

The writer is indebted to Dr. E. S. Narayanan for kind encouragement and facilities for the above studies.

Div. of Entomology, SNEHAMOY CHATTERJI.  
Indian Agric. Res. Inst.,  
New Delhi, December 9, 1953.

#### INTER-GENERIC HYBRIDIZATION BETWEEN BRASSICA AND RAPHANUS

In the course of *Raphano-Brassica* hybridisation during the last two years, attempted in different seasons when the plants were in flower, special efforts were made to cross *Brassica oleracea* (Cauli-flower), ( $2n = 18$ ) as female and *Raphanus sativus* (Radish), ( $2n = 18$ ) as male, as it had been reported by workers<sup>2,4</sup> that the cross did not succeed with *Brassica oleracea* as female. During the course of the present investigation it was observed that *Raphanus* female and *Brassica* male crosses were fairly successful, whereas the reciprocal cross did not succeed at all.

To examine the causes for the failure of the cross in the reverse direction, emasculated buds of each species (*Raphanus* BR.1 and *Brassica* BR.1) were pollinated with fresh functional pollen of the other species and were fixed in formol-acetic alcohol and carnoys solution for 24 hours, after varying intervals of pollination ranging from 6 hours to 96 hours. These pistils were dehydrated and infiltrated in a *n*-butyl alcohol series<sup>5</sup> and embedded. They were sectioned at  $10\mu$ . Sectioned as well as crushed pistils were stained in cotton blue. Pollen grains of both the species were cultured on sucrose-agar medium.<sup>1,3</sup>

It was found, both in sectioned as well as crushed pistils, that *Brassica* pollen germinated very freely after about 18 hours of pollination and also that fertilisation took place in about 36 hours of pollination. Germination of *Raphanus* pollen on *Brassica* stigma was very poor, and was calculated to be about 4 per cent., irrespective of the time-interval of pollination. These pollen grains, which had grown pollen tubes, were found to be on the stigmatic surface without any penetration into the *Brassica* styles. Scraping the stigmatic surface before pollinating the *Brassica* stigmas did not result either in any increase in the germinability of *Raphanus* pollen, or in the few pollen tubes growing down the *Brassica* stylar tissue. Pollen tube growth rate in separately cultured grains was almost similar in both the cases.

It may also be mentioned that the style measurements of the two species in question are the same. The style lengths of *Brassica* and

*Raphanus* are 9.6-9.7 mm. and 9.5-9.8 mm. respectively. Thus, the failure of the cross in the reciprocal direction may be interpreted as due to the presence of some inhibiting factor or factors, the nature of which has to be determined and which act as a barrier to pollen tube growth in *Brassica* styles and its penetration into them—a phenomenon characteristic of speciation.

The above investigation was carried out on the material supplied by Dr. R. H. Richharia, to whom I am deeply indebted for guidance and encouragement.

Agri. Res. Inst., K. N. SUBRAMANYAM.  
Sabour (Bhagalpur),  
October 12, 1953.

1. Beatty, A. V., *Stain Tech.*, 1937, **12**, 13.
2. Karpechenko, G. D., *J. Genetics*, 1924, **14**, 375.
3. Newcomer, C. H., *Stain Tech.*, 1938, **13**, 89.
4. Richharia, R. H., *J. Genetics*, 1937, **34**, 19.
5. Zirkle, C., *Science*, 1930, **71**, 103.

#### BREEDING HABITS OF THE INDIAN SHEATH TAILED BAT TAPHOZOUS LONGIMANUS (HARDWICKE)

THE reproductive patterns of bats so far studied can be classified into the following categories:

(i) Copulation occurs in autumn and the spermatozoa hibernate inside the genital tract of the female throughout winter and fertilise the ova in the next spring as in *Vespertilio murinus*, *Rhinolophus ferrum equinum*,<sup>9-11</sup> the British horse-shoe bats<sup>6</sup> and *Myotis lucifugus lucifugus*.<sup>12</sup> (ii) Copulation normally occurs in autumn and the sperms are stored inside the genital tract of the female; but there may also occur copulation in winter and spring as in *Myotis lucifugus lucifugus*.<sup>4</sup> (iii) Copulation and fertilisation occur in autumn as in *Lyroderma lyra lyra*.<sup>3</sup> (iv) Copulation as a rule occurs in spring and is immediately followed by fertilisation and pregnancy as in *Nyctinomus cynocephala*,<sup>5</sup> *Miniopterus australis*<sup>1</sup> and *Scotophilus wroughtoni*.<sup>2</sup> In all the cases mentioned above, pregnancy occurs only once a year whatever the period of copulation be. Occurrence of more than one pregnancy in a year was recorded by Matthews<sup>7,8</sup> in *Nycteris luteola*, which becomes pregnant during lactation period. (v) There is no restricted breeding season but breeding occurs all the year round, and pregnancy occurs in the lactation period as in *Desmodus rotundus*.<sup>13</sup>

Collections of specimens of *Taphozous longimanus* were started in October 1947 and are still being continued. Specimens were collected round about Nagpur and Amaravati (India),

and collections were made practically in all the months of the year. The following table is included to give the data of collections so far made with details of information necessary for the present study :

TABLE I

Month	Females			Males			Total
	Pregnant	Lactating	Non-Pregnant	Immature	Adults	Immature	
January	.. 3	2	1	1	3	..	10
February	.. 4	1	2	2	5	..	14
March	.. 8	3	1	1	3	1	17
April	..						
May	..						
June	.. 3	3	1	2	1	1	11
July	.. 1	1	3	1	2	..	8
August	.. 15	3	..	2	2	1	23
September	.. 11	8	1	5	12	2	39
October	.. 12	8	3	2	4	2	31
November	.. 4	4	4	2	3	2	19
December	.. 2	4	..	1	5	1	13
Total	.. 62	38	16	19	40	10	185

Note.—The word 'immature' has been used in the above table to denote young specimens that were found attached to the nipples of the mothers when the mothers were shot.

On the basis of the study of the collected material the following observations have been made: (1) pregnant females were collected in all the months of the year; (2) in any one collection there were females carrying foetuses at different stages of development and also females at different stages of sexual activity as revealed by the microscopic examination of the sections of the ovaries; (3) lactating females were collected in all the months of the year; (4) 16 lactating females each carrying a young at the breast and collected during different months of the year showed, on dissection and sectioning, that pregnancy had again started in one of the horns of the uterus. In 8 of these specimens the ovary on the non-pregnant side showed a distinct scar indicative of the *corpus luteum* of the previous pregnancy; (5) males in full spermatogenetic activity were collected in all the months of the year.

*Taphozous longimanus* thus resembles *Desmodus rotundus*<sup>13</sup> in its breeding behaviour. There is no restricted breeding season, but breeding occurs throughout the year. Further, these bats experience pregnancies in quick succession as pregnancy starts even before the lactation period is over, and in such cases,

pregnancies alternate between the two horns of the uterus.

Two interesting facts may, however, be mentioned—that *Lyroderna lyra lyra*,<sup>3</sup> which is also found in the same locality, has a sharply restricted breeding season; and secondly, that from the point of view of climatic conditions, Nagpur experiences sharply defined seasons, winter being fairly cold and summer being very hot and the rainy season being restricted to June, July, August and September. These points are mentioned here because two species of bats inhabiting the same locality have very different sexual rhythms.

Full details of sex-cycle in *Taphozous longimanus* are being worked out and will be reported soon.

Dept. of Zoology, A. GOPALAKRISHNA.  
College of Science,  
Nagpur, November 7, 1953.

1. Baker, J. R. and Bird, T. F., *Jour. Linn. Soc.* (Lond.), 1936, 40.
2. Gopalakrishna, A., *Proc. Ind. Acad. Sci.*, 1947, 26.
3. —, *Proc. Nat. Inst. Sci.* (India), 1950, 16.
4. Guthrie M. J., *J. Mammal*, 1933, 114.
5. Hartman, C. G. and Cuyler, W. K., *Anat. Rec.*, 1927, 35.
6. Matthews, L. H., *Trans. Zool. Soc. Lond.*, 1937, 23.
7. —, *Nature, Lond.*, 1939, 143.
8. —, *Proc. Zool. Soc., Lond., Ser. B*, Part III, 1942.
9. Rollinat, R. and Trouessart, E., *Bull. Soc. Zool. France*, 1895, 20.
10. —, *Mem. Soc. Zool. France*, 1896, 9.
11. —, *Ibid.*, 1897, 10.
12. Wimsatt, W. A., *Anat. Rec.*, 1942.
13. — and Trapido, H., *Amer. Jour. Anat.*, 1952, 91.

#### A REINVESTIGATION OF THE EMBRYOGENY OF *ISOMERIS ARBOREA* NUTT

In a paper entitled "Some New Features in the Reproductive Cytology of Angiosperms, illustrated by *Isomeris arborea*" Billings<sup>1</sup> reported many interesting features in this plant: (1) the megaspore mother cell directly gives rise to the embryo-sac; (2) the mature embryo-sac is 3-nucleate; (3) fertilization is absent; (4) the endosperm shows peculiar multinucleate nodules; and (5) the embryo arises from one of the endosperm nodules.

In a reinvestigation Maheshwari and Khan<sup>2</sup> have shown that the megaspore mother cell undergoes the usual reduction divisions and the mature embryo-sac is monosporic and 8-nucleate. They confirm the occurrence of endosperm nodules but leave the origin of the embryo as an open question to be decided by further study.