

SOME EFFECTS OF ARTIFICIAL LIGHTING ON WILDLIFE

As every gardener knows, outdoor chrysanthemums usually bloom in autumn with short daylight hours. This is the photoperiodic effect. Pot chrysanthemums are now sold which are either treated chemically or kept with less daylight than is available naturally. Some wild plants respond to photoperiodism e.g. Yellow toadflax flowers only when the nights are lengthening and there is uninterrupted darkness. Uninterrupted darkness is an important factor controlling bud dormancy, flowering and leaf-fall in native deciduous trees. Many weeds e.g. Chickweed and Dandelion seem unaffected and flower anytime that the weather is warm enough.

Common sense tells us that animals, particularly humans, have sounder sleep in darkness. The light sensitive cells in the retina of the eyes have to 'regenerate' during sleep in darkness. The nocturnal animals, particularly small mammals, have eyes adapted to low light conditions. In the same way that a human is rendered temporarily or permanently blind by a search light beam, small mammals are blinded by bright lights at night. Even if this is only partial, they are at risk from predators until their sight returns and they cannot see to forage for food and may die of exhaustion.

Invertebrate animals are also at risk from artificial light at night.

Insects

- Electric light can affect the behaviour of nocturnal insects e.g. the Robinson Brothers (1950) showed that a high general level of illumination causes night-flying insects to settle as they would normally do at daybreak so feeding, breeding and egg-laying activities cease. The congregation of moths round bright lights provides a concentrated source of food for some bat species at night and for birds in the early morning.
- Increase of lighting may lead to fragmentation of habitats, producing small isolated insect colonies. This may then affect the interbreeding potential between the populations.
- Artificial light can affect mating of moths in other ways:
a) females do not produce the sex pheromones to attract males.
b) moth larvae do not produce overwintering pupae and so will be killed by frost or, if they emerge as adults, die of starvation as a result of non-availability of food.
- Less work has been done on the impact of artificial lighting on other insects but Bratton (1990) suggests that mayfly life cycles may be disrupted and Crowson (1981) considers that the survival of the glow-worm is threatened by outdoor lighting.

- There is considerable evidence from experimental laboratory work that the life cycle and development of camouflage in insects can be severely affected by an incorrect day length.

Birds

- For birds in Britain, day length initiates behaviour patterns such as courtship, mating rituals, reproductive cycles, migration, fat deposition and moulting. Rawson (1923) demonstrated a close correlation between the commencement of dawn singing in Thrushes and a critical light intensity at sunrise. This clearly indicates the precise nature of the control of behaviour in birds by light which artificial outdoor lighting could disrupt.
- Lock (1965) noted that Robins and Blackbirds began laying one or two weeks earlier in urban gardens than in woods which could be the effect of artificial lighting. Problems of food supply for the young may occur if hatching is too early.
- Isolated artificial light sources on moonless nights can affect the orientational / migrational ability of birds but this is not observed on moonlit nights.
- Nocturnal birds are likely to be disturbed by the presence of bright illumination. Barn Owls, Long-eared Owls and Nightjars are already under threat and their ability to catch prey may be affected by artificial light.
- Birds which are normally active during the day may extend their feeding day leading to a decrease in prey population.

Mammals

- Nocturnal mammals are likely to be disturbed by the presence of bright illumination and could be deterred from using established foraging and breeding areas, e.g. Badgers and Otters.
- Bats – there are beneficial effects for fast flying bat species feeding on insects attracted to artificial light sources but slower flying species are not so attracted and these include most of those bats considered vulnerable in Europe.
- Beasley and Zucker (1984) suggest that, in at least one species of Bat, day length influences the male reproductive cycle and the level and timing of peak body weight through autumn fat deposition.
- Physiological and hormonal changes initiating hibernating in Bats and Dormice have been linked to day length.

Suggestions for limiting harmful effects of artificial lighting on wildlife

If floodlighting of buildings is to be undertaken, care should be taken to establish the intensity of illumination being fitted and the wavelength of light being used. Some more mellow light from which blue and ultra-violet rays are excluded may be quite adequate – or even preferable. Ultra-violet light is very damaging to unprotected living organisms and kills many invertebrate animals and microscopic plant life.

The light should be directed at the buildings and wherever possible trees should not be directly illuminated.

If security lighting is necessary, take advice and try to install lamps which avoid the harmful effects of the blue / ultra-violet and the red / infra-red ends of the spectrum.

These are just a few of the possible effects of artificial outdoor lighting and increase of day length on the natural world. All the living organisms in one environment interact so even if just one organism is affected then this could have other 'knock-on' effects in the food chain.

References

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