

OBSERVATION ON THE BEHAVIOUR OF TIMBER IN ZUARI ESTUARY OF GOA

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SUMMARY

Studies on the behaviour of timber carried out in the Zuari estuary of Goa during February '81 — January '82 period has been presented in this paper. The dominant species of wood boring organisms were *Lyrodus pedicellatus* Quatrefages, *Nausitora hadleyi* Schepman, *Martesia striata* Linnaeus. The destruction of wood during different months and seasons, the causative wood boring organisms, their growth rate, and the co-relation with environmental parameters have been discussed.

Introduction :

Fishing activity plays a vital role in the economy of Goa. The economics of this activity is very much affected by the destruction of the wooden hulls of the fishing boats, due to the marine wood boring organisms. There is hardly any data available on this aspect for Goa waters and the present studies were initiated to fill the gap in our knowledge on the behaviour of timber in the aquatic environment of Goa.

Material and Methods

For exposure, untreated mango wood (*Mangifera indica*) was selected due to various factors such as its normal response to wood-boring attack, ready availability as well as the cost. The panels measuring 15 x 10 x 25 cm were exposed in the vicinity of one of the pillars of the bridge being built across the Zuari estuary at Cortalim. The panels were fixed to wooden bars and were kept suspended, at five different depths viz., at subsurface, 1.5, 3, 4.5 and 6 meters, all well below the low tide level. In all, sixteen such sets were exposed. It included one each for the

different months (February '81 to January '82) to collect the data on monthly incidence of borers. In addition to these, one set of panels was exposed at the same place during each season i.e., pre-monsoon, monsoon, post-monsoon and one for the the total period (February '81 – January '82).

During the analysis in the laboratory, the foulers on the panels were scraped off. Thereafter, the number of entry holes of the wood-borers were counted and recorded. The panels were subsequently cut into two halves in order to determine the extent of internal destruction. In addition, to find out the relative abundance of different species of wood borers, as many pallets as possible were collected. To determine the growth attained by the wood-borers during the period of immersion, lengths of the tunnels made by these organisms were measured with the help of a flexible iron wire which is the normally accepted method.

The data on the environmental parameters such as temperature dissolved oxygen, salinity and PH collected by

Sawant (personal communication) have been presented so as to correlate the extent of the wood destruction with environmental factors.

Observations

The variations observed in the environmental parameters during the period were, temperature 25.9°C to 32°C, salinity 0.38% to 36.2%, dissolved oxygen 2.02 ml/litre to 5.12 ml/litre and pH 7.00 to 7.92 (Fig. 1).

The dominant species of wood-borers encountered were *Lyrodus pedicellatus* Quatrefages, *Nausitora hadleyi* Schepman; and *Martesia striata* Linnaeus. In addition, specimens of *Bankia compa-*

nellata Mole/Roch were also found, but they were of stray occurrence.

The panels which were exposed for monthly duration exhibited variations in the attack by way of entry holes. The panels exposed during September showed maximum number of entry holes. This was observed at all the depths except at 6 metres depth about which data could not be collected due to the loss of panel. The minimum number of entry holes was found during the month of June. Except during the months of August and September, the internal damage caused by these organisms during one-month period was negligible, since in these panels only superficial entry holes could be observed (Table 1).

TABLE—1

Monthly variations in number of entry holes and % destruction

Months	Depth									
	Sub surface		1.5 Metres		3 Metres		4.5 Metres		6 Metres	
	Entry holes	Dest-ruktion	Entry holes	Dest-ruktion	Entry holes	Dest-ruktion	Entry holes	Dest-ruktion	Entry holes	Dest-ruktion
February '81	*	*	*	*	66	S	44	S	30	S
March	*	*	*	*	54	S	44	S	9	S
April	86	S	108	S	172	S	119	S	106	S
May	5	S	127	S	118	S	62	S	122	S
June	56	S	4	S	17	S	62	S	24	S
July	*	*	45	S	24	S	20	S	30	S
August	84	5%	124	5%	*	*	406	10%	500	10%
September	585	S	726	S	590	5%	838	S	*	*
October	409	S	296	S	414	S	329	S	272	S
November	238	S	330	S	365	S	334	S	259	S
December	406	S	397	S	353	S	450	S	313	S
January '82	424	S	313	S	327	S	562	S	265	S

* Panel lost

S — Destruction superficial only

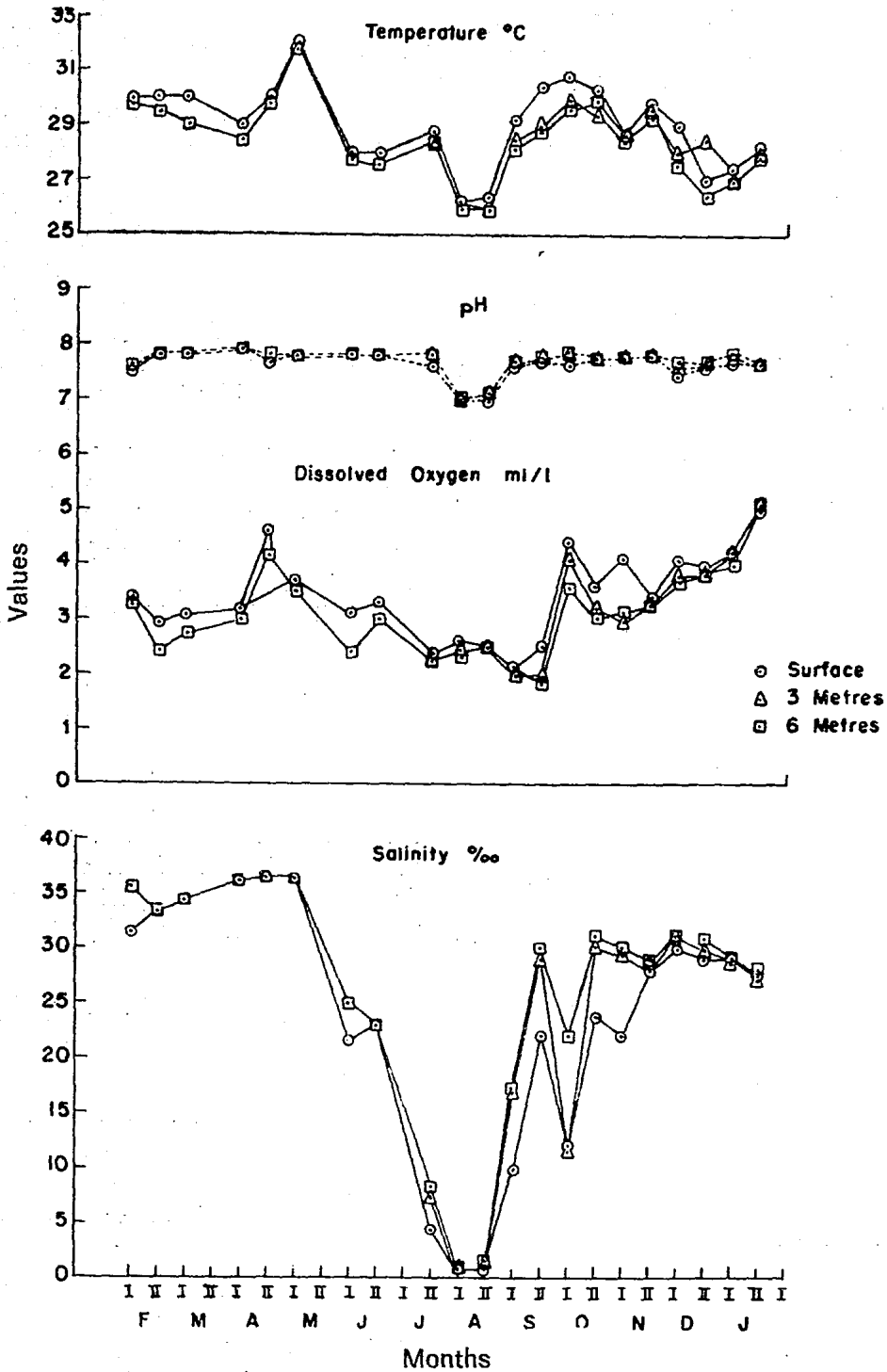


Fig. 1. Fortnightly variation in environmental parameters in Zuari estuary during the year 81-82.

Panels exposed during the monsoon season (June-September) were found to have the abundant number of entry holes of wood-borers than those for pre-monsoon and post-monsoon seasons. Among the latter two, the number of entry holes was higher in the case of post-monsoon panels than in the pre-monsoon panels (Fig. 3).

Internal destruction of seasonal panels was comparatively much higher in the case of monsoon season than the pre-monsoon and post-monsoon seasons. Among the panels exposed for pre-monsoon and post-monsoon period the panels exposed at 4.5 and 6 metres had higher extent of damage during pre-monsoon period, whereas the panels at 1.5 metres and 3 metres were found highly destructed during post-monsoon period. As regards the destruction at the subsurface level, it was negligible during the post-monsoon period whereas the seasonal panel for the pre-monsoon period at sub-surface level was lost, hence no observation could be made (Fig. 2).

It was observed that seasonal panels for pre- and post-monsoon periods exhibited larger number of entry holes with increased depth except for 6 metres depth. At this depth for both the seasons the attack was much less (Fig. 3).

The panels initially planned to be exposed for the total period of one year (February '81 — January '82) were found fully destroyed by November, and were no longer suitable for exposure, hence they were brought back to the laboratory in November.

As evidenced by the recovery of pallets, the internal destruction of the seasonal panels of pre-monsoon was caused by *M. striata* (90%), *L. pedicel-*

latus (7%) and *N. hadleyi* (3%) in the decreasing order of their relative abundance.

In the case of panels exposed during the monsoon season, the wood-boring organisms responsible for the internal destruction were the same as those in the pre-monsoon period, except that the decreasing order of relative abundance was *L. pedicellatus* (53.4%), *N. hadleyi* (29.1%) and *M. striata* (17.5%) (Fig. 3). The panels for the post-monsoon season were destroyed by *L. pedicellatus* (60%) and *M. striata* (40%).

The panels exposed for the total period of nine months (February '81 — November '81) were mostly destroyed by the cumulative effect of *L. pedicellatus* and *N. hadleyi*. The observations also indicated that *M. striata* attained a length of 0.4 to 2.8 cm during pre-monsoon period, 0.5 to 1 cm during monsoon period and 1.5 to 3 cm during post-monsoon period. *N. hadleyi* attained a length of 1.5 cm to 6.5 cm during pre-monsoon period and 20 to 22.5 cm during monsoon period. *L. pedicellatus* attained a length of 1.1 cm to 6 cm during pre-monsoon period and upto 8 cm during monsoon and post-monsoon period. The growth of the wood boring organisms must have been attained during their total period of exposure.

Discussion

The results obtained indicated that the timber panels have been attacked throughout the period of observations. The attack as evidenced by the number of entry holes, has been severe during the months of August and September at all the depths, indicating the abundance of wood boring larvae in the area. It correlates with reduced salinity values of the environment viz., 0.38% and

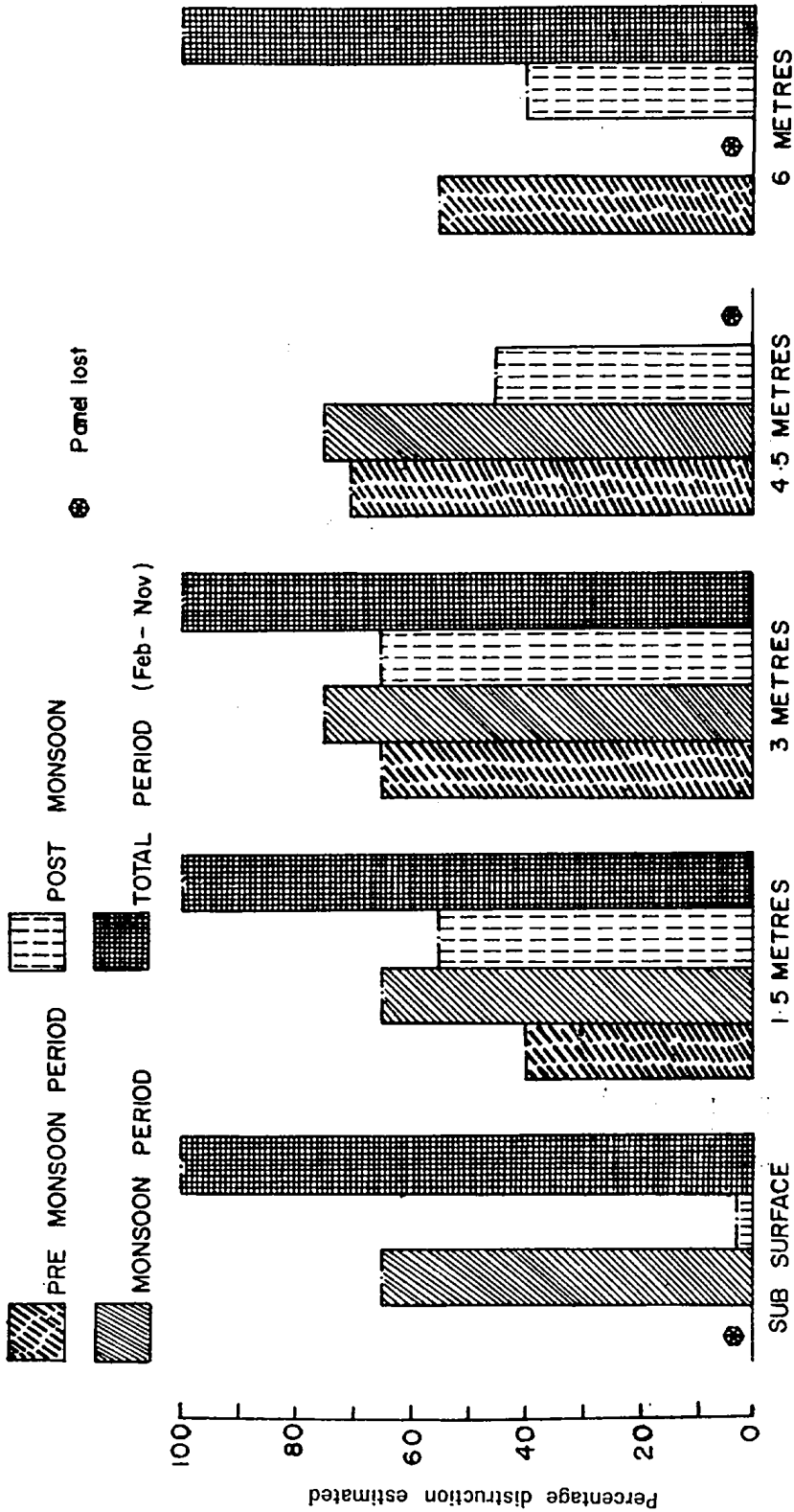


Fig. 2. Seasonal variations in destruction of wood at different depths

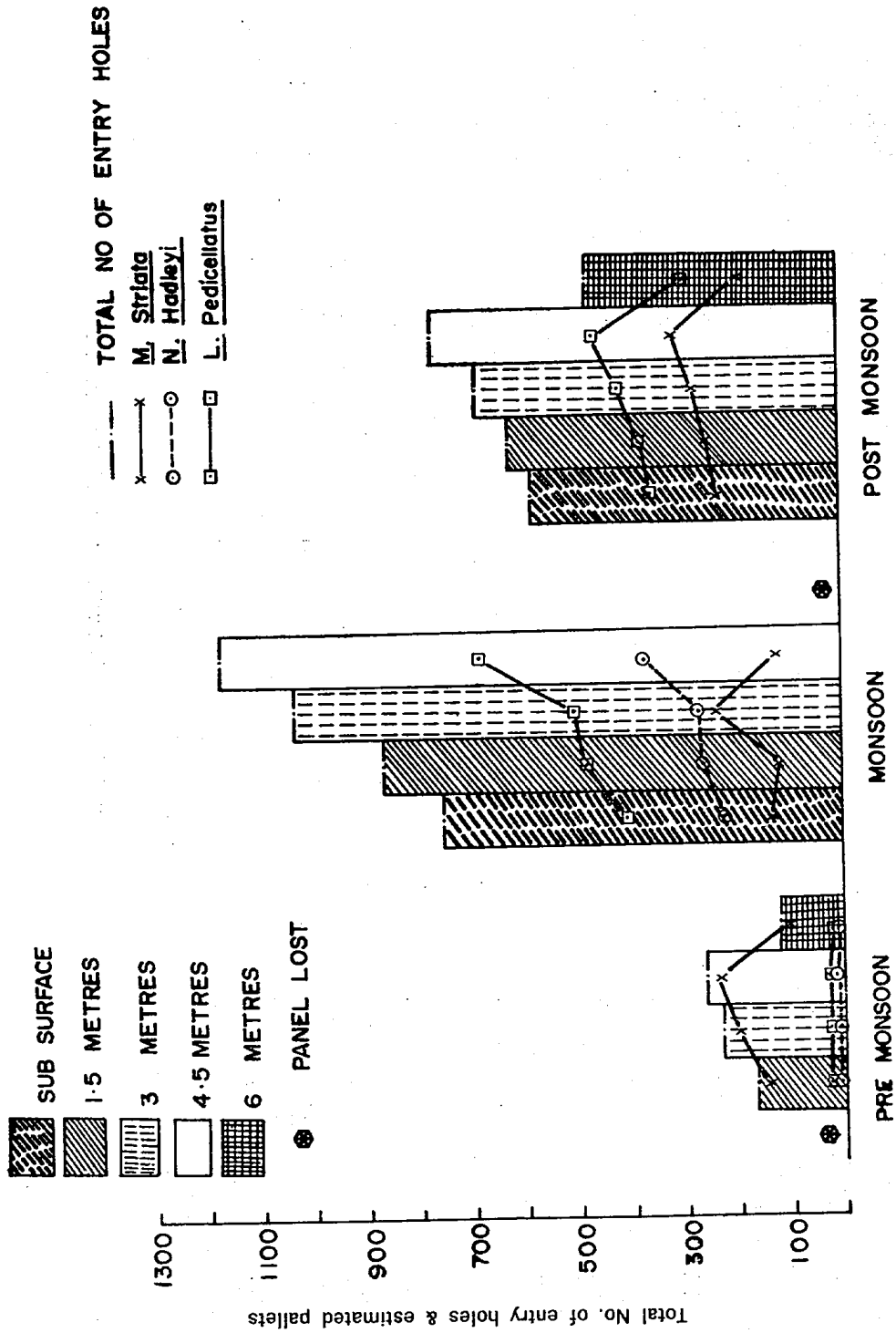


Fig. 3. Seasonal variations in number of entry holes and estimated pallets.

1.41% for the subsurface and 6 metres depth respectively. These two observed facts lead to the inference that the extremely low values of salinity must have triggered off the breeding of adult wood boring organisms as has been found by Santhakumaran and Ali kunhi (1). The attack on the panels which was found to be comparatively less during pre-monsoon period could be explained by the fact that the fouling organisms which settled on these panels in large number must have prevented the contact between the larvae of wood boring animals and the surface of the panels. Similar observation has been made by Santhakumaran (2). The observation regarding the attack being less at 6 metres depth could be explained on basis of silty bottom of the estuary (3) and reportedly high values of turbidity (4). Similar phenomenon was observed and explained by Devenish and Mearns (5) for Hoogly estuary.

The relative abundance of pallets during the pre-monsoon period indicates the abundance of *M. striata*. During the monsoon period *L. pedicellatus* was relatively more abundant than *M. striata* the low salinity values during monsoon period must have caused this fluctuation. This observation agrees with earlier observation made by Nair (6) and Cheriyan and Cherian for Cochin back-waters (7). Similarly, *N. hadleyi* which is more tolerant to the reduced salinity values extending upto fresh water condition as reported by Cheriyan (8), Nair and Saraswathi (9), has shown increase in its abundance during the monsoon months.

The observation of faster growth rate of *N. hadleyi* compared to *L. pedicellatus* during monsoon period indicates that *N. hadleyi* could grow without any

restriction imposed by the low saline conditions, whereas the less saline conditions are not conducive for *L. pedicellatus* for its growth as reported by Santhakumaran (10). He has observed that under laboratory conditions, *L. pedicellatus* can tolerate a reduction in salinity upto 10.5% with very little boring activity.

Conclusion

From the results obtained it is clear that the preservation of timber in various marine constructions in this estuary requires greater emphasis during the months of August and September and in general during Monsoon season.

Fishermen of Goa practice an indigenous way of protecting their fishing crafts, from wood boring and biofouling organisms. This consists of applying a mixture of chandrous and lime in karanjel oil. The observations reported by Santhakumaran, Udayabhaskar, Wagh and Rao (11) reveal that this method has no particular efficacy to prevent bio-deterioration. Hence, it is felt that preservative treatment with Creosant, Ascu should prove more beneficial, as it has been already reported by Purushotham and Sathyanarayana Rao (12) that these preservatives are effective in controlling the activity of wood boring organisms.

Acknowledgements

The authors are indebted to Dr. V. V. R. Varadachari, Director, National Institute of Oceanography; for his keen interest in the investigations and constant encouragement. They are grateful to Dr. T. S. S. Rao, Head, Biological Oceanography Division for going through the manuscript quite critically and for making very useful sugges-

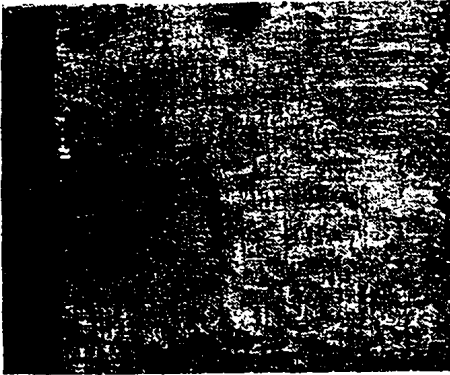


Fig. 4-a



Fig. 4-c



Fig. 4-b

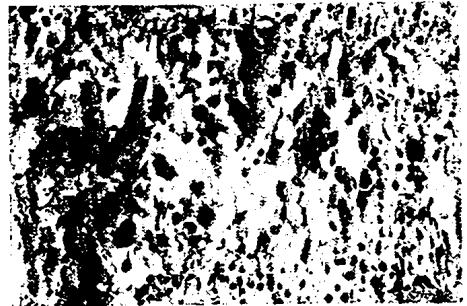


Fig. 4-d



Fig. 4-e

- Fig. 4 (a) Panel showing the entry holes, August 81.
- (b) Panel showing the extent of destruction for pre-monsoon period (4.5 m).
- (c) Extent of destruction for post-monsoon period (3 m).
- (d) Destruction during the monsoon period (3 m).
- (e) Destruction for the total period Feb.-Nov. 81 (1.5 m).

tions. Most sincere thanks are due to Dr. L. N. Santhakumaran, Sr. Research Officer, Wood Preservation Scheme (Marine) for his most valuable help. The authors also acknowledge the most willing help rendered by s/shri S.S. Sawant and K.G. Kamat and are thankful to them for permitting us to utilise the data on environmental parameters collected by them.

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