chromosome as described by Sharma and Kakati[3]. On the other hand, Ushijima *et al.*[2] have reported a much larger and submetacentric Y chromosome for this species. This may represent polymorphism of the Y chromosome.

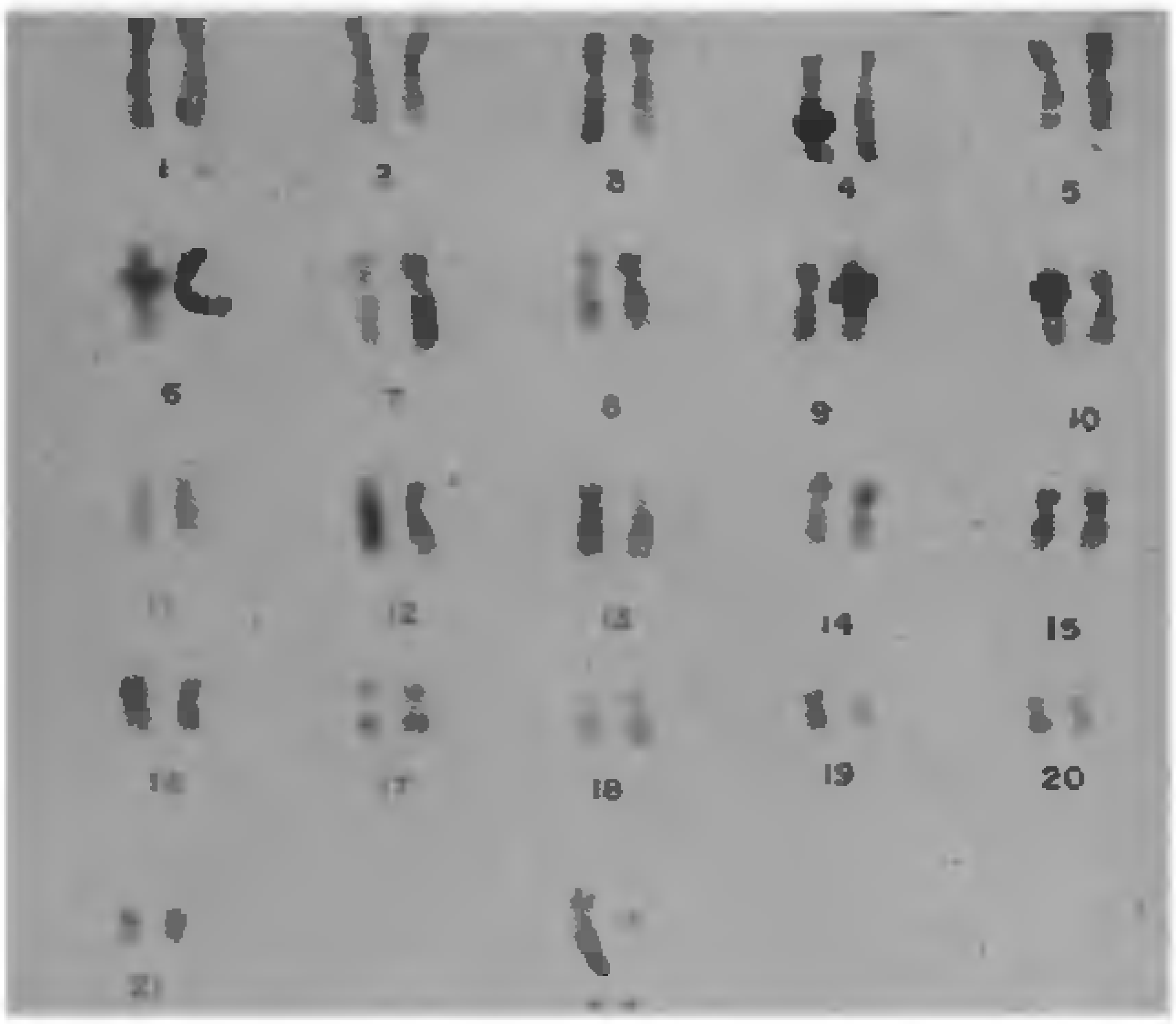

FIG. 3. Karyotype of male *Presbytis entellus entellus* (dufr.).

Application of the other staining techniques, particularly quinacrine fluorescence banding, C banding and the silver staining techniques should lead to an understanding of the homology of *Presbytis* chromosomes with those of other primates.

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1. Makino, S., *Cytologia*, 1952, **16**, 288.
2. Ushijima, R. N., Shininger, I. S. and Grant, T. I., *Science*, 1964, **146**, 78.
3. Sharma, T. and Kakati, S., *Mam. Chrom. News Lett.*, 1966, **20**, 70.
4. Goldstein, P. R. and Birdwell, T. R., *Ibid.*, 1967, **8**, 197.
5. Hungerford, D. A., *Stain Tech.*, 1965, **40**, 333.
6. Sun, N. C., Chu, E. H. Y. and Chang, C. C., *Mam. Chrom. News Lett.*, 1973, **14**, 26.
7. Chiarelli, A. B., *Comparative Genetics in Monkeys, Apes and Man*, Academic Press, London, New York, 1971, p. 273.

SIGNIFICANCE OF VENTRAL LUMINESCENCE OF SILVER-BELLIES (FAM.: LEIOGNATHIDAE)

THE catches of silver-bellies in bottom trawls were found to vary between the day and night times. The ventral luminescence of leiognathids appears to be one possible reason for the variation.

Data on leiognathid catches by bottom trawls were collected from the local fish landing centre (Porto Novo) for a period of one year from June, 1976 to May, 1977. The average catch of leiognathids per boat per day was estimated for each month. Haulings of trawl nets between 06·00 A.M. and 06·00 P.M. were regarded as day operations and between 06·00 P.M. and 06·00 A.M. as night. The boat net combination was treated as unit effort and the catch per unit effort (CPUE) was calculated.

Table I shows the diurnal variations in catches and the average catch per unit effort was highest in July, 1976 (360·6 kg) during the day. The highest landings during night for the entire period was 39·0 kg during September, 1976. The lowest average catch during the day was in April, 1977 (51·4 kg) and 8·5 kg was the minimum in May, 1977 during night operations

The luminescent system in the silver-belly has been studied by Harms[1], Haneda[2] and Haneda and Tsuji[3,4]. Basically, the system consists of a light organ harbouring the symbiotic luminescent bacteria[2,4-6], a reflector, lens and other accessory structures producing, transmitting and diffusing bacterial light of regulated intensity over the ventral surface of the body[2,4,5].

Balan[7] reported a good catch of *Leiognathus bindus* off the coast of Calicut from the surface and the subsurface waters during the dark phases of the moon and foggy nights and also stated that the detection and the capture in huge quantities of this fish during dark nights must be due to the luminescence emitted by the shoals of this species. Hastings[8] suggested that ventral luminescence is used by silver-bellies to match the downwelling ambient light so as to conceal their silhouettes from predators. He believed that the regulation of light and the optical arrangement provided a continuously available but readily variable ventral glow to match the background light. Such bioluminescence in marine organisms has been suggested by Jerzmańska[9], Fraser[10], McAlister[11], Young[12] and Lawry[13]. Later studies by Hastings[14] during the second *Alpha helix* Cruise (1975) revealed that the ventral bioluminescence of leiognathids was in direct proportion to the light coming from above, as brighter overhead light induced brighter ventral luminescence. Haneda and Tsuji[4] supported this with their observations in *L. nuchalis* and stated that the varying intensity of luminescence emitted from the sexually dimorphic light organs of *L. elongatus* and *L. rivulatus* may have sexual functions such as communication between sexes, that is, to aid in aggregation and mating.

TABLE I

Difference between day and night catches of silver-bellies by bottom trawl nets at Porto Novo

Month	Total landing of silver-bellies (in kg)	Day		Night	
		No. of boats landed	C.P.U.E.* (in kg)	No. of boats landed	C.P.U.E.* (in kg)
June, 1976	67969	230	215·3	820	22·5
July	82580	180	360·6	595	29·7
August	60692	246	189·8	390	35·9
September	54684	321	135·0	291	39·0
October	6346	45	65·0	181	18·9
November	No operation				
December	No operation				
January, 1977	16750	62	185·0	220	24·0
February	49448	168	228·3	566	19·6
March	24172	99	149·0	256	36·8
April	13415	261	51·4	..	..
May	27131	403	63·4	186	8·5

* C.P.U.E.—Catch per Unit Effort.

The day and night variatons in the catches of silver-bellies seem to support the view of "luminescent camouflage" suggested by Hastings[8]. The increased catches during the day at the bottom suggest that silver-bellies occur at the bottom in greater numbers in the day than at night. A similar observation has been made by Venkataraman and Badrudeen[15] who suggested that silver-bellies, particularly *L. jonesi* and *L. brevirostris* stay at the bottom during the day and migrate to surface and subsurface waters during nights. They further observed a better catch on full-moon nights than on new-moon nights. The catch variations, according to them, were due to vertical migration of silver-bellies.

Hastings[8] suggested that 'at an ambient light intensity higher than that which can be matched by the bioluminescence, the fish would presumably be driven to the bottom, attempting to move to greater depths'. He was also of the view that the silver-bellies spend a part of their daily life off the bottom.

Exploitation of silver-belly resources would be possible from near the bottom when the background illumination is high during the day. This has to be verified by fishing for leiognathids in surface water, midwater and bottom water. The functional and adaptive significance of bioluminescence in silver-bellies would then be clear.

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1. Harms, J. W., *Z. Wiss. Zool.*, 1928, **131**, 157.
2. Haneda, Y., *Palao Trop. Biol. Sta. Stud.*, 1940, **2**, 29.
3. — and Tsuji, F. I., *Sci. Rep. Yokosuka City Mus.*, 1972, **19**, 7.
4. — and —, *J. Morph*, 1976, **150**, 539.
5. —, *Pacif. Sci.*, 1950, 4, 214.
6. Jayabalan, N., Dhevendaran, K. and Ramamoorthi, K., *Curr. Sci.*, 1978, **47**, 648.
7. Balan, V., *Indian J. Fish.*, 1963, **10**, 118.
8. Hastings, J. W., *Science*, 1971, **173**, 1016.
9. Jarzmańska, A., *Prezegl. Zool.*, 1960, **4**, 112.
10. Fraser, J., *Nature adrift. The Story of Marine Plankton*, G. T. Foulis and Co., London, 1962, p 153.
11. McAlister, D. E., *J. Fish. Res. Bd. Canada*, 1967, **24**, 537.
12. Young, R. E., *Pacif. Sci.*, 1973, **27**, 1.
13. Lawry, J. V. (Jr.), *Nature*, 1974, **247**, 155.
14. Hastings, J. W., *Oceanus*, 1976, **19**, 17.
15. Venkataraman, G. and Badrudeen, M., *Indian J. Fish.*, 1974, **21**, 254.