

CHAPTER -II
MATERIAL AND METHODS

MATERIAL & METHODS

In the present study various units were used for rearing of insects for screening the braconid Parasitoids. The details are as follows :

GLASS CAGES :

Two types of glass cages were used for rearing of insects. Both were quadrangular (size 25 x 25 x 30 cm) in shape. Each type consists of wooden base and glass walls on three sides. In first type, 4th side was closed by muslin cloth with a sleeve for handling the insects. In the 2nd type the 4th side of cage consists a glass window. With first and 2nd type rearing of hosts & parasitoids was carried out.

GLASS TROUGHS :

The caterpillars that were collected from the field have been screened for their parasitoids in the troughs (size 9 x 20, 12 x 25 cm). The glass troughs were covered with muslin cloth at the time of rearing.

PLASTIC CONTAINERS :

Various types of plastic containers (size : diameter & heights, 6.5 x 8, 5 x 6.2, 4 x 4 cm) were also used for rearing the hosts & their parasitoids. The plastic lids as well as sides of the containers were perforated for ventilation.

PETRIDISHES & TEST TUBES :

Petridishes of 18.5 cm and 9 cm. in diameter and test tubes of the size 19 x 25, 15 x 2, & 14.5 x 2.8 cm were used for rearing & handling the hosts & parasitoids respectively.

SPECIMEN TUBES :

Specimen tubes of 10 cm. and 5 cm. in height and 2 cm in diameter were used to keep the parasitoid cocoons for adult emergence. The open ends were covered with muslin cloth for ventilation.

During the course of present investigation all necessary precautions were taken to avoid fungal & other microbial attacks. The rearing of insects was done at room temperature ($25 \pm 5^{\circ}\text{C}$, $60 \pm 5\%$ RH, 12 hrs photoperiod).

PHOTOGRAPHY :

The whole mounts of the braconids and the various morphological parts viz. antenna, propodeum, wings, leg, tergites & ovipositor were considered for microscopic photography. The coloured photography of wholemounts was made with the help of Asahi Pentax Auto Bellows K Set Camera, while the rest of the parts were photographed by Leitz Orthoplan Microscope (Germany).

The whole mounts are magnified 150 times to its original while the rest of the parts 252 times.

METHODS :

Extensive survey of Braconid flies was made from the districts, Kolhapur, Sangli and Satara of Maharashtra State (Plate I. Fig. I) from August 1994 to June 1995 and a large number of specimens were collected from the horticultural, ornamental and Agricultural plants. Many times, parasitized larvae of Lepidoptera and cocoons of braconids were collected on host plants and reared in the laboratory. Collection was made early in the morning and evening. For preservation and study the specimen were killed in cyanide killing bottle and kept in 70% alcohol. Some of the braconids are pinned and kept in the insect box. The detail records were made about the locality, date of collection, name of collector and possible identification. The head, antenna, wings, propodeum, tergites, leg & ovipositor were mounted on slides in D.P.X. Morphological studies were carried out with the help of monocular microscope. Comparative measurements were made with ocular micrometer. Body length of specimens calculated with the help of graduated mechanical stage. All measurements were made in millimeters.

The collections of braconid parasitoids were identified, belongs to genera of different subfamilies proposed by Mason (1981). For the easy & exact understanding of the terms the terminology adopted modified here is same as that of Bhatnagar (1948), Nixon (1965) and Mason (1981) are adopted in the description of the species.

A large number of references were consulted in the course of the studies, those listed, are not cited in the text of the thesis.

The following terms adopted in the thesis for head, thorax, wing venation and leg are as follows.

HEAD OF BRACONID : ^{plate 2} (Fig. 2) Front & dorsal view

- Ocellus - 1
- Vertex - 2
- Frons - 3
- Face - 4
- Cheek - 5
- Clypeus - 6
- Groove between face & clypeus - 7
- Clypeal fovea - 8
- Labrum - 9
- Mandible - 10
- Orbit - 11,12,13
- Ocellocular space - 14
- Interocellar space - 15
- Front ocellar space - 16
- Interorbital space - 17

THORAX OF BRACONID ^{Plate 3} (Fig. 3) Side View

Area

- Median lobe of mesonotum 1 and 2
- Mesoscutum - 1

Lateral lobe mesoscutum	-	2
Scutellum	-	3
Metascutellum	-	4
Hind margin of Metanotum	-	5
Tegula	-	6
Pronotal collar	-	7
Pronotal trough	-	8
Propleurum	-	9
Pronotum	-	10
Mesopleurum	-	11, 12, 13
Upper division of Metapleuron	-	14
Metapleurum	-	15
Juxtacoxal area	-	16
Propleurum	-	17
Prepectus	-	18
Mesosternum	-	19
Front coxa	-	20
Middle coxa	-	21
Hind coxa	-	22
Propodeum	-	23
Propodeal spiracle	-	24

CARINAE AND GROOVES

Notaulus	-	A
Epemia	-	B
Prepectal carina	-	C
Mesopleural fovea	-	D
Mesopleural furrow	-	E

Mesopleural suture - F
 Post pectal carina - G
 Juxtacoxal carina - H
 Submetapleural carina - I
 Pleural carina - J
 Lateral longitudinal carina - K
 Basal transverse carina - L

Plate 4

FORE WINGS OF BRACONID (Fig. 4)

Costo : SC + R - AB
 Metacarpus : R1 - EF
 Basal : 1 M and Rs base - DMN
 Radius : 2r 2Rs and 3 Rs - GHIJ
 Medius : M + Cu and 1 A - CN
 Cubitus : Rs + M, 2 M and 3M - KLT
 Discoideus : Cul and Culb - NPO
 Brachium : Distal part 1 A - NM
 Subdiscoideus : Cula - PQRS
 Intercubitals : 1 Rs and r-m - HK
 Recurrent : m - Cu - OP
 Nervulus : Cu - a - L
 Internal : 2 A - H
 Stigma : Pts - BGE

Plate 5

HIND WINGS OF BRACONID (Fig. 5)

Subcostella : SC + R, R and 1 R 1 - abd
 Metacarpella : 2 R 1 and 3 R 1 - de

Basella	:	1 r - m - jL
Radiella	:	Rs - jL
Mediella	:	M + Cu and 1 M - Cj
Cubitella	:	2 M and 3 M - KMP
Submediella	:	1 A - hf
Intercubitella	:	2 r - m - no
Nervellus	:	Cu and Cu - a - gh

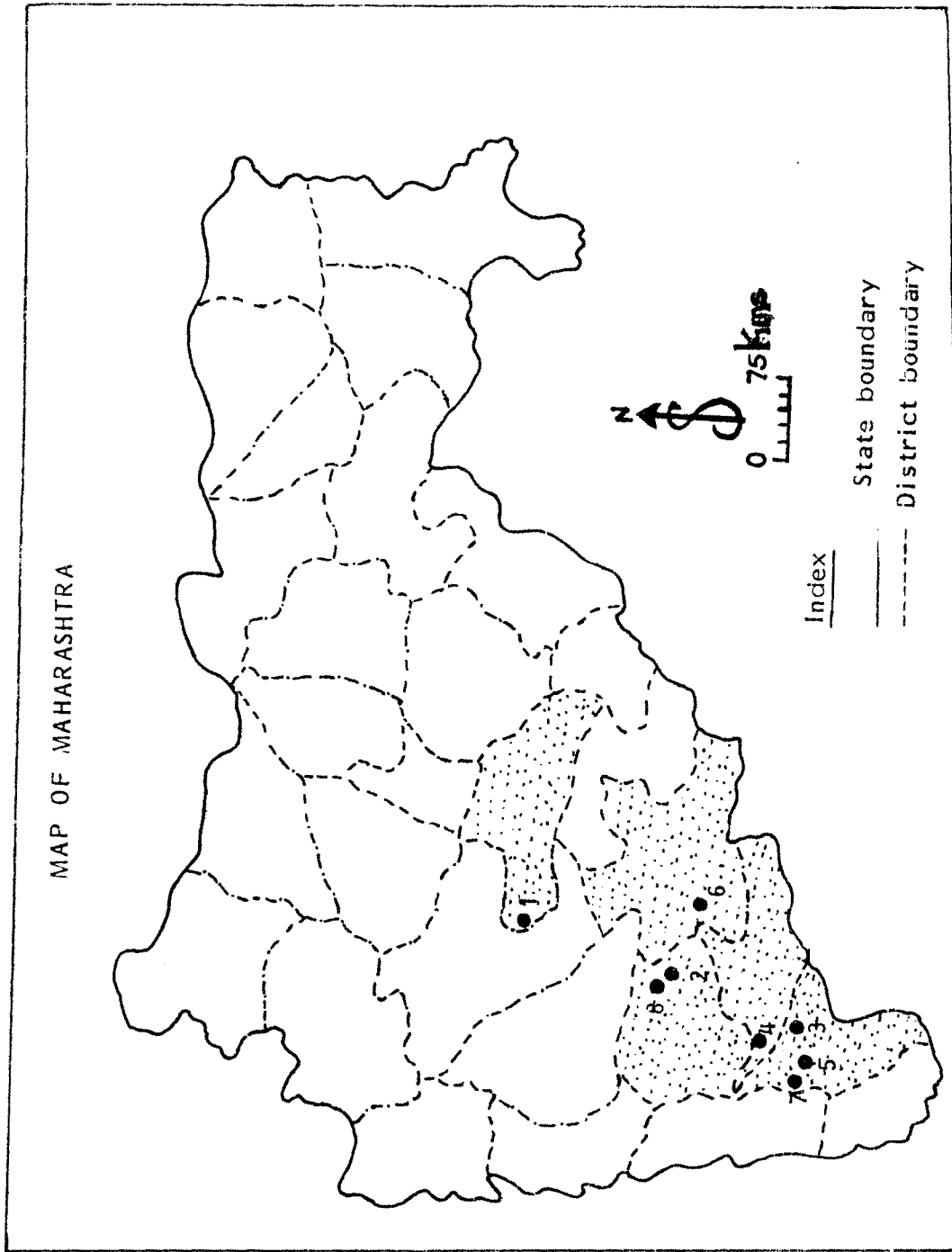
CELLS

Medial cell -	1
Discocubital cell -	2
Radial cell -	3
Areolet -	4
Third cubital cell -	5
Third discoidal cell -	6
Second discoidal cell -	7
Submedian cell -	8
Anal cell -	9
First brachial cell -	10
Second brachial cell -	11
Costellan cell -	12
Radiellan cell -	13
Mediellan cell -	14
Basellan cell -	15
Cubitellan cell -	16
Analan cell -	17

plate 6
LEG OF BRACONID (Fig. 6)

21

- Coxa - 1
- Trochanter - I & II - 2 & 3
- Femur - 4
- Tibia - 5
- Tibial spurs - 8
- Tarsus - 6
- Claw - 7



Collection Area :

- | | | | |
|-------------|--------------|-----------------|-------------|
| 1. Ashta; | 2. Dahi wadi | 3. Hatkanangale | 4. Islampur |
| 5. Kolhapur | 6. Sangli | 7. Ujalaiwadi | 8. Vaduj |

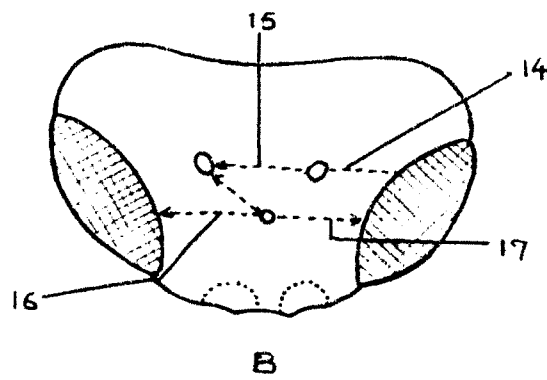
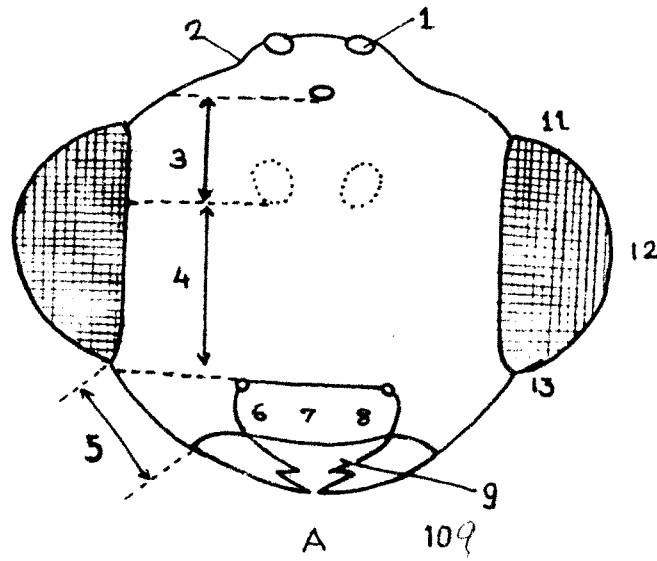


Fig.2 : HEAD OF BRACONID : FRONT & ABOVE VIEW

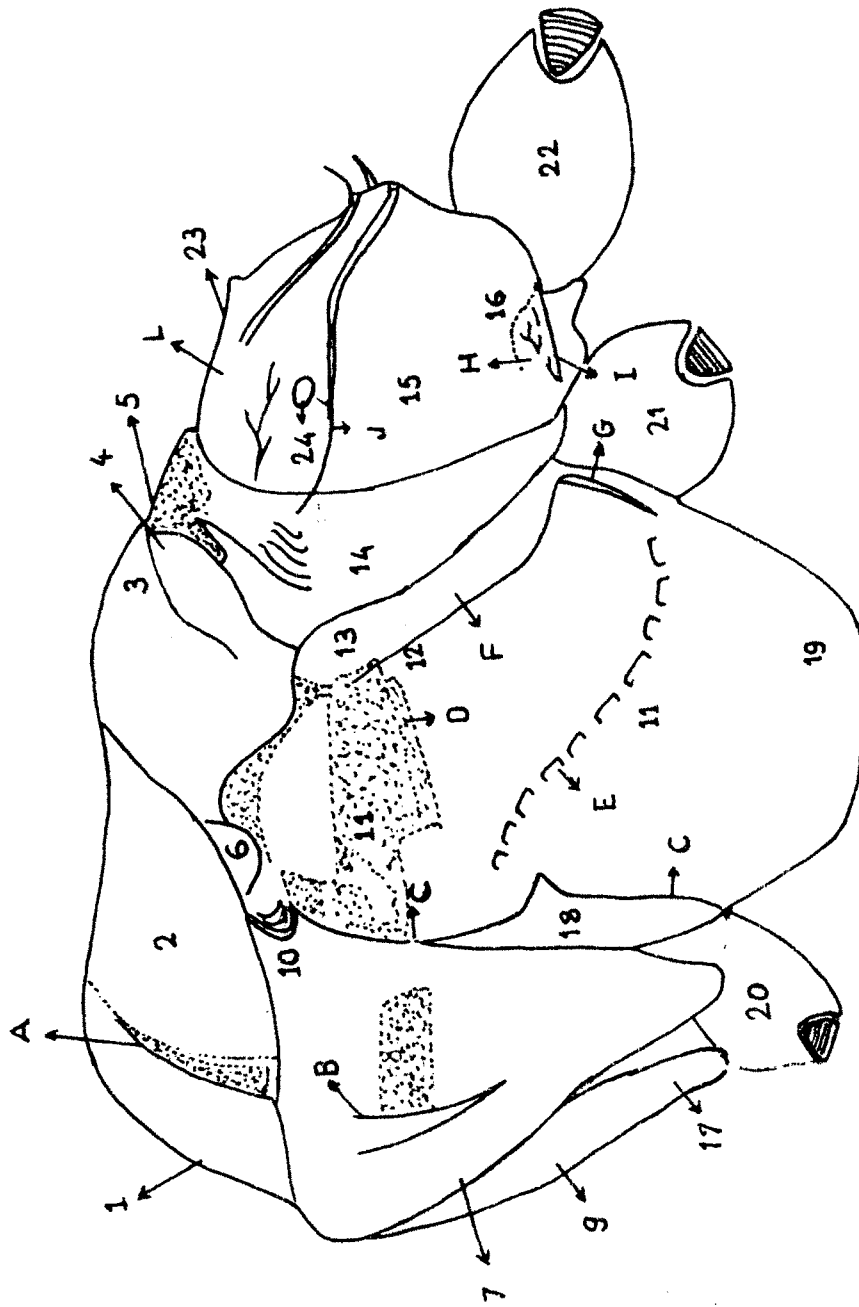


Fig.3 : THORAX OF BRACONID (Side View)

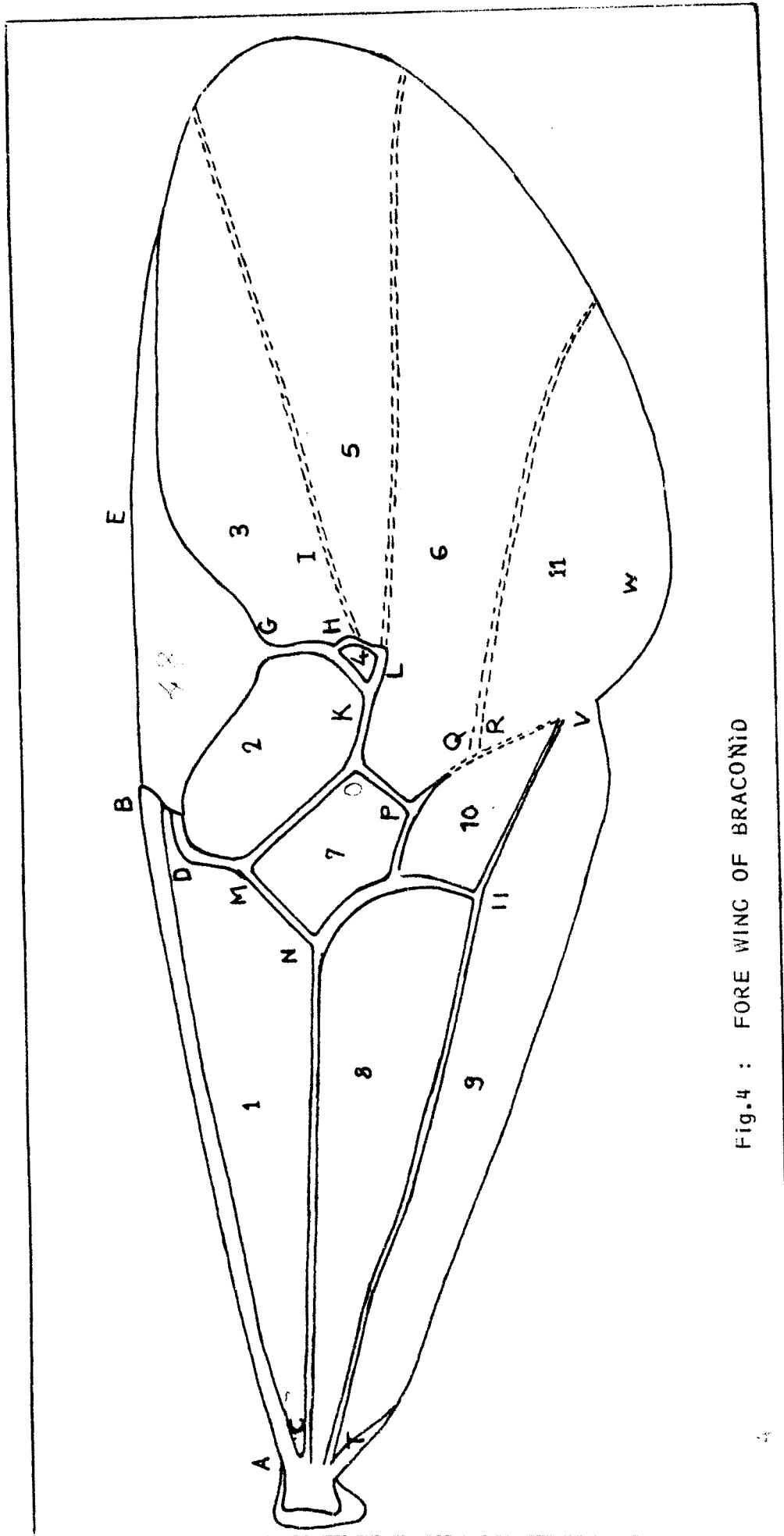


Fig.4 : FORE WING OF BRACONID

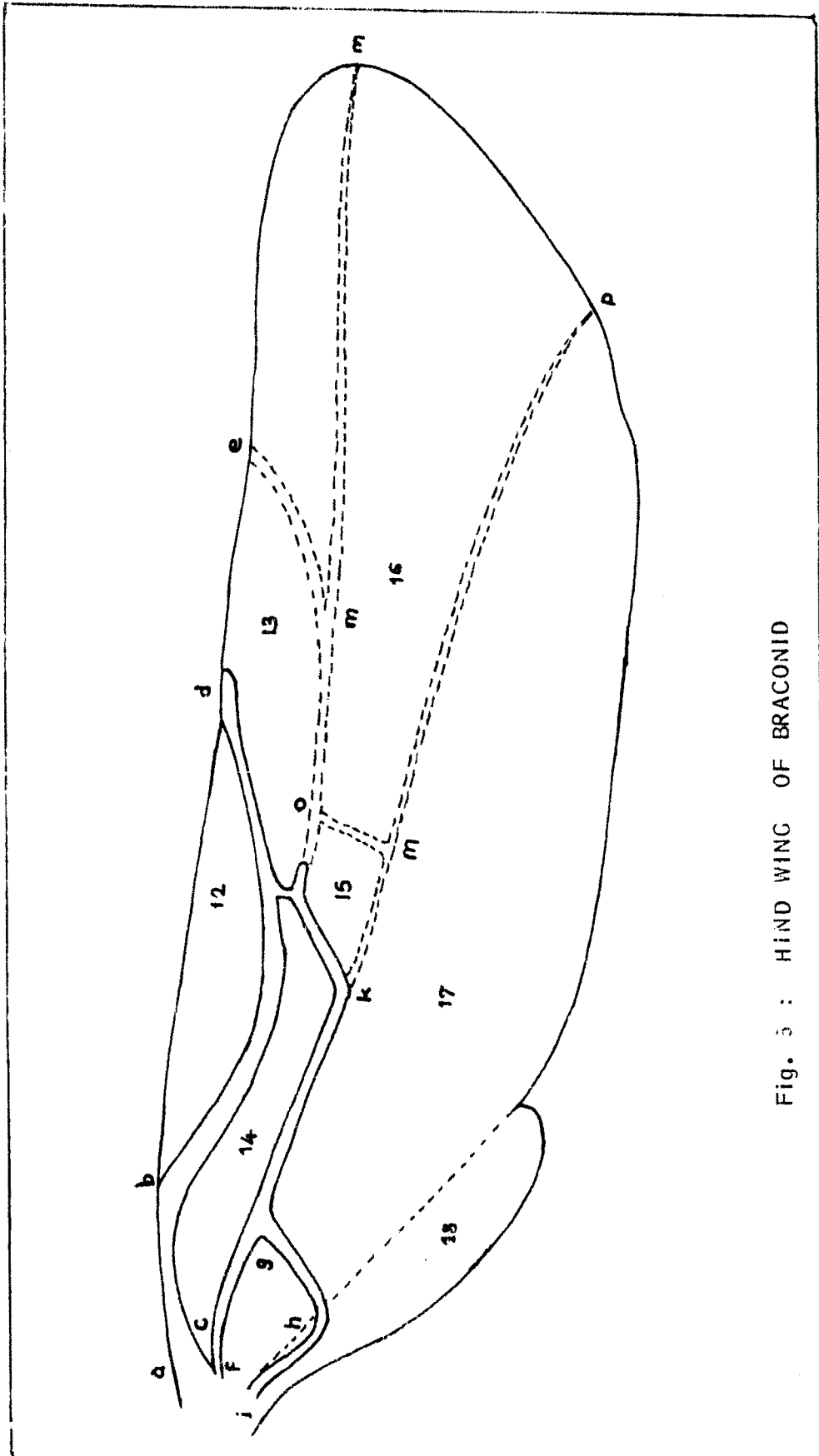


Fig. 3 : HIND WING OF BRACONID

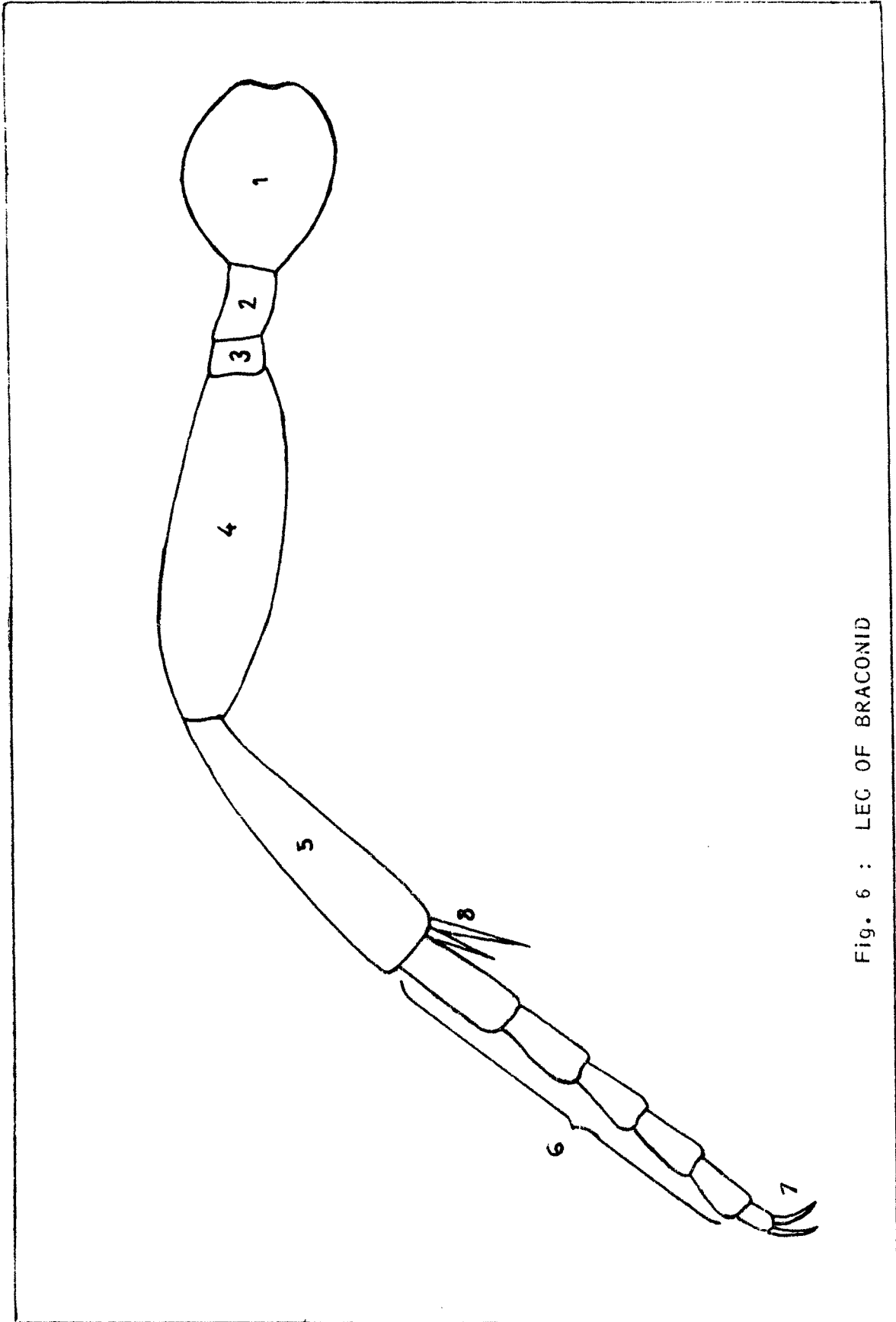


Fig. 6 : LEC OF BRACONID