



## DIURNAL FLUCTUATIONS IN COMMUNITIES ADJOINING THE FOREST-EDGE NEAR URBANA, ILLINOIS\*

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Variations in the composition of biotic communities constitutes one of the more frequently studied phases of ecology; aspection is dwelt upon in nearly every community study; annuation has received but scant attention; diurnation has been dealt with by three papers: those of Sanders and Shelford ('22), Gudoshchikova ('27), and Davidson and Shackleford ('29). In all of these studies migration, either horizontal or vertical or both, was found to occur between the layer communities of the vegetation and the ground, or between the communities of adjacent areas. Migrations appeared in several instances to be coincident with changes in environmental conditions occurring within the day.

The present study was made in the forest-edge and adjacent communities in the tract known as the "University Woods," studied by Weese ('24), near Urbana, Illinois. Stations were set up throughout the environmental gradient from open field into the forest interior; collections were made at intervals with the sweep net during the 24 hours in the early autumnal (October 1, 1932) and prevernal (April 29, 1933) periods. The abundant and no doubt influent species fluctuated in abundance throughout the day in what appeared to be rhythmic cycles. These periods of greatest frequency grouped themselves with those of other species with the result that sub-communities or *phases* were present during the 24 hours. A tabular expression of these phases accompanies this report.

\*Contribution from the departments of Zoology and Entomology, University of Illinois, and the department of Zoology, University of Oklahoma, number 122, new series.

*Intradiel*: Pertaining to phenomena taking place within the confines of a single 24-hour day.

*Phase*: intradiel subcommunities; equivalent to "seasonal society" in aspection.

*Auroral*: the dawn or morning crepuscular period; from the first appearances and influences of daylight to the effect of the heat of the day (about mid-morning).

*Diurnal*: the portion of the day which is free from the nocturnal and crepuscular influences (chiefly decreased light and increased humidity).

*Vesperal*: the evening crepuscular period; the complement of *auroral*.

*Diel*: the day in the sense of the 24 hours.

*Diurnation*: the phenomenon of diel fluctuation in community composition, i. e., within a single day (equivalent to aspection; the fluctuations within a single year).

An analysis of the statistics of the collections led to the following observations:

The more abundant species did not occur in the vegetation together; the selection of the varying environmental conditions offered by the various communities studied and the different times of day appeared to be at no time coincident.

Autumnal vertical migrations were most noticeable with *Notorus monodon*, *Harpalus* spp., and *Empoasca viridescens*; there were horizontal migrations from the woods into the open by *Lygus pratensis*, *Diabrotica vittata*, and *Phalacrus politus*, and vice versa by *Euschistus* spp and *Dicyphus gracilentis*. Prevernal migrations were also chiefly lateral, with migrations to the forest-edge from the interior by *Epitrix brevis* and *Symphycnus lineatus* during the afternoon. The same vertical migrations in general occurred here as in the autumn.

In the two seasons compared, certain species occurring in both were found to be in greatest numbers in different phases in the two seasons; examples of this were *Wala palmarum*, *Phalacrus politus*, and *Epitrix brevis*.

Limitation in the periods of greatest abundance of the more abundant species was found to be coincident with the major shifts of temperature and relative humidity.

Greatest fluctuation in total population figures occurred in areas having the greatest vegetation population; in the autumnal this was the forest-edge, in the prevernal, the forest interior.

Nocturnal species characterized the forest edge in the autumnal society; diurnal and crepuscular species were characteristic of all communities in the prevernal.

In general, the total population trend assumed a bimodal curve, the greater mode occurring at night, shortly after midnight, and the lesser shortly before noon. This phenomenon of bimodality agrees with the observations of Davidson and Shackelford.

#### REFERENCES

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3. Sanders, Nell J. and Victor E. Shelford. 1922. A quantitative and seasonal study of a sand dune animal community. Ecology 3:306-320.
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TABLE

Intradiel Phases of Two Seasonal Socies In a Forest Edge		
PHASE	AUTUMNAL SOCIES	PREVERNAL SOCIES
DIURNAL	<i>Diabrotica vittata</i> <i>Empoasca viridescens</i> <i>Ceratomegilla fuscilabris</i>	<i>Sympycnus lineatus</i> <i>Empoasca viridescens</i> <i>Wala palmarum</i>
VESPERAL	<i>Harpalus erythropus</i> <i>Notoxus monodon</i>	<i>Phalacrus politus</i> <i>Glyptina spuria</i> <i>Epitrix brevis</i>
NOCTURNAL	<i>Epitrix brevis</i> <i>Lygus pratensis</i>	<i>Notoxus monodon</i>
AURORAL	<i>Wala palmarum</i> <i>Phalacrus politus</i>	<i>Muscidae</i> <i>Fontaria sp.</i>
		<i>Sympycnus lineatus</i> <i>Ceratomegilla fuscilabris</i>

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