

\[ a = -1.8209470 + 2.2693648 b \]

showing perfect straightline relationship between 'a' and 'b' values of LWR of the 16 seasons under study was found out and in 't' test this relation was found to be highly significant.
Though some 'b' values were significant in 't' tests against the 'b' of pooled equation as also 3.0, between 'a' and 'b' all of them including indeterminate fish in relation to above equation showed good three-dimensional growth. Using this equation, the LWR at other places available in literature were verified and the mistakes found were rectified. According to the relation between 'a' and 'b', the LWR on Cube Law is

\[ \log L = -5.0 + 3.0 \log L. \]

10. From monthly size distribution of mackerel in the commercial catches at Cochin the growth was found to be 15.07 mm per month in 1st year and 5.26 mm per month in the 2nd year.

11. The length of fish at different age found out in the study are <159 mm 0-year, 160-229 mm 1-year, 230-269 mm 2-year, and >270 mm 3-year old. This age-length structure was fitted into a curve with von Bertalanffy's Growth Function.

12. The commercial catches by Thangy vela accordingly comprised of 1-year old fish 72.5%, 0-year old 24.2%, and 2-year old 3.3% in the pooled value for the 15 seasons. The 3-year old occurred only in one season, that too in negligible numbers.

13. From age composition, the total instantaneous mortality (Z) was calculated to be 3.2522. It was further apportioned to
instantaneous fishing \( (F) \) and natural mortality \( (M) \) as 2.0814 and 1.1708 respectively. The rate of exploitation accordingly is 0.6152.

Between effort of *Thangy vale* and its cpue of mackerel, the regression relation gives a negative 'a' and a positive 'b' values indicating the fishing by this unit not to affect the stock. This relation hence cannot be used for yield studies.

The growth parameters like \( L_0 \), \( K \), and \( t_0 \) were therefore computed and found to be 315 mm, 0.6 and 0.141 respectively.

In Beverton and Holt (1957) model the fishing curve steadily increases up to \( F \) 2, takes a right turn afterwards and gets more or less stabilized at 4. Beyond this there is no commendable gain in yield per recruit \( (Yw/R) \). Though the stock is not affected by fishing, the effort has to be restricted between \( F \) 2 and 4 to avoid waste in it. The \( Yw/R \) is observed to be at its best when the fish is 200 mm in length and 83 g in weight, and 1.55 year old. The \( F \) calculated in the study is very close to the turning point seen in the yield curve.

The average yield in India, during 1969-'80 representing a unit time in 10-year cycle in the long-term fluctuation of the fishery, is 87,257 tonnes; and the standing stock
(Y/F) and annual stock (Y/U) are calculated to be 41,922 and 141,835 tonnes respectively. The potential yield at 

$F_{\text{max}}$ is 209,820 tonnes and the maximum recorded 

all-India catch of 204,575 tonnes is within its limit.

18. The findings in the study are discussed with relevant 

information in literature cited, suitability confirmed, 

infirmities indicated and improvements suggested.

19. Conclusively, regulation on more effort is pointed out, and 

an introduction of quota system and sharing of stock between 

the mechanized and non-mechanized sectors is proposed.