Programme

Monday, 19 July 2004

9.00 Opening ceremony

Chair: ***Dieter Glandt***

Introductary contribution

9.15 The evolutionary relationships of Ravens: Worldwide phylogeography and a phylogeny of the genus *Corvus*
ROBERT FLEISCHER, KEVIN OMLAND & WILLIAM I. BOARMAN

9.45 Discussion

Population biology and ecology

10.00 Population genetics of Ravens in the Western United States: an analysis of movements, population size, and patterns of colonization
ROBERT FLEISCHER, WILLIAM I. BOARMAN, ELENA GUITIERREZ, ALVARO GODINEZ, KEVIN OMLAND, SARAH YOUNG & CARL MCINTOSH

Discussion

10.30 Extreme population growth of the Raven in California, habitat use and movements
WILLIAM I. BOARMAN

11.00 Discussion

11.15 Coffee break

11.30 Habitat requirements and nest site selection of the Common Raven (*Corvus corax*) in Białowieża Forest, Poland
THOMAS MÜLLER, NURIA SELVA, EUGENIUSZ PUGACEWICZ & ERIK PRINS

12.00 Discussion

12.15 Population dynamics, reproductive success and intraspecific regulation in Schleswig-Holstein, a long-term study
THOMAS GRÜNKORN

12.45 Discussion

13.00 Lunch

Breeding and field biology, distribution, reintroduction

Chair: *Dieter Wallschläger*

14.00 Comparative breeding biology of Common Ravens in northern Germany and Denmark
THOMAS GRÜNKORN, CARSTEN HINNERICHS, BERND REICHELT & H. CHRISTENSEN

14.30 Discussion

14.45 Persecution, recolonization and distribution of the Raven in Central Europe
DIETER GLANDT

15.15 Discussion

15.30 Coffee break

15.45 The recent status of the reintroduction project in The Netherlands
THOM A. RENSSEN & ROB L. VOGEL

16.15 Discussion

16.30 Breeding biology and distribution of Raven in Corsica
ANNE DELESTRADE

17.00 Discussion

17.15 Common Raven juvenile survival and movements in a human-augmented landscape
WILLIAM C. WEBB & WILLIAM I. BOARMAN

17.45 Discussion

18.00 End of the first day

Townhall of Metelen

19.15 Reception
The mayor of Metelen

Dinner

Tuesday, 20 July 2004

The feeding niche of the Raven and its ecological consequences

Chair: ***William I. Boarman***

8.30 **Ravens in the scavenging guild of Białowieża Primeval Forest (E Poland)**
NURIA SELVA

9.00 **Discussion**

9.15 **Spatial aspects in carrion use of Common Ravens (*Corvus corax*), Białowieża Forest, Poland**
SASCHA RÖSNER

9.45 **Discussion**

10.00 **Nutritional ecology of Common Ravens during the breeding period in southwestern Brandenburgia, Germany**
CARSTEN HINNERICHS

10.30 **Discussion**

10.45 ***Coffee break***

11.00 **Relationships between anthropogenic resources and raven reproductive success in the West Mojave Desert**
WILLIAM B. KRISTAN & WILLIAM I. BOARMAN

11.30 **Discussion**

11.45 **Round table discussion**

What should be future research on distribution, ecology, and population biology in the Raven?

Chair/stimulating statements: DIETER GLANDT, WILLIAM I. BOARMAN

12.15 ***Lunch***

Visit of the Institutes´ outdoor grounds and the CITES Rescue Centre

Social behaviour and cognition of the Raven and some other corvids

Chair: ***Kurt Kotrschal***

13.30 **Tests of Ravens´ Understanding**
BERND HEINRICH & THOMAS BUGNYAR

14.00 **Discussion**

14.15 **Effects of social environment on exploration in ravens (*Corvus corax)***
MAREIKE STÖWE, THOMAS BUGNYAR, BERND HEINRICH & KURT KOTSCHRAL

14.45 **Discussion**

15.00 **Deception and social cognition in Ravens**
THOMAS BUGNYAR & BERND HEINRICH

15.30 **Discussion**

15.45 ***Coffee break***

16.00 **Are ravens „intelligent“? About species-centrism and cognitive concepts**
KURT KOTRSCHAL, MAREIKE STÖWE & THOMAS BUGNYAR

16.30 **Discussion**

16.45 **Social Cognition in Food-caching Corvids**
NATHAN J. EMERY & NICOLA S. CLAYTON

17.15 **Discussion**

17.30 **Retrospective and prospective cognition in food-caching scrub-jays**
NICOLA S. CLAYTON & ANTHONY DICKINSON

18.00 **Discussion**

18.15 **End of the second day**

Dinner (on one´s own)

Wednesday, 21 July 2004

Chair: ***John M. Marzluff***

9.00 **A talk about raven talking**
UELI PFISTER & PETER ENGGIST-DÜBLIN

9.40 **Discussion**

9.55 **"Corvus habilis": the cognitive basis of tool use and manufacture in New Caledonian crows (*Corvus moneduloides*)**
JACKIE CHAPPELL, BEN KENWARD, ALEX WEIR & ALEX KACELNIK

10.25 **Discussion**

10.40 ***Coffee break***

10.55 **Towards a better understanding of jackdaws´ relationships**
ANKE ADRIAN

11.25 **Discussion**

11.40 **Round table discussion**

What should be future research on behavioural biology in the Raven and related corvids?

Chair/stimulating statements: BERND HEINRICH, KURT KOTRSCHAL

12.10 ***Lunch***

Chair: ***Leszek Jerzak***

The Raven as a "predator"

13.00 **The Raven as a subsidized predator**
WILLIAM I. BOARMAN & WILLIAM B. KRISTAN

13.30 **Discusssion**

13.45 Responses of ravens and other corvids to human settlement and recreation in a temperate rainforest
JOHN M. MARZLUFF & ERIK A. NEATHERLIN

14.15 Ravens in cattle and sheep flocks: a savenger and/or a predator?
DIETER WALLSCHLÄGER, ANGELIKA BREHME & TORSTEN LANGGEMACH

14.30 Discussion

14.45 Coffee break

Cultural aspects

15.00 The reputation of Corvids in German people – results of a sociological study
ANTONIA HERETH

15.30 Discussion

15.45 Cultural Coevolution between Ravens and People
JOHN M. MARZLUFF & TONY ANGELL

16.15 Discussion

16.30 Final round table discussion
The Raven – a "useful" or a "harmful" animal? Endangered or a pest?
A threat or threatend?
Chair/stimulating statements: DIETER WALLSCHLÄGER, WILLIAM I. BOARMAN

17.00 Closing ceremony

POSTERS

Is magpie (*Pica pica*) breeding success correlated with nest height in urban environment?
MARCIN BOCHENSKI, LESZEK JERZAK & TOMASZ SROMALA

Common raven roosting behavior on a Military Base in the Mojave Desert, California, USA
H. DOUGLAS CHAMBLIN & WILLIAM I. BOARMAN

Cache protection strategies in Western Scrub-Jays
JOANNA M. DALLY, NATHAN J. EMERY & NICOLA S. CLAYTON

Social behaviour and communication in the Alpine Chough, *Pyrrhocorax graculus*
ANNE DELESTRADE

Deferred maturity in Common Ravens
THOMAS GRÜNKORN

Survival of non-breeding Common Ravens
THOMAS GRÜNKORN

Aspects of the moult of primaries of nonbreeding Ravens in Brandenburgia, Germany
CARSTEN HINNERICHS

The raven: a relevant useful source of small mammal fossil accumulations?
FREDERIC LAUDET & NURIA SELVA

Wolf poster exhibit (with emphasis to the wolf-raven-relationship)
MARTINA OTTENS & OLIVER MATLA

The secret to a long life is knowing when it´s time to go: uncertainty and utility determine when a search should be abandoned
GERIT PFUHL, STURLA MOLDEN & ROBERT BIEGLER

Personalized memories for food-caches in Magpies (*Pica pica*)
HELMUT PRIOR, NICOLE GONZALEZ & ONUR GÜNTÜRKÜN

The Raven in Brittany and Normandy (Western part of France): the survival of a small population
THIERRY QUÉLENNEC

Testing physical cognition in rooks (*Corvus frugilegus*)
A. M. SEED, S. TEBBICH, N. J. EMERY & N. S. CLAYTON

Breeding population and feeding habits of the Raven *Corvus corax* in Wigry National Park (NE Poland)
DOROTA ZAWADZKA

The Piagetian object permanence in European Jays (*Garrulus glandarius*)
PAOLO ZUCCA, N. MILOS & G. VALLORTIGARA

Towards a better understanding of jackdaws´ relationships

ANKE ADRIAN

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Animals living in non-anonymous groups develop relationships to individuals within their group. The question arises how these relationships are structured and whether animals "get along better" with certain individuals. If individuals prefer a certain partner it would be interesting to examine the stability of these relationships in different functional contexts.
Jackdaws *(Corvus monedula)* live together in non-anonymous flocks and are very social birds. To address the above mentioned question, I investigated relationships among jackdaws held in groups of 4 same-sex individuals to exclude preferences in a reproductive context. In the cases where individuals formed a close relationship, birds sat more often, preened more often and behaved less aggressively with the preferred partner. In situations where cooperation between two individuals was necessary to access food, specific partners were more likely to work together than random individuals.To examine if the participants of such a relationship provide each other with social support, one individual was placed in an unfamiliar situation.
It was hypothesized that the presence of one partner would reduce the stress level of the other partner under stressful conditions. I present preliminary findings and compare these with a psychological definition of human friendship to point out similarities and differences between these two kinds of relationships.
Relationships among jackdaws may share certain characteristics with human friendship, and may be interpreted as precursors to human relationships.

Extreme population growth of the Raven in California, habitat use and Movements

WILLIAM I. BOARMAN

U.S. Geological Survey, San Diego, CA, USA

Common Ravens are ubiquitous throughout much of North America. In some areas they are rare, in others they have become pests. In the Mojave Desert of the southwest United States, their populations have grown over 1000% in the past 25 years and they have been implicated in the declines of the threatened Desert Tortoise (*Gopherus agassizii)*. Ravens benefit from resources provided by many human activities, making them superb subsidized predators. Ravens are particularly found at landfills and sewage ponds, but also other human-dominated areas. Radio-tagged ravens move among anthropogenic resource sites, but also move into the open desert, where the often nest. Our research is designed to elucidate the causes and consequences of ravens ability to take advantage of anthropogenic resources and what managers can do to reduce their impacts on tortoises.

The Raven as a subsidized predator

WILLIAM I. BOARMAN
U.S. Geological Survey, San Diego, CA, USA
&
WILLIAM B. KRISTAN
California State University, San Marcos, CA, USA

Ravens are superb examples of a subsidized predator. Their population increases and reliance on humans have caused them to impact desert tortoise populations. They eat primarily juvenile tortoises whose shells (up to 7 years old) are not fully ossified. The abundance of anthropogenic resources in the Mojave Desert allows ravens to affect tortoise populations by two processes: spillover predation and hyperpredation. An experiment with model tortoises demonstrated that predation pressure by ravens is highest near successful nests and near concentrated food sources. Because nest locations in some habitats can change from year to year, tortoise populations have a difficult time finding refuge from raven predation.

Given what we know about ravens as subsidized predators, there are several management actions that can be taken to reduce their impacts on tortoise and other animal populations. Eradication is not the answer, but behavioral modification is impractical. Reducing the availability of resources will have the most lasting effect. Early efforts implemented in the Mojave Desert were met with mixed success.

Is magpie (*Pica pica*) breeding success correlated with nest height in urban environment?

MARCIN BOCHENSKI, LESZEK JERZAK & TOMASZ SROMALA

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In urban areas, magpies build their nests much higher than in typical farmland. Many authors suggest that it is an effect of human activity, heavy traffic and terrestrial predators (like cats and martens). If this is true, magpies breeding in higher nests should have better breeding success.

We studied magpie breeding biology in the town of Zielona Gora (west Poland) from 1998 to 2004 (N=96 nests). The magpie population in this town is old (observations since 1920) with high density of breeding pairs.

First of all, we looked at the correlation between nest height (N=91, x=6.6m (3-13m), SD=1.967) and clutch size (N=86, x=5.9 (1-8), SD=1.325). There is no statistical correlation (N=86, r=0.01, p=0.920). So, magpies' clutch size is not correlated with the nest height. There is a positive correlation between nest height and number of fledglings (N=92, x=1.35y/bp (0-7y.), SD=2.008) leaving the nest (N=91, r=0.323, p=0.002). Additionally, we find a positive correlation between nest height and number of the nests with breeding success (N=91, r=0.352, p=0.001). Therefore, the pairs living in higher nests have greater breeding success (more successful nests) and produce more birds.

In Zielona Gora in recent years we have observed that cats are most often the main predators of nests. What is important, the town is not colonised by carrion crows at this time. We think that higher nests are better than lower ones for magpies in the urban environment. So, the areas with higher trees and grasslands are more attractive for this species (like districts in town with block-buildings).

Common raven roosting behavior on a Military Base in the Mojave Desert, California, USA

H. DOUGLAS CHAMBLIN & WILLIAM I. BOARMAN

U. S. Geological Survey, San Diego, CA, USA

As human communities in California deserts have grown, common ravens have experienced precipitous increases. Ravens roost nocturnally in trees, abandoned buildings, cliffs, power lines, and even on the ground amidst vegetation. The behavior is thought to be an adaptation for predator avoidance and to help locate food sources. At the Marine Corps Air Ground Combat Center, Twentynine Palms, California, common ravens formed a nocturnal roost on power lines near the Exercise Support Base at Camp Wilson, a concern to natural resource managers because aggregations of ravens may lead to increased predation pressure on juvenile desert tortoises (*Gopherus agassizii*), a Federally threatened species. Also, the roost represents a Bird Aircraft Strike Hazard (BASH) because of its proximity (< 3 km) to the Base's airfield. We monitored attendance at the roost on a monthly basis from December 2002-present, examining temporal patterns of roost attendance. Monitoring consisted of counting roosting ravens at 5-minute intervals as they arrived at the roost in the evening and departed in the morning. Roost attendance ranged from 23 to 2100 ravens, varying significantly by season, with more ravens present in fall and winter than spring and summer. Seasonal differences may reflect the birds' loyalty to nesting territories at these times of year. Alternatively, they may reflect changes in human activity on the base. Marine deployments to Iraq led to suspended training activities from February until October, 2003. Predictable patterns were observed in the timing of raven arrival and departure on a daily basis. Most ravens settled onto the roost by 30-45 minutes after sunset and departed by 30-45 minutes before sunrise; a pattern that was predictable by both time relative to sunset and actual ambient light levels. Ravens frequently passed directly over or very close to the airfield. To avoid BASH problems, Marine pilots should avoid flying or be very cautious during peak periods of raven arrival and departure from the roost, especially during the fall and winter months. Also, we suggest a region-wide effort to control raven access to human subsidies to help alleviate other problems associated with raven overpopulation, especially predation on desert tortoises.

'Corvus habilis': the cognitive basis of tool use and manufacture in New Caledonian crows (*Corvus moneduloides*)

JACKIE CHAPPELL, BEN KENWARD, ALEX WEIR & ALEX KACELNIK

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In the wild, New Caledonian crows (*Corvus moneduloides*) show extraordinary tool using and manufacturing abilities; observations which have been confirmed by experiments in captivity. So what - if anything - is special about New Caledonian crows? We will discuss experiments performed in captivity to probe their cognitive abilities, including whether they manufacture and use appropriate tools for a particular task, and whether they understand some general principles about the tools they are using and the behaviour of objects. When humans use tools, knowledge about the properties of materials and fundamental facts about physics guide our behaviour. However, animals lacking these insights could generate tool behaviour that looks superficially identical. We show that New Caledonian crows are selective about the length and diameter of the tools that they make or use, and that one female crow was able to use a novel technique to manufacture a tool, without opportunities for imitation or chance shaping of the behaviour. In an experiment testing her understanding of the effect of gravity on objects (using the 'trap tube' paradigm), she developed her own, reliable technique to remove the food by combining two actions. However, when the trap tube was inverted to test her understanding of the operation of gravity on the food reward, she did not alter the frequency of her responses. This suggests that she had learnt to displace food away from the trap without reference to the principle of gravity.

Key words: New Caledonian crow, tool manufacture, selectivity, folk physics

Cache protection strategies in Western Scrub-Jays

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Social context has a profound effect on corvid caching behaviour. In three experiments, we demonstrate that western scrub-jays (*Aphelocoma californica*) use a range of cache protection strategies in order to reduce the chance of cache theft. Experiment 1 shows that they preferentially hide items in sites furthest from the observer whereas near and far cache sites were selected equally when the same birds cached in private. This use of distance may reduce the quality of visual information available to the potential thief. However, the optimal cache protection strategy would be to prevent the transfer of visual information altogether. Experiment 2 demonstrates that when given a choice between equidistant sites that are 'in-view' or 'out-of-view' of an observer, storers hide most caches in sites observers cannot see. Yet when unobserved, these birds cache equally in both sites. It is not clear whether the storers differentiated between what the observer could see, as opposed to what they saw, however, because the observer could not be seen when caching behind the barrier. In experiment 3, the observer was always in view of the storer and we tested whether the jays could exploit the level of ambient light in order to reduce the clarity of visual information available to the observer. The jays cached preferentially in the shade when observed, but cached equally in well-lit and shady sites when in private. Intriguingly, they cached a few items in non-preferred sites in all three experiments (near, in-view, well-lit). At recovery, which always occurred in private, these items were selectively re-cached in new sites. There may be an advantage in not hiding all your caches in one place, because unpredictability might provide the best insurance against pilfering. Taken together these results suggest that scrub-jays use a range of tactics to minimise the chance of cache theft.

Key words: Scrub-jay, social cognition, caching, cache protection, corvids.

Breeding biology and distribution of Raven in Corsica

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The breeding biology and distribution of Ravens was studied in Corsica during the breeding season. Corsica is a large western Mediterranean Island where Ravens are distributed throughout the island in coastal areas and inland up to 2700 m. Breeding biology and density of breeders were studied in different habitats: the occidental coast, a pastoral zone in the lowlands, a high-altitude pastoral zone and mountain habitat. From 1999 to 2004, 51 breeding pairs were recorded. Nests were mainly found in rocks from 20 m to 1500 m in all open habitats. Variation in phenology, breeding success and density of breeders were analysed between zones and years. Great variation in density was found between zones with high density in pastoral zones (20 pairs/100 km^2) and low density in mountain areas (4 to 8 pairs /100 km^2). No significant variation in breeding parameters was found among years. The high density found in Corsica is discussed in relationship to farming practices and food availability.

Key words: Raven, breeding biology, density, pastoralism, Mediterranean island.

Social behaviour and vocal communication in the Alpine Chough

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The Alpine Chough, *Pyrrhocorax graculus,* is a monogamous social corvid that lives all year round in large flocks in which breeders and non breeders occur together. A long-term study is being carried out (since 1988) in the Northern French Alps (Chamonix valley), focusing on social behaviour and population dynamics. Here, we present preliminary analyses on call variations among individuals, from tape recordings made on a wild population that has been extensively colour ringed.
Calls of ringed birds were recorded at their foraging sites in winter (ski stations) or summer (picnic areas, hut surroundings). We analysed the two main call types of adults, i.e. the whistle and the trill. A total of 203 whistles and 338 trills from 32 and 49 different individuals respectively were analysed using sonagrams. Sexual, as well as individual variations were detected in the two calls, and additionally, the two call types were uttered differently according to sex. Moreover, unexpectedly, individuality was found in the two call types.

Key words: Alpine chough, vocalisations, sexual and individual variability

Social Cognition in Food-caching Corvids

NATHAN J. EMERY[1] & NICOLA S. CLAYTON[2]

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Food caching is only beneficial if the food is retrieved by the storer, and not pilfered by conspecifics. As such, some food-caching animals have evolved a number of strategies to either enhance their pilfering of another's caches or to protect their own. Some less sophisticated strategies include a cessation of caching when others are present or eating rather than caching. A series of recent experiments in western scrub-jays (*Aphelocoma californica*) have provided evidence that this species also utilises a number of more complex cognitive strategies which suggest social reasoning skills that are as complex as those demonstrated for chimpanzees. I will describe experiments in which scrub-jays were either observed during caching or cached in private, and allowed to recover caches 3hr later only in private. When jays were provided with caching trays which were either near or far from an observer, the storers cached selectively in the far tray, but not when caching in private. Birds also cached predominantly in the shade when observed, but cached equally in bright and shaded areas when in private. Scrub-jays also cached out of sight of an observer, caching behind a barrier. In all three studies, storers re-cached those food items that were at risk of future pilferage; i.e. caches made in the near tray, caches made in bright areas and caches made in sight of an observer. When observed, storers re-cache food in new sites, but not if they had cached in private. Re-caching appears to be dependent on having previous experience of pilfering another birds' caches, as naïve birds without pilfering experience do not re-cache. This suggests that jays with experience of being a thief project those previous experiences onto another bird. As such, this may represent an example of scrub-jay 'theory of mind'.

Population genetics of Ravens in the Western United States: an analysis of movements, population size, and patterns of colonization

ROBERT FLEISCHER[1], WILLIAM BOARMAN[2], ELENA GUITIERREZ[1], ALVARO GODINEZ[1], KEVIN OMLAND[3], SARAH YOUNG[1] & CARL MCINTOSH[1]

1-Smithsonian Institution, Washington, DC, USA
2-U.S. Geological Survey, San Diego, CA, USA
3-University of Maryland, Baltimore, MD, USA

Ravens of the western United States occur commonly in desert regions of southern California and Nevada. Many of the local populations have developed a commensal relationship with humans in this region by feeding at landfills and on road-killed wildlife. Ravens were sampled at several sites in three regions: southern California Mojave Desert, southern Nevada, and northern Nevada. Analyses of mtDNA control region sequences reveal a clinal increase in the frequency of Holarctic clade haplotypes from south to north, with the California clade haplotypes nearly fixed in southern California. Analyses of eight microsatellite loci reveal little evidence of local or regional population structure, suggesting that the (maternally-inherited) mtDNA structure may be due to lower female dispersal relative to males. Analyses of structure and relatedness provide some evidence for local movements within regions. The high level of movement inferred from our data suggest that efforts to manage ravens by local control alone may not be effective.

The evolutionary relationships of Ravens: Worldwide phylogeography and a phylogenyof the genus *Corvus*

ROBERT C. FLEISCHER, KEVIN OMLAND & WILLIAM I. BOARMAN

The genus *Corvus* is a widespread and morphologically conservative genus, and the common raven (*Corvus corax*) is the most widely distributed species of Corvid. We present results of studies of genetic markers designed to reconstruct the phylogenetic relationships within the genus *Corvus*, and to determine its placement within the overall Corvidae. Phylogeny estimation using mitochondrial cytochrome b DNA sequences from 22 species of *Corvus* provide a well-resolved topology. All *Corvus*, with one exception (the jackdaw, C. monedula) form a monophyletic group nested within the jays and magpies. The *Corvus* clade consists of at least three major clades: an Austalian/Pacific/Asian crow clade, a raven and rook clade, and a Northern crow clade. The jackdaw (*C. monedula*) is sister to *Ptilostomus* and to other jays and nutcrackers, and may represent a case of convergence. Mitochondrial control region and cytochrome b sequences from common ravens from nearly their entire range form two clades: one we call the "Holarctic clade" which also contains *C. albicollis* of Africa; the other we call the "California clade," and it contains *C. cryptoleucus* of southwestern North America. Thus the common raven is a paraphyletic taxon. The California clade is limited to the southwest of North America and has a broad zone of overlap with the Holarctic clade individuals in the northern part of its range. We discuss the systematic and biogeographic implications of the phylogenetic reconstructions of the genus *Corvus* and the worldwide phylogeography of ravens.

Persecution, recolonization and distribution of the Raven in Central Europe

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In former centuries, the Raven, *Corvus corax*, has been a widespread and abundant species in Central Europe. Due to human persecution over a long time the species became rare in the 19th century, during the second half of which Ravens disappeared more and more. Between 1870 and 1930 the Raven died out in most parts of middle Europe. About 1945 the species was present only in three refugia: in Schleswig-Holstein (North Germany) and southern Denmark, in east Poland and in the central Alpin region (mainly Switzerland and Austria). Between these areas there was a large so-called „cultural gap".

An outstanding reason of persecution was the belief of many people that Ravens would feed on live lambs, calfs and wild animals (game). The Raven had been looked at a serious predator. But in recent time thorough investigations (in Germany mainly by Prof. Wallschläger and his co-workers) have shown that this is not right.

Since 1940-45 the Raven is resettling the former breeding area between the three refugia, and this process is continuing today. In North Germany the recolonization front proceeded at up to 10 km/year, but later slowing to about 4 km/year. In some regions (e.g. western part of Lower Saxony) the recolonization stagnated. The reason for this is unknown.

To enhance the resettlement rate, several reintroduction projects have been carried out in the Netherlands, Northrhine-Westphalia and other regions. All these projects had no significant effect on the reexpansion velocity, due to new human opposition, too small numbers of animals and other unknown reasons, respectively.

In the three refugia, the Raven prefered beech (North-Germany, South Denmark), pines (Poland) and rocks (Alps) for breeding, so there were separate regions with tree-nests and crag-nests, respectively. During expanding of their range, the animals changed to breeding on other substrates, e. g. Alpin Ravens from rocks to trees and „beech breeder" to pines.

Most parts of the Federal Republic of Germany are now resettled, but there are some great gaps, mainly west of the Rhine River, in the western part of Lower Saxony and Bavaria. The agglomerations of Rhine-Ruhr and Frankfurt/Main have also no breeding pairs, and it is questionable whether the species will breed in these regions at all.

The breeding population in Germany is meanwhile about 9000 pairs, but it seems possible that after resettling the remaining regions there could be at least 12000-14000 breeding pairs. Furthermore there are several large assemblages of nonbreeders (each containing up to several hundred animals), mainly at landfills and in cattle and pig farms. There are conflicts with farmers and ranchers, e.g. Ravens can cause some damages to agriculturial fields near landfills. But these are only local problems and do not justify new persecution.

I think an important task is a good scientifically-based public relations programme to inform people correctly about the role of the Raven in different ecosystems.

Key words: *Corvus corax*, persecution, recolonization, reintroduction, breeding population, conflicts

Population dynamics, reproductive success and intraspecific regulation in Schleswig-Holstein/Germany, a long term study

THOMAS GRÜNKORN

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The breeding stock and breeding performance of the Common Raven was studied in Schleswig Holstein for decades. Since 1950 three censuses covered the breeding stock of the whole area, but more detailed information about breeding success is available from several study areas (1991 eight areas with in total 7200 km^2 and 2002 two areas with in total 2280 km^2). Two areas were covered for more than 20 years. The breeding stock showed significant changes in the second half of the last century: dense populations in the 1950s, decreases with lowest densities in the 1970s, recovery since the middle of 1980s and highest densities after 1995. A leveling off at high levels suggests that the actual carrying capacity has been reached. The local density depends significantly on the amount of woodland and actually ranges between 2 and 12 breeding pairs/100 km^2. The breeding success is significantly dependent on the density of breeding pairs in a specific area. This was supported by different parameters: year, area (woodland), distance to the nearest neighbour. Furthermore, breeding performance is influenced by the time of breeding, density of voles, distance to the roost of non-breeders and in some woodlands by the presence of Eagle Owls as predators. Since 1985 the breeding success decreased from 3 to 2 nestlings per brood (failures included). The increasing density between 1985 and 1995 led to a decrease of breeding success, an increase of the stock of non-breeders, a deferred maturity, and stabilization of the breeding population (intraspecific regulation).

Deferred maturity in Common Ravens

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The age of reproductive maturity and the actual age of first reproduction are important to questions of population turnover. An aim of this study was to determine the minimum age of reproductive maturity and, if possible, the average age of first breeding, which matters most in population dynamics. From 1985 to 1999, 3250 birds, mostly nestlings, were ringed in the northern part of Schleswig-Holstein/Germany and Sønderjylland/ Denmark. Since 1991, 2600 birds were additionally marked with individual colour rings. Trough sightings of individuals at roosts in winter and breeding sites in spring, I was able to reveal the age of first breeding (change of status non-breeder/breeder). Common Ravens bred at first in their fourth calendar year (almost third year of living). Two birds bred for the first time as late as in the seventh and eighth calendar year. According to the actual high breeding density not all of the birds can breed in their first year of physiological maturity but `wait in line´ to replace dead breeding birds. As a consequence, the number of non-breeders increased during the study period. The deferred maturity is therefore an efficient mechanism of intraspecific regulation of the density of breeding pairs. The chances of recruitment are small, about 95 % die as a non-breeder (see abstract "Survival of non-breeding Common Ravens"). Together with the observed low rate of marked individuals, I assume a high average age of the breeding birds.

Survival of non-breeding Common Ravens

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The calculation of mortality or survival rates is only possible with a high number of ring recoveries. From 1985 to 1999, 3250 mostly nestlings were ringed in the northern part of Schleswig-Holstein/Germany and Sønderjylland/ Denmark. Since 1991, 2600 birds were additionally marked with individual colour rings. In spite of their remarkable size, until now only 102 (3.3%) ravens were found dead. An age specific mortality rate can not be deduced from this material. In contrast, during eight winters (1991/92 to 1998/99), 1.025 (39%) marked ravens were observed at roosts or feeding places. Very few ring recoveries were reported from localizations outside the study area. This leads to the assumption, that a bird which has not been observed in a winter within the study area is dead. Following this assumption, the average survival of the non-breeders to the first winter is at least 38%. This is lower than in the following years, when about half of the birds survived. Due to this exponential decrease, about 10% of the birds of a given year reach physiological maturity and about 5% of the birds of a given year actually breed (see abstract "Deferred maturity in Common Ravens"). This rate seems to be very low.

Comparative breeding biology of Common Ravens in northern Germany and Denmark

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The breeding biology of four independent studies in northern and eastern Germany (Brandenburg, BB; Niedersachen, NS; Schleswig-Holstein, SH) and southern Denmark (Südjütland, DK) are compared. We were able to compare studies because we each climbed the nest trees to count and ring the nestlings.
The studies were carried out for 4 (DK), 6 (BB), 12 (NS) and 18 (SH) years. In total, the results of 1373 breeding attempts were recorded. The density of breeding pairs was significantly different with 2.2 (SH), 6.6 (NS) and 9.0 (BB) nests/100 km^2.
The average of nestlings per successful pair varied significantly: 3.9 (DK), 3.2 (SH), 3.0 (BB) and 2.7 (NS). Related parameters, such as the number of nestlings per breeding attempt and the rate of failures, show similar results and depend mostly on breeding density. The similarity of outcomes is discussed in relation to the different density of Ravens (breeding pairs including number of non-breeders). Furthermore, the interspecific concurrence (predation), as measured by the distance to territories of the Eagle owl (*Bubo bubo*), is important (SH).
Ring recoveries, individual colour rings and wing tags showed that birds moved between study areas and do not support ideas of persistent sub populations.

Tests of Ravens' Understanding

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We tested if sub-adult ravens understood the means-end connection in their ability to access meat suspended from a perch by string. In contrast to a previous study of problem solving by older ravens, we here controlled for possible effects of fear of string, competition by dominants, and social learning. Ravens showed no interest in dangled string that did not hold food but when food was attached on the string (and dangled 50 cm below a horizontal perch), they tried several (ineffective) ways to access the meat. Within eight minutes of trying to reach the meat, five of six naïve birds successfully pulled up meat. We further tested the raven's means-end understanding of the meat on string through (1) fly-offs versus dropping of food that is attached to string, (2) string choice of blank versus rewarded string, (3) novel string, (4) crossed strings, and (5) grip strength for light versus heavy loads. With experience, birds increased speed of pull-ups and were able to transfer skills to a novel task. However, our results indicate that ravens understand the string-meat connection and the steps that aid them in skill acquisition.

The reputation of Corvids in German people - results of a sociological study

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In order to collect data on the opinion and knowledge of persons of different social groupings a public inquiry was carried out based on a five page questionaire containing 27 sections of questions. 1533 persons from Hessen and Thuringia were included in the inquiry. The results concerning persons of different profession, interests, age classes, education, and place of residence all derive from one sample. The test subjects remained anonymous.
To achieve knowledge and practice for inquiries and their analysis I absolved a personal engagement in the Allensbach Institute. Moreover, psycholocical literature and discussion with three pysychologists helped to improve the task. For the analysis of data I used software SPSS 6.1. for Windows.
The persons involved did not represent a sample of the society. Only differences between particular groups could be analyzed. Members of different clubs, societies and political parties as well as members of the Lufthansa staff and civil servants of the State Departments of Hessen and in particular pupils of different schools were selected. All the questionaires delivered to potential participants were returned with at least some questions answered. This feedback of 100 % was due to a preliminary test and the experience of the Allensbach Institute according to which postal sending was avoided instead of personal delivering and collecting the sheets.

The questions were grouped to major subjects as follows:

1. General knowledge;
2. Taxonomic grouping of Corvids;
3. Distribution and population dynamics;
4. Food and feeding behaviour;
5. Useful or pest animals?
6. Information sources;
7. Emotional and tradtitional relationships;
8. Managements in favour or against Corvids - How should Corvids be treated?

A Corvid lobby is needed; there are considerable differences between respondents of different ages; a long-term and sustainable solution for problems with Corvids is needed, there were differences between males and females.

Nutritional ecology of Common Ravens during the breeding period in southwest Brandenburg, Germany

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From 1997 to 2002, I investigated the nutritional range and the distribution of food of Common Ravens during the breeding period in southwest Brandenburg. The investigation based on the analysis of pellets from 77 pairs. The range of were very divers in all years, but the frequency of components from year to year were very different. Some components were always commonly found in pellets (e.g., grain, pebbles, parts of vertebrates), others were irregularly found (e.g., invertebrates, refuse).The high frequency of plant components indicates high needs. The number of offspring increases a brood's need for food. A higher diversity of food used rises with the number of offsprings in a brood.

Are ravens "intelligent"? About species-centrism and cognitive concepts

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Are ravens "special"? And if, in what respect? Chimps, dolphins and ravens, seem "intelligent", but are geese, for example, stupid? In a way, "intelligence" is an anthropocentric, folk psychology concept. "Intelligent" animals usually impress with human-like features, such as play and exploratory behaviour, problem solving, quick learning alone and from others, complex communication, deception, alliance formation, perspective taking, mental state attribution, etc. Cognition research is bound to test hypotheses and hence, mainly employs experimental approaches. Because answers always depend on the question asked, the scientific methods produces a bias towards quantitative, rather than qualitative differences between species.

Birds may be peculiar in some respect, because of their unique forebrain formation employing mainly basal ganglia instead of pallial telencephalic components in most other vertebrates. Even though untested, this may lead to a higher context-dependence and even a higher prevalence of stereotyped behaviour patterns, as compared to mammals. Hence not to mix apples with pears, the first adequate question is probably, how peculiar ravens are within their own taxa, birds, song birds and corvids, rather than asking how ravens differ in their cognitive abilities from wolves, chimps or humans.

On the other hand, when trying to explain the functional/evolutionary context of cognition, a comparison between distant taxa may be even more interesting, because it may reveal convergent evolution. If, for example, ravens are indeed as good as chimps in alliance formation, perspective taking or mental state attribution (contribution by Bugnyar et al.), this cannot be due to common ancestry, but must be due to parallel evolution. Such comparisons may reveal, what the notoriously conservative and constrained vertebrate brains will achieve in interaction with specific ecological and social conditions (and what not). We will try to integrate what is known about ravens in perspective with the cognitive skills in other corvids. And we will speculate why particularly in corvids, cognitive features have evolved that, in some respect, resemble those found in primates.

Key words: Alliance formation, Cognition, Corvids, Deception, Mental states, Neophobia, Theory of mind

Relationships between anthropogenic resources and raven reproductive success in the West Mojave Desert

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In addition to large, obvious effects of anthropogenic developments on raven abundance, developments affect raven reproductive success. We monitored locations of nest sites, clutch size, nest success, and number of chicks fledged in the Edwards Air Force Base (EAFB) study site between 1996 and 2000. Additionally, we collected regurgitated pellets from nest sites in 1999 and 2000. Ravens nest disproportionately near anthropogenic sites such as towns, but do not nest disproportionately near roads, in spite of the beneficial effects of both on raven fledging success. Pellets found at nests near anthropogenic sites show a greater incidence of trash, whereas pellets found near roads had a greater incidence of small mammal bones, suggesting that different kinds of anthropogenic sites provide different foods; pellets from nests far from both roads and towns had a greater incidence of plant material. Ravens with a more "urban" diet had the greatest fledging success. Variables that affected the likelihood that a raven would select a nest and initiate breeding activity were different from those that affected breeding success, suggesting that even ravens are capable of making poor choices in novel environments.

The raven : a relevant useful source of small mammal fossil accumulations?

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Taphonomy studies different fossilization processes to interpret fossil assemblages. Numerous studies have stressed the potential role of prey accumulations as a source of small vertebrate assemblages, mainly from owl and raptor pellets and scats of carnivorous mammals . However, the raven *Corvus corax*, despite its abundance and wide distribution, has not yet been studied as a taphonomic agent. We conducted the first study on the preservation of small mammal bones from 567 raven pellets collected in Białowieża Forest (Poland). Remains of 191 rodents and shrews were recovered from a total of 130 pellets. The taphonomic signature of raven pellet bone assemblage was close to that of the less destructive owl pellet assemblages: main skeletal elements were in a good preservation state, with little breakage, and a few teeth exhibited traces of digestion. Skeletons of individual prey/carrion items within a pellet were seldom complete, particularly those of the largest rodents and moles. The genus *Corvus* is known from at least the Upper Miocene period, and their remains are common within Pleistocene and Holocene bone accumulations. Results suggest an alternative interpretation to that concerning owls when explaining the accumulations of small bone remains through fossil and recent periods, particularly in mountain and cold areas. Due to their opportunistic feeding behaviour and their habit of scavenging on carcasses of large vertebrates (complete bones, teeth and flacks from medium-sized and large vertebrates were frequently recovered in the pellets), a wide variety of vertebrate taxa may be present at raven pellet accumulation sites. These sites could provide a very good image of the fauna in the area. Also, ravens are often associated with open landscapes and human activities, a fact that may be relevant for archaeological or archaeozoological considerations.

Key words: taphonomy, raven pellets, small mammals, rodents, temperate forests

Cultural Coevolution between Ravens and People

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Ravens and people have interacted since the dawn of human time. We explore this relationship and that of people with the various members of the genus Corvus, "crow". We suggest that people are the central factor affecting current crow ecology, culture, and evolution. Crows simultaneously affect human culture. Ravens were a primary influence on our culture in past centuries, but more urban crows play that role today. Corvid populations benefit tremendously from our activities, and this leads to increasingly common contact between these birds and ourselves. This prolonged association between humans and corvids has led to their incorporation into our cultural fabric in a manner quite unlike any other animal. Our art, language, spirituality, and pop culture reflect the cultural importance of crows and ravens. Crow and raven culture is also well developed and modified by people. We describe our relationship with corvids by extending the concept of coevolution to situations where interactions among species lead to social learning and evolution of culture. We call this cultural coevolution. We illustrate how cultural coevolution works within six important interfaces between crows, ravens, and people: 1) hunting and gathering, 2) expansion of agriculture, 3) war and aggression, 4) urbanization and recreation, 5) hunting, and 6) bird feeding. We conclude that the cultural stimulation provided us by corvids is an important reason to conserve biodiversity.

Responses of ravens and other corvids to human settlement and recreation in a temperate rainforest

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Human settlement and recreation in wildlands often increases the interface between synanthropic species and sensitive native species with potentially negative consequences to biodiversity. This is occurring throughout the urbanizing world as corvids increase in the presence of humans and threaten other native birds with increased rates of nest predation. The process of corvid responses and actual affects on other species is only vaguely understood, so we quantified the population response of radio-tagged common ravens (*Corvus corax*) to human settlement and recreation and examined their influence as nest predators on artificial marbled murrelet (*Brachyramphus marmoratus*) nests on Washington's Olympic Peninsula from 1995 – 2000. We also studied American crow (*Corvus brachyrhynchos*) and Steller's Jays (*Cyanocitta stelleri*) and compared their responses to ravens. Ravens responded positively to settlement and recreation with smaller home ranges and higher reproduction. This was greater than jay responses, but less than crow responses. Local density of corvids was influenced most strongly by their sociality. Crows relaxed territoriality and increased local abundance with extensive home range overlap (6x more than ravens and 3x more than Steller's jays) and regular forays to anthropogenic sites providing food. Territoriality appeared to constrain ravens and Steller's jays nesting on the periphery of settlement and recreation; ravens rarely visited anthropogenic sites and neither raven nor Steller's jay populations expanded their ranges with excursive forays to anthropogenic sites. Corvids accounted for 32.5% of the predation events (n = 837) we documented on artificial murrelet nests. Small corvids (jays) were common nest predators across our study area but their contribution as predators did not vary with proximity to settlement and recreation. In contrast, large corvids (crows and ravens) were rare nest predators across our study area but their contribution varied greatly with proximity to settlement and recreation. As a result, the risk of nests to predation correlated positively with the abundance of large corvids. Managers seeking to reduce the risk of nest predation need to consider the varied impacts and variable behavioral and population responses of potential nest predators. Removing large corvids may do little to reduce overall rates of nest predation because of the diverse predator assemblage. Controlling features in the environment that increase nest predator species may be more effective. On Washington's Olympic Peninsula this means controlling the availability of anthropogenic

A talk about raven talking

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In Switzerland, south of its capital Bern in area of approximately 1000 km^2 we studied individually known free-ranging breeding pairs of ravens whose vocalisations were recorded during interactions with a caged pair. We recorded the vocalisations of 74 individuals and analysed the vocal interactions between the partners of 21 pairs.
Adult ravens have repertoires of distinct vocalisations (12 calls in the median), which comprise only a small part of all the different vocalisations occurring in the whole study area (at least 79 call types; only calls occurring during interactions between adult ravens are considered). Analysis of the distribution of call types among individuals regarding sex, partnership and neighbourhood and aspects of the geographical distribution of calls showed different pathways of cultural transmission: within the sexes, between pair partners, between neighbouring and more distant individuals. Most of the calls in an individual's repertoire were culturally transmitted.
Analysis of the call sequences with matrix correlation of preceding and following calls of the partners during interactions and correspondence analysis of the matrices showed that calls are used according to specific rules. Some of these rules are either valid for all investigated pairs, for the sexes or even for pairs only. They can be independent of the call types itself: same calls can be used differently and different calls can be used the same way by different individuals.
There is an astonishing similarity to human language in this communication system: Most of the vocalisations are discrete and clearly identifiable as call types and the overwhelming part of an individuals vocal repertoire is learnt from conspecifics. Although ravens doubtlessly have the capacity to learn and use any raven call, it must be assumed that social effects determine repertoire composition and call use. The pronounced sexual dimorphism in the vocal repertoire reflects such an effect: females behave vocally like females, and males like males because they have learnt to behave that or the other way. The observed exceptional use of sex specific calls by the opposite sex and the missing of certain sex specific calls in the repertoires of some individuals, are further indications that the sexual dimorphism in the vocal repertoire must be considered as a role behaviour instead of a biological differentiation between the sexes. Call use in raven communication has become mostly independent of the call type itself, it relies primarily on the social relationship between the interaction partners. This vocal expression of social relations is strongly suggestive of human language.
This analogy reveals that the question about meaning and function of the calls might not be the prime one to be answered, because meaning and function can not be attributed to the calls per se, but only in relation to the social environment. Answers to these questions might be found in an expanded framework considering communication as bound to the social relationship between individuals. For that reason we do not talk about what ravens are talking about, but how they are talking.

Key words: *Corvus corax*, vocalisations, cultural transmission, communication, social relationship

The secret to a long life is knowing when it's time to go: uncertainty and utility determine when a search should be abandoned

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Uncertainty is an important factor in computations ranging from those commonly considered basic to others thought to be sophisticated, from categorisation over cue combination, conditioning, and risk sensitive foraging to metamemory. Knowledge of uncertainty is also essential for optimally determining giving up time in cache retrieval or other search.
Assuming that knowledge of the location of a hidden item can be characterised by normally distributed parameters, uncertainty by the variance of the distribution, and that pilfering is possible, we find the following: initial expected utility depends on the a priori pilfering rate only. Expected utility decreases as an increasing area is searched, but decreases less rapidly when uncertainty is greater. Initial expected cost is greater for greater uncertainty, but then increases more slowly. Search should be abandoned when expected cost exceeds expected utility. This crossover point depends critically on uncertainty.

Personalized memories for food-caches in Magpies (*Pica pica*)

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We tested the hypothesis that food-storing corvids are not only aware of when and where they have stored what kind of food, but also encode and recall who else could have a knowledge of the location of their food-caches and, therefore, might be a competitor during retrieval. Hand-raised Magpies were used as focus birds and observers. The focus birds were allowed to store food in their home cage, and while doing so they were consecutively watched by two observer birds. In a subsequent retrieval test, one of the two observers was present. The focus birds preferentially retrieved caches they had made while the actual observer had watched. Findings show that Magpies 'personalize' their memories for food-caches and adjust their retrieval behaviour in a way that takes into account whether a conspecific might have knowledge of their hoards. Such an adjustment of an individual's behaviour to the possible knowledge of a conspecific represents an essential feature of a 'theory of mind'.

The Raven in Brittany and Normandy (Western Part of France) : The Survival of a small population

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In France, the Common Raven, *Corvus corax*, is often regarded as a mountain bird. Centuries of destruction led it to take refuge in these difficult-to-reach areas. On the other hand, it is often less known that this large bird has always bred in sea cliffs of Brittany and Normandy.
After having reached a maximum of 70 pairs in Brittany in 1984 and 11 pairs in Normandy in 1982, the population of western France now counts 33 pairs in 2003. At the beginning of the Sixties, when monitoring began, this micro-population bred only in coastal cliffs. But the Raven population is threatened by two factors :
- firstly, the development of recreational activities in the littoral zone and the systematic installation of the coastal trails, which makes it possible for people to reach even the most remote places.
- secondly, the development of an "hygienic" society which reduces accessibility to certain food sources (modern stock farming in closed buildings, elimination of extensive grazing, development of effective and systematic carcass collection, closing of rubbish dumps, collection of corpses on the coast by municipalities), which has consequences in an area where large wild fauna are missing.
Until 1972, the Raven bred exclusively on the coastline. The following year the first nesting in an inland quarry was discovered. From this time, the coastal population decreased drastically, (declining from 48 to 16 breeding pairs between 1984 and 2003), while the population in quarries increased. In 2003, nearly half the Breton population (44 %) bred in quarries. The future of the species in our area lies in this new habitat. Paradoxically, the Ravens are undisturbed in working quarries: pairs accustomed to the noises of the machines and the routine of the workmen take no notice of his presence. The deserted quarries, which are not fenced, are often used by people for activities such as rifle shooting, moto-cross, climbing, gatherings, that are incompatible with Raven breeding. With this change of habitat, fidelity of occupation is less than on the coastal nesting sites which, are relatively stable. Thus, between 1985 and 1997, the number of sites in quarries remained almost unchanged : nine in 1985 versus ten in 1997, but more than 50 % of these nests were in different quarries.
The quarry is unstable : sometimes explosions can destroy the nests. However, the Raven must settle in this new habitat to have a chance to survive in western France. The lack of food will otherwise prevent recovery.

Key words: Raven, small isolated population, coastal pairs, quarry

Spatial aspects in carrion use of Common Ravens (*Corvus corax*), Bialowieza Forest, Poland

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Common Ravens, *Corvus corax,* are well known for their adaptation to carrion. Up to now there was very little known about the spatial aspects of carrion use by ravens in densely forested ecosystems. In the Białowieża Forest (eastern Poland) a new method was developed for collecting spatial information on carrion use by territorial ravens. In the breeding season 2001, sixty-three carrion baits (ungulate intestines, chickens) were marked with a distinctive type of small plastic markers. These markers were distinguishable by size, color and shape. Marked baits were experimentally placed at different distances and directions around occupied raven nests.
To detect a possible influence of habitat characteristics on bait use by ravens different habitat attributes were measured around bait locations: main habitat type, tree density and canopy cover. Moreover, presence and absence of snow on the day of bait exposure was recorded. Afterwards, droppings and pellets were collected at the raven nests and checked for plastic markers.
A total of more than 2,200 pellets and droppings from 13 raven nests and from a communal roost were checked for markers during the study. In all, 89 % of the baits and carrion were used by ravens. In total, 705 markers, corresponding to 40 different baits, were recovered. The proportion of baits utilised by a raven pair, as well as the total number of recovered markers declined with increasing distance of the bait from the nest. As confirmed by marker-type recoveries, ravens fed on 63% of the experimental baits. The distance from the nest correctly explained 84.5% of variation in the use of carrion by ravens. A threshold of 2,040 m indicated a raven home range size of 13.1 km^2. Raven pairs utilised baits and carrion further than 2,040 m rarely (never exceeding 5,580 m), usually at open landscapes and in the presence of non-breeders. Habitat characteristics and snow cover did not have a significant effect on bait use.

Key words: bait-marking, scavengers, carrion, territory size, Białowieża Forest

Testing physical cognition in rooks (*Corvus frugilegus*)

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Rooks are not reported to use tools in the wild, but the fact that they are large-brained, highly social animals suggests that they should be capable of finding cognitive solutions to physical problems. We report the performance of four hand-raised 10 month-old rooks on two tests of physical cognition: the trap tube (Limongelli et al., 1995) and the raven string-pulling task (Heinrich, 1995). Birds were tested in visual isolation to prevent social learning. Subjects were presented with the trap tube, with its orientation varied in a randomised, counterbalanced schedule. Subjects were deemed to have completed the task if they responded correctly over a significant proportion of twenty trials. One bird reached this threshold within 50 trials, one within 40, and a third within just 30, though all birds responded randomly in the first 10 trials. The final bird did not perform above chance in 100 trials. Two rooks were also tested on the string-pulling task. On the fifth trial, both succeeded in pulling up the reward that was suspended from a 40 cm-long string. Subsequently, the birds never failed to obtain the reward, and used a variety of techniques to reach it including the lateral step and straight pull-up shown by ravens. When presented with two strings, one bearing food, the other a stone, one rook only pulled up the string connected to the food. The other bird pulled up the food first on both trials, and only pulled the stone after eating. This is the first study to demonstrate that a non-tool user can solve the trap tube task. Furthermore, rooks show a rapidity of learning that surpasses that seen by conventional tool-users tested on the trap tube, namely chimpanzees, New Caledonian Crows, capuchins and woodpecker finches.

Key words: Corvids, Rooks, Physical Cognition, Trap Tube, String Pulling

Ravens in the scavenging guild of Białowieża Primeval Forest (E Poland)

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Monitoring and direct observations of 214 carcasses, mainly ungulates, were conducted in Białowieża Forest (E Poland) in 1998-2002 to investigate the utilization of carcasses by scavenger species of birds and mammals. Main scavengers were raven *Corvus corax*, fox *Vulpes vulpes*, raccoon dog *Nyctereutes procyonoides*, jay *Garrulus glandarius*, buzzard *Buteo buteo*, wild boar *Sus scrofa*, wolf *Canis lupus*, pine marten *Martes martes*, white-tailed eagle *Haliaeetus albicilla*, tits *Parus spp.* and stray dogs. Most species were scavenged during winter. I discuss the scavenging frequency and efficiency, the habitat-related utilisation of carcasses, and the differential use of several carcass types (wolf kills, lynx kills, natural deaths, harvested animals, entrails discarded by hunters and non-ungulate carcasses) by ravens, in comparison to the other species of the scavenging guild. Ravens used all carcass types and from all ungulate species, however they discovered lynx kills (usually camouflaged) less often than expected. Together with foxes, ravens formed the wolf-kill subguild. Ravens occupied a medium-low rank in the interspecific dominance hierarchy. They fed often together with white-tailed eagle and buzzard. Although jays and ravens were frequently recorded as present together at carcasses, they were seldom commensals. The number of ravens present and feeding at carcasses negatively affected the duration of visits by jays and buzzards, respectively, but not the duration of white-tailed eagle visits, the most dominant species. Facilitation processes were common within the guild. White-tailed eagles and buzzards may follow flocks of immature ravens to carcasses and the probabilities of both raptors discovering a carcass significantly increased with the number of ravens.

Effects of social environment on exploration in ravens (*Corvus corax*)

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The social environment may facilitate approach to novel objects and especially intake of novel food. In this study we examined the effects of social context and social relationships on explorative behaviour in ravens (*Corvus corax*). In the first set of experiments with seven hand raised juvenile/adult ravens we conducted novel object tests. Birds were either tested alone or in dyadic combinations by presenting two sets of novel objects. Contrary to prediction, individuals tested alone approached novel objects quicker than in pairs and spent significantly more time close to the novel objects as compared to dyads. Social relationships, as defined by socio-positive behaviours during the test, predicted joining to explore only when approaching familiar objects but not novel ones. In a second set of experiments we added food to another set novel objects. This increased the motivation to approach and stay close. Again, social relationships correlated with joining in the approach to familiar objects only. We interpret higher latencies of dyads in approaching novel objects when compared to singles as an effect of a negotiation process between the two individuals over risk taking.
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Key words: explorative behaviour, social facilitation, social relationships, *Corvus corax*,

Ravens in cattle and sheep flocks: a scavenger and/or a predator?

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Over the last ten years, interactions between corvids and sheep or cattle herds have been registered regularly in different parts of Germany. The described facts are especially connected with the well-known bloody pictures from the Hitchcock-movie "The birds" shown in the yellow-press. Without any knowledge of the kind of the interactions the occurrence of large raven flocks led to claims for regulation by hunting.
Since 1996, the University of Potsdam has been doing research concerning this phenomenon in cooperation with the conservation authorities in the state of Brandenburg. Those studies are aimed at improving our knowledge about the ravens' behaviour in connection with their complex environment. The methods used comprise questionnaires, close contact to farmers complaining about problems, intensive observation (>1000 hours), documentation of preventive measures and their effect as well as post-mortem investigations of lambs and calves.

As a result, it can be said that

- since the seventies non-breeders flocks became more abundant consisting of up to more than 500 individuals meanwhile due to the increase of the breeding population;
- the flocks can mostly be found around food-abundant places such as rubbish dumps or herds;
- the ravens have developed new behaviour strategies for an optimal exploitation of food resources in these places;
- the flocks show a high mobility using joint roosts as communication centres;
- the problems in cattle and sheep herds actually come up by the activities of ravens. This doesn't lead to the death of these animals, but rather to disturbances – mostly during time of birth – as well as to injuries of animal which have already fallen ill or are handicapped in other ways. Here were previous incidents in all investigated cases. These animals were either neglected or sick lambs/calves or there mothers in difficult births. Ravens aren't able to kill healthy calves or even grown-up cattle or sheep. With lambs, this seems to be theoretically possible but it hasn't been proven in present, really extensive research so far.

The solution of these problems can only be found by an ecological understanding of nature and by developing a reasonable handling of the raven. Thus we succeeded in making the reasons of the loss of cattle and sheep comprehensible to the farmers including the fact that the raven is only one part of a complex texture.
The environmental factors of the flocks are of great importance. The surroundings (dumps, compost-heaps) are hardly possible to influence. But considering the herd you can take measures in order to reduce the number of ravens and the risks for the animals as well as to prevent damage extensively. With an appropriate management, such as the decrease in attractiveness of non-breeder flocks (reduction of food by an improved health-check and an intensified supervision) the acceptance of ravens can be achieved.

Common Raven juvenile survival and movements in a human-augmented landscape

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In order to increase our understand the relationship between anthropogenic resource subsidies and Common Raven demography in the Mojave Desert, we examined whether survival to juvenile departure from the natal territory could be predicted by a set of environmental and morphological variables, such as nest proximity to anthropogenic resources, and juvenile condition. We also evaluated the movements of juvenile Common Ravens in the context of common models for explaining avian natal dispersal including resource competition, inbreeding avoidance, and social behavior. Nest proximity to the nearest point subsidy and fledging date significantly predicted successful raven juvenile survival to departure from the natal territory. The best-fitting mark-recapture models predicted post-departure survival as a function of time since fledging, nest proximity to the nearest point subsidy, and year hatched. The positive effect of proximity to anthropogenic subsidy was apparent for at least 9 months after fledging. Overall, raven juvenile movements resembled an optimization process, rather than a strictly patterned behavior. They appeared to maximize their survival by tracking resources in the environment and displayed the potential for avoiding future inbreeding by suggesting an ability to recognize close relatives. We combined the juvenile survival data and related data and modeled the population using a stage matrix which estimated annual growth rates between 4% and 8%. Our results support the hypothesis that anthropogenic resources contribute to increasing raven numbers at least in part due to increased juvenile survivorship and recruitment.

Breeding population and feeding habits of the Raven *Corvus corax* in Wigry National Park (NE Poland)

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In 1989-1996, 22-26 pairs of ravens bred in Wigry National Park (150 km^2). Mean density was 15.9 pairs per 100 km^2. Nests located in woodlands were placed, on average, 0.3 km from the forest edge (range 0-1.6). Average size of the breeding territories was 2.6 km^2. Forest pairs of ravens built nests only in pine trees (100-160 years old), and those nesting in open areas constructed their nests on pylons. Eighty-three percent of broods were successful. Production of young was 3.2 per successful pair and 2.4 per breeding pair. In the diet of ravens, 39 species of animals, eggs of 5 bird species, and 6 species of plants were recorded. The most important food was carrion of mammals and birds with body masses >300 g, domestic animals, large forest mammals, and fish (in total 75% of food biomass and 40% of items). The second major food category was small mammals captured by ravens. The mean body mass of prey (carrion excluded) was 25 g, and prey with body mass <50 g accounted for over 90% of items. Ravens foraged mainly in open areas. About 80% of prey originated from fields. The share of food biomass collected and captured in open areas varied from 48% in territories located in the forest interior, to 100% in those located in open areas. Utilisation of lakes and forests as feeding grounds increased with a higher proportion of those habitats in ravens' territories. Food niches of ravens overlapped strongly with those of the hobby, the buzzard, and the lesser spotted eagle, and only slightly with the food niches of the red and black kites.

The Piagetian object permanence in European Jays (*Garrulus glandarius*)

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Object permanence in European Jays (*Garrulus glandarius*) was investigated using a version of the UZGIRIS & HUNT (1975) scale. Twice a week, four jays were tested individually in physical and visual isolation from their cage-mates. Testing began when the animals were about 2-3 months-old. The four birds completed all the scale tasks of UZGIRIS & HUNT (1975) within 3-4 months. "A-not-B errors" were never observed. The evidence of achieving Piagetian Stage 6 competence in this species was clear in all the subjects tested.

Key words: object permanence, birds cognition, corvids, jay