SUMMARY
Adults of *Choroedocus illustris* are commonly found in long grasslands and are chiefly graminivorous and distinguished from its large size and brown colouration; a dark longitudinal stripe extending from fastigium of the vertex to the hind margin of pronotum; hind tibia and tarsi purplish – blue and distributed in India (Tamil Nadu, Bengal, and U.P.), Pakistan, Thailand. Adults and nymphs are gregarious and found crowding in bushes and crop fields, photopositive and strong fliers to long distances.

Adults of *Acrida exaltata* are found in tall grassland and cultivated grounds during rainy season. The acridid migrates from its original habitat to other new habitats. The adults are distinguished from other economic species throughout most of its range by the hind wings developing into yellow tinge and distributed throughout India, Pakistan, Bangladesh, S.E. Tibet, Afghanistan, Sri Lanka, Iran, Yemen, Nepal. Adults and nymphs are occasionally gregarious and congregate in masses on thick grasses, bushes and treetops up to the height of 25 feet, photopositive in nature.

A method for measuring the colour patterns of *choroedocus illustris* and *Acrida exaltata* by means of the Dictionary of colour is described. Using this
method, the results obtained in measuring colour patterns by different observers are comparable.

The components of the colour patterns are numerous. The ground colour of the head and pronotum can apparently be measured with accuracy than that of most other body regions. Furthermore, the range of colour variations in these two body regions is greater than others. Consequently, the classification of the colour types has been based primarily on the coloration of these two regions. Within the limits of available data and the number of populations studied, it is concluded that the inferences on the population history can probably be derived from the characteristics of the ground colour and pronotal dark pattern. The colour patterns may be very complex but it may be sufficient to describe the colour types by reference to only three pattern characters.

Copulation in these two species is preceded by elaborate courtship with special reference to long copulating time.

The mechanism involved in oviposition is of acridian pattern. The egg-laying period takes about 218 minutes for *Choroedocus illustris* and 188.7 minutes for *Acrida exaltata*. The size of the egg-pod is variable in both cases and mainly determined by the number of eggs laid per female. The average
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number of egg-pods by a single female, on an average, has been $5.30 \pm 0.21$ (Isolated condition) and $4.40 \pm 0.24$ (Crowded condition) in *Choroedocus illustris* and $4.90 \pm 0.48$ (Isolated condition) and $3.50 \pm 0.45$ (Crowded condition) in *Acrida exaltata*.

The effect of isolated and crowded conditions on the fecundity of females of these two grasshoppers has revealed that the average fecundity is affected. Isolated condition produces more eggs than crowded conditions. The average number of eggs per pod was $64.80 \pm 2.65$ (Isolated condition) and $35.96 \pm 0.90$ (Crowded condition) for *Choroedocus illustris* and $31.30 \pm 2.20$ (Isolated condition) and $25.90 \pm 0.92$ (Crowded condition) for *Acrida exaltata*.

The incubation and hatching follows a typical acridian pattern with a difference of having enclosure of a cuticular membrane around newly hatched nymphs. The viability of egg-pods, eggs and incubation period was found affected by isolated and crowded condition. The crowded condition affects as in locusts and this behaviour is recorded as a new record in these occasionally gregarious species.

Diapause does not occur at any stage of life cycle and therefore, they have shown throughout the year breeding and sustained populations. At least
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four generations a year with an additional overlapping generation has given special pest status.

The life cycle is completed in 86–100 days (Isolated condition) and 84–96 days (Crowded condition) approximately in males and about 93–104 days (Isolated condition) and 90 – 100 days (Crowded condition) in females in case of *Choroedocus illustris* and about 84–105 days and 85–109 days under Isolated condition in males and females respectively, and 78–99 days and 83–106 days under Crowded condition in males and females respectively in *Acrida exaltata*.

The hopper duration is attributed to the number of instars in cycle and crowding affects nymphal duration, which is a new record and addition to the knowledge.

Dyar’s law has been successfully applied to the hopper instars of *Choroedocus illustris* and *Acrida exaltata* and they were reared in constant as well as natural conditions. The application of Dyar’s law is new to acridological knowledge.
The variation of colours and patterns are much shown by *Choroedocus illustris* and less shown by *Acrida exaltata*. Preliminary experiments show chromatic changes under crowded and environmental changing conditions and are definitely indicative of the influences therein.

The eggs of these two species are laid in moist soil and incubation, development and fertility is greatly affected by temperature and relative humidity gradients. The lowest percentage of hatching was recorded as 61.16 at 27°C and 70±5% R.H. in *Choroedocus illustris* and as 65.09 at 27°C and 70±5% R.H. in *Acrida exaltata*. The highest percentage of hatching was 73.98 at 37°C and 70±5% R.H. in *Choroedocus illustris* and 71.52% at 37°C at 70±5% R.H. in *Acrida exaltata* respectively. The average incubation was longest at low temperature and shortest at high temperatures.

The combinations of temperature and relative humidity at lower and higher side was most significant in survivability, developmental rate and day-long activities. Extremes of temperature and relative humidity resulted in high mortality at all stages of life cycle. It was found that higher side of temperature coupled with high relative humidity was most preferred by both species in all stages.
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Since both these acridids pest form a common population in north Indian grassland and cultivated crops, their life – cycles are of similar nature except flight potential and vigorous activities of hoppers in *Choroedocus illustris* is the unique feature as compared to *Acrida exaltata* which was found mostly active when remain gregarious otherwise show least activities.

In both species, the generations have an overlapping generation over and above four complete generations in a year.

Seasonal variations govern the population structure in both the species in different moths of the year. Adults of these acridids are seen active in extreme colder months of December and January with reproductive activities and it may be attributed to an ecological adaptive behaviour.

The population size of these grasshoppers with reference to seasonal variations on yearly basis of all stages through random sampling has been estimated. It was found that the populations were very high with reproductive activities during rainy season in August & September and March & April. The population of hoppers and adult was found pronounce where grasses like *Cyperous rotundus, Seteria glauca, Paspalum distichum, Andropogon adoratus, Cynodon dactylon* were dominating the vegetation. The fluctuation in
numbers of grasshopper is attributed to the other ability of these grasses. The early nymphal instars have preferred *Cynodon dactylon* while the advance stages like to enter in the crop fields.

The small-scale movement of all stages of these grasshoppers were extremely influenced by day temperature and relative humidity, air speed, light, and human activity and after sunset they were hidden under thick vegetation.

The food preference in nymphs and adults and successful completion of cycle have been recorded typically in these grasshoppers. It was found that the distribution of these species remains directly proportional to the preferential value of the food plants available.

The most important and needed aspect of this study was the morphometrical analysis and chromatic profile. In both the species, all parameters and body parts and their ratios as done in locusts were tested and thus amazingly majority of them were highly significant leading to a conclusion that the species have tremendous ability to become gregarious when environmental and biotic conditions are available suited to the behavioural profile. Both the species were put to isolated and crowded conditions in order to establish any hidden instinct of being locust ‘locust in making’ may be
researched out. These observations were corroborated with visual, occasional record on these species. The gregarious behaviour was definitely exhibited but with discontinuous aggregational behaviour. The observation certainly leading to accept the fact that both the species are having distinct behaviour of gregarization, swarm forming and having ability of mass active behaviour with local migratory instincts. These observations are the substantial addition to the knowledge of polymorphism in acridoids.

The chromatic changes, thus, observed visually were tested under experimental designs and amazingly found that the colour spectra shown were on the same pattern as in locust species and were reversible as and when ecological conditions were changed.

On the basis of the present studies it can convincingly be concluded that the species under study are very dangerous in behaviour, can assume new dimensions of behaviour, may become gregarious and migratory under suitable ecological parameters. The life-cycle of these species hitherto unknown, have been made known. A complete eco-ethological profile, under all considerations, has been completed and the entire research work will be in addition to entomologist in general and very special to acridologists the world over.