

RSPCA Wildlife Rehabilitation Protocol: Crows

RSPCA

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Fledgling magpies at RSPCA West Hatch Wildlife Centre
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Protocol for the rehabilitation of the bird group
CROWS
(family Corvidae)

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1 Introduction

The RSPCA's Wildlife Centres and the Wildlife Department have prepared a series of husbandry protocols for the different species that are admitted to the Wildlife Centres.

The protocols have been produced by amalgamating the working practices from each centre into one document which has then been discussed at a workshop before being agreed by RSPCA staff. Any areas where agreement cannot be reached are then highlighted as areas for future research.

Where possible, an expert (from outside the RSPCA) on the behaviour and ecology of the species in question was invited to attend these workshops so they could offer advice and comment.

These protocols are based on the experience and knowledge of our wildlife centre staff and are supported by research demonstrating their success. They are subject to review and updates will be added as and when required. New protocols will also be added over time.

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Notes:

Areas highlighted within the text are areas that require further research or further clarification.

All dimensions and weights are in metric units.

All area measurements are for length x breadth x height (L x B x H).

2 Species information

2.1 Species or group of species covered by this protocol

This protocol will cover seven species of crow that are admitted to RSPCA centres:

English name	Latin name	International name
Jay	<i>Garrulus glandarius</i>	Eurasian jay
Magpie	<i>Pica pica</i>	Eurasian magpie
Jackdaw	<i>Corvus monedula</i>	Western jackdaw
Rook	<i>Corvus frugilegus</i>	
Carrion crow	<i>Corvus corone</i>	
Hooded crow ¹	<i>Corvus cornix</i>	
Raven	<i>Corvus corax</i>	Northern raven

Table 1: Species covered

Other species that occur in Britain and not listed in Table 1 but are within the same family (corvidae) are the nutcracker *Nucifraga caryocatactes*, and the chough, *Pyrrhocorax pyrrhocorax*. Although never recorded on the Wildlife centre's intake the chough may be a potential "casualty" as its range is beginning to increase in south Wales and southwest England.

Note: While the hooded crow is listed as a separate species its captive care regime will be covered by that provided here for the carrion crow.

2.2 Identification of main species covered by this protocol

Adult

Jay

The jay is the most colourful of the Western European corvids. Rich brownish-pink back, chest and belly; black and white streaks on head, black moustache, white rump and vent and black tail feathers. The wing shows a distinctive blue and black patch on leading edge, primaries are black and secondaries are white. The bill is dark brown (horn coloured) and the legs pale brown. The irides are bluish-white or pearl-grey with a faint brown inner ring.

Magpie

A distinctive black and white bird with a long wedge-shaped tail. The white shows around the belly and across large wing panels. The bird is glossy black over the rest of its body with wings showing purple and green in different lights. The tail is basically glossy black but in different lights it shows graduation from bottle green to an almost purple sheen towards tip. Bill and legs are black. The irides are dark brown.

Jackdaw (Pictured right)

The bird is black with a grey nape. It is often noted as having a dull grey breast tracing back to the vent. The legs and beak are black. The irides are pearl grey and very distinctive. Adults moult their wing feathers in June.



Adult jackdaw

¹ The British Ornithological Union (BOU) recognises the hooded crow and the carrion crow as separate species. See BOU website at <http://www.bou.org.uk/recbrlst1.html>.

Rook (Pictured right)

The adult rook has highly glossy black plumage with white (bare) cheek patches and “baggy” trousers, both features distinctive of the species. The bill is more slender than other corvids. The irides, bill, legs and feet are all dark brown.



Carrion crow

A highly glossy black bird without the adult rook’s bare face patch, and, by comparison, a heavier bill. The bill, legs and feet are black while the irides are dark brown.

Hooded crow

The “hoodie” is similar to the carrion crow in all aspects except that it has a clear grey nape, back and belly. The wings, head and tail are black.

Raven

A large black corvid that is 30 – 35% bigger than the rook or crow and, when seen in the field, almost as big as a buzzard! Back feathers glossy black showing green, purple and iridescent blue according to the light and the reflection from different areas of the body and wings. Noticeable heavy, sturdy black bill and “shaggy” throat feathers. The irides are dark brown.

Adult Rook

Young

Jay

- Down is completely absent on hatching.
- Inside of mouth pale pink and without spots.
- Brooded for up to 15 days by both parents.
- Fledge around 21 – 22 days at which time they have adult plumage but are downy around head and have fluffy underparts.
- Bill slate grey with blackish tip and pinkish white flanges.
- Young ceased to be fed by adults at 6-8 weeks.

Magpie

- Down is absent on hatching.
- Mouth is a deep flesh pink and the base of tongue and palate shows small white spurs.
- Bill has flesh-pink flanges.
- Feather pins appear at around 10 days and open at 17 days.
- Fledge in about 22 – 27 days.
- On fledging the plumage is similar to adults but more brownish and less glossy but tail is shorter.
- Recently fledged young may roost close together, often in contact.
- Young independent at around 70 – 80 days old

Jackdaw

- Down absent on hatching skin pink but becoming blackish as feathers develop.
- Eyes start to open at about 8 days and fully open by day 11.
- Brooded by ♀ until day 11.
- Fledge after about 34 days.
- Yellow gape flanges disappear about 10 days after fledging.
- Young usually independent about 5 weeks after fledging.
- Irides grey-blue at fledging; by autumn iris fully brown then changing over time until fully pearl-grey by the second calendar year.

Rook

- At hatching the bare skin is brown then fades to a dark purpleish hue.
- The down is short & sparse and the colour is mostly dark grey.
- Incubation by ♀ alone for 16 -18 days.
- Young remain in nest for 30 – 36 days.
- Irides at fledging light grey-blue; completely brown iris colour attained during first autumn.
- Often shows a white patch of feathers just below the beak on the chin.
- Fed by both parents for about 6 weeks after fledging.
- Longer and paler beak than crow.
- Beak tapers gently to the tip.
- The feathers around the nares are often retained until the spring of the following year.



Figure 1 Juvenile rook

Carrion crow

- Down absent, skin pink becoming yellowey-green by day eight.
- Gape flanges yellowish pink.
- At fledging irides are greyish.
- Young remain in nest 30-34 days.
- Dependant for several weeks after leaving the nest.
- The young can feed themselves on leaving the nest and are usually independent from about 5 weeks old.
- Noticeably “chunkier” beak than that of the rook.
- Beak curves strongly downwards towards the tip.



Figure 2 Juvenile carrion crow

Raven

- Largest of all the corvids and of course this size will be reflected in the size of the young.
- Short, mousy coloured down but thickly distributed.
- Purple-pink almost red inside mouth.
- Pale yellow flanges to the edge of the beak.
- Brooded by ♀ alone for up to 3 weeks after hatching.
- Fledges at around 45 days although the young may not always be able to fly.
- May not be totally independent until almost 6 months old.
- Irides dove-grey in nestling only achieving adults brown some months after leaving nest.

2.3 General information on species (or group) as relevant to care in captivity

Jay

- Resident however, winter numbers are increased by migrants from the continent due to food shortages within their home ranges.
- Rarely far from woodland and prefers deciduous trees.
- Most arboreal of all the Corvidae.
- Known to bury (cache) food - mostly acorns.

Magpie

- Resident.
- Usually associated with hedgerows and small copses where it can gain quick access to open fields.
- Today can be found more and more in urban situations.
- Feeds mainly on the ground.

Jackdaw

- Resident.
- Frequently found around human habitation often nesting in chimneys and roof spaces of houses.
- Feeds in fields and other open grasslands but prefers nearby trees, cliffs or buildings.
- *Pair for life*. If a pair-bond lasts for more than 6 months then a lifelong partnership is established and that pair will stay together for life often visiting the nest site as a pair.
- High use of grit both for food processing and providing mineral supplements¹.

Rook

- Resident, although there may be some migration into and from the continent with younger birds travelling further than the adults.
- A bird of farmland with enough trees for nesting.
- Avoids open moorland, and heavily wooded areas.
- Forages almost exclusively on the ground favouring ploughed fields and pasture. Digs frequently with its bill for grubs under the soil.
- Roadsides are also favoured places where these birds look for insect road-kill.
- Occasionally caches food.
- Acorns provide a high-energy food.

Carrion crow

- Resident and rarely found far from site of ringing.
- Found in an extremely varied range of habitats from coasts to mountains and urban sites to remote islands.
- Feeds mainly on the ground.
- May bury (cache) food items.
- Uses dropping items onto anvil to extract food e.g. mussels and walnuts.
- Will cache food.
- Over half food taken is animal protein the remainder is grains, cereals fruits roots etc.
- The carrion crow is found throughout England and Wales whereas the hooded crow may only be found on higher ground in the far north of England increasing in density the further north they are found. The two species may interbreed and produce fertile young.

- The Carrion crow distribution is expanding slowly to the north and west. This spread is thought to be linked to climate changeⁱⁱ

Raven

- A bird of the more remote areas of Britain and may be seen in a variety of locations. Much prefers cliff nesting locations both on the coast and inland, although it will regularly use trees.
- A range of feeding methods is applied and may involve predatory and scavenging techniques as well as foraging and grazing.
- Adults roost away from the nest very soon after the young have hatched.
- Out of breeding season large roosts may be found – often of over 100 birds in popular areas.
- Fledge in 5-6 weeks.

2.4 Notes on environmental enrichment

- Almost all the members of this group of birds have a tendency to hide objects, including food. Consideration of this behaviour should be made when planning environmental enrichment.
- All of them are intelligent and inquisitiveⁱⁱⁱ.
- The ability to make simple tools has been demonstrated in wild crows^{iv}.
- They show “handedness” preferring one side of the bill to another to manipulate items^v & ^{vi}
- Hiding food and allowing them to find it has shown the logical powers of these birds.
- Magpies and others are often noted as using water to “dunk” food items in water before consuming them. This occurs in captivity but its importance in the wild is unknown. (See entry for magpie in Crows of the World - 1986.)

3 Pre-admission treatment.

This part of the protocol is to provide information for telephone queries regarding the species and their rehabilitation, prior to receiving the bird(s) at an RSPCA Wildlife Centre. There are two possible scenarios:

- i. A member of the public is reporting a sick/injured/orphaned member of this family of birds and wants further information as to what to do.
- ii. Prior to admission, some animals may be held at a veterinary surgery or other facility. Some, if not all, of these facilities may request information on care of the animal, before they send it to an RSPCA centre.

Does the bird need to be admitted? Try to determine if the bird needs treatment, if it can be treated on site or left alone?

NOTE: in all cases ensure that the bird is really in need of care. Consult the Society's "Leave me Alone" campaign material. However, any grounded bird from this group of any age will be in need of care.

3.1 Information should be collected on the following:

- a) Species.
- b) Extent of injuries, evidence of shock.
- c) Body condition, any previous injuries.
- d) Age of animal cygnet or adult.
- e) Location animal was found (important for the animal's future release).
- f) Ringed or not ringed.
- g) All records of previous treatment (if from another establishment).

3.2 Advice related to care, e.g. diet, provision of heat etc.

- Diets – see below
- Once warm keep at room temperature.
- Keep good ventilation.
- Keep adults on their own in separate boxes
- Young of the same brood may be housed together.
- Keep away from predators including cats and dogs.

3.3 Advice related to the treatment of particular problems.

Advice should be given regarding Society policy relating to the rehabilitation of permanently disabled casualties. Disabled casualties include those that show unusual behaviour, are tame in any way or show any tendency towards aggression to humans. See section 8.1.1 on page 19.

3.4 Advice regarding the fitness of the animal for transport.

- Ensure birds are adequately hydrated before travel.
- Standard RSPCA pet carriers (45 x 35 x 25cms) are suitable containers for holding individual adult crows.
- The tail of the adult magpie may prevent it being carried in the standard cardboard RSPCA pet carrier and an alternative carrier should be used. The fluted polythene pet carrier laid on its side may prove suitable for the magpie.
- Ensure there is sufficient space to prevent (further) injury during transit.

4 Health and Safety

4.1 Introduction

The RSPCA has developed the Wildlife Centre Protocols to provide guidance and advice on the keeping of certain species of wild animal for rehabilitation. Anybody who intends to treat sick, injured and/or orphaned wild animals must accept that there are risks in doing so. Some wild animals are potentially dangerous and may be capable of causing serious injury. Furthermore, all wild animals have the potential to carry parasites, disease and bacterial infections. Some of these may be passed to humans (zoonoses) or to other animals, either domestic or wild. Barrier nursing methods should be used to minimise the spread of these infections between animals.

4.2 Risk assessments

It is recommended that any establishment admitting corvids should complete risk assessments for all areas.

This is a brief summary of some of the possible risks and suggested ways to reduce the effects.

Members of public are advised to use gloves or a suitable alternative (e.g. towel) when handling corvids and to keep dogs etc away from injured wildlife.

Hazards	Control measures	Level of risk
Bites and scratches	Gloves to be used when restraining	Low
Diseases/Zoonoses	Gloves should be worn when handling Treatment areas must be cleaned thoroughly after examination	Low
Parasites	Gloves should be worn when handling	Low

5 Decision making – to treat or not to treat

5.1 Information should be collected on the following:

- a) Species
- b) Extent of injuries, evidence of shock
- c) Body condition, any previous injuries
- d) Age of animal,
- e) Location animal was found if it is to be released
- f) All records of previous treatment (if from another establishment)

5.2 Triage

Options for the animal are: euthanasia, treatment or immediate return to the wild. The considerations listed below will help to guide this decision.

5.3 Assessment relevant to the condition of the animal

Eggs will not be accepted for hatching.

Euthanasia is recommended for animals showing the following.

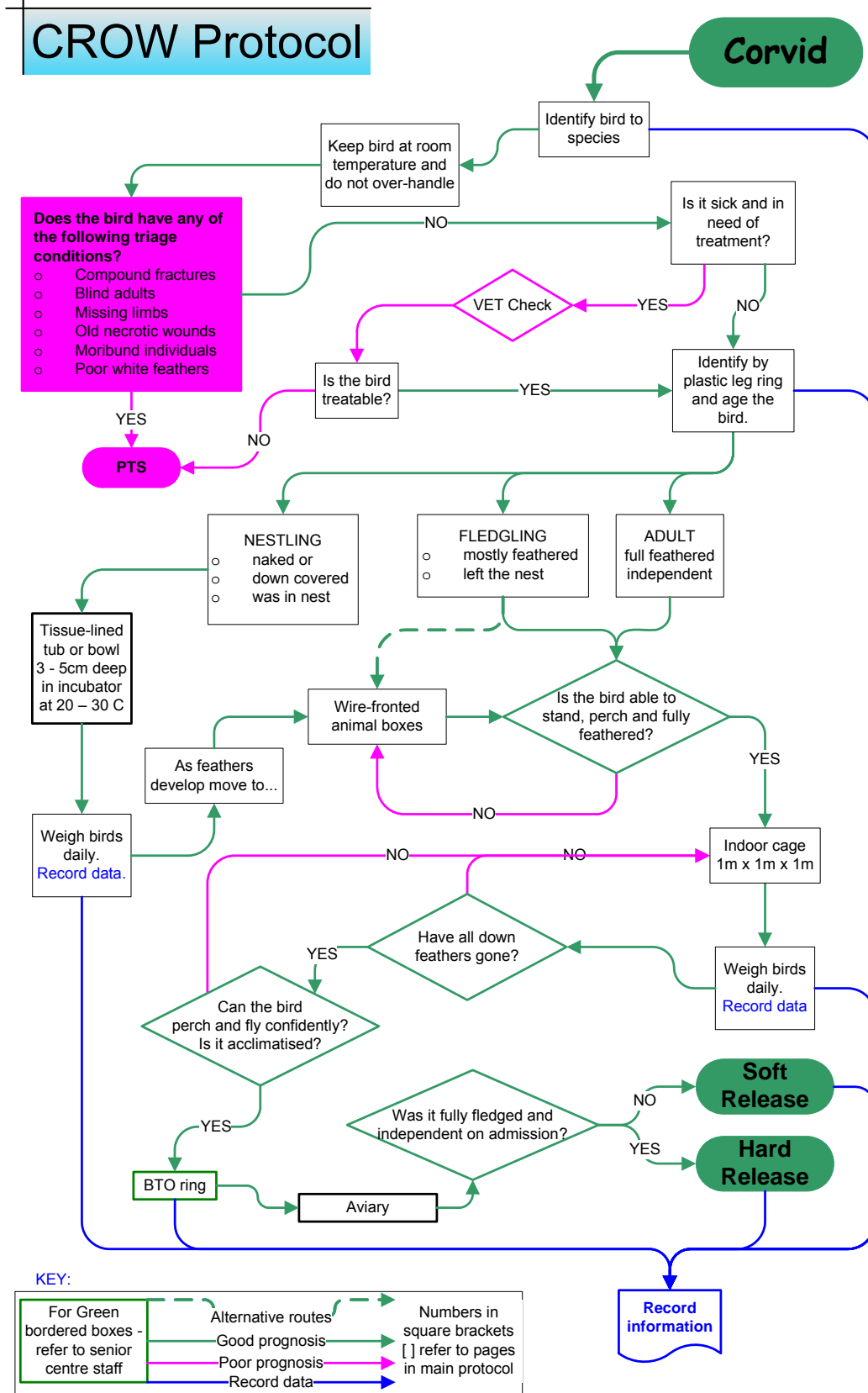
- Imprinted individuals may not be accepted for rehabilitation or if accepted may be PTS.
- Compound fractures (including exposed bones).
- Blindness.
- Missing limb.
- Seriously damaged, overshot or undershot beak.
- Individuals that are *in extremis* or clearly moribund.
- Where feathers are of poor quality. See details below and Notes relating to feathers on page 18.
 - Stress marks in feathers leading to breakages and/or ragged edges to feathers.
 - ◇ Note: The reason for admission must also be taken into account in addition to the feather condition when making decisions.
- Carrion crows and rooks admitted with a number of white feathers in one or both wings may require euthanasia².
 - Note, however, feather quality and the structure of the plumage should be carefully considered. If there is poor quality and structure combined with other deleterious factors then euthanasia is recommended. However, a small number of white feathers within a plumage that has an otherwise good quality and structure has not been found to hinder the birds.

5.4 Assessment relevant to the Centre and the management of the animals

- Orphans are held in care for a mean time of 34 days before release.
- Most corvids prefer not to be housed individually. Pairs or small groups are preferred.
- **Individual identification via temporary leg ring may be necessary when groups are cared for.**
- Birds may be weighed when handled to monitor progress and development but bird numbers may prevent this.
- Gape worms can be a significant problem in jackdaws and young rooks. *Syngamus trachea* is the main parasite. See entry on earthworms at 7.2.5 on page 17.
- Defra's Wildlife Group of the Veterinary Laboratories Agency (VLA) is investigating a disease syndrome causing deaths in rooks and crows, which has been termed 'Corvid Respiratory Disease Syndrome'. *"Preliminary results indicate the involvement of Pasturella multocida and mycoplasma spp. and the pathological changes show similarities to those of fowl cholera in chickens."*^{viii}

² Evidence from the RSPCA Wildlife Centres database shows that where carrion crows or rooks have been admitted and a note has been made regarding white feathers (usually in the wing) the bird has not been released having either died or been humanely destroyed.

5.5 Flowchart



6 Accommodation

The progression from *Indoor 1* to *Indoor 2* to *Outdoor 1* to *Outdoor 2* represents the movement of an animal through the Centre as its condition improves. Not all of the categories will be applicable to all these species, their condition etc. The need for environmental enrichment should be identified and used wherever possible in each of the following sections.

6.1 Indoor 1 (Intensive care)

Enclosure

Nestlings

- Newly hatched and small sickly crows may be kept in incubators for four to five days.
- Jackdaws, being hole nesters, particularly like to hide in cardboard boxes or large, purpose-built nest boxes.
- Bowls are used for artificial nests, as the nestlings will defecate over the side keeping the feathers cleaner.
- Older birds are held in standard cardboard pet carriers or plastic variants of these boxes eg “*Voyagers*” or “*Skipppers*”.

Substrate

- All crows need a non-slip substrate – towels or sheets are ideal but *Astroturf* may be suitable.
- In incubators, newspaper covered with towels is suitable.
- Carpet tiles, camping mats or *Astroturf* can be used as alternatives for older birds in larger environments.
- Do not use hay, straw, shredded paper or similar materials these may tangle around legs and may even cause respiratory conditions.

Lighting requirements

- No additional lighting is required – room lighting is sufficient.
- Normal daylight hours are sufficient.

Temperature

- In boxes, suitably placed heat pads for small or sickly individuals provide a temperature gradient
- In other cases room temperature is generally adequate.

Ventilation

- Good ventilation is required at all times.
- Avoid draughts.

Humidity

- With raised temperature, humidity will be slightly raised.
- Ensure good ventilation to avoid stagnation of air.

Access to water

- Very young birds should not be allowed to bathe.
- A shallow pebble-filled bowl of drinking water or a drinking fountain may be provided.

Environmental Enrichment

- Contact with siblings or other similarly aged individuals.
- Twigs, leaves or clean egg-shells may be provided for older nestlings to manipulate and “play” with.
- Scattering dry foods may also stimulate pecking responses and or other activities.

6.1.1 When to move to next stage

- Nestlings are moved from incubators when they are approximately **5 – 7 days old**.

6.2 Indoor 2 (less intensive monitoring)

NESTLINGS:	INDEPENDENT, FULLY GROWN BIRDS (IMMATURES AND ADULTS):
<ul style="list-style-type: none"> • Intensive care cubicle 1m x 1.2m • 	<ul style="list-style-type: none"> • Different species will be kept separately. • Intensive care cubicle – 2 x 3m for up to 4 birds. • Note: jays may be best kept separately in these restricted areas

Table 2: Intermediate enclosures for before being moved outside

Substrate

- A non-slip substrate is essential in all areas.
- Clean sheets, large towels, *Astroturf* carpet tiles or soft camping mats placed over newspaper is adequate.

Lighting

- Natural daylight.
- Normal room lighting.
- Normal day length.

Temperature

- Heat lamps may be provided for smaller birds or sickly individuals in these areas.
- Normal room temperature for all others.

Ventilation

- Good ventilation is required at all times.

Access to Water

- Fresh drinking water must be available at all times

Environmental Enrichment

- To avoid dominance by an individual, provide a number and range of shallow food and drinking trays.
- Sticks leaves and a variety of substrates should be provided for investigation and “play”.
- Ensure water bowls are suitable as food may be “washed” prior to being eaten.

6.2.1 When to move from Indoor 2 (cubicle) to outdoor enclosure

- No bird should be on medication.
- When flight feathers are well developed.
- Good strong activity in getting around enclosure.

6.3 Outdoor areas are used for both primary holding and holding prior to release.

Decisions of whether a bird is fit for a move to an outside aviary should remain with an experienced/senior member of staff.

Enclosure

- An aviary providing sufficient area for straight flight and space to allow for controlled turns. A secure area for roosting and with sufficient perches to prevent conflict.
- The aviary is provided with three solid sides and one open wire with a roof part covered by wire and the rest solid to provide shelter.

Substrate

- A range of good, environmentally enriching substrates must be available but may create additional management problems, examples include grass, earth and gravel or a mixture of these.
- Concrete and gravel substrates must be kept clean.

Shelter

- Shelter is provided within the aviary design.

Access to Water

- Free access to bathing water *and* provision of fresh drinking water in shallow bowls.

Environmental Enrichment

- To avoid unnecessary dominance, provide many filled food bowls and drinking trays.
- Water bowls may be used for “dunking” food.
- A good range of perches both in number and size may need to be provided.

6.3.1 Outdoor enclosure to Release (or Release Pen)

Decisions of whether a bird is fit for release will remain with an experienced senior member of staff.

- All birds suitable for release must be clear of any veterinary treatment.
- The bird has been declared fit from a veterinary viewpoint.
- The bird’s weight is good and sustained.
- The condition of the feathering must be excellent.
- All birds should be able to fly well and may be released into established wild flocks.
- It has a suitable habitat to be released into.

7 Food and Feeding

7.1 Food in the wild

7.1.1 Adult

- See Table 3 below.
- Many species within this family will cache food for later consumption. The jay particularly caches acorns sometimes in very large numbers for winter food.
- All species will take a variety of foodstuffs but the proportion of vegetable matter to animal protein differs significantly during the yearly cycle and between species.
- Insects will be taken during the spring and summer months while more vegetable matter will be taken during the rest of the year.
- For a detailed overview of the diets of jackdaw, rook and carrion crow see the paper by Lockie 1956^{viii}.
- The rook and chough will probe the soil with their beak shut then while underground will open it and take grubs and worms from the opened hole.
- Many of these species will actively look under drying cowpats and search out grubs, flies and beetles from beneath them.

Species	Foods
Jay	Vegetable matter makes up around $\frac{3}{4}$ of the adult jays' diet including acorns (particularly important during the winter), peas, potatoes, corn, fruit and berries. Animal food includes a high proportion of beetles and lepidoptera and their larvae (caterpillars), insects, earthworms, slugs and snails and occasionally eggs and small birds.
Magpie	Insects make up the greater proportion of the magpies' diet but it will take a wide range of foods including carrion and small birds as well as their eggs. Grains, fruits, vegetables, molluscs and earthworms are also taken.
Jackdaw	About $\frac{3}{4}$ animal protein and the rest is vegetable matter. Beetles make up most of the animal protein. Will however, take a wide range of foods including eggs, carrion, earthworms and frogs. Vegetable matter includes grain, fruit, and seeds.
Carrion/hooded crow	Primarily carrion of mammals and birds but will take amphibians and a range of insects. Grains will also be taken as will fruits, vegetables and various seeds
Rook	Over half the food intake is vegetable matter consisting of grains, fruits and roots; potatoes are a favoured food in season as are peas and berries. Animal protein is mainly taken as earthworms but a range of insects is also taken (especially at roadsides). Earthworms and leatherjackets in season are more important to adults than young.
Raven	Carrion of all kinds; mammal, bird, reptile, amphibian and fish depending on the bird's normal habitat. Will also take a range of (larger) insects especially beetles and some vegetable mater in the form of grain, acorns, seeds etc.

Table 3: Diet of adult corvids in the wild.

7.1.2 Young

Species	Foods
Jay	A range of insects is provided similar to that of the adults, however a very high proportion of caterpillars is taken as a nestling but almost no vegetable matter.
Magpie	Almost exclusively insect larvae but earthworms and some vertebrate animals are included. Small amounts of vegetable matter are occasionally recorded. About 20 - 27gms food taken daily at age around 16-20 days
Jackdaw	Nestling food consists almost entirely of invertebrates. The nestling takes about 10gms of food on day 1; 133gms on day 24; falling to 80gms on day 35. The young are fed and supported for 4 week after fledging and the family bond is severed after about 5 weeks.
Carrion/hooded crow	Majority of nestling food is beetle larvae followed by a range of diptera. Occasionally a small amount of grains and other plant material is consumed. About 14gms of food required at fledging.
Rook	Over half the nestling food intake are earthworms the remainder being beetles and a variety of diptera. Energy requirements 1-5 days 230kJ; 16-20 days 460kJ; 26-30 days 500kJ.
Raven	Diet much the same as the adult. Food brought to the young in the adult's throat pouch is often moistened with water.

Table 4: Diet of young corvids in the wild.

7.2 Captive diet

7.2.1 Adults

- Chicks (occasionally chopped), mixed corn, *Prosecto*, mealworms
- Jays will take a proportion of peanuts and acorns in season.

7.2.2 Young

- Chopped chick, *Prosecto*, mealworms
- Moistened dried puppy foods

7.2.3 Frequency of feeding

Adults and young

- Food provided *ad libitum*.
- Freshened at least twice daily.

7.2.4 Supplements

- Vitamin/mineral supplements (SA37) may be used where necessary.
- Grit is important for all speciesⁱ and should be supplied *ad libitum*.

7.2.5 A note on earthworms

Of all the corvids the rook and jackdaw feed on earthworms to the greatest extent. As a result, they are more prone to severe infections of tracheal worms notably *Syngamus trachea* or gapeworm^{ix}. The young - being smaller and fed on a protein-rich diet can be more susceptible to the condition which in severe infections can restrict the trachea so much it reduces the birds ability to feed leading to starvation.

Most birds show no sign of infection but respiratory distress is a clear clinical sign with birds opening their mouth widely and gasping. Coughing may follow as the worms irritate the trachea.

The life cycle of the worm depends on earthworms, slugs and snails as intermediate host, moving from birds to invertebrate via droppings. There is no practical method to control the worm in wild populations but where earthworms are fed to captive animals ensure they are supplied from reputable suppliers or

from wormeries that are covered and protected from the faeces of potentially infected animals. See also the article by Pennycott^x.

7.2.6 Environmental Enrichment

- All the corvids require some form of environmental enrichment.
- One of the easiest forms of enrichment is food scattering.
- Hiding food and providing puzzle feeders will benefit longer-term casualties.
- Provide facilities to allow the birds to hide or cache food.

7.3 Notes relating to feathers

7.3.1 White feathers

White feathers in the otherwise totally black plumage of rooks and crows appear to be related to the reduced deposition of melanins that are responsible for the black colouration. It has also been shown that those feathers with reduced melanin are more susceptible to wear and breaks than those with a normal deposition^{xi}.

7.3.2 Fret marks

Fret marks³ show in feathers as lines across the vane they may also show as ragged breaks, splits and “cuts” in the edges of the feather - see photograph below. These abnormalities are caused by



Figure 3: A feather with fret marks

inadequacies in the diet while the feather is growing. The result may be a significant flaw in the feather frequently leading to breaks across the line of weakness. These conditions are of particular concern when found in one or more of the following feather groups; primaries, secondaries or tail feathers. Where a number of feathers are affected – which is the usual case – flight, for example, may be severely affected or made impossible.

7.3.3 Feather quality

Both poor quality white feathers and fret marks may be caused by deficiencies in diet, stress or both. Work on birds of prey and species of passerine bird have shown that poor diet during the growth of the feathers either while the bird was in the nest or during normal moult can cause weak feathers and poor plumage. Further, it has been shown that handling stress both of birds in the wild^{xii} and in captivity^{xiii} can also induce fault bars. Both (or either) can result in an overall lack of quality in the bird's plumage. It may lack lustre and iridescence, the colour may be poor and there may be a general dishevelled look to the bird. The feathers may feel dry and “straw-like” and the feather edges look worn and tatty. The plumage may also contain broken and bent feathers.

³ This condition may also be referred to as ‘*fault bars*’, ‘*subordinate bars*’, ‘*growth bars*’, ‘*stress bars*’, ‘*hunger trace*’, ‘*hunger faults*’ or ‘*hunger streaks*’.

8 Preparation for release

8.1 Training the animal for survival

A good range of environmental enrichment provided through its time in care will benefit the birds' release to the wild and their long-term survival.

8.1.1 Imprinting

This group of birds is known to imprint on humans easily. This often results in unwelcome behaviours towards people such as attacking them and generally being seen as menacing. At best, such behaviour means an unwelcome press for the species, at worse the death of the individual. Keeping human contact to a minimum while in care and providing a range of good environmental enrichment will significantly reduce any potential to become imprinted or "tame".

8.2 When to release

- A morning release gives the bird/s time to find food, shelter and orientate themselves before dark.
- Windy days are best avoided, as birds need to establish themselves before flying off.
- The weights of wild corvids are listed in Table 5. Most individuals of these species do vary considerably in weight throughout the year. For example most females will be heavier just before the breeding season and males tend to put on weight towards winter and occasionally may even exceed the upper weight range provided here.

	♂♂	♀♀
Jay	168 – 180gms	158 – 166gms
Magpie	235 - 250gms	210 – 220gms
Jackdaw	256gms	232gms
Rook	489 – 500gms	432gms
Carrion crow	489 – 500gms	452 – 523gms
Raven ⁴	1150 - 1380gms	800 - 1200gms

Table 5: Weights of wild corvids

8.3 Where to release

- Adults should be returned to the site of finding providing it is suitable. Where sites are unsuitable they can be released into the nearest well - established flocks.
- Jays tend to flock less although groups may be seen at favoured feeding areas. Jays may be released as individuals.

8.4 How to release

- Soft release
 - ➔ Jackdaws are regularly soft released with a few birds returning for support feeding.
 - ➔ Rooks are soft released into a small rookery at dispersal time.
- Hard release
 - ➔ Release into known roosts or other communal areas but avoid releasing rooks into a busy rookery.
 - ➔ Crows may be released at landfill sites (with appropriate permissions where necessary).
 - ➔ Jays are highly reliant on acorn crops for autumn food - deciduous woods with plenty of mature oaks are advised as a release site.
 - ➔ Ravens are more common around coastal areas, although large roosts are well known and may be ideal for the release of hand-reared birds.
 - ➔ Many corvids are territorial, ensure release of hand reared birds is undertaken during times of natural dispersal.

⁴ In exceptional cases the male raven may be up to 1560gms and the female to 1315gms.

8.5 Information taken prior to release

- Weight and basic biometrics may prove to be useful data.

8.6 Tagging for later identification

- All temporary ID must be removed.
- No rehabilitated or captive-bred corvids should be ringed. Permission to fit rings may, in certain circumstances, be granted by the BTO. (See BTO Ringer's Manual^{xiv})

9 Areas for research

- Jackdaws are to be radio tracked after being soft and hard released.
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10 Annexes

10.1 Glossary

♀; ♀♀	Female; females
♂; ♂♂	Male; males
ad libitum	Free feeding; free access to food.
Biometrics	Measurements taken to provide greater detail on the biology of birds. Data includes: plumage, size(s) and condition. Further detail can be found in the <i>Ringers' Manual</i> ^{xiv} .
BTO	British Trust for Ornithology
BWP	A book – The Birds of the Western Palearctic. See Bibliography on page 21.
Cache	To store food for later consumption usually buried underground.
Cm	Centimetres
Coverts	Structure feathers on wing.
Diptera	Two-winged insects; e.g. flies, crane flies, daddy-long legs, etc.
Fret marks	A line of weakness across the feather usually caused by deficiencies in the diet during the feather growth period. See Notes relating to feathers on page 18.
Gms	Grams
ID	Identification
Irides	Plural of iris. A part of the eye.
Kg	Kilograms
Lepidoptera	Butterflies and moths
M	Metres
ml	Millilitres
mm	Millimetres
Primaries	The <i>primary feathers</i> (q.v.) of the wing. These are the long flight feathers borne on the digits at the distal end of the wing.
Primary feathers	Major flight feathers – usually the longest feathers on a bird's wing. (q.v. <i>primaries</i>)
Secondaries	A group of feathers borne on the forearm (ulna).

10.2 Products named in the text

Astroturf	A brand of artificial turf. Usually made from plastic and rubber with additional fibres for realism.
Complan	A whole-food dietary supplement – widely available. <i>Complanfoods Ltd., Imperial House, 15-19 Kingsway, London WC2B 6UN.</i>
Lectade	An oral rehydration preparation available either in liquid or powder forms. Available from most good pet stores.
SA37	A complete vitamin and mineral supplement. <i>Intervet UK Ltd, Walton Manor, Walton, Milton Keynes, MK7 7AJ.</i>
Zoolyte	A water soluble oral rehydration and probiotic supplement. <i>International Zoo Veterinary Group, Keighly, N Yorkshire, UK</i>
Prosecto	A pre-prepared insectivorous food with crushed dried insects and a range of other foods bound together with oils and baker's honey. <i>JE Haith Ltd., 65 Park Street, Cleethorps, N E Lincolnshire, DN35 7NF</i>

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