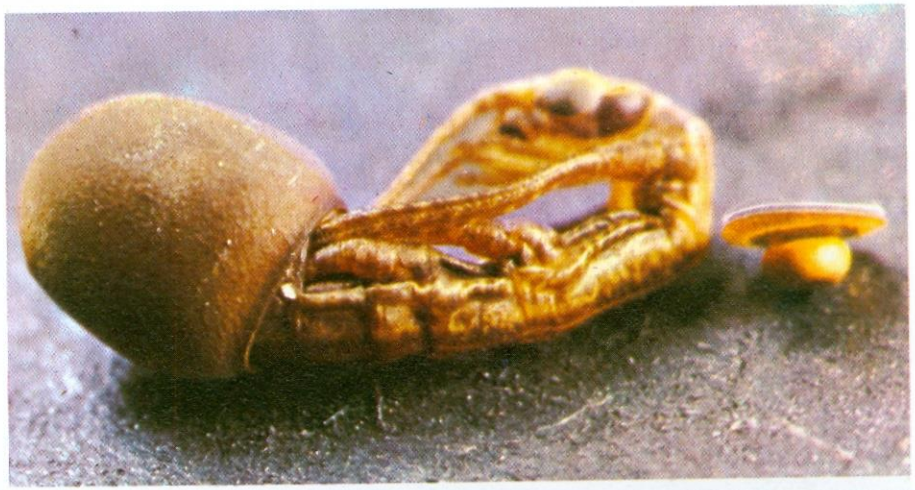
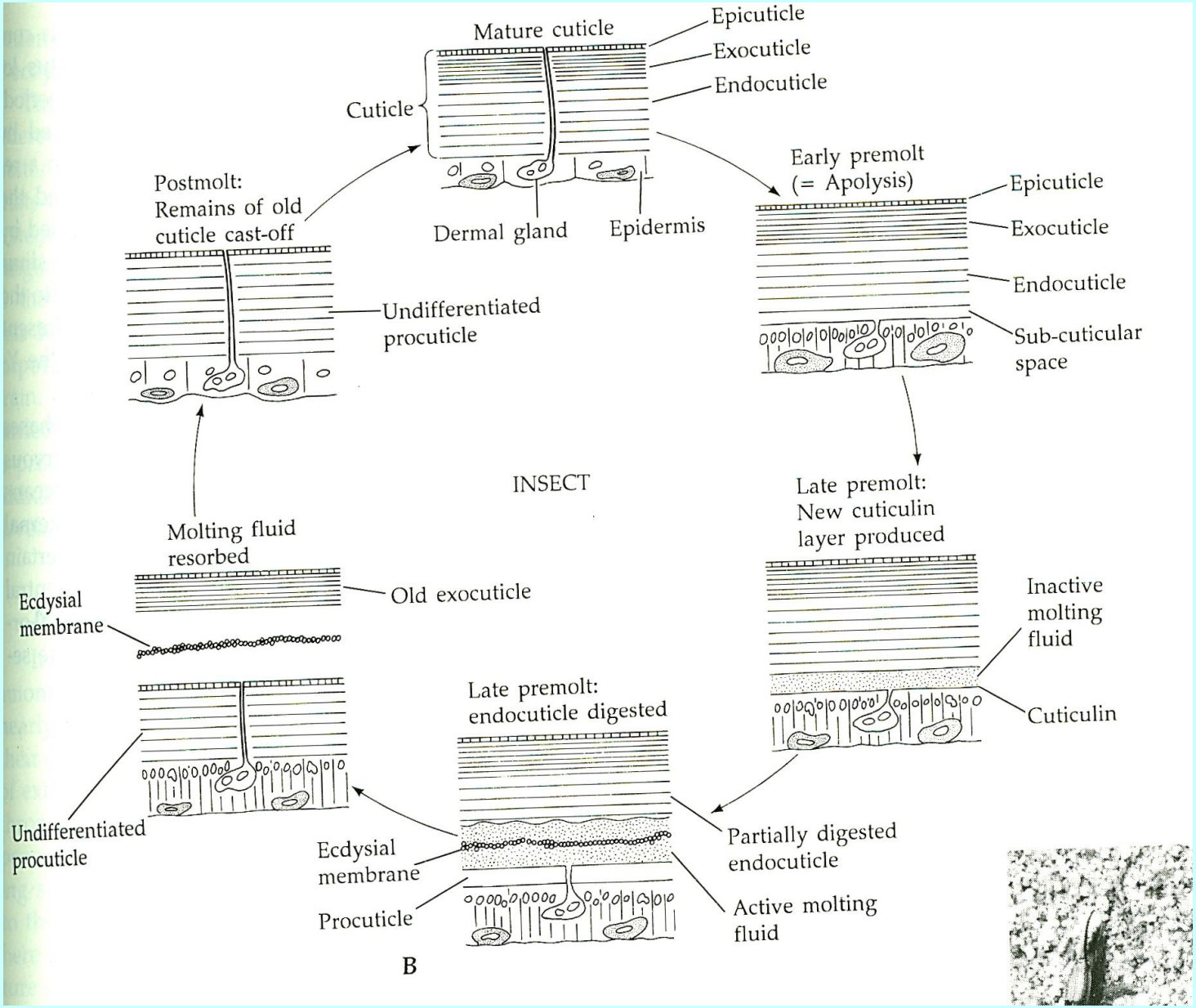
# Gelişme ve metamorfoz

## (Postembriyonik gelişme)



Stick insect *Carausius morosus* hatching. This species is often kept in insectaria and breeds parthenogenetically: males are very seldom found. The young insects emerge from the unfertilized eggs after some months by lifting a small lid. The empty egg-shell is often carried about for several days after birth.

# Böceklerde deri değiştirme



# Metamorfoz

## Ametaboli

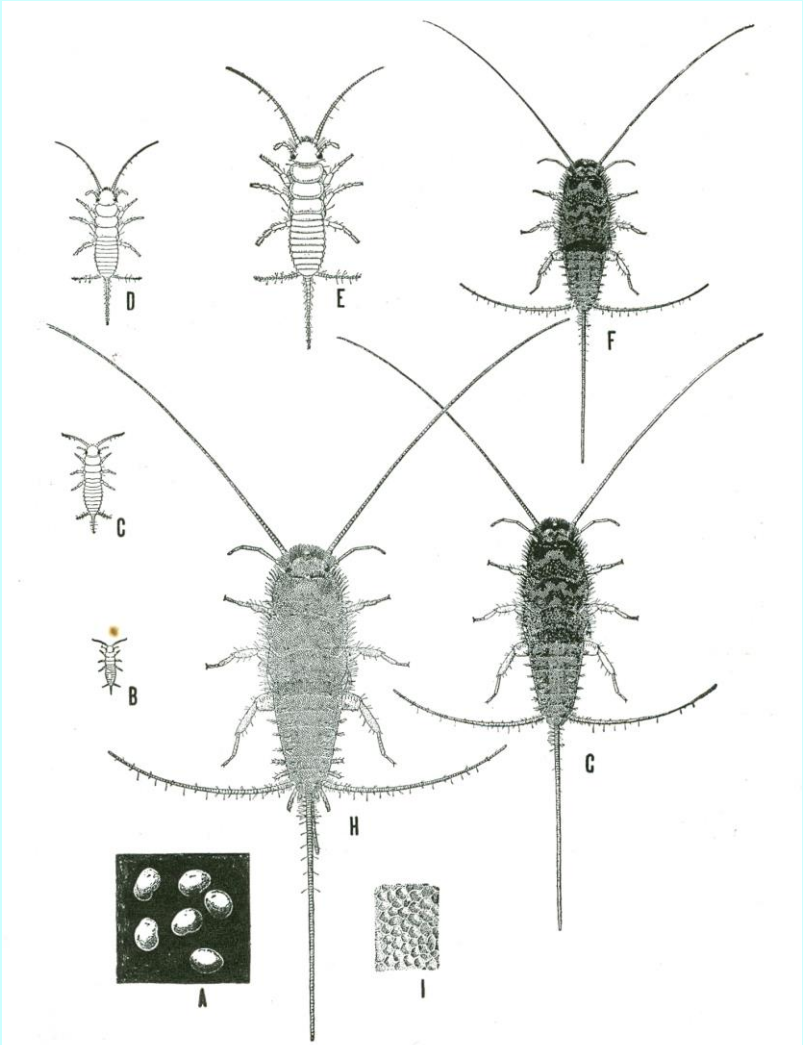



Fig. 83.—Development of the firebrat, *Thermobia domestica* (Packard), illustrating development without metamorphosis. There are more instars than illustrated, the intervening ones being of intermediate sizes but otherwise very similar to those shown. The covering of scales first appears at the third or fourth instar. *A*, a group of eggs; *B*, *C*, *D*, *E*, *F*, *G*, nymphs or young of various sizes; *H*, adult female, as recognized by the styli and ovipositor at tip of abdomen; *I*, sculpturing of the egg shell, as faintly visible under the microscope. (*Original, drawings by Ruth Slabaugh and Kathryn Sommerman.*)

## Hemimetaboli

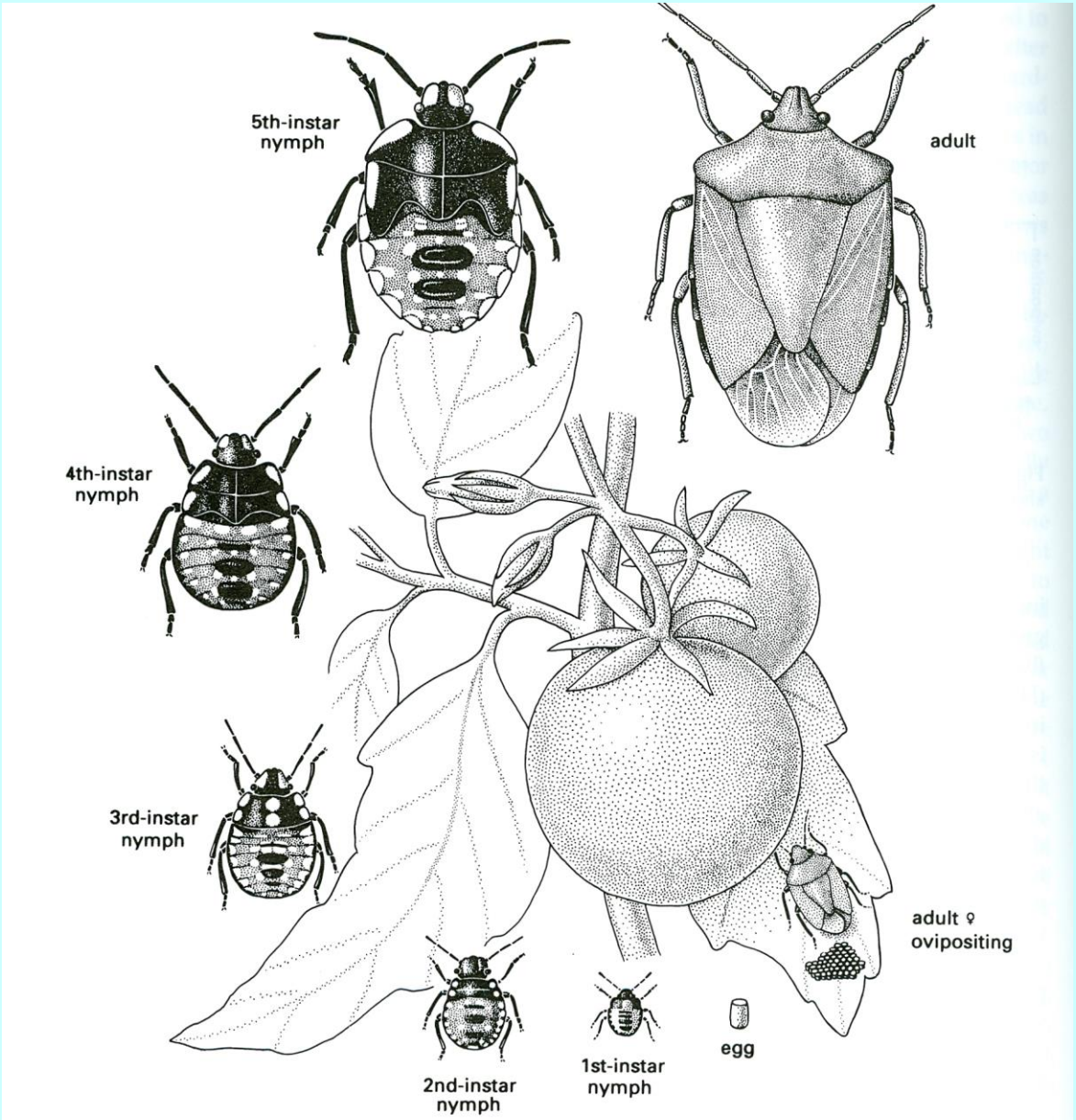



**Fig. 6.2** The life cycle of a hemimetabolous insect, the southern green stink bug or green vegetable bug, *Nezara viridula* (Hemiptera: Pentatomidae), showing the eggs, nymphs of the five instars and the adult bug on a tomato plant. This cosmopolitan and polyphagous bug is an important world pest of food and fibre crops. (After Hely *et al.*, 1982.)

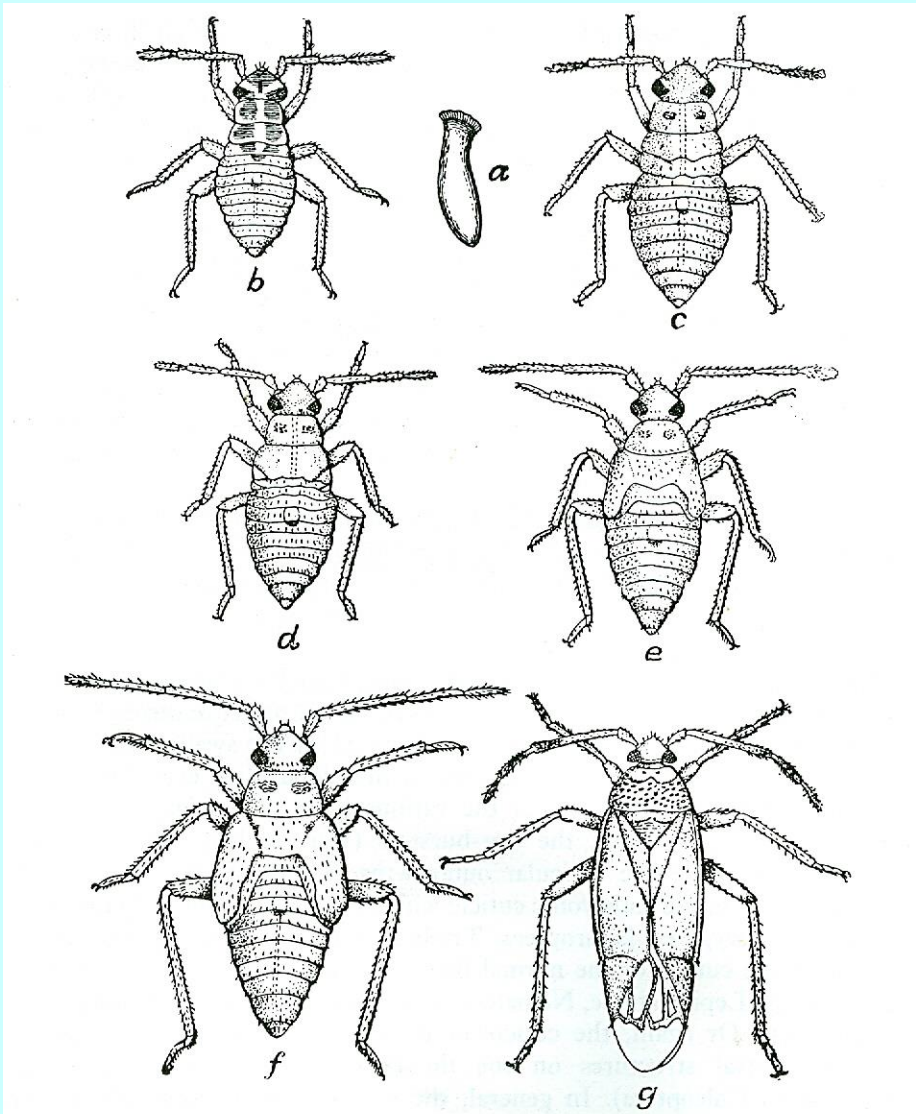



FIG. 180 Metamorphosis of a Mirid (*Plesiocoris rugicollis*)

*a*, egg; *b–f*, larval instars (wing-rudiments minute in *d*, larger in *e* and *f*) × 20; *g*, imago × From Carpenter, *after* Petherbridge and Husain.

## Nimf örnekleri

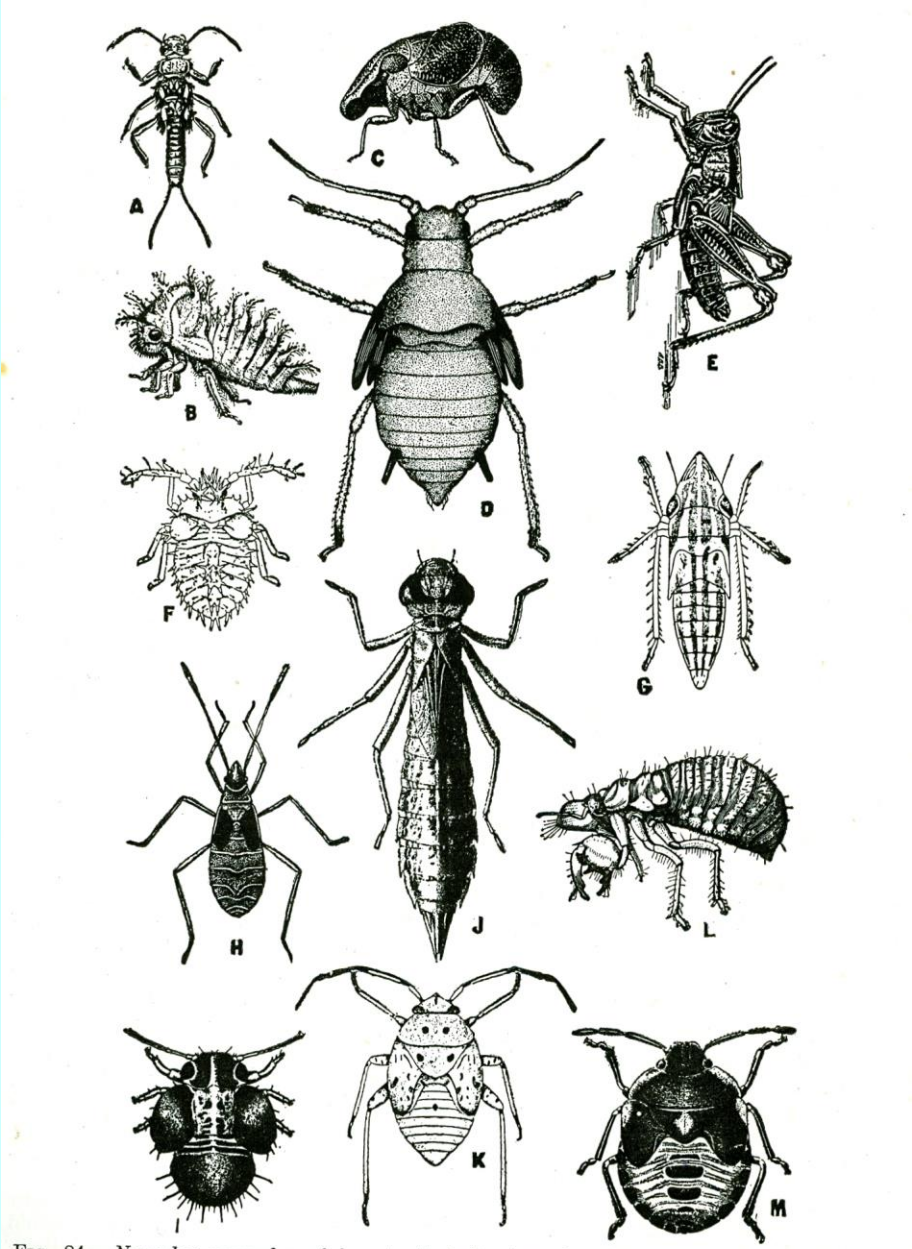



FIG. 84.—*Nymphs:* examples of insects that develop the wings externally during the growing period and transform to the adult usually without a pupal stage. *A*, nymph of a stone-fly, order Plecoptera (*from Kellogg's "American Insects,"*); *B*, nymph of a treehopper, *Ceresa basalis* Walk., order Homoptera (*from N.Y. State College Forestry*); *C*, nymph of a fulgorid, *Bruchomorpha oculata* Newm., order Homoptera (*from N. Y. State College Forestry*); *D*, nymph of an aphid, *Aphis cucumeris*, order Homoptera (*from U.S.D.A.*); *E*, nymph of

# Holometaboli

## *Larva tipleri*

### A – Oligomer larva

**1. Protopod larva**

(*Platygasteridae*,
Parazit *Hymenoptera*)

### B – Eumer larva

**1. polypod (Eruciform larva)**

*Lepidoptera*
*(Hymenoptera–Tenthredinidae)*

**2. Oligopod larva**

a. Campodeiform tip
*(Neurop.,Strepsipt., Trich.)*

b. Scarabeiform tip
*(Coleoptera - scarabaeidae, Ptinidae, Anabiidae )*

**3. Apod larva**

a. Eusefal

b. Hemisefal

c. Asefal

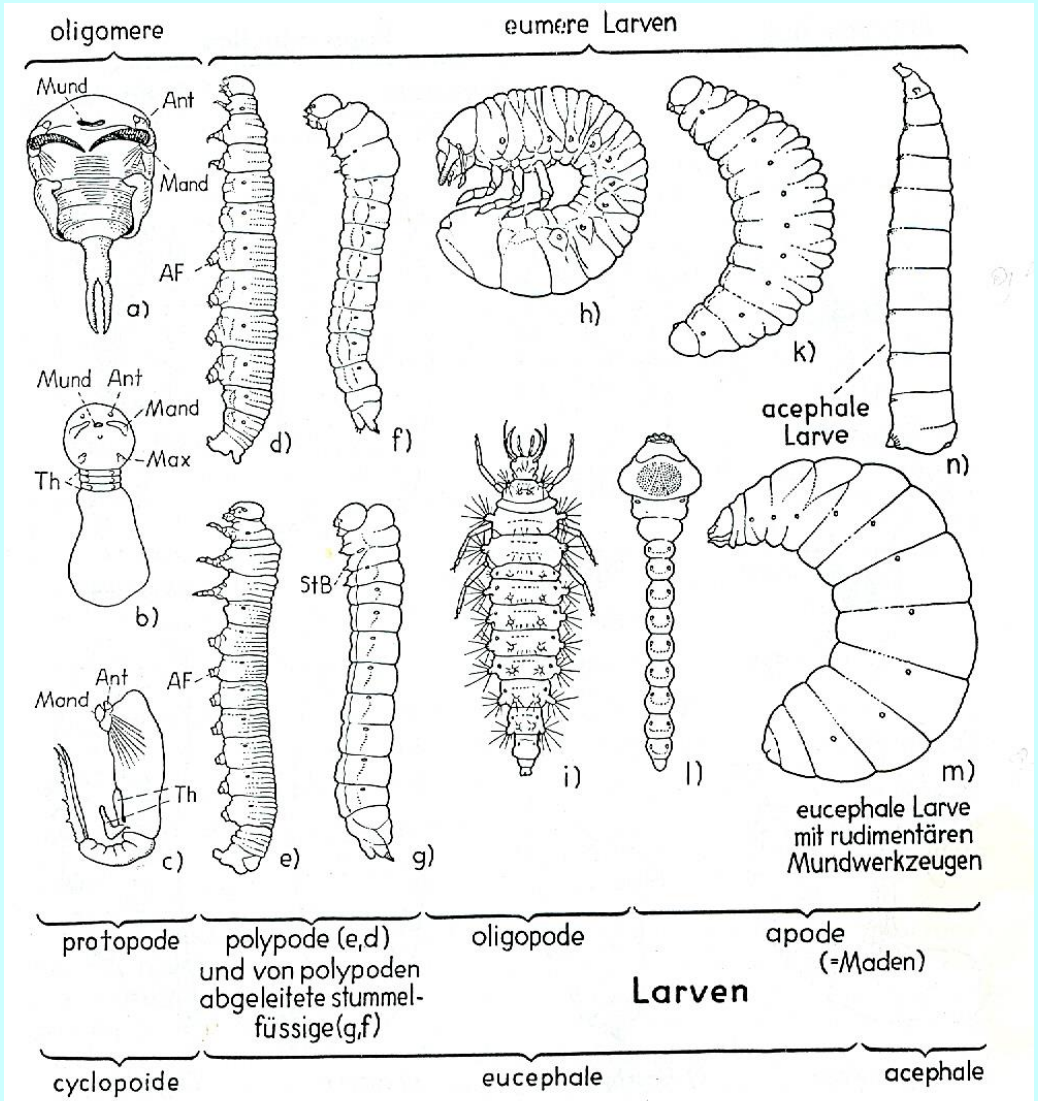
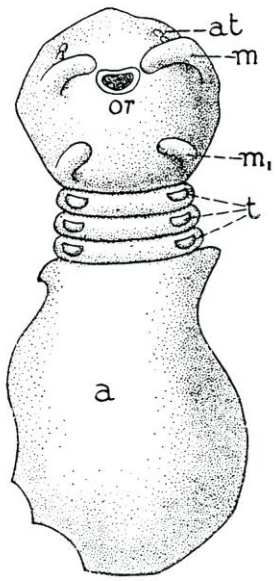



Fig. 129. Beispiele für die wichtigsten **Larventypen der Holometabolen. a–c** Junglarven von Platygasterinen (*Inostemma*, *Platygaster*, *Synopeas*), d typische Lepidopterenraupe (*Pieris*), e typische Afterraupe einer Tenthredinide (*Neodiprion*), **f, g** stummelfüßige Larve einer Cephide (*Janus*) und einer Siricide (*Tremex*), h Engerling eines Lamellicorniers (*Popillia*), **i** campodeoide Larve eines Planipenniers (*Chrysopa*), **k** Curculionidenlarve (*Anthonomus*), l Buprestidenlarve (*Chrysobothris*), **m** Apidenlarve (*Apis*), n Cyclorrhaphenlarve (*Musca*). (a-c aus WEBER, alle andern nach PETERSON).
AF = Afterfuß, Ant = Antennenrudiment, Mand = Mandibel, Max = Maxillenrudiment, StB = Stummelfuß, Th = Thorax (mit Extremitätenrudimenten).

# Larva tipleri

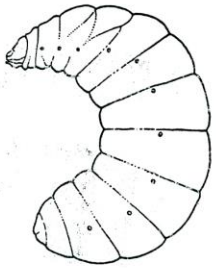



***Şekil 90.*** *Platygaster herrickii (Hymenoptera)'de instar larva.*

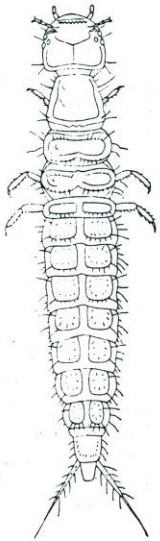
a. abdomen, at. anten, m. mandibül, $m_1$. maksilla, or. oral açıklık, t. toraks eklentileri (Kulagin'den).

***Şekil 91.*** *Pieris brassicae (Lepidoptera)'da Eurisiform (polypod larva) (Imms'den).*

***Şekil 93.*** *Scarabeiform larva (Epicauta vittata-Coleoptera) (Riley'den).*



***Şekil 94.*** *Eusefal larva (Apis-Hymenoptera) (Weber'den).*



***Şekil 92.*** *Philonthus nitidus (Staphylinidae-Coleoptera)'un campodei form (oligopod) larvası (Schiödte'den).*

***Şekil 95.*** *Asefal larva (Musca-Diptera) (Weber'den)*

# Larva tipleri

***(kanat taslakları içten gelişir)***

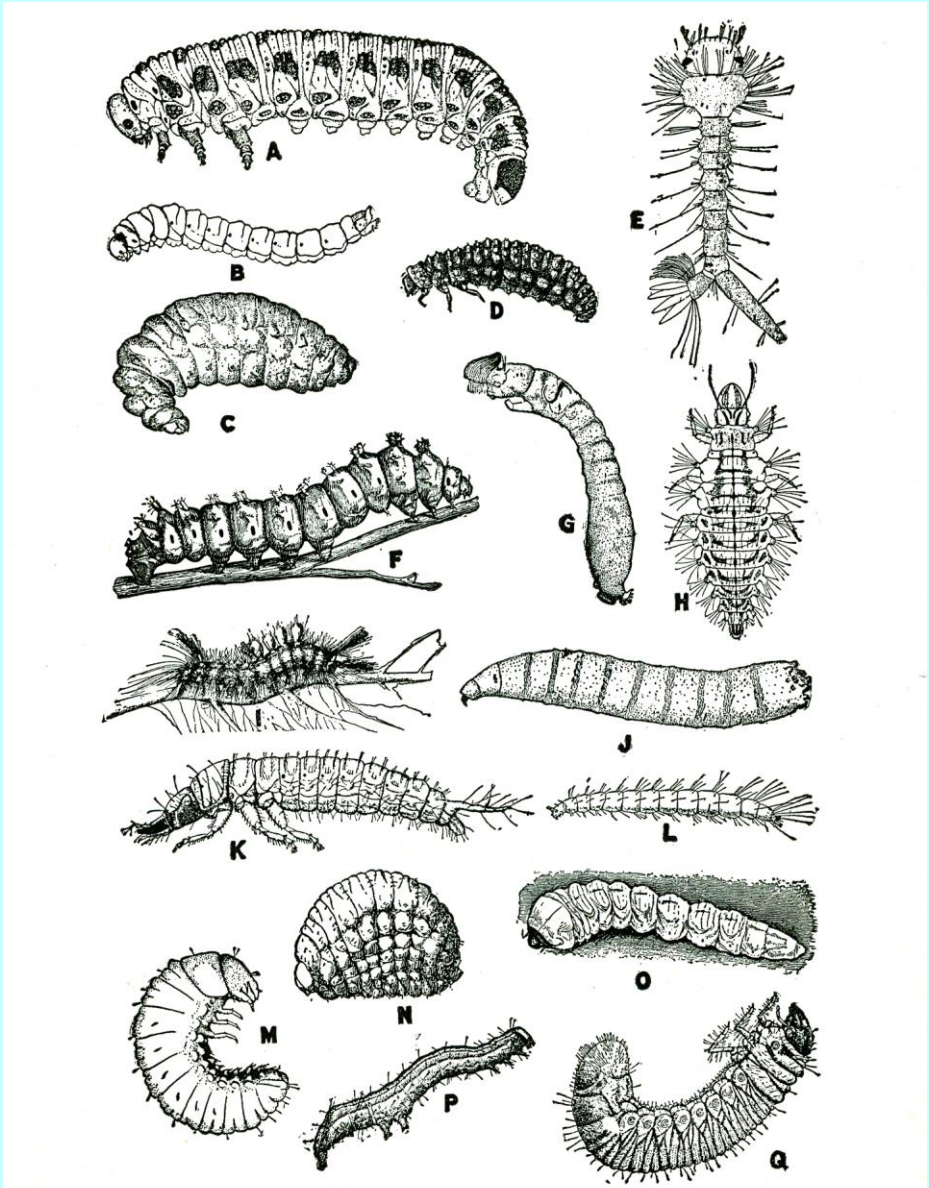



FIG 88.—*Larvae:* insects that develop the wings internally during the growing period, that are very different in appearance from the adults, and that have a pupal stage intervening between larva and adult. *A*, larva of a sawfly, *Neodiprion lecontei* (Fitch), order Hymenoptera (*from Middleton in Jour. Agr. Res.*); *B*, larva of the European wheat stem sawfly, *Cephus pygmaeus* (Linné), order Hymenoptera (*from Ries in Jour. Agr. Res.*); *C*, larva of a black digger wasp, *Tiphia* sp., order Hymenoptera (*from Davis, in Bul. Ill. Natural History Surv.*); *D*, larva of the beet leaf beetle, *Erynephala puncticollis* (Say), order Coleoptera (*from U.S.D.A.*); *E*, larva of a mosquito, *Culex territans* Walker, order Diptera

# Hypermetamorfoz (Heterometamorfoz)

## Coleoptera, Neuroptera, Diptera, Hymenoptera

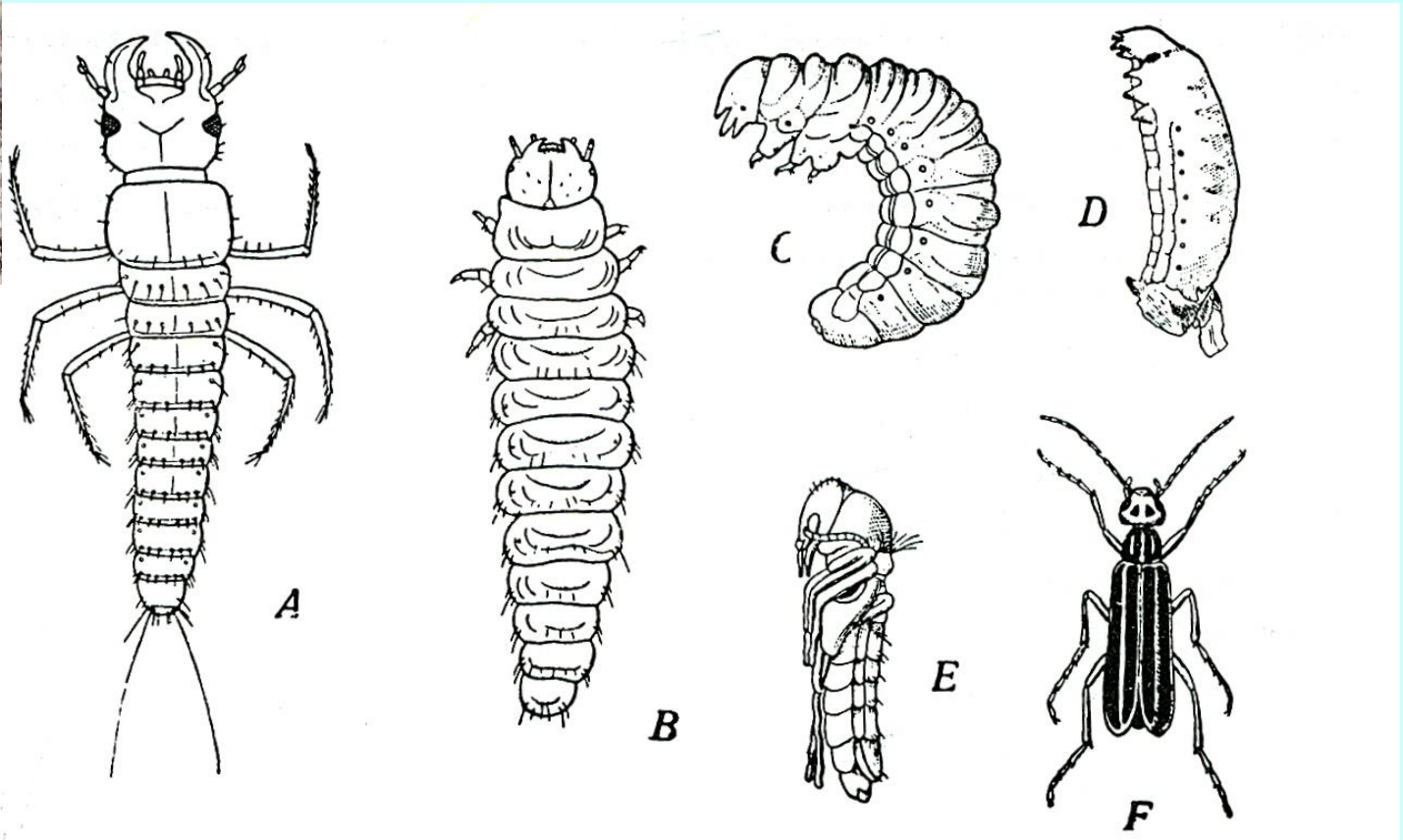
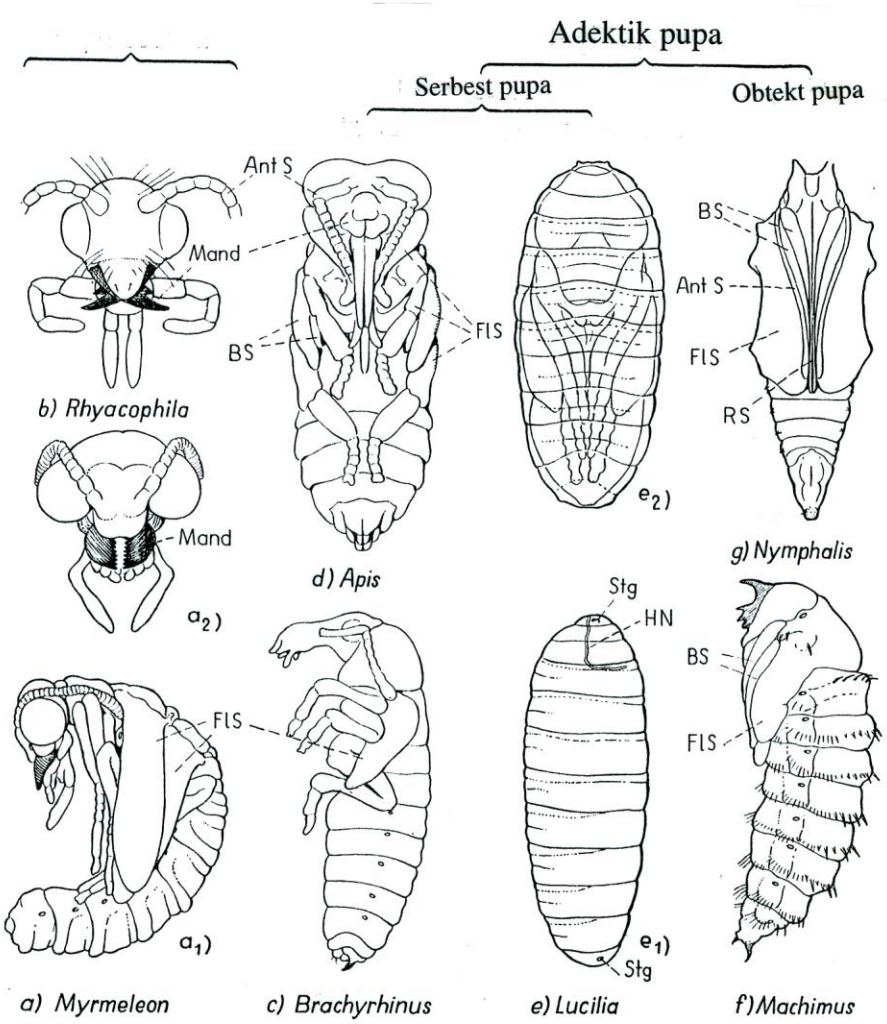



FIG. 188 Hypermetamorphosis of *Epicauta*

A, triungulin; B, caraboid second instar; C, ultimate form of second instar; D, coarctate larva; E, pupa; F, imago. All refer to *E. vittata* except E, which is *cinerea* (F nat. size, others enlarged). From Folsom's *Entomology*. *After* Riley.

# *Pupa tipleri*

1. **Dectic pupa**
   (Neuropt., Mecopt., Trichopt., Lepidopt.,)
2. **Adectic pupa**
   a. Serbest adectic pupa
   (Siphonapat., Strepsipt., Dipt., Coleopt., Hymenopt.)
   b. Obtect adectic pupa
   (Dipt.,Coleopt., Hymenopt., Lepidoptera)




***Şekil 96.*** *Pupa tipleri. Üsteki sıra alttan görünüş, alttaki sıra yandan görünüş.*
*a. Planipennia, b. Trichoptera, c. Curculionidae, d. Apidae, e. Cyclorrhapha, f. Asilidae, g. Nymphalidae.*
*Ant. Anten, BS. Bacak taslağı, FlS. Kanat taslağı, HN. Pupa yırtılma çizgisi, Mand. a ve b şekillerinde fonksiyonel pupa mandibülü, c - f şekillerinde mandibül taslağı, RS. Hortum taslağı, Stg. Stigma.*

# Pupa tipleri

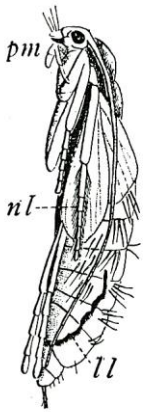



FIG. 540
A typical Trichopterous Pupa
*ll*, lateral line; *nl*, swimming leg; *pm*, provisional mandibles.

**Dectic pupa** - ***Trichoptera***

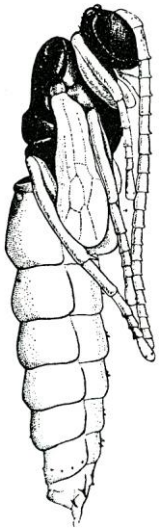


FIG. 189
Exarate or free pupa of a Hymenopteran (Ichneumonidae): lateral view

**Adectic (serbest) pupa**
***Hymenoptera***

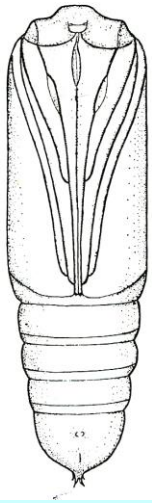


FIG. 191
Obtect pupa of a Lepidopteron (Noctuidae) ventral view

FIG. 192
Puparium of a Dipteron (Muscidae): dorsal view

**Obtect adectic pupa**
***Lepidoptera***

**Puparium**
***Diptera***

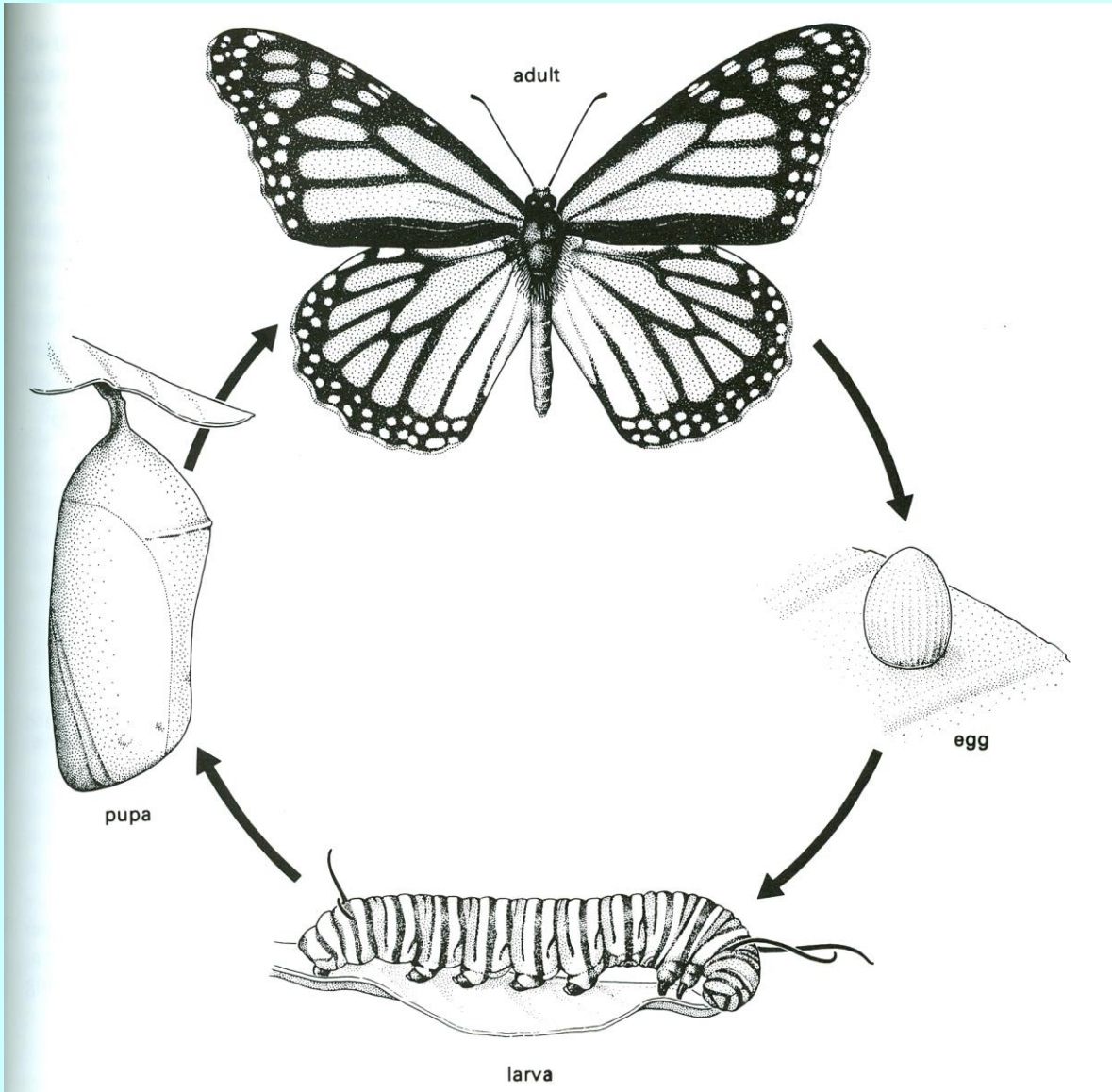
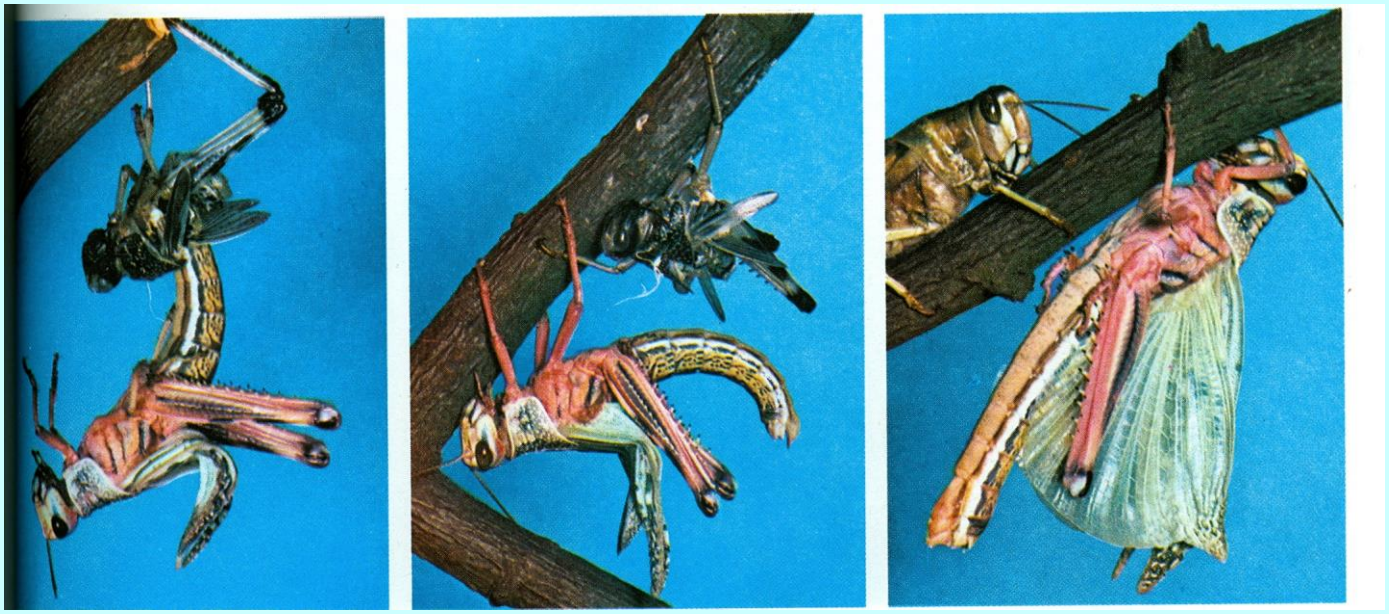



**Fig. 6.3** Life cycle of a holometabolous insect, the monarch or wanderer butterfly, *Danaus plexippus* (Lepidoptera: Nymphalidae), showing the egg, a mature larva, the pupa or chrysalis, and the adult butterfly. There are five caterpillar (larval) instars.

The life-history of a blowfly. Top left: An adult female blowfly, attracted by the odour, seeks out dead or decaying flesh upon which to lay her eggs. Top right: Blowfly larvae. Bottom left: Blowfly pupae. Bottom right: Adult blowflies.

# Nymf’ten ergine geçiş - Acrididae



# Odonata – *Aeshna cyanea'nın* yumurtadan ergine dönüşü

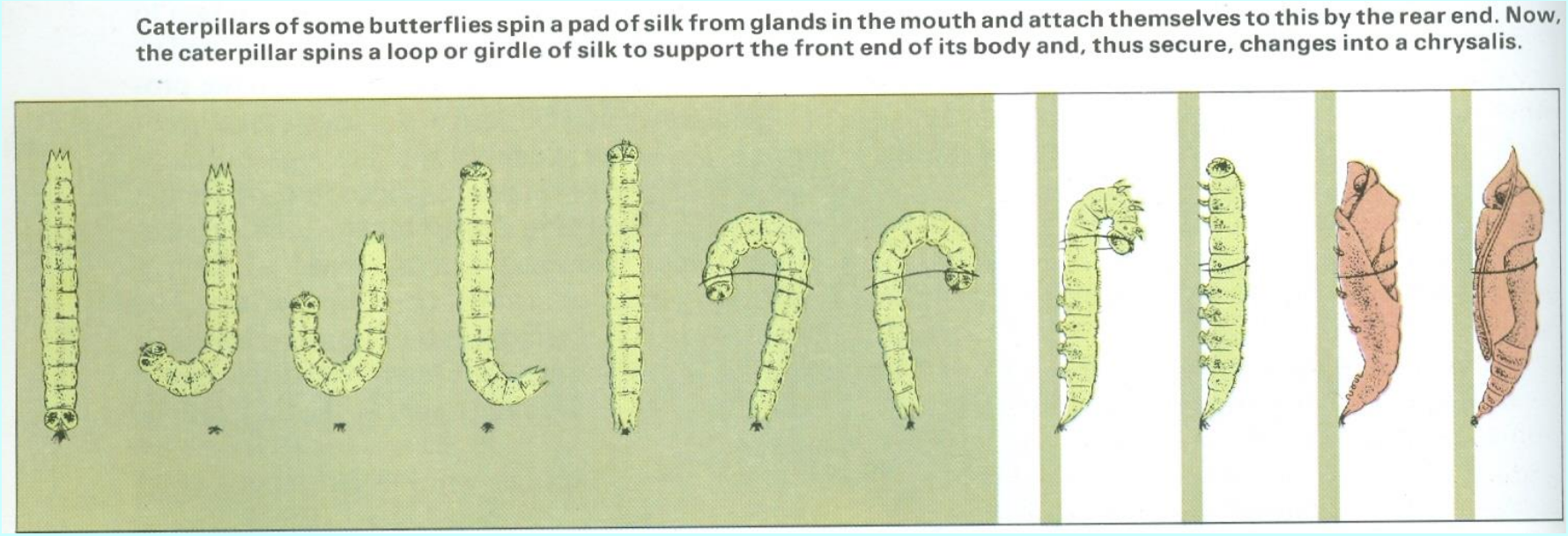
Adult dragonflies lay eggs in or near water. The aquatic larva casts its skin 8–15 times before completing development. At the end of the last stage the adult organs begin to form inside the larval skin. The first of these six pictures of the male *Aeshna*

devam…

VI Common Aeschna, *Aeschna juncea*. Imago emerging from the nymph. Central Europe.

*cyanea* shows this stage, the nymph in water. It then climbs out of the water, hatches and the adult dragonfly wriggles free of the nymph skin, then hangs clinging to it while its wings expand, harden and dry. Only then is it ready to take wing.

# Larval safhadan pupaya geçiş



# Diptera – Culex pipiens'in su yüzeyinde pupadan çıkışı

A male mosquito *Culex pipiens* just emerged from the pupa at the surface of the water. After emergence there is a resting period of several hours while the wings expand and harden and flight becomes possible. After this the mosquitoes disperse.

# Kelebeğin pupa’dan çıkışı

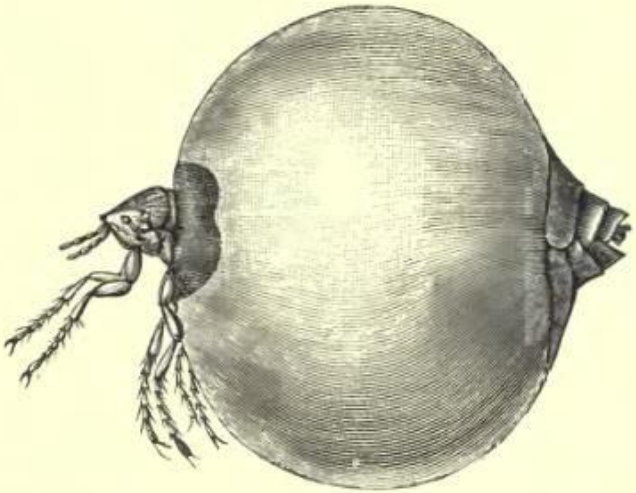
A butterfly emerging from its pupal case. The case has split along a predetermined line of weakness to release the head and legs. Some parts of the new insect's body are already hardened to allow it to move but the wings are soft and must soon be expanded before hardening occurs.

# Lepidoptera – *Actias selene'nin* yaşam döngüsü

Life history of a moth *Actias selene*. Top left: the larva, which becomes inactive and spins a cocoon, top centre. Inside this, the larva changes to a pupa, top right. The adult moth, bottom left, breaks out and waits for its wings to extend before being able to fly, bottom right.

# Hymenoptera – *Aphis mellifera* pupaları (bağımsız kuluçka odacıklarında)

Honeybee pupae, each in its separate cell in the comb. After five days of feeding, the larvae change into pupae and the worker bees cover the tops of the cells with a cap of wax. The limbs and antennae of these pupae are free from the body but little movement takes place.



Jigger flea (*Sarcopsylla penetrans*). Female with the abdomen distended.

**Fig. 1** - Female *Tunga penetrans*.

**Fig. 3** - Several vital tungiasis lesions on the first toe. Eggs attached to the nail are visible. On the left nail rim, feces are being expelled from a lesion.

# Diptera – Chironomidae- *Chironomus* (yaşam döngüsü)

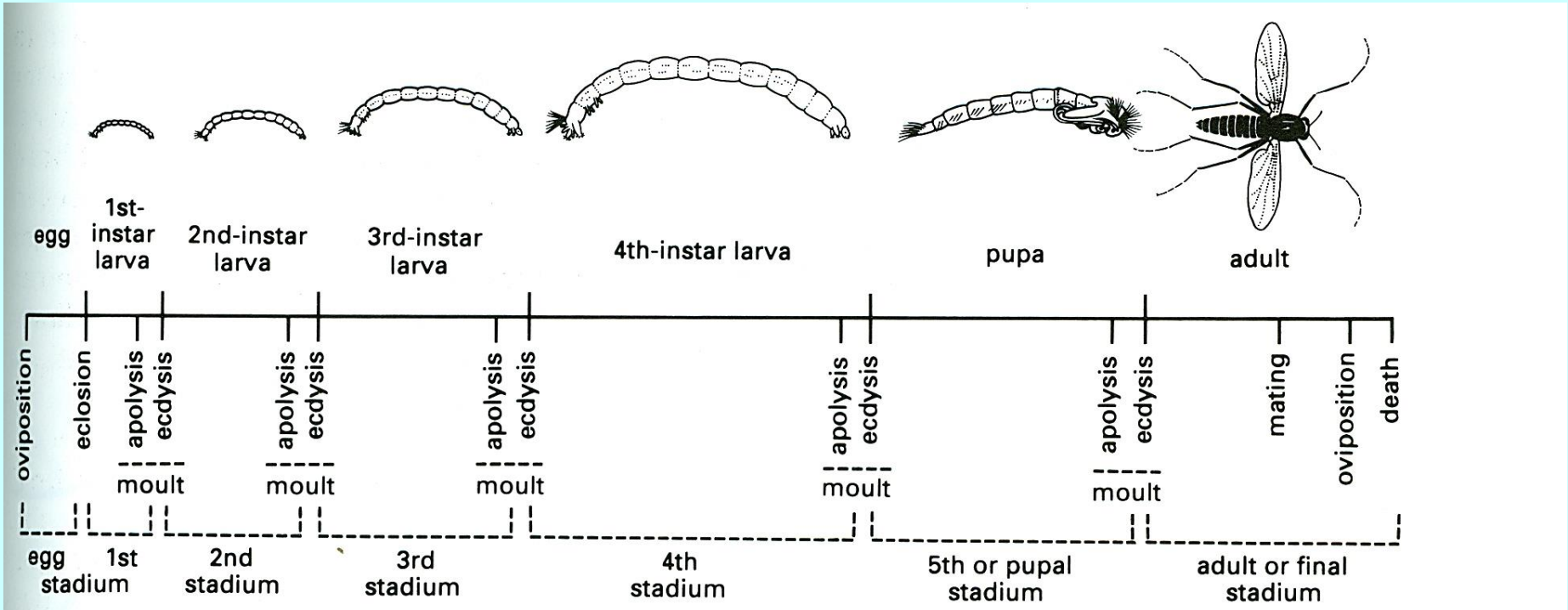



**Fig. 6.1** Schematic drawing of the life cycle of a non-biting midge (Diptera: Chironomidae, *Chironomus*) showing the various events and stages of insect development.

# Böcek gelişim (başkalaşım) safhaları

| Başkalaşım tipi | Başlama peryodu | Büyüme peryodu | | Değişim peryodu | | Üreme peryodu | |
|---|---|---|---|---|---|---|---|
| Ametabol | Yumurta | Yumurtadan çıkış | Genç | Deri değiştirme | | | Ergin |
| Hemimetabol | Yumurta | | Nimf | | | | Ergin |
| Holometabol | Yumurta | | Larva | | Pupa | Deri değiştirme | Ergin |

# Böceklerde temel endokrin merkezler

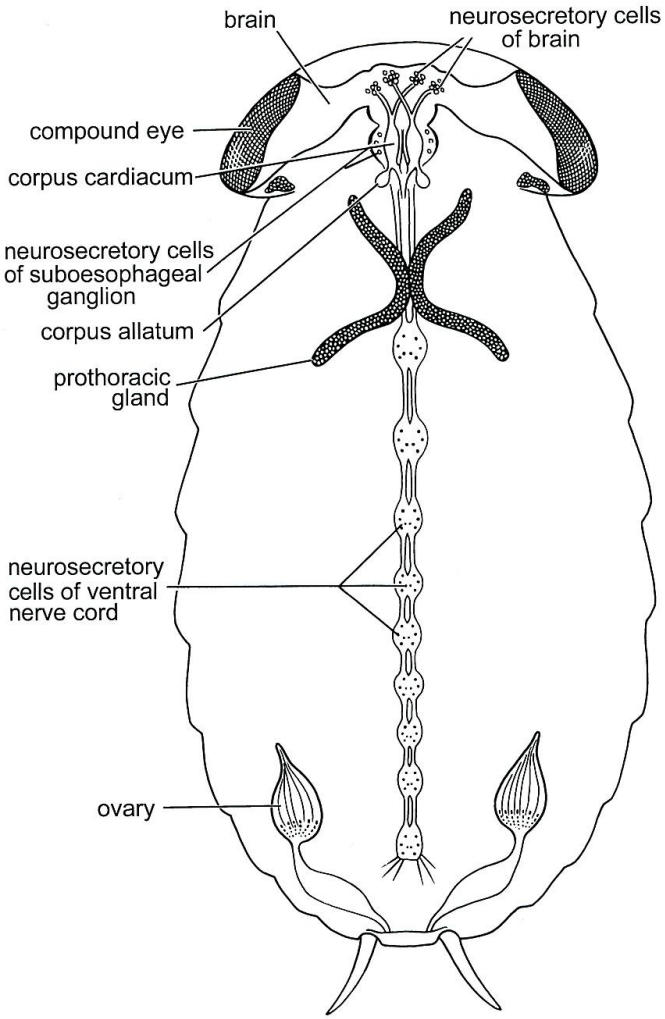



**Fig. 3.8** The main endocrine centers in a generalized insect. (After Novak 1975.)

# Böceklerde endokrin organlar

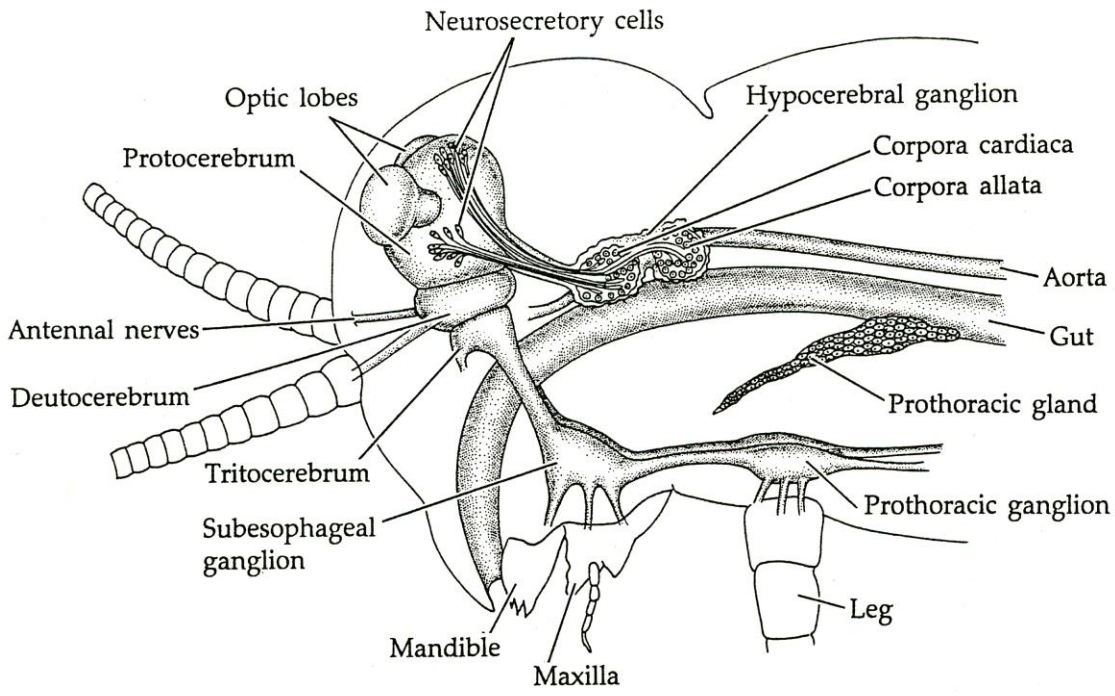
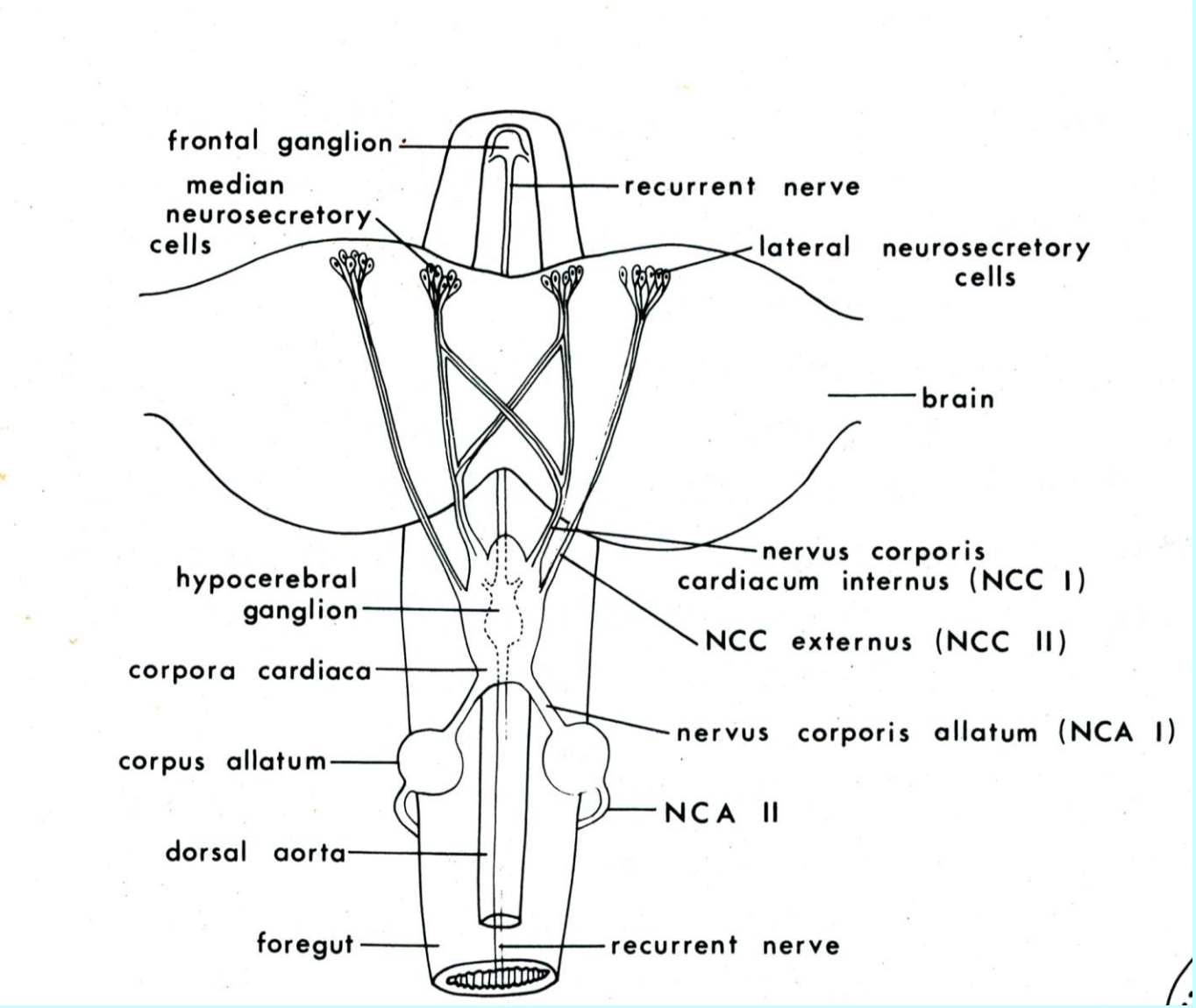



*Figure 34*

**Endocrine organs and central nervous system in the head and thorax of a generalized insect. These cells all play some part in the control of molting and metamorphosis. (After Wells 1968.)**

# Syomatogastrik sistem ve ilişkili endokrin yapılar



# Weismann halkası : Diptera - Calliphora

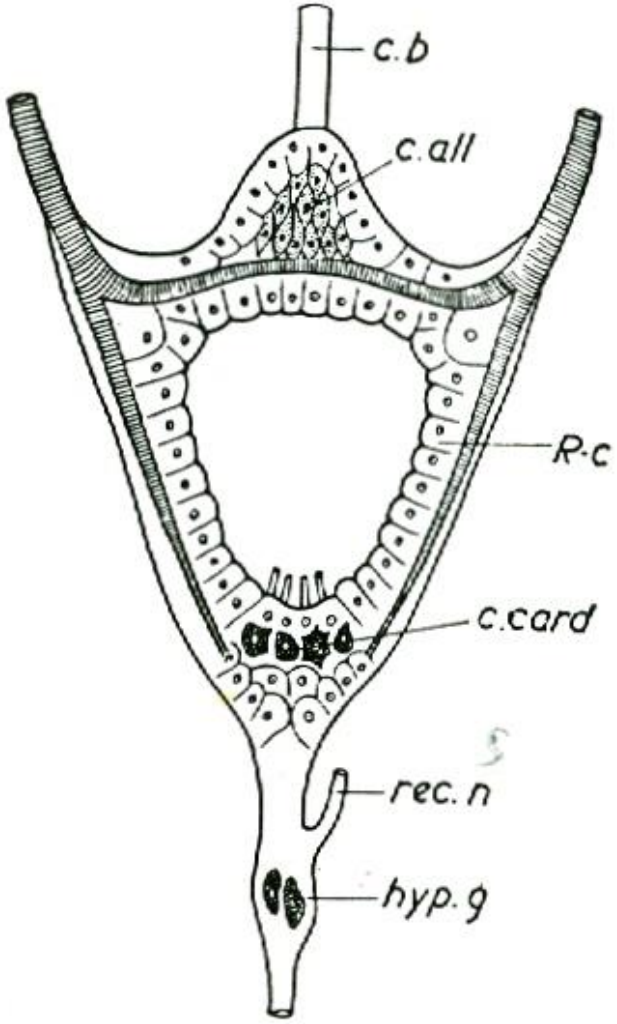
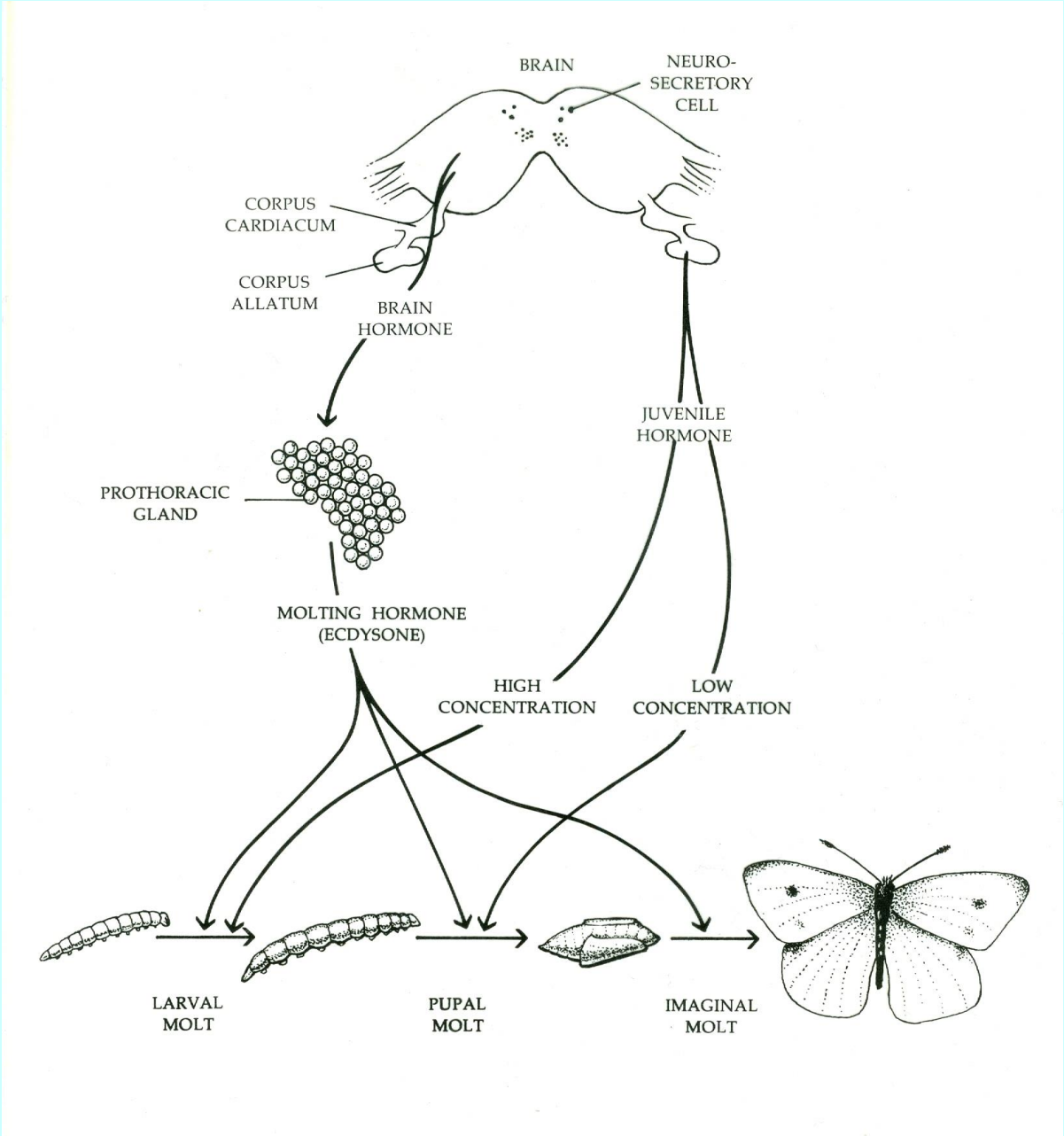


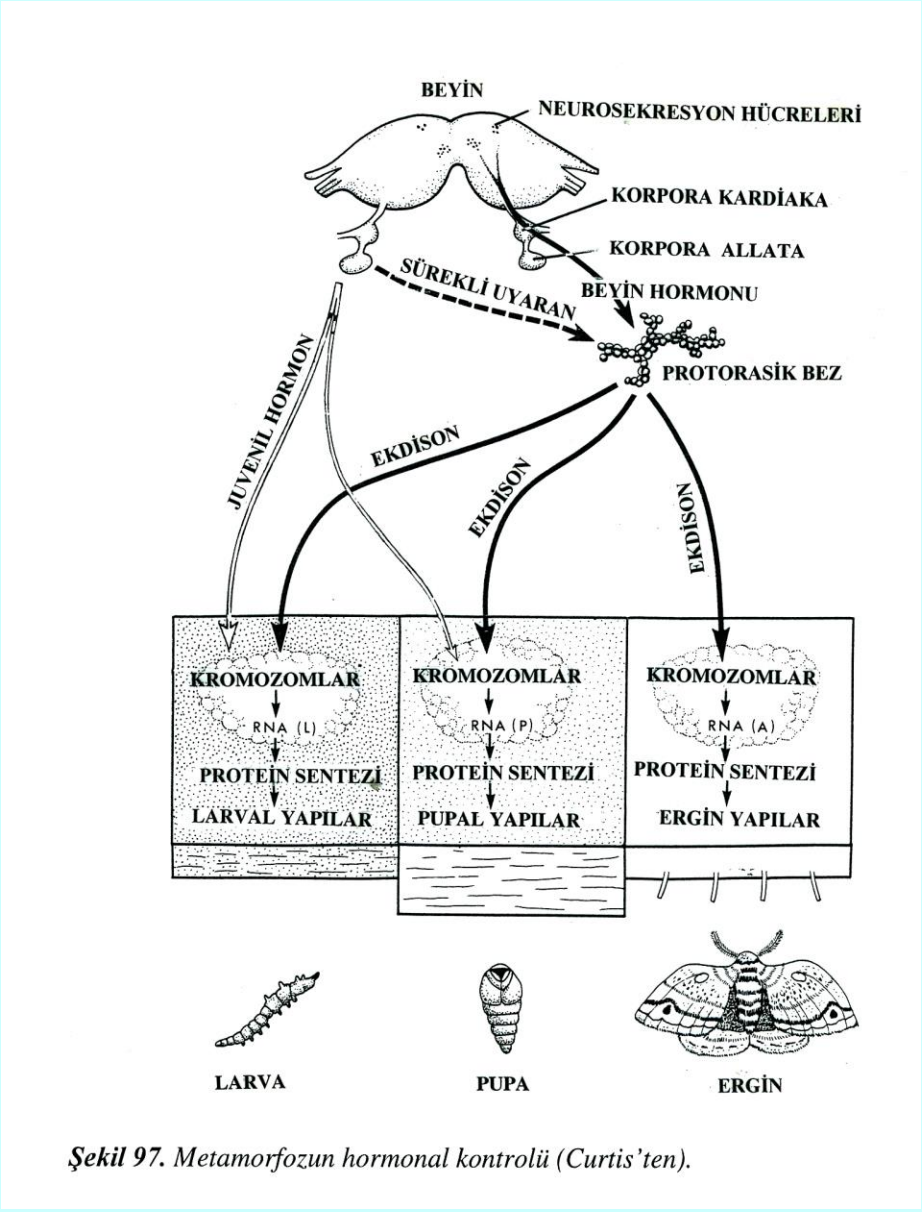

FIG. 143
Diagram of Weismann's ring from *Calliphora* larva (*after* Thomsen, 1951)

*c.b*, cephalo-pharyngeal band; *R-c*, R-cells (probably homologous with prothoracic glands of other insects). Other lettering as in Fig. 141.

# Böceklerde metamorfozun hormonal kontrolu



# Böceklerde metamorfozun hormonal kontrolu




*Şekil 97. Metamorfozun hormonal kontrolü (Curtis'ten).*