Crowding and High-density Living

Since the industrial revolution, populations have tended to migrate away from rural areas towards cities. This had led to a situation in which larger numbers of people are living in smaller areas (i.e. high urban **population densities**). Although there has been a trend in more economically developed countries (MEDCs) towards **counter-urbanisation** in the past 30 years, it remains the case that in many of the world's cities, population density (usually measured as the number of people per km^2) remains very high (see Table 1). This has led to the problem of crowding.

City	People per KM^2
Hong Kong (China)	28 405
Mumbai (India)	18 247
Jakarta (Indonesia)	17 056
Sao Paulo (Brazil)	6823
London (UK)	3095
New York (USA)	2086

Given that the trend towards counter-urbanisation appears restricted to MEDCs, and that the world's population appears inexorably to be rising (it passed the 6 000 000 000 mark in 1999) it appears that we can only look forward to more crowded cities in the foreseeable future.

However, the feeling of being crowded does not just depend on objective factors such as population density. Whilst it is true that people are likely to feel crowded in situations where large numbers of people are packed into small spaces (for example, on public transport) crowding is partially a subjective matter. A person that prefers solitude in certain situations may feel crowded even when only a few other people are present. Psychological research has indicated that crowding may have effects on performance, social behaviour and health. The following sections discuss some of these effects.

Animal Studies of Overcrowding

For centuries it has been noted that, once the population of the European lemming (a small rodent common in Scandinavia) grows sufficiently high, large numbers of the animal mass together and travel for long distances, swimming large lakes and rivers and eventually drowning in costal waters. They congregate in such numbers that Norwegian folklore suggests that they fall from the sky like rain. Early scientific opinion suggested that such actions had an altruistic motivation. The lemmings were assumed to be 'committing suicide' in order to bring the population down to sustainable numbers (Elton, 1942). Such **anthropomorphic** explanations are no longer considered credible, but the fact remains the relationship between population pressures and apparently maladaptive behaviour in some animals has been supported by subsequent research. As regards the lemming, it appears that their 'suicidal' behaviour is actually the result of a hormonal disturbance (Curry-Lindahl, 1963). Lemmings breed extremely prolifically. As a result, their population rises at a steady rate and is not held in check by predation. Dubos (1965) found that, in European lemmings, high population densities result in abnormally functioning adrenal glands. Abnormal adrenal secretions result in confusion and disordered behaviour, the result of which for many lemmings is accidental drowning, rather than consciously directed self-annihilation. Regardless of this, it appears that this curious feature of lemming behaviour serves an important evolutionary purpose as a **population limitation mechanism**. Whereas the populations of many animals are held in equilibrium through predation, species that reproduce faster than they die or are killed will eventually outstrip the resources available to them. The mass death of lemmings as a result of endocrine malfunction serves to reduce the population to more sustainable numbers. As, however, it does not impact on the creature's reproductive habits, the population once more begins to rise and the pattern is repeated every three or four years. Here then, is an example of a behaviour that, whilst it is maladaptive on an individual level (it threatens the survival of the individual lemming), is actually adaptive for the species (lemmings as a whole are more likely to survive).

Population limitation mechanisms have been observed in a number of animal species. Rodent enthusiasts will be aware that gerbils may devour their own offspring if there is insufficient space and food to sustain them. In some cases besides the lemmings, endocrine malfunction has been found to play a role. Christian et al (1960) studied the introduction of Sika deer to an island on which they had no natural predators. Predictably, the population of deer exploded shortly after introduction to the island. However, this was

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followed by a sharp fall as many animals died. Investigations showed that these animals had abnormally enlarged adrenal glands. Christian et al concluded that stress caused by overcrowding had resulted in fatal endocrine malfunction. Following the slump in population, numbers of deer stabilised at a sustainable level. Laboratory studies of overcrowding in animals have supported the observation that it may contribute to abnormal behaviour. Calhoun (1962) carried out a study using Norweigan rats. The rats were kept in a four compartments, each of which would support a population of twelve rats. As breeding occurred, the population grew until it reached eighty. At this point, new offspring were removed to keep the population steady. Calhoun observed that a small number of dominant rats claimed and defended most of the available territory. In the remainder of the available space (referred to as the 'behavioural sink'), behaviour and health deteriorated. The rats were highly aggressive and showed a poorer quality of offspring care (there was a 96% offspring mortality rate).

These findings suggest that overcrowding leads to physiological and behavioural abnormality. However, apart from the questions about the ethical acceptability of studies like Calhoun's, three important points should be made. First, in laboratory studies like this, it could be argued that the effects of overcrowding were confounded by other features present, such as territoriality. Therefore it is difficult to say what actually caused the behaviour of the rats in the 'behavioural sink', overcrowding as such, or the territorial behaviours of the dominant rats. Second, The space available to the rats was artificially restricted. In a natural environment, the most probable response of the rats to overcrowding would be to spread out into new areas. Given the ability of rats to exploit a huge range of environments this would normally prevent population density from reaching intolerable levels. Third, human beings are arguably more adaptable than rats, lemmings and gerbils (although infanticide has been recorded in some hunter-gatherer societies as a response to famine; Boserup, 1981). Therefore, it would be unwise to assume that humans react to overcrowding in a way analogous to other species.