The present note records four new arrangements in D. ananassae. Of these one is a translocation and the other three are heterozygous paracentric inversions. The translocation (Fig. 1) named here (2L-3L)9 is a heterozygous reciprocal translocation involving the left arm of the second chromosome and the left arm of the third chromosome. It is associated with the coextensive inversion 2LA and is found in a low frequency of 1% in the Merupalyam population (Niligiri Range). Its break points are located in 19A of the left arm of the second chromosome and 55 D of the left arm of the third chromosome (chromosome map by Rajeshwari, 1971). 19A lies within the inversion loop of the inversion 2LA.

Of the three paracentric inversions one is a simple inversion located in the left arm of the X-chromosome, and is found in a low frequency of 1% in Gudalur population. Its proximal break point is located in 6B and distal one in 4D. This has been called XLb (Fig. 2) and is different from XLA of Futch (1966). The second inversion called 2Le (Fig. 3) is an overlapping inversion discovered in 1% individuals of Merupalyam (Nilgiri Range). The extreme break points of this are located in 16F and 31E. The first inversion has its break points in 16F and 26F which are similar to those of the coextensive inversion 2LA. The second inversion overlapping the first has its break points at 20D and 31E. It is thus possible that the latter is of more recent origin and has not thus far been found separately. The third paracentric inversion is an included type wherein a new inversion has been included inside the coextensive inversion 2LA. This gene sequence is called 2Lf (Fig. 4) and found in Perumalmalai population (Kodaikanal Range) in a low frequency of 1%. The break points are located at 23C-26D. The new inversion found within the inversion 2LA has not been recovered independently.

The above mentioned new gene arrangements have added to our knowledge on the peculiar pattern of polymorphism exhibited by D. ananassae. Further the participation of the inversion 2LA in three of the four arrangements presented here needs a special mention. In addition to other avenues of gene rearrangements, it is possible that this species is utilizing one more avenue through the coextensive inversion 2LA in order to incorporate more novelties into the polymorphic pattern.

Acknowledgements: The authors gratefully acknowledge the help and encouragement given by Dr. M.R. Rajasekarasetty, Professor and Head of the Department of Zoology, University of Mysore. The authors are also thankful to Sri Ramakrishna Raju for his help in the preparation of microphotographs.

Sreerama Reddy, G. and N.B. Krishnamurthy University of Mysore, Mysore, India. Two new gene arrangements in Drosophila ananassae from South India.

The rarity of translocations and pericentric inversions in the natural populations of various species of Drosophila is attributed to the production of aneuploid gametes which reduce the fecundity and fertility. Although these rearrangements are forbidden by natural selection and per se disadvantageous, that these rearrangements have played a significant role during the past in the phylogeny of several species of the genus Drosophila cannot be denied. Drosophila ananassae, a domestic cosmopolitan species is a favourable material for the analysis of gene arrangements as it harbours a wealth of chromosomal rearrangements. In addition to several paracentric inversions, certain translocations and pericentric inversions have also been reported for this species. The number of pericentric inversions and translocations found in this species out-number similar rearrangements in all the other Drosophila species so far studied.

The two new gene arrangements reported here were observed in two populations out of seven populations collected from Ooty (Niligiris) and Kodaikanal (Palani Hills) ranges. Of the two new gene rearrangements, one is a heterozygous pericentric inversion found in Gundlupet population and the other is a heterozygous translocation found in Perumalmalai population of Drosophila ananassae. The pericentric inversion (Fig. 1) is found in the second chromosome and has been named (2L-2R)9, as it is the ninth pericentric inversion reported for this species. It is a long inversion found associated with the co-extensive heterozygous paracentric inversion 2LA. Its break points are located in 26F of the left arm and 45A in the right arm of the second chromosome (chromosome map by Rajeshwari 1971). It was found in a frequency of 0.07%. The heterozygous translocation reported here involves the right arm of the X chromosome and the left arm of the second chromosome (Fig. 2) called here (XR-2L)8 as it is the eighth translocation reported in this species. The breakage points are located in 14D of the right arm of the X chromosome and 22E of the left arm of the second chromosome (chromosome map by Rajeshwari 1971). It is an asymmetrical reciprocal translocation detected, also in a frequency of 0.07%. Further it is quite interesting to note that the Perumalmalai population in which the translocation has been found is devoid of any of the known or new heterozygous paracentric inversions.

Drosophila ananassae is a unique species where including the two new gene arrangements reported here, a total of nine pericentric inversions and eight translocations are known (Table 1). Of the nine pericentric inversions, five of them, IIa, IIIa, IIIb, IIIc and IIId, were reported by Freire-Maia (1961) in Brazilian populations and three (2L-2R)A, (3L-3R)A and (3L-3R)B were reported by Futch (1966) in some of the Pacific island populations. Except (2L-2R)A and (3L-3R)B, which are symmetrical, all the other pericentric inversions reported are known to be asymmetrical. The pericentric inversion (2L-2R)9 reported here is slightly asymmetrical. Alexander (1952) in Drosophila melanogaster and Futch (1966) in Drosophila ananassae have shown that symmetrical pericentrics are at a lesser disadvantage than asymmetrical ones. The (2L-2R)9 being asymmetrical probably is at a higher disadvantage and hence not incorporated into the karyotype. Of the eight translocations reported for this species, one was shown to be karyotypically fixed involving the translocation of basal region of the X chromosome to the fourth chromosome (Kaufmann 1936b and Kikkawa 1938). The other seven translocations are of floating types. Of these one has been reported between 2L and 3L in a Brazilian population by Dobzhansky and Dreyfus (1943), one between 3R and 2R found in Uberlandia, Minas Gerais population of Brazil by Freire-Maia (1961), one between 3L and 4 in Mughalsarai population of North India by Ray-Chaudhuri and Jha (1965), one between XL and 2R in one individual of Niue island population by Futch (1966), two translocations between XR and 2R, and 2R and 3R found together have been reported by Sajjan and Krishnamurthy (1970) in Hiriyur population of South India and the new one between XR and 2L reported here.

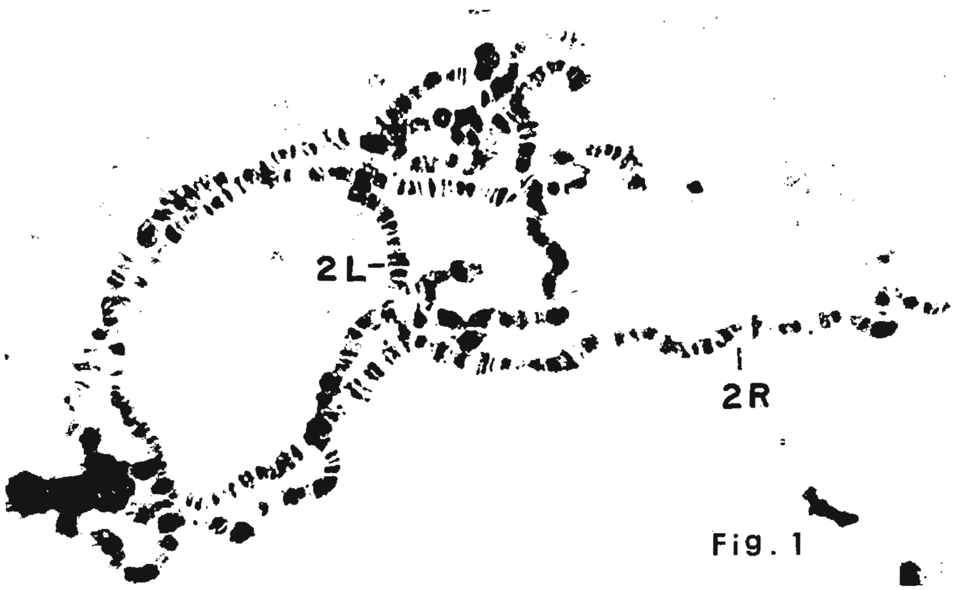
Both these gene arrangements reported here are so rare that at this stage we cannot attribute any evolutionary significance except to say that these are two more unsuccessful attempts made by this species for a change in its karyotype.

Acknowledgements: We are highly indebted to Dr. M.R. Rajasekarasetty, Professor and Head of the Department of Zoology, University of Mysore, for his help and encouragement. Our

Table 1. List of pericentric inversions and translocations recorded in various natural populations of Drosophila ananassae all over the world.

X Chromosome	Second Chromosome	Third Chromosome
	Pericentric inversions	
	IIa (Inversion in second chromosome) FM	(3L-3R)A (18.3-8)F
	(2L-2R)A (35.2-28.9)F	(3L-3R)B (5-5.5)F
	(2L-2R)9 (26F-45F)RK	IIIa (Inversion a in third chromosome)FM
		IIIb (Inversion b in third chromosome)FM
		IIIc (Inversion c in third chromosome)FM
		IIId (Inversion d in third chromosome)FM
	Translocations	
XL-IV[Ka; Ki]	(2L-3L)[DD]	(IIIL-IV)[RJ]
(XL-2R)A[F]	(IIR-IIIR)[FM]	
(XR-2R-3R)[SK]		
(XR-2L)8[RK]		

Ka = Kaufmann (1936); Ki = Kikkawa (1938); DD = Dobzhansky and Dreyfus (1943); FM = Freire-Maia (1961); RJ = Ray-Chaudhuri and Jha (1965); F = Futch (1966); SK = Sajjan and Krishnamurthy (1970); RK = Reddy and Krishnamurthy.



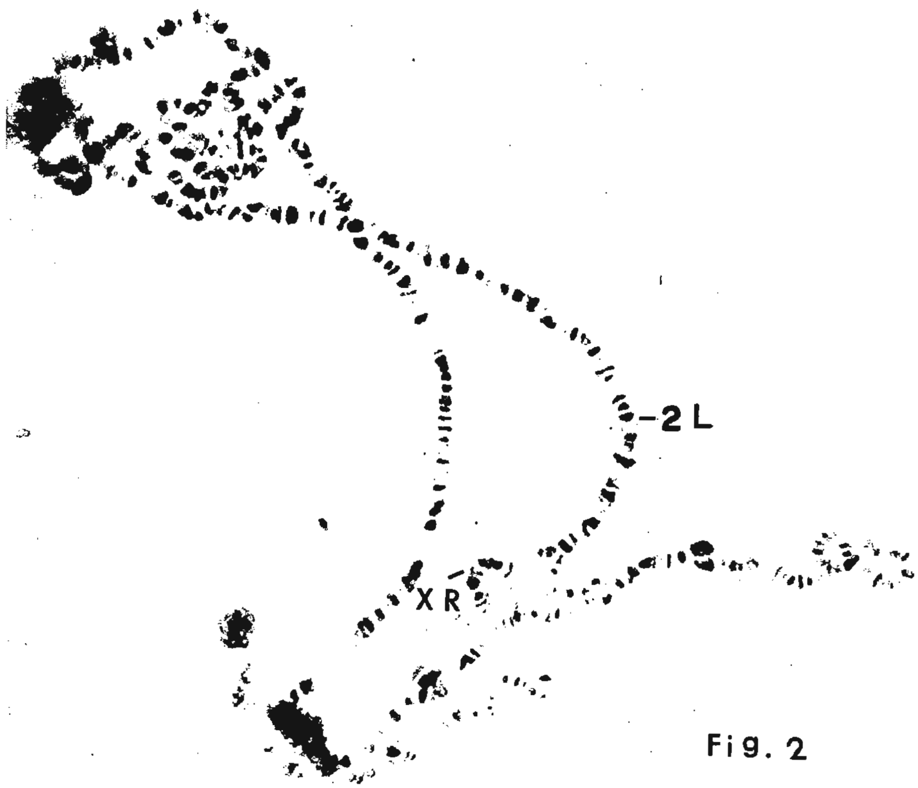


Fig. 1. Pericentric inversion (2L-2R)9

Fig. 2. Translocation (XR-2L)8

thanks are due to Mr. Ramakrishna Raju for preparing the photomicrographs. One of us (G. Sreerama Reddy) is thankful to University Grants Commission for the award of personal grants to support our work.

References: Alexander, M.L., 1952 Univ. of Texas Publ. 5204:219-226; Dobzhansky, Th. and A. Dreyfus, 1943 Proc. Nat. Acad. Sci. 29:301-305; Friere-Maia, N., 1961 Evolution 15: 486-495; Futch, D.G., 1966 Univ. of Texas Publ. 6615:79-120; Kaufmann, B.P., 1936b Science 22:39; _____ 1937 Cytologia, Fujii Jub. Vol. 1043-1055; Kikkawa, H., 1938 Genetica 20: 458-516; Rajeshwari, P., 1971 Doctoral dissertation; Ray-Chaudhuri, S.P. and A.P. Jha, 1965 Proc. Cell. Biol. Meetings, Bombay, 352-383; Sajjan, S.N. and N.B. Krishnamurthy, 1970 DIS 45:166.