

FIGS. 1-4. Fig. 1, *Horaclupea intertrappea* gen. et sp. nov.: Holotype, specimen, No. BM 8/70,  $\times 1$ . Fig. 2. *Palaeopristolepis feddeni* gen. et sp. nov.: Syntype, Specimen, No. BM 33/72,  $\times 1$ . Fig. 3. Same; Syntype, No. BM 1/71,  $\times 1$ . Fig. 4. Scale of same,  $\times 10$ .

rivers of New South Wales and Chili (Zittel, 1932, p. 155).

*Clupea geei* Hora (1937, p. 189, Text-Figs. 1-3, Pl. XV, Figs. 4-6) from Eocene of the Saline Series of Salt Range (Pakistan) has to be transferred to this new genus, and is very closely like the present species.

**Occurrence:** Cherty shales in the Inter-trappean bed at Ninama and Bamanbor.

#### 2. *Palaeopristolepis feddeni* Gen. et Sp. Nov.

Flat percoid fish with distinctly pristolepid scales.

The nearest ally to this form is the living genus *Pristolepis* Jerdon met with in the freshwaters of the plains and hills of Malabar, Burma, Siam and Malay Archipelago (Day, 1889, p. 84).

**Occurrence:** Cherty shales in the Inter-trappean bed at Bamanbor.

#### 3. Pristolepid Fish (Genus Indet.)

Material representing this form consists of vertebrae, ribs and spines in intimate association with scales which are more or less like the pristolepid scales described by Hora (1938, p. 281, Text-Fig. 12 b. Pl. XVII, Fig. 1) from the Inter-trappean beds at Deothan ( $22^{\circ} 20' : 77^{\circ} 34'$ ) and Kheri ( $22^{\circ} 22' : 77^{\circ} 29'$ ).

**Occurrence:** Cherty shales in Inter-trappean bed at Bamanbor.

#### 4. *Perca* sp. cf. *P. angusta* Agassiz

A fragmentary specimen, consisting of a percoid skull, form nearest comparable to it being *Perca*

*angusta* Agassiz (1833-44, Vol. IV, p. 7, Pl. XI, Figs. 1-3) from the Eocene of Monte Bolca.

**Occurrence:** Cherty shales in the Inter-trappean bed at Bamanbor.

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for the Cultivation of Science,

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### FOOD INTAKE AND ENERGY EXPENDITURE PATTERNS IN TWO INSECT PRIMARY CONSUMERS

THIS report is based on earlier publications dealing with the intake and utilization of food in the grasshoppers *Oxya velox* and *Poecillocerus pictus*<sup>1,2</sup>. It presents a comparative account on food intake and energy expenditure patterns in *O. velox* and *Bombyx mori*<sup>3</sup>; it also clearly indicates that, based upon dry weight analysis, the feeding rate of *B. mori* is 2 times greater during the first 4 instars and 3 times

greater during fifth instar period than that of *O. velox*.

TABLE I

Comparative energy budget of the grasshopper *Oxya velox* and the silkworm *Bombyx mori*

Parameter	<i>Oxya velox</i>	<i>Bombyx mori</i> *
1. Life span (day)	249 or 149 <sup>a</sup>	34 + 18 <sup>b</sup>
2. Feeding rate (mg dry food/g wet animal/day)	80	147 <sup>c</sup>
3. Assimilation efficiency (%)	27	42
4. Assimilated food energy (%)	100	100
5. Conversion efficiency ( $K_2$ ; %)	32	48
6. Energy Content in:		
Exuvia (%)	5	2
Silk (Cocoon) (%)	0	20
Egg (%) <sup>d</sup>	14	13
Body at death (%) <sup>e</sup>	12	14
7. Respired energy (%)	68	52

\* Recalculated data from Hiratsuka<sup>3</sup>.

(a) Female 240 days; Male 149 days.

(b) 34 days feeding larval stages and 18 days non-feeding pupal and adult stage.

(c) Calculated considering only feeding life stage.

(d) Male *O. velox* uses only 3% for semen production.

(e) Male *O. velox* contains 26%, while male *B. mori* 25% at death. Data given are for female.

Table I presents the basic data obtained for *O. velox*<sup>1</sup>. For comparative purpose corresponding data reported by Hiratsuka<sup>3</sup> for *B. mori* have been recalculated and presented. *O. velox* assimilates only about 27% of the ingested food. Of the assimilated food, as much as 66% or 71% is oxidized by the male or the female to release metabolic energy, 3% or 14% is used for reproduction, 5% or 4% for the production of exuvia. A male or female contains 26% or 12% assimilated energy at death. On the other hand, *B. mori* assimilates as much as 42% of the ingested food. About 52% of the assimilated energy is lost on respiration, 20% on silk and 2% on the production of exuvia. At death 25% is lost by a male, while this loss in a female is only 14%. A female uses 13% of the assimilated energy on egg production. *B. mori* eats 147 mg dry mulberry leaf/g live weight/day, while the feeding rate of *O. velox* is only 80 mg dry grass/g live weight/day. *B. mori* assimilates 42% of ingested food, while assimilation efficiency of *O. velox* is only 27%. *O. velox* spends as much as 67% of assimilated food on respiration, while *B. mori* only 52%. This low metabolic expenditure of *B. mori* is due to the reduced metabolic level of its pupal stage. The net energy earned via faster feeding and saved via better assimilation and conversion efficiencies is partly spent on silk production

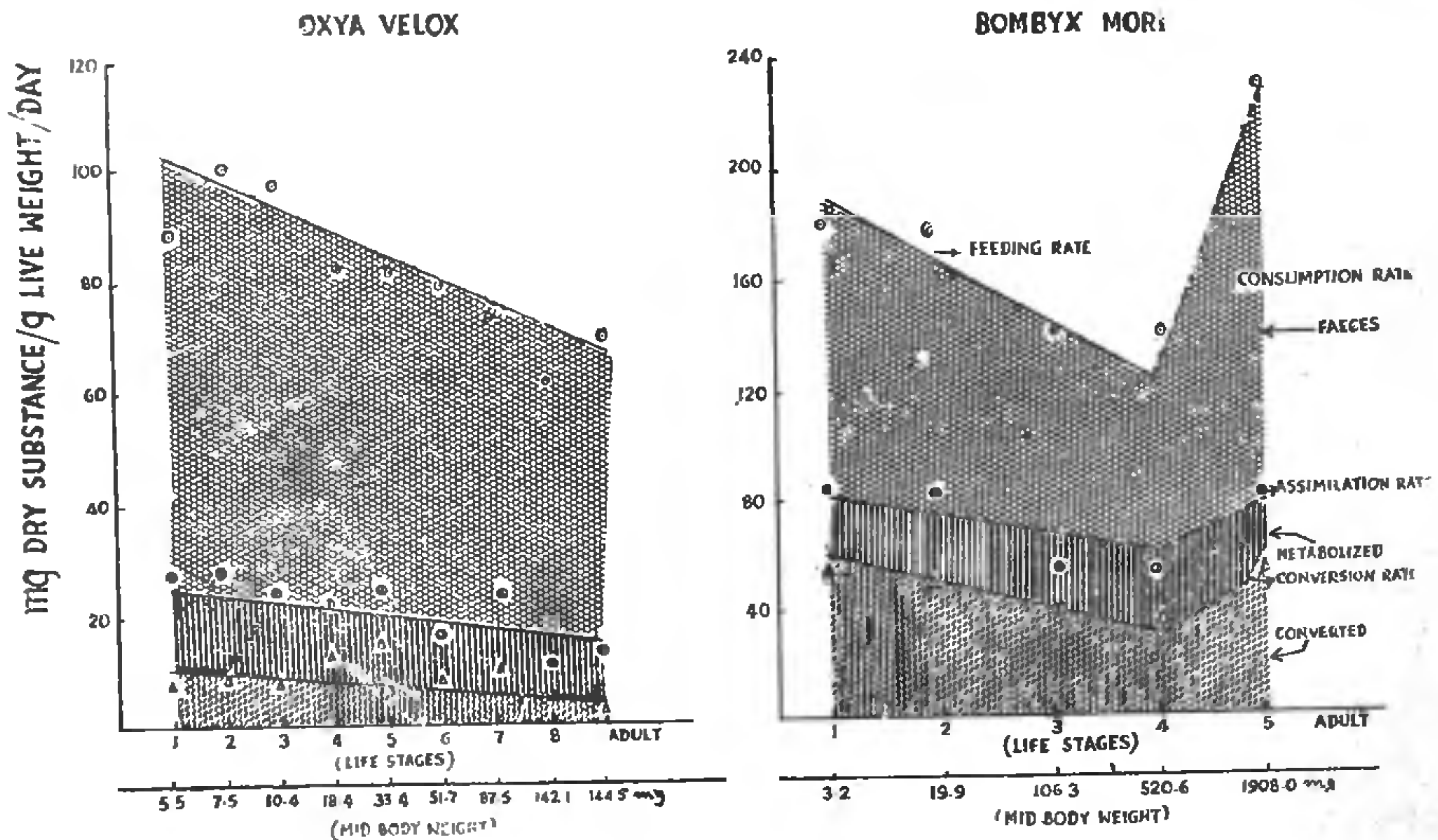


FIG. 1. Rates of feeding (⊙), assimilation (●) and conversion (Δ) in grasshopper *Oxya velox* and silkworm *Bombyx mori*. The basic data of Hiratsuka<sup>3</sup> for silkworm have been used to calculate regressions; lines for the data obtained on the fifth instar individuals are eye-fitted.

and partly on metabolism of non-feeding pupal and adult stages.

The feeding life stages of these 2 species have so far been considered as a single unit. Hence it is not clearly known whether the higher feeding rate and efficiencies of assimilation and conversion observed in *B. mori* are features limited to one or more life stages and if so, to what extent the rates are altered during the different instars. With a view to compare the quantitative data on food consumed, assimilated, and converted as a function of life stages, the basic data were calculated on the basis of dry substance/g live weight of the animal/day and the values obtained are plotted in Fig. 1. The feeding rate decreases from about 100 mg dry substance/g live weight/day during the early stage of *O. velox* to about 70 mg/g live weight/day during the adult stage. In *B. mori* feeding rate decreases from 180 mg/g live weight/day during the first instar to 134 mg/g live weight/day during the fourth instar. A regression calculated for feeding rate-body weight relationship suggests that mean feeding rate is 7 mg food/g animal/day for the 5th instar individuals, but actually they consume 226 mg food/g animal/day. Thus the feeding rate of *B. mori* is 2 times greater during the first 4 instars and 3 times greater during fifth instar in comparison to the corresponding first few and the seventh or eighth instars of *O. velox*. The levels of the trends obtained for the rates of assimilation and conversion-life stage relations of *B. mori* are also correspondingly higher than those of *O. velox*.

While an Orthopteran like *O. velox* feeds throughout the life, a lepidopteran like *B. mori* accumulates sufficient food energy during larval period to tide over the subsequent non-feeding pupal and adult stage. Available information indicates higher feeding rate and assimilation and conversion efficiencies for lepidopterans<sup>4</sup> than for herbivorous orthopterans like *Poecilocerus pictus*<sup>2,5</sup>. Consequently the food intake and utilizations in these two insect groups show considerable adaptive differences.

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RECORD OF *HYDROPHITREMA*  
*GIGANTICA* SANDARS, 1960  
(TREMATODA: HEMIURIDAE) FROM  
SEA SNAKES OF WALT AIR COAST  
BAY OF BENGAL

*Hydrophitrema gigantea* Sandars, 1960 is one of the two hemiurid trematodes reported from the lungs of sea snakes. It has been reported previously from the lungs of *Hydrophis elegans* (Gray, 1842) and *Aepysurus laevis* at Australia, *Kolpophis annandalei* (Laidlow, 1901) from Indochina and *Hydrophis cyanocinctus* Daudin, 1803 from Malaya and Formosa<sup>1-3</sup>. There appear to be no other reports although the sea snakes are widely distributed in Indopacific regions.

In the course of studies on parasites of sea snakes from Waltair Coast, Bay of Bengal, six mature *H. gigantea* were obtained from lungs of *Enhydrina valakadyen* Gray and one juvenile fluke from lungs of *Microcephalophis gracilis* Shaw. The three whole mounts of mature flukes measured 15.6 to 16.0 mm in length and 2.5 to 3.5 mm in width, possessed a short but distinct ecsoma (Fig. 1) and agreed closely with the description of Sandars<sup>1</sup>. A comparison of the descriptions of the species from different localities, however, revealed that those described from Malaya differ from both the type and present specimens in respect of the size of seminal vesicle. The Malayan specimens possess a considerably longer seminal vesicle with two or more coils situated posterior to acetabulum and the seminal vesicle body length ratio is 1:1.7. In the type and present specimens the seminal vesicle is smaller with only one coil situated posterior to acetabulum (Fig. 2) and seminal vesicle body length ratio is 1:4.1 to 4.3. The length of seminal vesicle does not appear to vary independently of the body length since the juvenile fluke measuring 4.32 mm from the lungs of *Microcephalophis gracilis* had a correspondingly smaller seminal vesicle with the ratio approaching 1:4.0. Vercammen-Grandjean and Heyneman<sup>2</sup> also noted the difference in the size of seminal vesicle and stated that their specimens have a consistently longer seminal vesicle than the type specimens but did not consider this difference specific. The Malayan specimens also possess a characteristic