

Foraging signs and cavities of some European woodpeckers (Picidae): Identifying the clues that lead to establishing the presence of species

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Abstract: This paper examines the subject of the foraging and feeding signs and holes and cavities that European woodpeckers produce. The role that identifying such signs can play in establishing which woodpecker species are present in a given area is discussed. Both diagnostic and non-diagnostic signs are presented, many with associated photographs. The pitfalls of the misinterpretation and hence mis-identification of some of the non-diagnostic signs that woodpeckers produce are also outlined.

Key words: woodpeckers, Picidae, signs, cavities, holes, foraging

Introduction

Identifying the clues that wildlife leave to their presence is not an exact science. However in the absence of the animal, it can be a very useful tool in establishing which species occur in an area. The art of tracking wildlife has traditionally focused on mammals, with birds usually located by sight and to a lesser extent sound. Nests, eggs, feathers, pellets and droppings are the most obvious evidence that birds leave to indicate their occurrence but, as a group, birds leave relatively few discernible traces of their activity. Yet the breeding and feeding activities of woodpeckers, results in many signs which can be examined (GORMAN 1995b). In periods when woodpeckers are not vocal, these signs can be useful clues that indicate whether or not an area is inhabited by these birds. Signs include various cavities, cavity entrance sizes, location and position and a range of markings on trees from foraging. Autumn and winter are particularly good seasons in which to search for these signs, as many trees are defoliated and hence evidence of foraging and cavities are easier to locate.

Woodpeckers signs (indeed all the signs left by wildlife) are best interpreted when the ecological context, habitat niche and niche partitioning, is understood and considered. A careful examination of woodpecker excavation and foraging signs can be an important tool in helping to establish woodpecker occurrence, although some signs can be difficult, if not impossible, to accurately assign to a particular species. Within European forests up to eight woodpecker species can occur together. But despite such sympatry, it

is often possible, with experience, to identify to a group the species which have produced any signs found using a knowledge of the local habitat factors including tree types and age, cavity dimensions and even the sizes of bill marks on timber. However, some of the evidence left by woodpeckers is diagnostic, that is, unique to a particular species.

Ten species of woodpecker (Picidae) are resident in Europe. The following nine species are discussed here: Lesser Spotted Woodpecker *Dryobates minor*, Middle Spotted Woodpecker *Leiopicus medius*, White-backed Woodpecker *Dendrocopos leucotos*, Syrian Woodpecker *Dendrocopos syriacus*, Great Spotted Woodpecker *Dendrocopos major*, Eurasian Three-toed Woodpecker *Picoides tridactylus*, Black Woodpecker *Dryocopus martius*, Eurasian Green Woodpecker *Picus viridis* and Grey-headed Woodpecker *Picus canus*. These woodpeckers belong to a wider avian foraging guild in Europe's woodlands that includes treecreepers (*Certhia*) and nuthatches (*Sitta*). Members of this guild forage in similar ways such as probing bark and gleaning foliage and buds, but woodpeckers are unique in being able to bore deeply into wood.

Cavities

Woodpeckers have evolved the anatomy and skills to excavate deep nesting chambers and foraging holes in trees. In Europe, some tit species excavate nesting holes in trees, but the vast majority of cavities in the continent's woodlands and forests are made by woodpeckers. As primary-cavity makers, woodpeckers create

their own holes, whereas most of Europe's cavity using birds are secondary nesters, taking advantage of the woodpecker holes but unable to excavate them themselves. Cavities are the most obvious signs that woodpeckers leave to reveal their presence. Some are used as nesting sites, others as roosts while a few can be used for both. In any given area there will be a mix of active, unused, abandoned, usurped and unfinished cavities. Cavities are often in clusters, where several holes exist in adjacent trees with some individual trees in a cluster containing several holes. Individual cavities in these hole-centres can be used as nests, roosts, used by other species, or are unused.

Woodpeckers generally excavate cavities in living trees, although completely dead trees and snags are sometimes chosen. Trees that are externally solid, but soft at the core (due to heart-rot and/or invertebrate activity) are favoured. The trunk or branch must, of course, be large enough to house a chamber. Climate and elevation also play a part. For example, in the north of Europe, and at high elevations, woodpecker cavities are more often in coniferous trees, whilst in the south, and at low elevations, mainly deciduous species are selected (pers. obs.).

Nesting cavities

Europe woodpeckers excavate nesting cavities in spring (March to May depending upon prevailing weather and location). A wide selection of tree species are used for nesting. In fact, all of the naturally occurring and suitable non-native tree species may be used. Most woodpeckers make several nesting cavities each year and it is not uncommon for excavation work to begin and then be abandoned: sometimes work stops although a cavity is almost complete. There are usually several of these partly excavated cavities and as a result a tract of woodland or forest can contain several apparent cavities, which upon inspection prove to be just a few inches deep. Unfinished cavities may be revisited and completed later, sometimes in the following spring. Occasionally, a cavity can be worked upon for several years, being excavated a little more in successive springs before final completion.

The nesting cavities of some woodpeckers are often easier to ascribe to a species than their feeding signs. Entrance holes can often be identified based on size and shape. Generally, the diameter of an entrance hole to a woodpecker nesting cavity matches that of the body of the woodpecker that created it. Presumably, this is to minimize access to the cavity chamber by predators larger than themselves and of course energetic demands are such that there's no benefit in working harder than necessary. Hence, a knowledge of the relative sizes of

adults of each species aids the identification of cavities where the creators/are not seen. Old entrance holes can narrow over time as the tree grows around them and the rim of the hole curls inwards and these can be mistaken for natural tree cavities.

Roosting cavities

Woodpeckers rest and sleep in cavities. Many roosting cavities are actually former nesting cavities but some, which are specifically intended to be roosts, are also excavated. Cavities intended as roosts can be made at any time of year (GORMAN 2010bc). The time spent on excavating roosting cavities is less than that spent on making a nesting cavity, days rather than weeks, as it seems a cavity of lesser quality is acceptable as a roost. However, to the human eye at least, the characteristics and dimensions of nesting and roosting cavities do not differ significantly.

Foraging cavities

Some holes in trees which woodpeckers make when foraging might be mistaken for nesting or roosting cavities, however such holes actually differ significantly. Most importantly, they do not lead into a chamber. Foraging holes will also invariably be irregular in shape and have rough peck marks around their rims, whereas entrances to nesting cavities are more uniform and precise. Feeding holes are also often low down on trees, even at ground level, whereas most nesting cavities are located at some height.

Wood debris

During cavity excavation woodpeckers must dispose of sawdust and wood-chip debris. During the initial stages of opening a cavity entrance, wood fragments simply fall to the foot of the tree or are flicked away. Later, when inside the tree sawdust is carried to the entrance and thrown out. Debris is not carried away from the site and so accumulates below the tree or stump. The size of wood-chips can indicate which species was at work: those over 5cm long are almost always the work of Black or Eurasian Green Woodpeckers.

Holes in structures

Woodpeckers will make holes, and occasionally nesting and roosting cavities, in wooden houses, log cabins and other man-made structures such as utility poles. Even timber coated in wood preservatives is sometimes hacked into. Woodpeckers will also bore into other materials such as foam board insulation. A shortage of dead trees locally may be a reason woodpeckers turn to man-made structures. In addition, soft insulation materials can be attractive to woodpeckers as they are

easier to excavate than trees and are often hollow inside. The reasons for this behavior may be varied and are likely to include foraging for prey, such as Carpenter Ants, Carpenter Bees and various wood-boring beetles that can reside within timber walls, while insulation material is occasionally excavated to create roost holes. Unsurprisingly, such activity can create conflict with people, especially when new homes are attacked/affected. Across Europe Great Spotted and Syrian Woodpeckers (and to a lesser extent Grey-headed Woodpecker), are frequent culprits responsible for drilling into man-made structures. In some regions (particularly Scandinavia) Black Woodpeckers which are known to bore their large, oval holes in buildings can be legally culled in an attempt to prevent damage.

Foraging and feeding signs

Collectively woodpeckers are one of the best bird families in terms of the foraging signs they leave. Besides cavities proper, a range of holes, marks and debris often betray foraging sites. Much foraging work cannot be identified to particular species and may have been visited by different bird and mammal species resulting in an assortment of markings, but some signs are species specific. Wood-chips produced by Black Woodpecker when foraging at tree stumps can be 10cm long and no other European species produces such large chips. The size of chips is related to the structure of the wood; whether it is long or short-grained and dependent on how densely fibrous it is. Peck marks around large holes at tree bases, stumps or in logs indicate a woodpecker, whereas claw, paw or hoof marks indicate a mammal.

Unsurprisingly, different species occupy different feeding habitat niches. These range across heights and diameters of trees (from the canopy to the ground), foliage, twigs, snags, bark, stumps, logs, turf and soil. A variety of prey is sought by different species and is foraged using a range of techniques. Terms such as hacking, digging, boring, pecking, chiselling, stripping, prising, ringing and gleaning, perhaps help describe the various foraging methods used. There are also seasonal differences in food sought. All of Europe's woodpeckers are opportunistic, with seasonal and unexpected, irregular food resources exploited, but nevertheless, in terms of foraging behaviour and food eaten, three basic groups can be identified: 1) generalist omnivores, 2) ant-eaters, 3) arboreal invertebrate eaters (GORMAN 2004). Overlap inevitably exists amongst these groups, with local conditions, weather, seasonal changes and food abundance all influencing diet.



Fig. 1: Woodpecker cavity in a utility pole. Photo: G. Gorman.

Generalist non-specialist omnivores:

Great Spotted Woodpecker *Dendrocopos major*
 Syrian Woodpecker *Dendrocopos syriacus*

Mainly specialist ant-eaters:

Black Woodpecker *Dryocopus martius*
 Eurasian Green Woodpecker *Picus viridis*
 Grey-headed Woodpecker *Picus canus*

Mainly specialist arboreal invertebrate eaters:

Lesser Spotted Woodpecker *Dryobates minor*
 Middle Spotted Woodpecker *Leiopicus medius*
 White-backed Woodpecker *Dendrocopos leucotos*
 Eurasian Three-toed Woodpecker *Picoides tridactylus*

Cones

The seeds housed in conifer cones are an important food for many animals. Pine (*Pinus* spp.) and Norway Spruce (*Picea abies*) cones that have been worked on by woodpeckers can be distinguished from those opened by other birds and mammals. Woodpeckers extract conifer seeds by crudely pecking and twisting the cone scales apart, which results in a rather battered cone with damaged scales. This can be compared to cones fed upon by Crossbills (*Loxia* spp.) which access the seeds in a more precise manner, splitting the scales lengthways with their specially adapted bills. In addition, woodpeckers always remove cones from trees and work on them elsewhere, at 'anvils' (see below), whereas crossbills may deal with cones on the tree and do not use 'anvils'. Red Squirrels (*Sciurus vulgaris*) also remove cones from the tree and extract the seeds from them at a special 'workshop', usually a tree stump or log. Squirrels feed on cones by gnawing, nibbling or tearing off the scales to reach the seeds (woodpeckers and crossbills do not remove the

scales). The cone is frayed, stripped almost bare, with only the stem and the very end of the cone where the squirrel held it, remaining. Cones fed on by mice look similar, but are even less ragged as they are nibbled even closer and cleaner and the tip is also nibbled.

Anvils

Several species of woodpeckers create and maintain 'anvils' (also called 'smithies' or 'workshops'). These are cracks or crevices, in trees or walls, where large or hard items, such as conifer cones and nuts are brought and wedged before being hacked open (WINKLER 1967, GORMAN 1995a). Some anvils are regularly used and piles of discarded debris, such as opened cones or cracked nutshells, accumulate on the ground below after having been deliberately flicked out or pulled out and dropped. Other anvils are used just once, with a bird wedging and processing an item in an available site, and then leaving the remains in place. Sometimes anvils are customised, the hole or crevice being enlarged in order to fit the shape of each item brought there. Great Spotted and Syrian Woodpeckers are the most regular users of anvils.

Ringing and sapsucking

Some woodpeckers make lines of regularly spaced small holes on tree trunks in order to obtain sap for food. The bark and cambial layer of the trunk is pecked and the sap conducting xylem vessels of the tree are punctured. This foraging method and the marks it produces are both termed 'ringing', sometimes 'girdling' when the trunk is encircled. In Europe, probably only three woodpecker species (Great Spotted, Middle Spotted and Eurasian Three-toed) deliberately ring trees, although other species will take sap from ringed trees and from natural wounds in trees (WINKLER et al. 1995, GORMAN 2004).

Ringing varies in extent across Europe, with some woodpecker populations ringing more than others and certain individuals within local populations ringing more than others. Ringing is typically done in early spring when trees are actively growing as the sap rises. Limes (*Tilia*), oaks (*Quercus*), maples (*Acer*), elms (*Ulmus*), Silver Birch (*Betula pendula*), Larch (*Larix decidua*), pines (*Pinus*) and Norway Spruce (*Picea abies*) are favoured trees. Limes are often ringed by Great Spotted and Middle Spotted Woodpeckers and spruce by Three-toed Woodpecker. South-facing, sunlit, main trunks, where sap rises the fastest, are usually ringed first and most often. Ringing can be at almost any height, and the marks created vary from just a few lines of shallow peck marks (light ringing) to around a dozen regular lines of holes which girdle the trunk (heavy ringing). Ringing lines are more or less horizontal, sometimes

broken or zigzagged. Middle Spotted Woodpeckers only lightly ring trees, whereas Great Spotted and Eurasian Three-toed will create distinct lateral lines around trunks, which sometimes result in grooves. Continued, heavy ringing, on regularly visited productive trees, results in large patches of bark-less trunk where the lines have merged. But ultimately, ringing cannot be described as diagnostic. Rather, habitat and location often indicate which species was responsible for any ringing found.

The shallow holes made by Europe's woodpeckers when ringing are seldom as obvious as the very distinct 'sap-wells' created by the New World sapsuckers (*Sphyrapicus*). Although locally xylem sap can be an important part of a woodpecker's diet, foraging for this energy-rich food is not done to the same extent in Europe as it is in the Americas. For European woodpeckers sap is a supplement to their diet rather than a staple food source. The foraging holes of Black Woodpecker often ooze sap (particularly those in pines) and sometimes it may seem that such holes were made with the direct aim of sapsucking, but this is not the case, rather any flowing sap is a by-product of foraging for invertebrates. This does not mean however that Black Woodpeckers (and other wildlife) will not take sap at such sites and also prey upon invertebrates (especially ants) that become stuck in the sticky substance.

Species accounts

Grey-headed Woodpecker *Picus canus*

Although this woodpecker is more arboreal than its close relative Green Woodpecker, it does often feed on ground. It forages for ground-dwelling ants and in season wind-fall fruit, but few clear signs are left as prey is licked up or gleaned and stabbing marks in soil or turf, peck marks in apples and pears and holes in ant-hills, are hard to distinguish from those of other woodpeckers (GORMAN 2004). Similarly, foraging work in trees is difficult to separate from that of other woodpeckers. Grey-headed Woodpecker will forage for ants in tree stumps, but does not leave large holes at such sites as Black Woodpeckers do. This species does not seem to 'ring' trees to obtain sap. All in all, Grey-headed Woodpeckers do not leave clearly diagnostic foraging signs.

New nesting cavities are excavated each spring, usually high in mature trees, at least three meters above the ground and often much higher, and usually located on the main trunks of trees. Occasionally holes are located in surprisingly thin standing dead trees and in wooden utility-poles. Cavity entrances are round, sometimes slightly oval, and 5-6cm in diameter. Nest-boxes for songbirds are sometimes used, the woodpecker enlarging

the entrance hole. Favoured trees for nest location include Beech (*Fagus sylvatica*), Aspen (*Populus tremula*), Silver Birch (*Betula pendula*), Common Hornbeam (*Carpinus betulus*), Lime *Tilia cordata* and willows (*Salix* spp.). Most trees used are in decay. Conifers are seldom used, although very occasionally a sound, living Scots Pine (*Pinus sylvestris*) is selected.

Eurasian Green Woodpecker *Picus viridis*

The most terrestrial of Europe's Woodpeckers, this species specialises in taking ground-dwelling ants (*Lasius*, *Myrmica*, *Formica*) (WINKLER et al. 1995, GORMAN 2004, ALDER & MARSDEN 2010). Turf and soil is prodded and dented with the bill and small round holes of 2-3cm diameter. In areas where the two species are sympatric, such holes are probably not safely distinguishable from those made by Grey-headed Woodpecker, although Green Woodpecker is more likely to forage in the open, for example on an exposed lawn. In some cases these holes might also be mistaken for those made by Eurasian Badger (*Meles meles*), although other signs left by such mammals, such as foot-prints or droppings, usually help in establishing which animal actually created any holes found. Similarly, cigarette butt-shaped droppings and pellets at such places indicate a woodpecker rather than a mammal. Green Woodpecker faeces can be separated from those of most other woodpeckers by their high ant remains content. Similarly, their pellets are mostly composed of hard, shiny ant exoskeleton remains.

Conical, funnel-shaped, tunnel-like holes, 5-10cm in diameter and of varying depth (up to 60cm, rarely more) are also bored into ant-hills and through snow to reach hidden prey. Such sites are visited repeatedly when productive and wing and tail impressions and foot-prints are sometimes left. Foot-prints are X-shaped, with a zygodactyl arrangement of two toes pointing forward and two pointing backwards.

A fallen tree trunk or log that is heavily pecked and hacked into ('beaten-up'), is more likely the work of this species looking for invertebrates rather than Grey-headed Woodpecker. But it is difficult to rule out Black Woodpecker (where that species co-occurs), although the wood-chips are smaller and less debris litters the ground around the stump when done by Green Woodpecker as it works in a tidier manner. When foraging in trees, large, deep holes are seldom made, rather bark is prised up or striped off or chiselled away. Any foraging holes made are difficult to separate from those made by Black and Grey-headed Woodpeckers.

Nest-holes are usually located on the main trunk of old deciduous trees, usually between 1.5 and 2.5m, but



Fig. 2: Green Woodpecker leaving foraging marks in snow. Photos G. Gorman.

sometimes higher. Soft or decaying trees are invariably chosen. Several are started, but not all finished, each spring. Cavity entrances are 6-7cm in diameter, usually round but sometimes slightly oval. Commonly used species include oaks (*Quercus* spp.), Beech (*Fagus sylvatica*), poplars (*Populus* spp.) and larger willows (*Salix* spp.). Nest-boxes intended for songbirds are occasionally used as nest or roost sites, the woodpecker enlarging the entrance hole.

Black Woodpecker *Dryocopus martius*

Europe's largest woodpecker (40-50cm in length) specialises in preying on arboreal Carpenter Ants (*Camponotus*), but also takes wood-boring invertebrates particularly beetle larvae (GORMAN 2010a). In dense forest where Eurasian Green Woodpeckers seldom occur, extensive work on stumps or at ant-hills, with much debris (panels of stripped off tree bark) and large (6-



Fig. 3: Foraging excavations and chips; Black Woodpecker. Photos G. Gorman.

10cm long) wood-chips, indicates Black Woodpecker. In winter, swept away snow and deep holes around ant-hills are also typical of the species, which is comfortable on the ground. Productive feeding sites are visited repeatedly and debris accumulates.

A series of vertically long, narrow slits or oblong holes in a line that follows the grain, in conifer trees or stumps, are made by Black Woodpeckers that have searched for carpenter ants. Such holes are usually low down, can be 50cm long and 20cm wide. The tunnels and chambers that are exposed within the tree when a Black Woodpecker opens it up are the galleries of the ant colony that was raided.

Black Woodpeckers also strip bark from dead trees, snags and stumps, leaving areas worked with peck marks

and lateral grooves just below the surface (MUTH 2012). These might be confused with the work of White-backed Woodpecker, however Black Woodpecker does not totally shave the whole area from top to bottom or completely around the trunk or stump in a systematic manner and some large, rather rough bill marks are usually visible. Nesting cavities are typically placed away from foliage on the wide main trunk of a living tree with sound wood. They are often placed rather high up, on average seven meters, but sometimes over 20m and occasionally as low as three meters. A wide-girthed tree is selected as obviously one that can comfortably house a nesting chamber is needed. Most entrance holes are oval-shaped (elliptical), though teardrop-shaped with the top tapering to a point, oblong and rounded ones can also be found. Entrance size varies between 5-12cm wide and 6-15cm long. Often there are several holes (old nests and/or trial holes) on the same tree. Black Woodpecker entrance holes are never placed on downward inclining tree trunks, as is often the case with some smaller sympatric species.

Eurasian Three-toed Woodpecker *Picoides tridactylus*

This species is highly arboreal, mainly inhabiting mature conifer forests with a particular attachment to Norway Spruce (*Picea abies*) (WINKLER et al. 1995, GORMAN 2004). Indeed, it forages mainly for arboreal invertebrates especially spruce bark-beetles (*Polygraphus* spp.). Three-toed Woodpeckers remove bark from dead and dying spruces to reach beetles that reside just beneath in a method called scaling. Fragments, wide strips or panels of dry bark are levered and prised off and the exposed timber is dotted with rows or mottled patches of shallow peck marks. However, Three-toed Woodpeckers do not completely chisel or shave trees in the way White-backed Woodpeckers do and similar bark removing work by Black Woodpeckers results in much larger peck marks on the tree. Scaling signs are usually found from low to medium heights. Sometimes sections of bark are not entirely levered off, but hang from the tree, leaving the beetle galleries exposed. The ground below scaled trees is littered with bark debris and the underside of panels riddled with intricate markings, made by the beetles as they bore their tunnels. Scaled trees are easier to find when snow covers the ground as the dark bark fragments are more obvious. In spring spruce trees are ringed to obtain rising sap. Ringing is done at any height on main trunks, often on favourite trees which are returned to repeatedly and are thus heavily marked by horizontal lines of shallow holes.

Nesting cavities are usually located in old, dead trees, rotten snags or tall stumps, as low as one but up to

10m. New cavities are excavated each spring with usually round entrances of 4.5-5cm in diameter.

Middle Spotted Woodpecker *Leiopicus medius*

This species feeds mainly upon arboreal invertebrates such as bugs, aphids, weevils, woodlice, arboreal ants and spiders, especially surface and leaf-dwelling species. Most foraging takes place in the crowns of trees with insects gleaned from foliage and twigs, and the bark of boughs and trunks probed rather than hacked open. Deep boring for prey is not done, although lines or rows of small holes in dry snags are made. The species also occasionally rings trees to access sap. Middle Spotted Woodpeckers seldom feed on the ground, though windfall fruit is eaten, and rarely uses anvils, although in season a range of seeds and nuts are taken (WINKLER et al. 1995, GORMAN 2004). Ultimately, the foraging work of Middle Spotted Woodpecker is non-diagnostic and indistinguishable from that of other woodpeckers. Nesting cavities are usually located on side branches and boughs, often on the underside, although main trunks are also used. In most cases the timber excavated is dead or rotten. Unlike some other woodpeckers, Middle Spotted rarely excavates several cavities in the spring. A height of around three meters is typical, though as high as 20m is possible. Cavity entrance holes are round and between 4-5cm in diameter and often on a downward inclining trunk or the underside of a branch (as is



Fig. 4: Black Woodpecker working on its roost entrance.
Photo G. Gorman.



Fig. 5: Old ringing (sap-sucking) marks; Eurasian Three-toed Woodpecker.
Photo G. Gorman.



Fig. 6: Foraging marks; White-backed Woodpecker.
Photo G. Gorman.



Fig. 7: Almonds in simple anvils; Syrian Woodpecker. Photos G. Gorman.



Fig. 8: Old ringing (sap-sucking) marks; Great Spotted Woodpecker. Photo H. Winkler.

often the case with Syrian Woodpecker). Favoured trees for foraging include oaks (*Quercus* spp.) and various orchard fruit trees. For nesting a wider range of trees is used, although across its range this species shows a strong association to mature oak trees.

White-backed Woodpecker *Dendrocopos leucotos*

This forest-dwelling species forages mainly for arboreal invertebrates particularly wood-boring beetles such as long-horned beetles (Cerambycidae) which reside in larval form in dead or rotten wood (GORMAN 2004). Although much foraging work on trees results in signs that are indistinguishable from other sympatric woodpeckers, some typical, even diagnostic, signs are made. In particular, standing dead trees, snags and stumps, which already lack bark or with loose bark which is peeled off, are finely and systematically pecked and chiselled in many horizontal lines.

Eventually large patches, and often the whole circumference of the tree, snag or stump, from ground level to the very top, are completely and delicately shaved. Black Woodpeckers also work in a similar manner, and the results can be easily confused (MUTH 2012). However, Black Woodpecker never totally shaves whole stumps or snags and its peck marks are not as delicate. Eurasian Three-toed Woodpeckers also make horizontal dotted lines around trees, but do not leave large uniformly shaved areas as described above. When recently worked in this way the clean, exposed, pale timber of these foraging sites stand out remarkably amongst the mostly dark-barked surrounding trees. The most common trees worked in this way are Common Hornbeam (*Carpinus betulus*), Common Ash (*Fraxinus excelsior*) and Beech (*Fagus sylvatica*). Fine wood-chips litter the ground at such sites when newly worked. A fine wood-dust (sometimes almost a powder) that usually lies at the foot of timber worked is not produced by the woodpecker but rather by the wood-boring invertebrates searched for. Interestingly, the *D. leucotos lilfordi* race in central Italy and the French and Spanish Pyrenees, does not seem to work on snags and stumps in quite the same way as the nominate race in Central & Eastern Europe does (pers. obs.). Occasionally trees with small, neatly pecked areas can be found, but not the totally stripped and pecked stumps so typical of nominate *D. leucotos leucotos*. Conical holes at the base of rotten trees are also typical, although not entirely diagnostic as Black Woodpeckers make similar holes.

Nesting cavities are often located just below a branch or fungus, where the wood is most rotten. A slender, fragile tree or snag, with a girth that seems barely big enough to house a chamber, is sometimes selected. In Italy, Spain and France, nesting holes tend to be in bigger, 'healthier' trees than in C & E Europe. Cavity entrances are usually between 3-12m above the ground, but sometimes much higher. Several new holes are started each spring, often in the same or adjacent trees, but only one is finished and used. Sometimes a new nesting cavity is created in the same tree as the one used in the previous year. Preferred trees depend upon region, but include Common Hornbeam (*Carpinus betulus*), Beech (*Fagus sylvatica*), Silver Birch (*Betula pendula*) and Aspen (*Populus tremula*). Entrance holes are usually round, but sometimes horizontally oval, and between 5.5-6.5cm in diameter.

Syrian Woodpecker *Dendrocopos syriacus*

This species is an omnivore, eating invertebrates and plant matter, especially fruit and nuts. It avoids forests and dense woodlands, being typically found in secondary habitats such as gardens, parks, orchards and lightly wooded country (WINKLER et al. 1995, GORMAN 2004). In general, the holes and signs of this species cannot be easily distinguished from those of its congener, and often sympatric, Great Spotted Woodpecker. For example, Syrian Woodpecker uses anvils to process hard nut shells, such as almonds, but in urban areas, where both species coincide, it is impossible to distin-



Fig. 9: Nestbox damaged by Great Spotted Woodpecker to get at Blue Tit nestlings. Photo H. Winkler.

guish the anvils of these relatives from one another. Again, habitat context and location are important. However, Syrian Woodpecker does not seem to re-use anvils to the same extent as its congener does, rather using several in an area and often leaving the broken nutshell or other item in place. Hence, large piles of debris below anvils is quite rare. Syrian Woodpecker will also use cracks in fence-posts and in walls as anvils (GORMAN 1995a).

Nesting cavities can be as low as 1.5m, but are usually between 2-3m above ground level on main trunks or large side boughs of a softwood tree. Entrance holes are often on a downward inclining trunk or the underside of a branch (as are those of Middle Spotted Wood-



Fig. 10: A cone in a simple, opportunistic anvil; Great Spotted Woodpecker. Photo: G. Gorman.



Fig. 11: Anvil with cones; Great Spotted Woodpecker. Photo G. Gorman.



Fig. 12: Heavily used anvil site; Great Spotted Woodpecker. Photo G. Gorman.



Fig. 13: Spruce cone fed on by a Great Spotted Woodpecker in comparison with one worked over by a Red Squirrel. Photos G. Gorman.



Fig. 14: Start cavity in a styrofoam insulation. Photo: Z. Orban.

pecker) and the entrance is around 5cm in diameter. Songbird nest-boxes are also sometimes used, the entrance hole enlarged. Syrian Woodpeckers also regularly excavate holes in wooden utility-poles, but seldom complete them. Favoured nesting trees include False Acacia (*Robinia pseudoacacia*), walnut, cherry, pear, apple and other fruit trees and poplars (*Populus* spp.), which are often the very trees that are foraged in.

Great Spotted Woodpecker *Dendrocopos major*

Europe's most common and widespread woodpecker is an omnivorous generalist, eating invertebrates and plant matter alike. In some regions conifer seeds are important (WINKLER et al. 1995). Mostly decaying wood is worked upon to locate invertebrates. Trees are excavated to obtain prey, but rather bark is stripped and levered off and rotting timber probed. In season foliage is gleaned. The species will also 'ring' trees, making a girdle (more or less horizontal) of peck marks around trunks to obtain sap, although this form of foraging is not widespread (GORMAN 2004). However, only two other species in Europe (Middle Spotted and Eurasian Three-toed Woodpeckers) ring for sap regularly, so in many areas it is safe to presume that ringed trees are the work of Great Spotted Woodpeckers.

The species rarely visits ant-hills and is mostly arboreal, although sometimes fallen logs and the ground are foraged upon. Songbird nest-boxes are also opened up, usually around the entrance or along a joint, in order to reach nestlings prey within, and similarly the nests of songbirds in stumps are attacked in this way.

All in all, many signs are left by foraging, but none are diagnostic. Great Spotted Woodpeckers use 'anvils' to process hard food items and the remains are either left in place or flicked out. In the latter case piles of discarded items accumulate below the anvil. Anvils in forest are almost always those of Great Spotted Woodpecker, those in secondary habitats and urban areas can also be the work of Syrian Woodpecker. Anvils of the two species are impossible to distinguish from one another and so habitat and location are important.

Nesting cavities can be found at most heights, although typically they are above 2m on main trunks or large boughs or snags. In some regions utility-poles are used and also song-bird nest-boxes, the entrance hole being enlarged. A wide range of trees are used, and indeed tree species is not an aid to identifying whether Great Spotted Woodpecker created any cavities found. Cavity entrances are round and 5-6cm in diameter. Most cases of damage on houses insulated with Styrofoam or similar products are caused by this species and are related to cavity construction.

Lesser Spotted Woodpecker *Dryobates minor*

Europe's smallest woodpecker (14-16cm in length) feeds mainly on arboreal invertebrates, especially surface and leaf-dwelling insects. It is found in a variety of wooded habitats, such as forests, flood-plain woods, orchards and even gardens, but particularly deciduous stands with a high proportion of dead wood and high snags (WINKLER et al. 1995, GORMAN 2004). Being essentially a gleaner, with a slight bill, it rarely bores or hacks deeply into wood for prey and thus leaves few foraging signs which can be safely attributed to it. Small holes in snags, and line of holes, are made, however these cannot be distinguished from those made by other woodpeckers. This species seldom forages at ground level, although it will drop into bushes and onto bird-tables and feeders.

Due to the small size of the entrance (3-3.5cm in diameter), the nesting cavities of Lesser Spotted Woodpeckers are much easier to recognise than their foraging signs. Cavities have a round entrance and are invariably excavated in dead or rotten wood. They can be found high or low, from one to over 20m, with between 2-3m typical, in a snag, branch or thin trunk. In this they are similar to the larger, and sometimes sympatric, White-backed Woodpecker. Songbird nest-boxes will also be used. Specific cavities for roosting are excavated but from the outside cannot be distinguished from nesting sites.

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