FISHBYTE SECTION

From the Editor

This is the first issue of *Naga* with a *Fishbyte* section - we are still in touch!

The papers presented here are in part *Fishbyte* backlog papers - some selected to match the "tuna" theme of this issue of Naga - in part papers written to inaugurate this section. This applies especially to that of J.M. Vakily which documents a project which we hope will serve as a model to other countries in West Africa and elsewhere in the developing world. Feedback on this and on the other papers are welcome. *D. Pauly*

Relationship Between Sea Surface Temperatures and Dolphin-Associated Fishing Activities by the Mexican Tuna Fleet

VICTOR M. GOMEZ-MUÑOZ

Abstract

Data from the Mexican purse seiner fleet operating in the eastern tropical Pacific, for the year 1985-1990, are used to show that the fraction of surface schools of yellowfin tuna *Thunnus albacares* associated with dolphins (*Stenella attenuata* and others) increases with sea surface temperature ($P<0.01$). Possible reasons for this correlation are briefly discussed.

Introduction

The Mexican purse-seine fishers in the eastern tropical Pacific detect schools of yellowfin tuna *(Thunnus albacares)* in several ways: floating objects (commonly called "logs"), surface disturbances ("brisa") caused by tuna and their prey and the presence of birds or marine mammals. In 1985-90, more than half the sets were associated with dolphins, which suggests that tuna schools are best detected through dolphin sightings. However, no correlation has been found between tuna catch and the number of dolphins sighted, nor between the catch and the number of dolphins confined in the net. Hence the success of fishing does not seem to depend on density of dolphin schools.

Surface schooling of tuna with dolphins occurs when a shallow thermocline limits the vertical distribution of the two species to the surface layer (Au and Perryman 1985). In 1981, staff of the Inter-American Tropical Tuna Commission performed a discriminant function analysis of several physical factors to determine which were related to high and low catches of yellowfin tuna. In the 551 cases examined where yellowfin tuna were associated with dolphins, the gradient of thermocline was the only statistically significant discriminator (Anon. 1983). In fact a shallow thermocline probably acts as a vertical aggregating mechanism for the squids and fishes on which dolphins prey, along with tuna (Reilly 1990).

Association between Tunas and Dolphins

The spotted dolphin *Stenella attenuata* is the species most often associated with Mexican tuna fishing, being represented in almost 90% all purse-seine sets. The historical range of this species in the eastern tropical Pacific, as reported by Perrin et al. (1983), is similar to the operating range of the tuna fleet, as can be seen, e.g., in the maps of Ortega-Garcia (1989).

Blackburn (1965) and Nakamura (1969) have shown that the overall limits of distribution of most tuna species can be clearly defined by sea surface temperature (SST). Variations in dolphin sets showed maxima in zones of higher SST. Also, significant differences in SST and success of fishing found between the dolphin and the nondolphin associated sets: dolphin-associated sets occurred more frequently at a mean of 28 °C, with an average of 13 t per set; while most nondolphin sets occurred at a mean of 23 °C, with not quite 9 t per set (Fig. 1). Au et al. (1979)

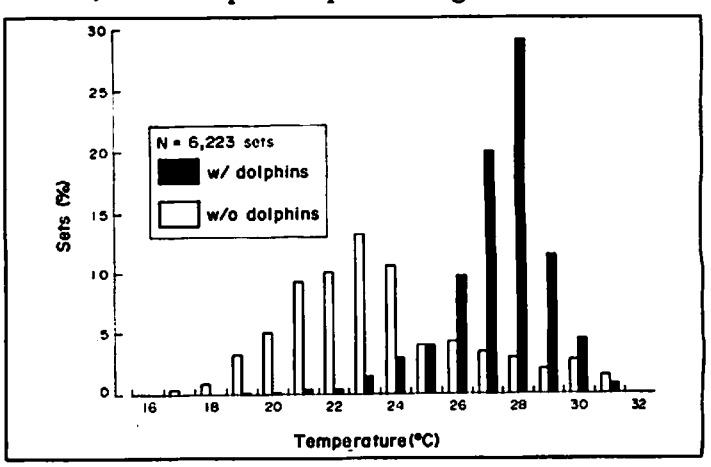


Fig. 1. *Percentage, in the Mexican (eastern Pacific) tuna fleet, of dolphin and nondolphin sets as a function of SST 1985-90.*

I wish to pursue the natural pond productivity approach for crayfish production rather than tracking directly to the total formulated diets common to penaeid culture.

This approach is likely to be more economic, certainly more environmentally sound, and of potentially greater significance for other tropical countries where redclaw may have real potential.

Our immediate concern is simply to gain the support of our own government to direct appropriate funding to the upgrading of facilities and staff for the conduct of relevant research.

I would like to invite readers and organizations interested in redclaw to contact me. Such interest may help to strengthen our case for the continuation of redclaw research.

Our preliminary research findings can be assessed by ordering the following publication: The Biology and Aquaculture Potential of the Tropical Freshwater Crayfish *Cherax quadricarinatus* by C.M. Jones; 1990; Information Branch, Queensland Department of Primary Industries, G.P.O. Box 46, Brisbane Qld 4001, Australia; Price: $25 Aust.

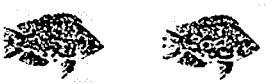
Dr. H. Shivananda Murthy, Asst. Professor of Aquaculture, University of Agricultural Sciences, College of Fisheries, P.B. No. 527, Kankanady, Mangalore 575 002, Karnataka, India.

I am a new member of the NTAS. My interest is fish nutrition and warmwater aquaculture. I am presently investigating the amino acid requirements of Indian major carps. If NTAS or its members can contribute reprints of research papers or information on the amino acid requirements of fish and shrimp, I shall be very much grateful to them.

Mr. Adekunle Idowu, Anglican Girls Grammar School, P.O. Box 35, Ijehu-Ode, Ogun State, Nigeria.

It is my pleasure to resume communication with NTAS members. I am currently researching on the performance and economics of feeding *Clarias gariepinus* and *Oreochromis niloticus* with crayfish. The research work has got to the advanced stage. There is however much handicap on getting the work published, as relevant literature is not available. I will be very grateful to NTAS members working in the same or related topics to please send relevant literature to me.

Thank you.



Photosection

Small-scale farmers use simple and economical methods for preparing fish feeds. Here, a farmer-cooperator in Sg. Baurung, Penang, Malaysia, makes feed for catfish (Clarias gariepinus x C. macrochepalus) cultured in semi-intensive ponds. Absolute feed quality is not critical. The feed is made from soybean meal and fish meal (ratio of 2:1 plant to animal protein) with crude palm oil as a lipid source. (Photo by Roshada Hashim)

Common carp (Cyprinus carpio) is an exotic species farmed by about 20 farmers in Malawi. These photos show common carp in fish harvests from the (a) Mankebu and (b) Kamkwale fish farms. As reported in* Aquabyte *4(3):16, the government of Malawi has decided to eradicate common carp from the country for fear that it may be spread to ecologically sensitive areas and could pose a threat to native farms and habitats. There is a wealth of native Malawian species to be screened for aquaculture potential [e.g., Bathyclarias loweae, see* Aquabyte *4(2):5] but in the short-term, the loss of common carp may discourage some farmers. (Photos by Dr. Reg Noble)

ICLARM's Network of Tropical Aquaculture Scientists (NTAS) links together aquaculture scientists working in the tropics, specifically those engaged in research in the genetics of fish cultured in the tropics, tropical integrated agriculture-aquaculture farming systems and coastal aquaculture of tropical molluscs. Research scientists whose major work are in these fields, the main research themes of ICLARM's Aquaculture Program, are invited to join the Network. Membership is free, but members should be willing to discuss their work and respond to enquiries from fellow scientists.

All correspondence including applications for membership (with a brief outline of scientific background, any scientific publications and current research program) and contributions to *Aquabyte* should be sent to: Ms. Mary Ann P. Bimbao, Secretary, Network of Tropical Aquaculture Scientists, ICLARM, MC P.O. Box 1501, Makati, Metro Manila, Philippines.

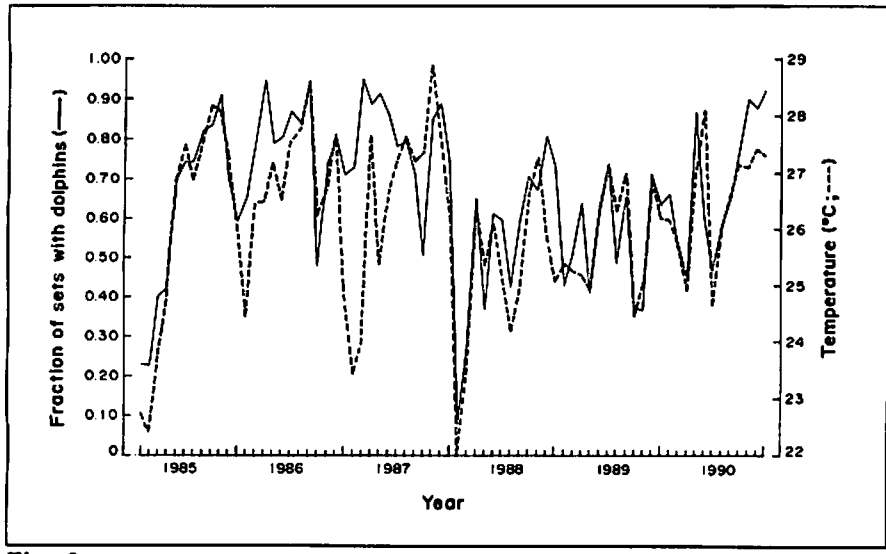


Fig. 2. ***Relationship in the Mexican (eastern Pacific) tuna fleet between SST and the proportion of sets with tuna.***

also found that, apart from the common dolphin (*Delphinus delphis*), other species were sighted mostly at 27-28°C irrespective of area or season. *Stenella attenuata* and the spinner dolphin *Stenella longirostris*, have been encountered mainly off southern Mexico, where the relatively deep 20°C isotherm indicates a large surface lens of warm water. The warmest surface waters in the Eastern Tropical Pacific normally occur in this area (Au and Perryman 1985).

Results and Discussions

The correlation between monthly mean SST and the proportion of dolphin sets was significant ($P<0.01$) for the time period considered here, i.e., 1985-1990 (Fig. 2). Dividing the time series into individual years leaves the correlation still significant ($P<0.05$), except for the 1987, an El Niño year when these variables had opposite trends during February-June and November.

The data presented here suggest that the tuna-dolphin association depends on the gradient and depth of the thermocline, and that SST is a good indicator of this situation.

References

Anon. 1983. Annual Report 1982. Inter-Am. Trop. Tuna Comm., La Jolla, California, 294 p.

Au, D.W.K., W.L. Perryman and W.F. Perrin. 1979. Dolphin distribution and the relationship to environmental features in the eastern tropical Pacific. NOAA SWFC Admin. Rep. No. LJ-79-43, 59 p.

Au, D.W.K. and W.L. Perryman. 1985. Dolphin habitats in the eastern tropical Pacific. Fish. Bull. 83(4):623-643.

Blackburn, M. 1965. Oceanography and the ecology of tunas. Oceanogr. Mar. Biol. Ann. Rev. 3:299-322.

Nakamura, H. 1969. Tuna distribution and migration. Fishing News Books, Farnham, Surrey, 76 p.

Perrin, W.F., G.J. Walker, F.M. Ralston and D.W.K. Au. 1983. Distribution of four dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern tropical Pacific with an annotated catalog of data sources. U.S. Dep. Commer., NOAA Tech. Memo. MNFS-SWFC-38, 65 p.

Ortega-Garcia, S. 1989. Análisis y normalización de la flota atunera mexicana de cerco y vara que opera en el Pacífico Oriental. Instituto Politécnico Nacional, México. 103 p. M.Sc. thesis.

Reilly, S.B. 1990. Seasonal changes in distribution and habitat differences among dolphins in the eastern tropical Pacific. Mar. Ecol. (Prog. Ser.) 66:1-11.

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Population Parameters of *Sardinella* Species in the Coastal Waters of Dar es Salaam, Tanzania

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Abstract

Population parameters of *Sardinella* species from the artisanal purse seine and ring net fisheries of the Dar es Salaam area, Tanzania, were investigated based on length-frequency data, analyzed with FAO's LFSA and ICLARM's Compleat ELEFAN packages. The results for *S. gibbosa* and *S. albella* were L_∞ = 18.6 cm and K = 1.8 year^{-1}, respectively, L_∞ = 16.8 cm and K = 1.15 year^{-1}. Preliminary estimates on mortalities and exploitation rates are also presented.

Introduction

Small pelagic fishes are the main target of the light-assisted purse seine and ring net fishery off Dar es Salaam, Tanzania. The important species caught are the goldstripe sardinella (*Sardinella gibbosa*), the white sardinella (*Sardinella albella*) and the spotted sardinella (*Amblygaster sirm*), which form more than 60% of the catches (Nhwani and Makwaia 1988). The small pelagic fishes caught along the coast of Tanzania were increased from 5,400 t or 11.6% of the total marine catch in 1977 to 9,200 t or 19.8% of the catch in 1986. Although these catches are quite modest compared to the estimated potential yield of between 20,000 t (FAO 1979) and 40,000 t (Iversen et al. 1984), the doubling of catch within ten years indicates the increasing intensity of fishing on these species. Since the estimates of potential yield are not very precise, also in view of the year to year fluctuations in recruitment