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# BIOLOGICAL CHARACTERISTICS OF INSECTS WITH INCOMPLETE METAGNOSIS (INSEKTA: HEMIMETABOLA) OF THE NORTHWESTERN PART OF THE KYZYL KUM DESERT

**Yusupova Asya**
*Assistant, Department of General Biology and Physiology, Karakalpak State University named after Berdakh Republic of Uzbekistan*

**ABSTRACT**
*The article discusses the biological features of insects with incomplete metamorphosis (Insekta: Hemimetabola) in the northwestern part of the Kyzylkum Desert. One of the key features of Hemimetabola is their metamorphosis, which does not include a pupal stage, and this ensures a faster transition to active adult life.*
**KEY WORDS:** *egg, adaptation, temperature, desert, energy, moisture, metamorphosis, stage.*

Insekta, or insects, are the most numerous and diverse group of animals on planet Earth. Among them is the subclass Hemimetabola, which is distinguished by the peculiarities of its life cycle and morphology. Hemimetabola, or incompletely metamorphosed insects, are a group in which development from egg to adulthood occurs without the pupa stage, which can be observed in such representatives as grasshoppers, cockroaches, and orthoptera.

The biological characteristics of insects with incomplete metamorphosis (Insekta: Hemimetabola) in the northwestern Kyzylkum region represent a unique adaptation to the extreme conditions of this region. Kyzylkum, a significant part of which is covered by deserts and semi-deserts, is characterized by extremely variable temperatures, limited water availability, and specific vegetation. These conditions pose specific challenges to Hemimetabola, to which they respond with a number of morphological, physiological, and behavioral adaptations.

One of the main adaptations of these insects is their ability to withstand extreme temperatures, which can range from scorching summer heat to cold winter nights. In terms of survival mechanisms, they have a slow metabolic state, which helps reduce energy expenditure when food is scarce or temperatures are not suitable for active life.

Structurally, many of the insects in this region have a dense chitinous covering that protects them from moisture loss. This covering also acts as a barrier to sudden temperature fluctuations, allowing them to maintain a stable internal state. Some species also have protective coloration that helps them blend into the environment, as sand dunes and sparse vegetation create conditions for mimicry and secrecy from predators.

One of the key features of Hemimetabola is their metamorphosis, which does not include a pupal stage, allowing for a faster transition to active adulthood. In the Kyzylkum environment, this clearly facilitates a quick start to reproduction and reduces the resource expenditure on long-legged stages of development, which might otherwise be more vulnerable to extreme climatic factors.

Many Hemimetabola species have evolved mechanisms to minimize moisture loss. They have dense exoskeletons and are often nocturnal, which helps them avoid excessive heat stress and moisture loss during hot daytime hours. Some species are able to accumulate moisture from food or minor precipitation, and to occupy niches where morning dew condenses.

The diet of these insects is also adapted to the local flora, which often has high concentrations of defensive compounds. Some Hemimetabola develop the ability to tolerate or even use these chemicals in their metabolism, allowing them to exploit niches inaccessible to less adapted competitors.

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Finally, social and defensive strategies among Hemimetabola species include both solitary and group modes of existence. Some species form temporary communities to increase their chances of survival and reproduction, while others specialize in moving quickly between temporary resource sources, outrunning their competitors.

A study of the biological characteristics of Insekta: Hemimetabola in northwestern Kyzylkum reveals a wide range of adaptations that allow these insects to survive and thrive in one of the harshest corners of Central Asia.
One of the key features of Hemimetabola is that they have three main stages in their life cycle: egg, larva (or nymph), and imago (adult). Unlike the Holometabola, which have a pupal stage, Hemimetabola go through a series of molts to eventually become adults. At each stage, the nymph looks like the adult, but is usually smaller and lacks fully developed wings and reproductive organs.

The morphological features of Hemimetabola also include various adaptations to the environment and lifestyle. For example, grasshoppers have powerful hind legs designed for jumping, and cockroaches have antennae that play an important role in sensory perception of the environment. Many representatives of this subclass have significant plasticity in the choice of food resources and adapt to various environmental conditions.

All this indicates that the insects' ability to survive difficult climatic conditions is the result of their long-term evolutionary adaptation, which allowed them to master and successfully survive even in such hostile conditions as northwestern Kyzylkum.

The ecological importance of Hemimetabola is difficult to overestimate. They occupy a wide range of ecological niches, ranging from herbivorous species that influence plant communities to predators that control the numbers of other small invertebrates. In addition, some species, such as aphids, can be vectors of plant diseases, which emphasizes their importance in nature and agriculture.

The life cycles and behavior of these insects are the subject of extensive research aimed at understanding their evolutionary adaptations and roles in ecosystems. Given the diversity and importance of Hemimetabola, further research could provide valuable data for biology, ecology, and even agricultural technology.

Thus, Hemimetabola represent a unique group among insects, distinguished by their biological features and adaptations. Research into their life cycle, morphology and ecological interactions continues, revealing more aspects of their role in natural systems and their importance to humans.

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