THE EFFECTS OF MICROWAVE RADIATION ON THE WILDLIFE. PRELIMINARY RESULTS.

© Alfonso Balmori Martínez.

Valladolid (SPAIN)

February, 2003

THE EFFECTS OF MICROWAVE RADIATION ON THE WILDLIFE. PRELIMINARY RESULTS.

© Alfonso Balmori Martínez.
February, 2003

INDEX:

INTRODUCTION

For decades a great variety of living beings have been used by men in order to detect possible changes in ecosystems. From lichens, sensitive to pollution for accumulating toxic substances in their tissues, to the birds living in our gardens and buildings, a great variety of organisms have been used as warning signs of the health of the human environment. Moreover trends in numbers over time are of particular interest to nature conservation (Bibby et al. 1992)

Since the second half of the nineties, base stations for mobile telecommunication have been spreading across the urban centres. These base stations have increased the electromagnetic contamination "*electrosmog*" in the urban centres. The fundamental reason for that is that these devices produce 900 for analog and 1800 MHz for digital transmission pulsated waves that interfere in the nervous system of living beings. There exist many scientific studies warning about the danger of this kind of electromagnetic radiation (MRW, microwave radiation) for health in human and living beings (see Hyland, 2000). It is forgotten that not only humans, but also animals who are exposed can suffer such impaiments to their health because of field exposure in the vicinity of transmitting antennas (Marks et al. 1995) and show conspicuous behavioural abnormalities (Löscher & Käs, 1998).

Synergic interactions between electromagnetic fields with different frequencies have already been described on a cellular level (Löscher & Liburdy, 1998). Furthermore, some studies warn about the effects of such radiation on reproduction ; such as, decreases in sperm counts and smaller tube development in rat testes (Dasdag et al., 1999) and increases in embryonic mortality of chickens (Farrel et al., 1997; Youbicier – Simo et al., 1998). The significant increase of micronuclei in erytrhocyte of cattle grazing near a transmitting is an indication of a genotoxic effect of the exposure (Balode, 1996). Genetic effects on hamster and rats of microwaves have been reported in various studies (Garaj-Vrhovac et al., 1991, Lai and Singh, 1995, 1996 y 1997)

The high frequency RF fields produced a response in many types of neurones in the avian Central Nervous System (Beason & Semm, 2002). Microwave irradiation affects central cholinergic activity in the rat (Lai et al., 1987). Also the activity and learning memory tasks of the rat (Thuroczy et al., 2001). That electromagnetic fields (EMFs) emitted by mobile phones have effects on blood-brain barrier permeability (Shivers et al., 1987; Fritze et al. 1997, Töre et al., 2001) and damage some neurones in the brains of the rats (Salford et al., 2003).

In view of the previously known effects of electromagnetic fields it may be possible that the observed abnormalities are related to the microwaves exposure.

"The need for further study are no excuse for inaction. The crucial point is that these figures constitute a strong signal that we can not ignore".

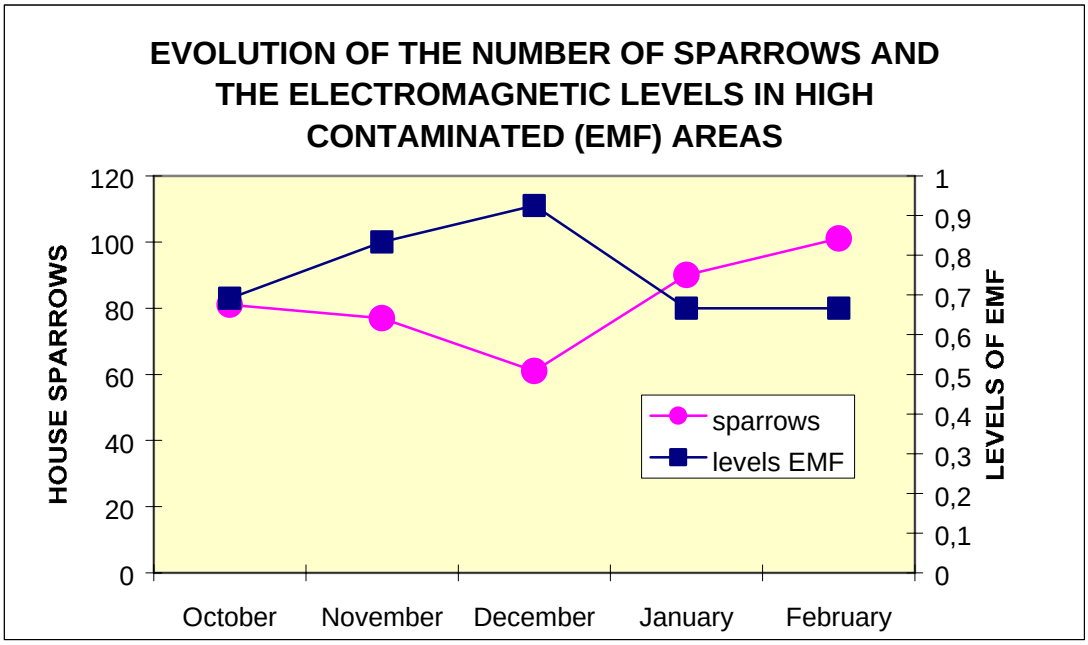
1) POPULATION MONITORING OF HOUSE SPARROWS IN VALLADOLID (SPAIN).*

*This study was carried out to be published in a scientific review. A summary containing the methodology used and the main results achieved is showed bellow.

a) Bird Census at point counts of the city.

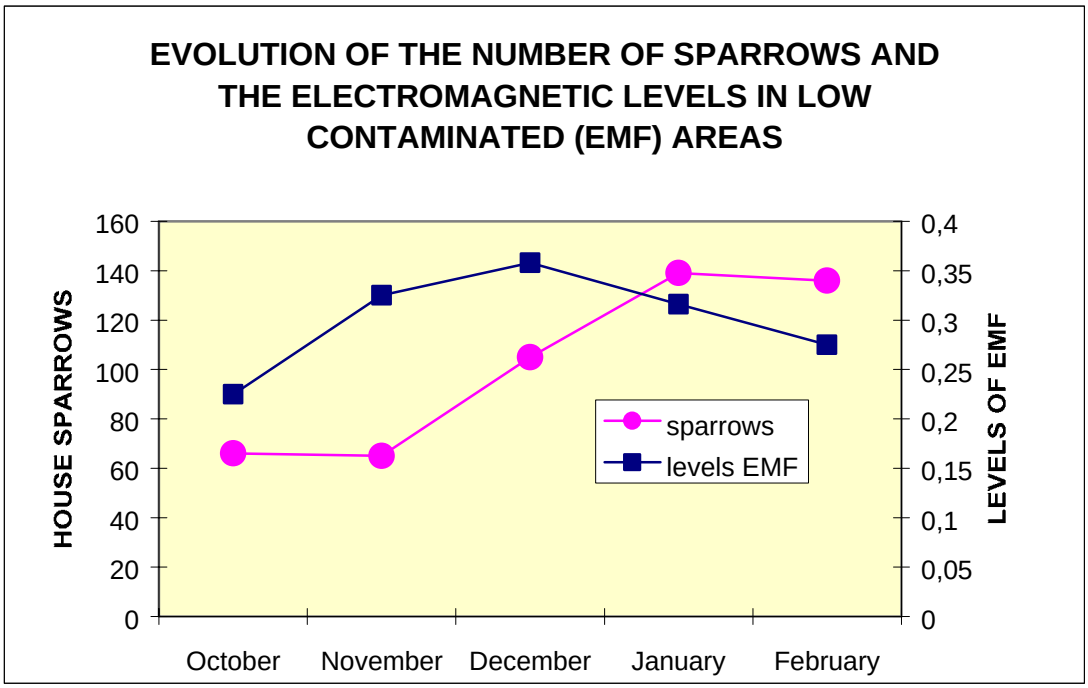
Method
32 point counts placed in small squares and tree-lined streets of the city were chosen. At each point, a census of the number of sparrows was carried out and the electromagnetic contamination (Microwave radiation) levels were measured once per month between October 2002 and February 2003.

Results and conclusions
During this study the sparrows at several points and streets of the city containing high electromagnetic contamination disappeared. Although, finding sparrows at these points is rare, they occasionally go back looking for some food and settle again when the contamination levels decrease. They gradually leave all the contaminated areas; it doesn't happen quickly. At the same time, the number of sparrows tends to increase in low contaminated areas. Therefore, there is a flow of sparrows moving from high to low contaminated areas.



The levels (mean) in high contaminated areas (EMF) (n= 12) increased from October to December, decreasing subsequently until February; while the number of sparrows (sum) progress in the other way (see chart). A very strong negative correlation R= -0.90 ($p<0.05$) between the mean electromagnetic field levels and the number of sparrows existing in contaminated areas was achieved.

On the contrary, a correlation in low contaminated areas (n= 12 points) wasn't found. (see chart).



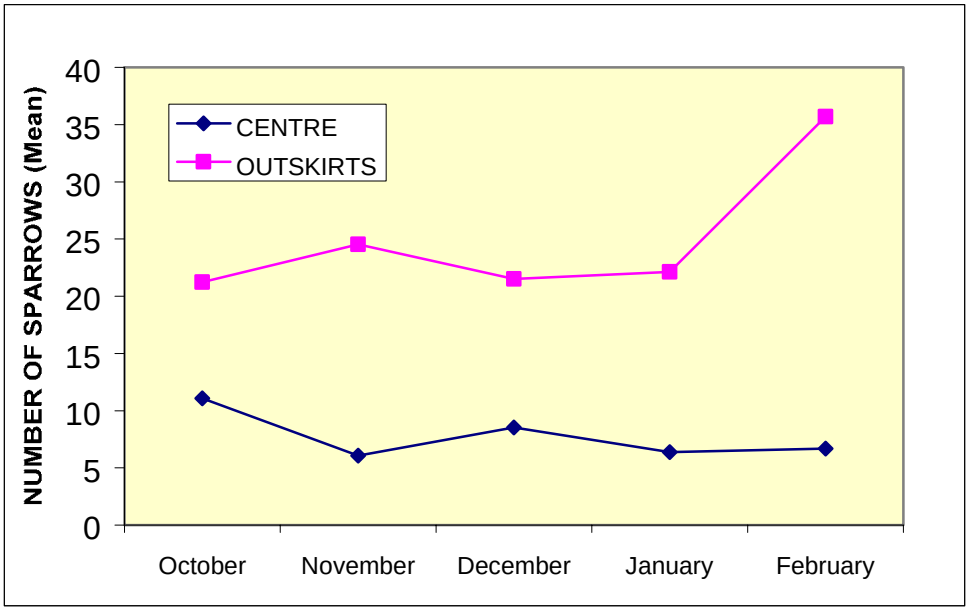
These results show that the number of sparrows increases or decreases depending on the electromagnetic contamination levels (EMF) at these points.
Sparrows are specially abundant in small squares or places well protected by the *screen effect* caused by buildings. They are also found in high contaminated areas but taking refuge in small safe redoubts. They avoid establishing in the antenna's main lobe direction (beam); however, they are sometimes found under it, taking advantage of the *umbrella effect*. Finding sparrows protecting themselves from EMFs in places where the waves don't reach, despite of being near base stations, is not rare because of the *screen effect* caused by buildings. Furthermore, it was observed that some areas where those base stations were took down were reused by sparrows and vice versa.

b) Line transects.

Methods

Two different routes approximately 2 Km long each were planned for the outskirts and the city centre and covered every day. The number of sparrows at each stretch was registered by noting the points where they were found between October 2002 and February 2003.

Provisional results and conclusions.
A gradual disappearance of sparrows in the most contaminated (EMF) streets and squares was observed. The number of sparrows decreased in the city centre, increasing in the outskirts (See the chart).



They are usually found on the ground or in low bushes and in places safe from the waves by walls or buildings causing *screen effect*.
Some specimens presented partial albinism in their feathers or couldn't fly properly.

Note:

Importance of these results related to the decrease of sparrows in the United Kingdom.

The results of the monitoring carried out in Valladolid provide us some possible causes to explain the decrease of sparrows in England.

Electromagnetic radiation could produce the following effects:

- **Effects on reproduction.**
- **Effects on the circulatory and central nervous system.**
- **Effects on the birds health and well-being (microwave syndrome).**
- **Indirect effects due to food shortage caused by electromagnetic contamination (death of insects).**

2) POPULATION MONITORING IN WINTER SLEEPING PLACES.

A) Starling's sleeping places (*Sturnus vulgaris*)

Method

Daily observation and tracking.

Results and conclusions

Displacement and division of the main sleeping place into smaller ones. Occupation of low contaminated points of the city to stay the night. There was always a rather small group of recurrent specimens that didn't even leave. It was unknown if they were the same specimens or if there was a changing.

B) White Wagtail's sleeping places (*Motacilla alba*)

Method

Monitoring a winter sleeping place in a *Lygustrum japonicum* under a lamppost near a small antenna emitting high microwaves radiation levels.

Results and conclusions

A gradual removal from the source of contamination was observed. Traditionally (prior placing the antenna) the most occupied tree was few metres from the antenna. The specimens moved to far away trees or even to near points, where sleeping places didn't exist before. There was a slow process of desertion of the sleeping place and there was always a rather small group of recurrent specimens that didn't even leave. It was unknown if they were the same specimens or if there was a changing.

3) OTHER COMMENTS ON WILDLIFE AND ELECTROMAGNETIC FIELDS.

BIRDS

Kestrel (*Falco tinnunculus*)
A general disappearance of the kestrels breeding every year in roofs placed near base stations for mobile telecommunication was stated.

White Stork (Ciconia ciconia)
Although this specie is quite opposed to abandon the nest, even in adverse conditions, the nests placed near the phone mast´s radiation beam gradually disappeared. A decrease of young birds and increase of death rate was observed in nests placed near base stations for mobile telecommunication. The safest pinnacles from radiation were used to alight, gradually leaving those highly exposed to the waves.

Rock Dove (domestic) (Columba livia)
Many dead specimens appeared near phone masts areas. They took refuge and formed groups in places safe from radiation. Many carrier pigeons were lost supposed by the existence of electromagnetic fields affecting their sense of direction (see Bardasano & Elorrieta, 2000).

Magpie (*Pica pica*)
Anomalies were detected in a great number of specimens at high contaminated points (MWR); such as, plumage deterioration, especially in head and neck, locomotive problems (limps and difficulties to fly), partial albinism and melanism, especially in flanks, and a tendency to stay long in low parts of the trees and on the ground.

Collared Dove (*Streptopelia decaocto*)
Despite of being an expanding specie, the number of specimens decreased in the whole city. At some points, where they were abundant, they disappeared when Phone masts were settled. Some specimens were found taking refuge in places safe from the electromagnetic waves.

General comment on birds.
The plumage of the birds of the city looked, in general, unflattering, run-down and dull-coloured. This not only occurred to ornamental birds; such as peacocks, but also to wild birds; such as, tits, great tits, House sparrows, etc.
Anomalous behaviour, probably caused by a lack of food (shortage of insects?), were observed; such as, excessively trusting great tits, tits and sparrows even eating breadcrumbs from our hands.

In some tracked nests (blackbird), the eggs never hatch after the incubation being abandoned by the mother.

BATS

Since 1998 a study in a free-tailed bat colony (*Tadarida teniotis*) has been carried out. (Balmori, 2003). During the study the number of bats decreased so much that the control (ringing) works had to be interrupted. Several phone masts affecting directly were placed 80 metre from the colony (they live in an air chamber).
The number of bats (*Pipistrellus pipistrellus*) decreased in some areas. Furthermore, a dead specimen of *Myotis myotis* was found near a small antenna in the city centre.

INVERTEBRATES

There was no life near base stations for mobile telecommunication. A decrease of insects and arachnids near those base stations was detected and corroborated by engineers and antenna's maintenance staff. Lack of fly in the house near the phone mast, not even in summer. See Wellenstein (1973) for lack of beas near high tension lines, and http://canterbury.cyberplace.org.nz/ouruhia/ for lack of beas near radio tower AM/FM.
The disappearance of insects could have an influence on bird's weakening caused by a lack of food, especially at the first stages in young bird's life.

DOMESTIC ANIMALS

There was proof of a frequent death in domestic animals; such as, hamsters and guinea pigs, living near base stations for mobile telecommunication.
There was a deterioration in the plumage of peacocks and other ornamental birds living in urban parks (lack of shine, beardless rachis, etc). We must mention that plumage deterioration is the first sign of weakening or illnesses in birds. Damaged feathers are a sure sign of stress.

TREES AND BUSHES

The tops of trees are dried up where the main beams are directed to and they seem to be most vulnerable if they have their roots or are close to the water (see Belyavskaya, 2001 and http://canterbury.cyberplace.org.nz/ouruhia/)
The plants placed inside the antenna's main beam showed a gloomy and unhealthy appearance, possible growth delays and a higher tendency to contract plagues and illnesses.

4) MONITORING THE WILD BIRDS NESTING IN "CAMPO GRANDE", AN URBAN PARK IN VALLADOLID (SPAIN).

© Alfonso Balmori Martínez.

MATERIALS AND METHODS

During the spring of 1996, 1997, 1998 and 2002 a research has been carried out to find out the number of existing species and to quantify the couples of wild birds nesting in the most important and emblematic urban park of Valladolid and their evolution. In 1996, 1997 and 1998 between two and four visits were carried out at favourable times. Whereas, in 2002 a more exhaustive tracking was carried out by covering eight different routes during the following dates: 07/04/02, 13/04/02, 23/04/02, 28/04/02, 11/05/02, 26/05/02, 02/06/02 and 09/06/02. To make an inventory of the species nesting in this park, favourable climate days neither windy nor rainy were chosen.

The park was fully covered in each visit between 8 a.m. and 10 a.m. by following the same route at about 0.6 miles/hour. For each contact the exact place, specie, brood category (male songbird, territorial behaviour, couple, way of distracting, adult going inside the nest, adult bringing food into the nest etc.) and number of specimens was noted. The sight of isolated specimens in silence was not counted as a clear evidence of breeding. Each probable and sure contact to breed was noted as a couple.

RESULTS AND DISCUSSION

Approximately 500 contacts with wild birds were achieved during the study. 15 bird species that could be classified as residents in the park during the breeding were recorded. Furthermore, a changeable number of specimens of other different species only pass through the park, specially in April.

According to the results achieved in the different samples, the resident species have been classified into three different categories, as follows:

1) Species present during the study, maintaining their number in 2002.

Great spotted woodpecker (*Dendrocopos major*) : 1 couple.
Magpie (*Pica pica*) : 3 – 4 couples.
Blue tit (*Parus caeruleus*) : 3 couples.
Robin (*Erithacus rubecula*) : 4 – 5 couples.
Blackcap (*Sylvia atricapilla*) : 5 – 8 couples.

2) Species present during the study, decreasing drastically their number in breeding season in 2002.

Blackbird (*Turdus merula*) : from 8 to 5 couples.
Great tit (*Parus major*) : from 4 to 1 couple.

Serin (*Serinus serinus*) : from 5 to 1 couple.
Greenfinch (*Carduelis chloris*) : from 7 to 1 couple.
Coal tit (*Parus ater*) : from 2 to 1 couple.
Wren (*Troglodytes troglodytes*) : from 5 to 1 couple.
Collared Dove (*Streptopelia decaocto*) : 50% of nesting specimens dropped between 1998 and 2002.

Relevant decreases, most of them higher than the 50%, have been found during the month of May in 2002.

3) Resident species usually breeding in 1996, 1997 and 1998 but not sighted in any of the visits carried out in 2002.

Green woodpecker (*Picus viridis*)
Short toed treecreeper (*Certhia brachydactyla*)
Bonelli's warbler (*Phylloscopus bonelli*)

These species have disappeared in some moment between 1999 and 2001 because they were constantly in the park (the Bonelli´s warbler just in spring) between 1996 and 1998.

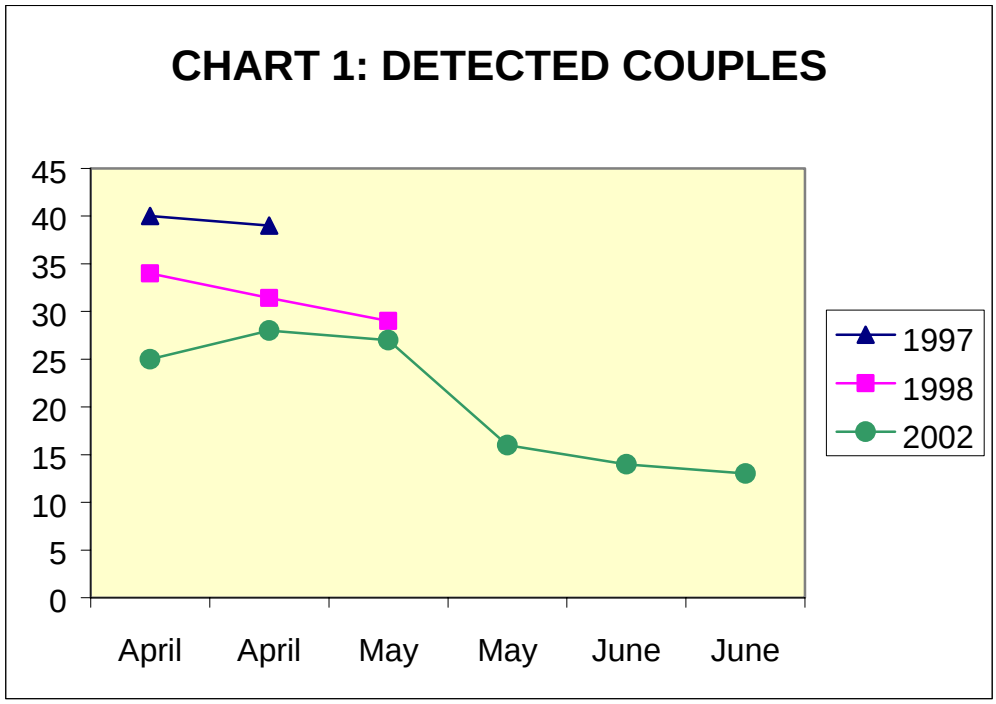
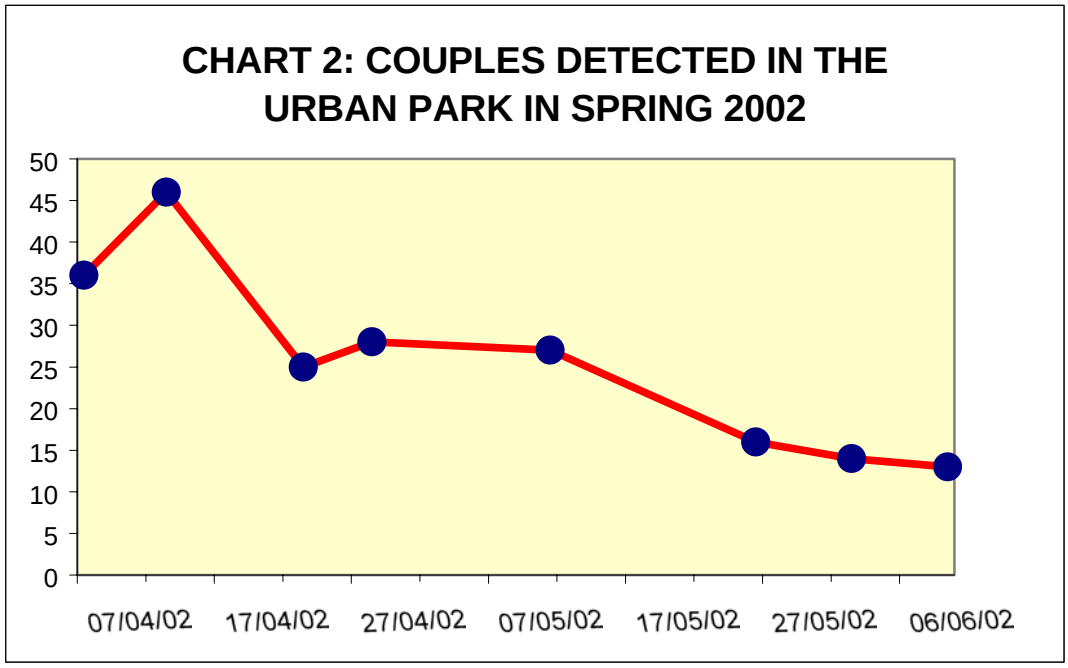


Chart 1 shows a comparison between the number of couples in 1997, 1998 and 2002. A decrease in 1997 and 1998 is observed, intensified in May 2002, from 30 or 40 couples to only 15 couples in the final sampling days (see chart 2).

Chart 2 shows an evolution in the number of couples detected in spring of 2002. It shows a high decrease in May, dropping more than half of the nesting couples, and the common path peak in the beginning of April showing the birds passing by the park during the spring migrations and not breeding inside it.



During the research carried out in 2002 some areas called “silence areas”, where different couples usually bred, specially greenfinches and finches serin, that totally disappeared in 2002, have been found.

As a conclusion, we could say that during the research in 2002 the disappearance of three species, 20% of the total breeding species between 1996 and 1998, has been proved. Furthermore, a decrease in the number of couples of seven species (47%) usually arriving to the area and leaving it without breeding has been achieved. It is unknown if the specimens staying are always the same or different but population stability has been found in five different species (33%) during the study. These results show that 67% of the birds in *Campo Grande* have suffered an important population decrease or have totally disappeared between 1998 and 2002.

Since birds are good warning signs of their habitat’s health, the increasing impoverishment of birds detected in *Campo Grande* in a short period of time (between 1996 and 2002) shows the recent appearance of some environmental cause having serious consequences on this ecosystem.

The cause provoking such decrease must be recent and correlative in time. In this time the air pollution (SO2, NO2, CO and Benzene) drop. So, the only possible cause found is the increasing establishments of base stations for mobile telecommunication; at least five of them were placed in three different points at < 100 meters from the park.

In view of the absence of any other convincing explanation for such decrease, all the electromagnetic transmission levels existing in the different areas were measured by means of an electromagnetic field meter equipment, that show relative levels. This way, it has been proved that the electromagnetic radiation existing in the park has been

multiplied by 3 or 20 during this study, compared with the existing in free base stations for mobile telecommunication areas. This could mean that this radiation affecting the birds could be quite increased in the trees. We must also bear in mind the different results achieved at each point, depending on the time, weather and mobiles connected in each moment.

By analysing these results it seems that these birds nest in breeding areas and start breeding but as the spring draws on they leave those contaminated areas creating "silence areas" with neither male songbirds nor breeding couples. The main reason for such population decrease could be, according to these results, a decrease in the perfect available breeding habitats causing failed breeding in contaminated areas. The probable reason for the decrease of some species instead of others could be a preference in habitats and habits, decreasing highly those species nesting in the top of the trees, roofs and phone wires or breeding in higher places and being more affected than those nesting in lowlyings and lands or breeding in safer places. Apart from all these reasons, it is possible that each specie shows different sensitivity to this radiation, complicating the interpretation of the achieved results.

It seems that this hypothesis is the only one correlating exactly in time. We must also bear in mind the existence of thousands of publications in scientific literature showing worrying signs of pernicious effects on living beings caused by electromagnetic radiation, specially by the ones using low pulsated waves transporting low frequency harmonics, such as the ones in mobile telecommunication. The results achieved confer a strong support to the hypothesis set out in this study.

5) Evidence of a conection between Sparrow decline in United Kingdom and the introduction of Phone mast GSM (Global system for mobile communication)

"Disappearance of the Sparrow and the introduction of phone mast GSM correlate closely in terms of time".

Evidence:

Since the second half of the nineties Base Stations for mobile telecommunication have been spreading across the urban centres. These base stations have increased the electromagnetic contamination "electrosmog" in the urban centres. The fundamental reason is that these devices produce 900 and 1800 MHz pulsated waves that interfere in the nervous system of living beings. There exist many scientific studies that warn about the danger for health in human and living beings of this kind of electromagnetic radiation electromagnética (MRW: microwave radiation). (see for example Hyland, 2000).

⇒ The circumstantial evidence of a connection between Sparrow decline and the introduction of Telecommunication Mast and Base Stations is strong. As the disappearance of the house Sparrow from the large cities correlates with the introduction of phone masts, the possibility that such cell masts (towers) are involved surely requires immediate investigation.

⇒ The high frequency RF fields produced a response in many types of neurons in the avian Central Nervous System.

⇒ Besides, some studies warn about the effects of these radiations on reproduction: Decreases in sperm counts and smaller tube development in rat testes (Dasdag et al., 1999) and increases in embryonic mortality of chickens, (Youbicier-Simo, et al., 1998).

⇒ Why have British Sparrow populations indeed collapsed in big cities but not in small towns?: The number of Telecommunication Masts in big cities and the use of mobile phones, in general, is much greater than in small towns. Big cities usually have more electromagnetic contamination, but this differs between areas (vicinity of Masts) and because of this the decline of these birds does not happen to the same degree in different parks or neighbourhoods or different cities. Small towns usually have the telecommunication masts located away from the urban centre because this is sufficient to maintain the coverage. Because of this birds are less affected in small towns and villages.

⇒ Telecommunication Masts usually are installed in high places in order to achieve more coverage for the signal. For this reason there is lower density power in lower places. These waves impact to the species in different ways depending on the breeding height, the height of singing, feeding, nest location, kind of nest etc. This is the reason for the decline of species that frequent roofs, aerials, phone wires or those

with higher breeding height such us House Sparrows (*Passer domesticus*), Starlings (*Sturnus vulgaris*) Magpies (*Pica pica*), but not those that live near the ground and vegetation like Blackbirds (*Turdus merula*), Robins (*Erithacus rubecula*), Wrens (*Troglodytes troglodytes*), or those that breed in cavities where they are more protected like the Blue Tit (*Parus caeruleus*), Great Tit (*Parus major*), Coal Tit (*Parus ater*). Apart from that, it is likely that each specie will show different susceptibility to these radiations.

⇒ In November 1999, in Scotland over one third of all Scottish Local Planning Authorities adopted or publicly committed themselves in to adopting precautionary policies as a direct result, by choosing to keep transmitter masts away from schools and residential areas.
Two years later the demise of the House Sparrows appears to have been reversed in Scotland (Paul Kelbie 10/11/2001, The Independent).

⇒ It is most likely that the same will happen in Northern Ireland very soon as there will be Planning controls on mobile phones masts, and the new regulations will be stricter than any other region of the U.K. (Marie Foy, 11/4/2002, Belfast Telegraph). So we might expect an increase in House Sparrows and Starlings in Northern Ireland in the next few years.

“The electromagnetic field is the perfect secret agent: you cannot see it, you cannot smell it, you cannot hear it, you cannot feel it and its effects are slow but relentless.”

References

Balmori, A. 2003. Contribution to the knowledge of the biology and social behaviour of the free-tailed bat (*Tadarida teniotis*). *Galemys,* 15 (n.e.) *in press*.

Balode, S. 1996. Assessment of radio-frecuency electromagnetic radiation by the micronucleus test in bovine peripheral erythrocytes. *Sci. Total. Environm.*, 180: 81-85

Bardasano, J.L. & Elorrieta, J.I. 2000. *Bioelectromagnetismo. Ciencia y Salud*. McGaw-Hill.

Beasond R. C. & P. Semm. 2002. Responses of neurons to an amplitude modulated microwave stimulus. *Neuroscience Letters*.

Belyavskaya, N.A. 2001. Ultrastructure and calcium balance in meristem cells of pea roots exposed to extremely low magnetic fields. Adv. Space Res, 28: 645-650

Bibby, C.J., N.D. Burgess & D.A. Hill. 1992. Bird Census Techniques. BTO and RSPB.

S. Dasdag, M.A. Ketani, Z. Akdag, A.R. Ersay, I. Sar, Demirtas Ö.C, M.S. Celik. 1999. Whole - body microwave exposure emmited by cellular phones and testicular function of rats. *Urological Research*, 27 : 3, 219-223.

Farrel, J.M., Litovitz, T.L., Penafiel, M. et al. 1997. The effect of pulsed and sinusoidal magnetic fields on the morphology of developing chick embryos. *Bioelectromagnetics*, 18: 431-438.

Fritze K, Sommer C, Schmitz B, Mies G, Hossman K, Kiessling M et al. 1997. Effect of global system for mobile communication (GSM) microwave exposure on blood-brain barrier permeability in rat. *Acta Neuropathol* (Berlin) 94:465-470.

Garaj-Vrhovac V, Horvat D, Koren Z. (1991) The relationship between colony-forming ability, chromosome aberrations and incidence of micronuclei in V79 Chinese hamster cells exposed to microwave radiation. *Mutat Res* 263:143-149.

Hyland, G.J. 2000: Physics and biology of mobile telephony. *The Lancet*, vol 356: 1-8.

Lai, H., Horita, A., Chou, C.K. and Guy, A.W., 1987. Low-level microwave irradiation affects central cholinergic activity in the rat. *J Neurochem* 48:40-45.

Lai H, Singh NP. (1995) Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells. *Bioelectromagnetics* 16:207-210.

Lai H, Singh NP. (1996) DNA Single- and double-strand DNA breaks in rat brain cells after acute exposure to low-level radiofrequency electromagnetic radiation. *Int J Radiat Biol* 69:513-521.

Lai H, Singh NP. (1997) Melatonin and a spin-trap compound blocked radiofrequency radiation-induced DNA strand breaks in rat brain cells. *Bioelectromagnetics* 18:446-454.

Löscher, W. and R.P. Liburdy. 1998. Animal and cellular studies on carcinogenic effects of low frequency (50-60 Hz.) magnetic fields. *Mutation Res*.

Löscher, W. and Käs, G. 1998. Conspicuous behavioural abnormalities in a dairy cow herd near a TV and Radio transmitting antenna. *Practical Veterinary surgeon*, 29: 5, 437-444.

Marks, T.A., C.C. Ratke and W.O. English. 1995. Strai voltage and developmental, reproductive and other toxicology problems in dogs, cats and cows: a discusion. Vet. Hum. Toxicol, 37: 163-172.

Salford, L.G., Brun, A.E., Eberhardt, J.L., Malmgren, L. & Persson, B.R. 2003. Nerve cell Damage in Mammalian Brain after Exposure to Microwaves from GSM Mobile Phones. *Environmental Health Perspectives.*

Shivers R, Kavaliers M, Teskey G, Prato F, Pelletier R. 1987. Magnetic resonance imaging temporarily alters blood-brain barrier in the rat. *Neuroscience Letters* 76:25-31.

Töre F, Dulou P-E, Haro E, Veyret B, Aubineau P. 2001. Two-hour Exposure to 2 W/kg, 900 MHz GSM microwaves induces Plasma Protein Extravasation in Rat Brain. In: *Proceedings from the 5th International Congress of the European Bioelectromagnetics Association*, 6 September 2001 (Hietanen M, Jokela K, Juutilainen, J, eds). Finnish Institute of Occupational Health, Helsinki , 43-45.

Thuroczy, G., Hernadj, I. and Kelleny, L. 2001. Activity and learning memory task of the rat, *Bioelectromagnetics*, 27.

Wellenstein, G. 1973. "The influence of high tension lines on honey bee colonies, *Zeitschrift fur Angewandte Entomoligie*, 74: 86-94

Youbicier-Simo BJ, Lebecq JC, Bastide. 1998. Mortality of chicken embryos exposed to EMFs from mobile phones. Presented at the Twentieth Annual Meeting of the Bioelectromagnetics Society, St. Pete Beach, FL, June 1998.