

# A FORECAST FOR THE ENSUING OIL-SARDINE FISHERY

Dr. B. T. Antony Raja  
*Central Marine Fisheries  
Research Sub-station, Karwar*

The ability to forecast the course of events likely to be encountered during the approaching fishery season enhances the value of fishery research in the eyes of those in the industry. As Simpson (1956) has put it, "Apart from the value to the industry of forecasting, predicting what is going to happen and checking it against the actual events is to the fishery biologist one form of the universal research tool of formulating a hypothesis and putting it to test." In the case of the Indian oil-sardine, since the fishery comprises usually of two successive generations, even among which the younger of the two — the juvenile community recruited every year — forms the mainstay, the problem of great variations spread over long periods or the question of long-term prediction does not arise. On the other hand, the responsibility of the fishery researcher is formidable since a reliable forecast for the ensuing fishery has to be done very quickly with no background data on the juveniles that are going to appear for the first time. Thus, to evolve a method of prediction, which would *per force* have a short-term value for that season only, the basic requirement is the detection of the factor

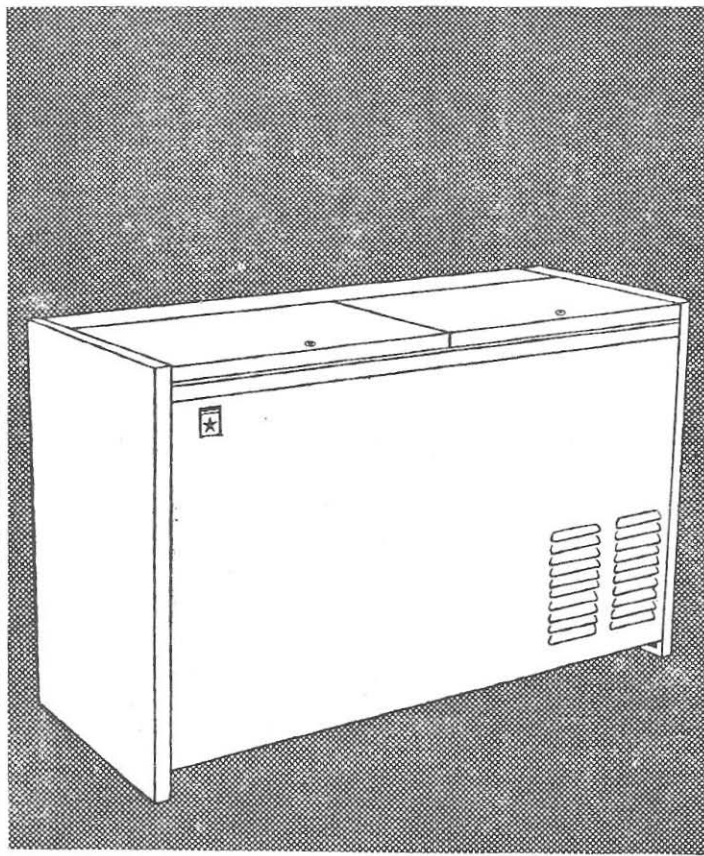
or factors responsible for the variations in the yield every year. Before reporting the outcome of this twin task of a fishery biology programme, it would be worthwhile to look at the performance record of this valuable resource.

## RECORD

The fishery, true to its tradition, was having rich and lean seasons in the past but suddenly registered a shock to the industry in the early forties of the present century which culminated in almost a total decimation of the stock in 1946-47. It, however, recovered steadily in the fifties but made such a boom in the sixties that it has shattered all the previous records. Although the fishery has been continuously yielding since 1964 so good a harvest that it has averaged 2.4 lakh tonnes forming 10% of the entire Indian Ocean catch, it is not all roses! That the fairest things have fleetest fortunes is true of the oil-sardine, for during the past two decades, it has been found to dip as low as 1% of the total marine catch in India as well as rise meteorically to a phenomenal portion of 33%! Hence, the problem is very much alive — the problem

# For Ice-cream Vendors, Poultry Farms and Retail Cold-stores...

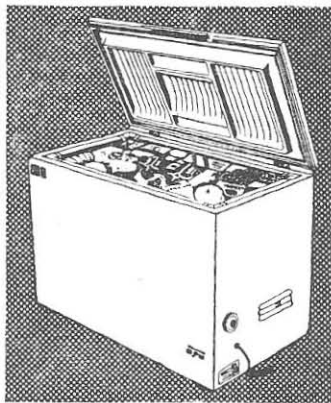
three profitable suggestions from Blue Star.



Suggestion 1: The Blue Star Freezfast 210 litre horizontal deep freezer



Suggestion 2: The Blue Star Leonard 275 litre vertical deep freezer



Suggestion 3: The Blue Star Leonard 425 litre horizontal deep freezer

Three spacious, dependable deep freezers. (Only Blue Star can offer as wide a choice!)

If your problem is to keep your merchandise frozen fresh for your customers, Blue Star's range of deep freezers provides you with three ideal solutions.

These deep freezers offer you efficient trouble-free performance, lots of storage space, easy access to the contents, and a small

electricity bill. What more could you want?

When you buy a deep freezer from Blue Star, you get with it the backing of the people who have led the refrigeration and air conditioning field for 30 years, and the kind of prompt, efficient after-sales service that

only Blue Star can give.



**BLUE STAR**

Bombay  New Delhi  Calcutta  Madras  
Kanpur  Secunderabad  Cochin  
Bangalore  Jamshedpur  Gauhati

of finding the reason for the erratic fluctuations.

## REASON

There are three major causes for the fluctuations in the fishery yields, namely, fluctuations in fishing effort, in accessibility and in population size. That fluctuations are not due to fishing effort has been indicated (Banerji, 1967). The problem of fluctuations in accessibility does not appear to arise, for the area and types of fishing have remained almost the same for years. So the fluctuations are due to variations in the population size, or more precisely, variations in the strength of the juveniles recruited every season. In other words, the fluctuations are fishery-independent and are governed by environmental factors at the time of recruitment, namely the period from June to September which is subjected to vagaries of monsoon.

## RESEARCH

Since the fluctuations are traceable to the quantum of recruitment in every season, the researcher's concern would be to study the whole range of phenomena which lead to the reproductive act and those that subsequently lead to recruitment. As the intense spawning period of the oil-sardine coincides with the height of monsoon, the most important period from the recruitment point of view is June to August. The studies of Antony Raja (1972 a & b) indicated that during certain years when the southwest monsoon is weak and the rainfall erratic or feeble during that is suspected as "spawning fortnight" (a week before and after New Moon day), a phenomenon called *atresia* (breakdown of eggs in the ovary) takes place prior to

spawning which causes heavy reduction in the potential stock of eggs for release. Together with the normal post-spawning atresia which is a characteristic feature of the oil-sardine's spawning habits (Antony Raja, 1967), the actual amount of ova released per individual gets considerably reduced with a cumulative effect for the whole population. As it is generally agreed that there must be a critical level of egg production below which recruitment to the stock would definitely decline (Parrish, 1956), it follows that greater attention is paid to the study of rainfall that appears to have a role in affecting the reproduction.

## RAINFALL

The writer first proposed the study of the relation between the rainfall as obtained during the spawning fortnights of June to August and the strength of juveniles that enter the fishery immediately thereafter (Antony Raja, 1969). He made a preliminary analysis of 10 years data (1960 to 1969) pertaining to Calicut (Antony Raja, 1971) and followed it with a detailed study of these records to conclude that the deductions made from Calicut region appear to hold good for the oil-sardine fishery of the entire west coast (Antony Raja, MS.). These studies showed that a mean daily rainfall of 20-21 mm for June, 25-26 mm for June-July and 22-23 mm for June-August periods appear to be the threshold values for obtaining favourable environmental conditions for normal ripening of gonads and successful spawning. It was further pointed out that while any reduction below a mean daily rainfall of 20 mm in June may start affecting the process of ripening and spawning, the resulting effect would be greatly minimised if there is an adequate rainfall during the following two

# *old habits die hard*

*There was a time when REFRIGERANT GASES were imported ■ Imports have been stopped quite some time ago. Today, you are most probably using our product MAFRON— but under the impression that it is an imported brand. ■ So next time you need a refrigerant gas, ask for MAFRON—and make sure that you get a safe, reliable, quality product from the renowned Mafatlal Group.*



Manufacturers of MAFRON :  
**Navin Fluorine Industries,**  
Bhestan, Surat.  
Chemicals Division :  
**The Mafatlal Fine Spinning  
and Manufacturing Co. Ltd.**



Distributors for MAFRON :  
**Hoechst Dyes & Chemicals Limited,**  
Dugal House, Backbay Reclamation,  
Bombay 20  
Ahmedabad • Bombay • Calcutta  
Madras • New Delhi

months. However, if the June rainfall is severely impaired to a level of less than 10 mm of daily average, then the damage caused may be beyond repair.

#### FORECAST

Based on the striking relationship between the rainfall, atresia and the strength of incoming juveniles, successful prediction of a fall in recruitment was made in 1963, 1965 and 1969. (*vide* Antony Raja, 1969). While in 1963, the catch records from the entire resource showed a precipitous fall, the landings data of 1965 and 1969 appeared to indicate that the catches had not been greatly affected. But it is necessary to point out that these were the seasons which were characterised by the support given by the adults — representing the spill-over fish after spawning — to the extent of partially masking the failure of the juvenile fishery. This incidence of departure from normal was due to the rich juvenile recruitment during the respective previous years, namely, 1964 and 1968, the year-classes of which continued to support the fishery during the respective succeeding seasons also.

The average daily rainfall (mm) during the current spawning season at different places of oil-sardine distribution, as taken from the daily meteorological bulletins, is given below:

	Karwar	Mangalore	Calicut	Cochin
June	2.2	3.5	3.3	6.2
June-July	17.2	17.7	21.4	19.2
June-August	16.7	20.4	16.0	15.1

Following the observations set forth earlier on the rainfall requirements, it is clear that the rainfall obtained during this season is distinctly below the minimum. In fact, it is comparable to the

years 1963, 1965 and 1969 when the juvenile fishery suffered a setback. A similar fate, thus seems to await the ensuing fishery for the juvenile oil-sardine as the gonadial picture also supports that the spawning has been severely affected. It is also likely that, unlike 1965 and 1969, the spill-over generation would not be able to offset the fall in the recruitment of the juveniles during the current season since the strength of the former (1971 year-class) is found to be very much lower than that of 1964 and 1968 year-classes as seen from the general catch records. Thus, the prospects for the 1972-73 season seem to be rather bleak and it should not be a surprise if the crop falls below that of the 1965-66 and 1969-70 seasons.

#### SYMPTOM

It is not the intention of this author to imply that the rainfall amount *per se* is responsible for varying degrees of recruitment but it is quite certain that rainfall is symptomatic of general climatic/oceanographic conditions that would control the spawning process. What is suspected is that a chain reaction, brought about by the failure or even unequal distribution of monsoon during the spawning, begins by affecting the spawning potential of the fish and if this continues in all the major spawning months of June to August, the overall egg production is impaired. The survival rate of eggs and larvae may also suffer as they would be out of phase with the required normal environment for development, resulting finally in the availability of a weak stock for exploitation. As reproduction in fishes is controlled by both exogenous stimuli, the oil-sardine can be reasonably expected to have a habit pattern or a built-in reaction that requires a particular condition or a set of conditions to

# BLYTH, GREENE, JOURDAIN & COMPANY, LIMITED

PLANTATION HOUSE,

FENCHURCH STREET,

LONDON, E. C. 3

IMPORTERS AND EXPORTERS OF

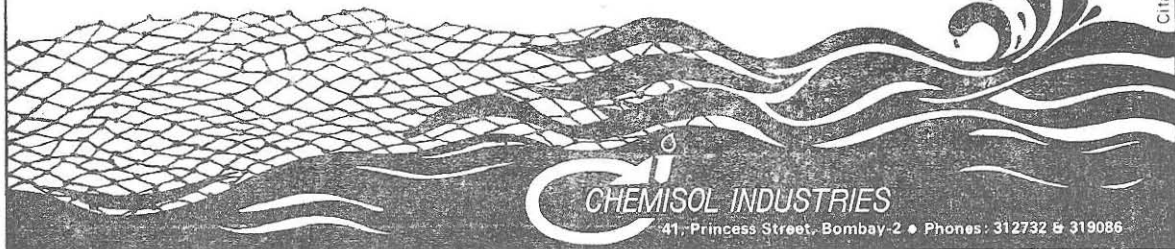
*Canned and Frozen Seafoods*



## Dip your fishing net in **CHEMISOL DIP COMPOUND** for net profit!

**CHEMISOL  
DIP COMPOUND**  
*gets you a netful  
of benefits.*

- Imparts excellent dimensional rigidity to the shape and knots of the twine.
- Adheres tenaciously to nylon/cotton twine, and prevents slippage of knots when net is loaded.
- Resists abrasion of rocks and sand; is inert to salt water.
- Minimal water absorption, hence no dead load to pull. Dries fast.
- Prolongs net life.
- Easy to use—just dip it and air dry.



**CHEMISOL INDUSTRIES**

41, Princess Street, Bombay-2 • Phones: 312732 & 319086

produce the trigger mechanism of spawning followed by an undisturbed rhythm of reproduction. The rainfall

amount only suggests the likelihood of obtaining or not obtaining this complex set of requirements.

#### REFERENCES

- Antony Raja, B. T., 1967 — Some aspects of spawning biology of Indian oil-sardine, *Sardinella longiceps* Valenciennes. *Indian J. Fish.*, (1964), 11A (1) : 45-120.
- Antony Raja, B. T., 1969 — The Indian Oil sardine. *Bull. Cent. Mar. Fish. Res. Inst.*, 16 : 128 pp.
- Antony Raja, B. T., 1971 — The Indian Oil-sardine fishery : Problems in perspective. *Symposium on Indian Ocean and adjacent seas*, Marine Biological Association of India, Cochin, January 1971, Abstract No. 317.
- Antony Raja, B. T., 1972a — Estimation of age and growth of the Indian Oil-sardine, *Sardinella longiceps* Val. *Indian J. Fish.*, (1970), 17 (in press).
- Antony Raja, B. T., 1972b — Fecundity fluctuations in the Indian Oil-sardine. *Sardinella longiceps* Val. *Ibid.*, (1971), 18 (in press)
- Antony Raja, B. T., MS. — Possible explanation for the fluctuations in abundance of the Indian Oil-sardine, *Sardinella longiceps* Valenciennes. Paper submitted to the 15th I. P. F. C. Symposium on "Coastal and High Seas Pelagic Resources".
- Banerji, S. K., 1967 — Fish population studies. *Souvenir, 20th Anniversary, Cent. Mar. Fish. Res. Inst.*, 37-40.
- Parrish, B. B., 1956 — The cod, haddock and hake. *Sea Fisheries - their investigations in the United Kingdom*. (Ed.) M. Graham, Edward Arnold Publishers Ltd., London : 251-331.
- Simpson, A. C., 1956 — The pelagic phase. *Ibid.* : 207-250.

## NEW ENGLAND FISH COMPANY

SINCE 1868



**NEFCO — THE WORLD'S LEADING PRODUCER OF CANNED SALMON — HAS ATTAINED ANOTHER "FIRST"!**

NEFCO IS NOW THE UNQUESTIONED LEADER IN THE DISTRIBUTION AND MARKETING OF INDIAN CANNED SHRIMP IN THE U.S.A. — BUILDING STEADILY INCREASING U.S. CONSUMER ACCEPTANCE, USE AND DEMAND FOR INDIAN CANNED SHRIMP, UNDER THE NEFCO FAMILY OF BRANDS.

**EXACTING QUALITY AND PACKAGING CONTROL ESSENTIAL!**

WE INVITE ALL INDIAN PRODUCERS OF CONSISTENTLY HIGH QUALITY CANNED SHRIMP TO JOIN — AND SHARE IN — OUR MARKETING PROGRAM.

*For steady, Dependable sales movement*

CONTACT:

**NEW ENGLAND FISH COMPANY**

PIER 89

SEATTLE, WASHINGTON 98119 U.S.A.

TELEX: 910-444-1667

TELEPHONE: 206-284-2750

CABLE: NEFCO SEATTLE