

Animal tool use: current definitions and an updated comprehensive catalog

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Summary

Despite numerous attempts to define animal tool use over the past four decades, the definition remains elusive and the behaviour classification somewhat subjective. Here, we provide a brief review of the definitions of animal tool use and show how those definitions have been modified over time. While some aspects have remained constant (i.e., the distinction between ‘true’ and ‘borderline’ tool use), others have been added (i.e., the distinction between ‘dynamic’ and ‘static’ behaviours). We present an updated, comprehensive catalog of documented animal tool use that indicates whether the behaviours observed included any ‘true’ tool use, whether the observations were limited to captive animals, whether tool manufacture has been observed, and whether the observed tool use was limited to only one individual and, thus, ‘anecdotal’ (i.e., $N = 1$). Such a catalog has not been attempted since Beck (1980). In addition to being a useful reference for behaviourists, this catalog demonstrates broad tool use and manufacture trends that may be of interest to phylogenists, evolutionary ecologists, and cognitive evolutionists. Tool use and tool manufacture are shown to be widespread across three phyla and seven classes of the animal kingdom. Moreover, there is complete overlap between the Aves and Mammalia orders in terms of the tool use categories (e.g., food extraction, food capture, agonism) arguing against any special abilities of mammals. The majority of tool users, almost 85% of the entries, use tools in only one of the tool use categories. Only members of the Passeriformes and Primates orders have been observed to use tools in four or more of the ten categories. Thus, observed tool use by some members of these two orders (e.g., *Corvus*, *Papio*) is qualitatively different from that of all other animal taxa. Finally, although there are similarities between Aves and Mammalia, and Primates and Passeriformes, primate tool use is qualitatively different. Approximately 35% of the entries for this order demonstrate a breadth of tool use (i.e., three or more categories by any one species) compared to other mammals (0%), Aves (2.4%), and the Passeriformes (3.1%). This greater breadth in

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tool use by some organisms may involve phylogenetic or cognitive differences — or may simply reflect differences in length and intensity of observations. The impact that tool usage may have had on groups' respective ecological niches and, through niche-construction, on their respective evolutionary trajectories remains a subject for future study.

Keywords: tool use, animal, catalog.

Introduction

The definition of 'tool use' is problematic, often arbitrary or subjective, sometimes anthropocentric, and open to interpretation. Over the years, most animal behaviour researchers have relied upon some version of definitions suggested by Hall (1963), van Lawick-Goodall (1970), Alcock (1972) and Beck (1980), but recent attempts to clarify and refine the definition of animal tool use (e.g., Pierce, 1986; Lefebvre et al., 2002; St. Amant & Horton, 2008) have been made. Despite these concerted efforts at removing subjectivity and adding precision and consistency to the definition, a completely objective definition of animal tool use remains elusive. This is, after all, animal behaviour and animal behaviour is interpreted by an observer. This does not mean that the study of tool use is closed to rigorous scientific investigation because of its inherent subjectivity, but it does mean is that there will always be some ambiguous occurrences.

In this paper, we have three objectives. First, we present a brief overview of the development of, and changes in, the definition of animal tool use and the current state of the discussion. Second, we offer an updated, expanded, and comprehensive catalog of tool usage and manufacture for all animals. A catalog such as this has not been attempted since Beck (1980) and has never been presented in a format that clearly differentiates between true vs. borderline use, use in the captive setting, circumstances/categories of tool use, etc. by species in an easily accessible format. The catalog, and the summary tables, provide not only easily accessible data on types of tool use observed in any species, but also provide data on broad trends both within and across phyla/classes — only some of which we explore in this manuscript. Finally, we present some brief remarks regarding areas of research where we see this catalog as potentially providing insight. We believe our work here will be useful to behaviourists, behavioural ecologists, phylogenists and cognitive evolutionists alike.

Tool use defined

There have been numerous attempts to develop and refine the definition of tool use over the past half century. One of the earliest systematic investigations of tool use was that of Hall (1963). While not providing a precise definition of tool use, his examples included social interactions, but excluded “applying a primary object to a secondary object” (Hall, 1963: 479). Additionally, he did not consider tool-using and tool-making as indicators of intelligence, *per se*. Dissenting voices at that time questioned whether *any* animal behaviour was tool use suggesting the ‘tool-user’ classification be restricted to hominins (Gruber, 1969).

Van Lawick-Goodall addressed tool use more systematically, defining it as “use of an external object as a functional extension of mouth or beak, hand or claw, in the attainment of an immediate goal” (1970: 195) but also noted that it was not an indicator of intelligence. Soon thereafter, Alcock (1972: 464) expanded upon van Lawick-Goodall’s definition to incorporate aspects of Millikan & Bowman’s (1967) discussion of woodpecker finch tool use and defined tool use as “. . . the manipulation of an inanimate object, not internally manufactured, with the effect of improving the animal’s efficiency in altering the position or form of some separate object”. Meanwhile, in a series of papers, Boswall (1977a–d, 1978, 1982, 1983) made the important distinction between ‘true’ and ‘borderline’ tool use; true tools were objects not a part of the substrate that were manipulated by the users while borderline tools remained a part of the substrate. For example, a thorn broken from a tree and used by an individual would be a true tool while a thorn that remained a part of the tree would be a borderline tool. Each of these early researchers laid important ground-work for discussions to come.

Beck (1980: 10) refined and broadened both Alcock’s and van Lawick-Goodall’s descriptions when he defined tool use as “. . . the external employment of an unattached environmental object to alter more efficiently the form, position, or condition of another object, another organism, or the user itself when the user holds or carries the tool during or just prior to use and is responsible for the proper and effective orientation of the tool”. Like Hall (1963), Beck also included ‘social tool’ use, *i.e.*, the manipulation of another individual, within his definition and argued against the ‘chimpanzee’ approach to tool use that awarded chimpanzees special status for their tool use capabilities. The latter was important in its recognition of other animals’ abilities. His volume not only offered more precise definitions for tool use and

tool manufacture, but also presented a catalog of animal true and borderline tool use and tool manufacture — an update of which has not been attempted until now.

While many researchers have utilized and simply restated Beck's (1980) tool use definition over the years (e.g., Anderson, 2002), others have made modifications. For example, Pierce (1986: 96) excluded social tool use and included "structurally modified inanimate environmental object(s)", which allowed the inclusion of nest and burrow building by insects. St. Amant & Horton (2008: 1203) argued that Beck's (1980) definition required clarification of the rationale for including/excluding various behaviours. They defined tool use as "... the exertion of control over a freely manipulable external object (the tool) with the goal of (1) altering the physical properties of another object, substance, surface or medium (the target, which may be the tool user or another organism) via a dynamic mechanical interaction, or (2) mediating the flow of information between the tool user and the environment or other organisms in the environment". The first part of this definition includes most behaviours that have traditionally been classified as tool use. However, the second part includes behaviours where the tool mediates the relationship between the user and the environment — a change from Beck's (1980) work because no object or organism is altered by another object that the user controls. The second part of the St. Amant & Horton (2008) definition also includes using tools to influence or alter another organism's perception of the environment. So, in addition to the alteration of physical aspects of the environment, they explicitly include sensory and communication-related uses of tools. Ultimately, they retained the fundamentals of Beck's (1980) earlier definition but added the 'dynamic' and 'flow of information' components.

Our definition

The definition of tool use that we used in constructing the catalog (see Appendix A) is an amalgamation of those presented in the preceding paragraphs. We begin with Beck's (1980) definition but, like Pierce (1986), we exclude social tool use. If tool use is to remain a useful behavioural classification, some behaviours/categories must be excluded and we firmly believe that social interactions are one such category. For this same reason, we disagree with Pierce (1986) and do not include nest/abode building as

a tool. Thus, we are essentially utilizing St. Amant & Horton's (2008) definition (see above). As such, birds (or other animals) building their abodes from twigs or other materials would not be considered using tools since the abode is not dynamic. However, we disagree with some of St. Amant & Horton's (2008) interpretations of 'dynamic'. By their definition, the stacking of boxes by chimpanzees to retrieve a reward (e.g., Köhler, 1925), a behaviour traditionally classified as tool use, can be decomposed into two separate and static behaviours — stacking and climbing — neither of which are, thus, tool use. Conversely, a chimpanzee using a box to knock a reward to the floor is dynamic and is, therefore, tool use.

This example highlights some of the subjectivity in making tool use behavioural distinctions. St. Amant & Horton (2008) presented another classic experiment (e.g., Köhler, 1925) where chimpanzees fitted two pieces of pipe together to create a pole that could be used to reach a reward as an example of tool manufacture. Using the pole to reach the reward was then considered tool use — unlike the stacking of boxes described previously. This difference in classification of what is and what is not considered tool use is unclear at best. We believe that the stacking of one box on top of another should be classified as tool manufacture and the use of that stack to reach the reward should be tool use. If the assembled pole could be viewed as an artificial 'arm' that extends a chimp's reach, the created tower of boxes could be viewed as an artificial 'leg' that does the same thing. While it is likely that this level of subjective interpretation will not arise often, even new and improved definitions of tool use have their short-comings. Thus, our tool-use definition is very similar to that of St. Amant & Horton (2008) with somewhat more leeway in what constitutes 'dynamic' behaviour.

Tool manufacture defined

Defining tool manufacture is somewhat more straight-forward than defining tool use. Beck (1980) noted four, relatively self-explanatory, types of tool manufacture: detach, subtract, add/combine and reshape. Detaching involves separating or disconnecting the tool from the substrate or another object such as removing a branch from a tree. Subtracting is the removal of something from the object so that it is a more useful tool such as pulling leaves off of a twig so that the twig can be used to fish for termites. Adding/combining is when two or more objects are put together to make a tool such as attaching

two short sticks to make one long stick. Finally, reshaping is a fundamental restructuring of an object such as creating a sponge by crumpling a handful of leaves. Of these four categories, detaching is the most ambiguous since ‘manufacturing’ may be difficult to distinguish from simply retrieving an object from the substrate. However, key to Beck’s (1980) categories of manufacture is that each requires an active act of creation as opposed to the mere acquisition of the object. We use these criteria in determining tool manufacture.

The catalog

To facilitate ease of use, we present the catalog data in a tabular format as Appendix A. The data are divided into nine sections according to phylum and class by descending size (i.e., class with the most orders first) (e.g., Phylum: Arthropoda, Class: Insecta; Phylum: Arthropoda, Class: Malacostraca, etc.) and listed alphabetically by genus/species within each class. The two exceptions are the Aves Order Passeriformes and the Mammalia Order Primates which have been extracted for ease of reference and to facilitate comparisons similar to those by Marler (1996) and Lefebvre et al. (2004). Each, however, immediately follow their respective class.

We have necessarily forsaken detail for streamlining. Tool use is classified into ten categories. Food preparation (Food Prep) is the use of a tool to prepare, but not extract, food. For example, curlews slamming a large food item against the ground until the item is broken into smaller pieces and that can be swallowed (Marks & Hall, 1992) is classified as an example of food preparation as is the observation of a red-tailed hawk bashing a captured snake against boulders (Ellis & Brunson, 1993). Food extraction (Food Extrac) occurs when a tool is used to gain access to a food item that is enclosed/encased and not immediately accessible. Gulls dropping clams on rocks (Maron, 1982) and macaques using sticks as dipping tools (Babitz, 2000) are clear examples of food extraction. Food transport (Food Trans) is the use of a tool to transport food and/or water. Barber et al. (1989) observed fire ants using sand to absorb and transport honey back to the nest while Antevs (1948) observed Gila woodpeckers to do the same thing using larger objects such as lumps of bark to absorb the honey. Food capture (Food Cap) occurs when a tool is used to acquire food not using extraction. The use of a

stick to pull a food item into reach by chacma baboons (Bolwig, 1961) is an example of food capture, as is the plugging of hibernating ground squirrels' tunnels by hunting badgers (Michener, 2004). Physical maintenance (Phys Main) is the use of a tool to affect one's appearance or body. The use of a thorn by a lion to remove another thorn from its paw (Bauer, 2001) and the use of a towel by a sandhill crane to dry itself (Bartlett & Bartlett, 1973) are tools used in physical maintenance. Mate attraction (Mate Attrac) includes only those cases of tool use where the purpose is unambiguously determined to affect the behaviour of potential mates. There are, thus, relatively few examples. One common example is the decoration of bowers by bowerbirds (Crook, 1960); the use of sound baffles by African tree crickets to amplify their calls (Prozesky-Shulze et al., 1975) is another example. Nest construction (Nest Const) is the use of a tool to construct an abode. Numerous digger wasp species use pebbles to compact the soil around their nests (Brockmann, 1985) while the common octopus builds a 'wall' in front of the entrance to its den from rocks, glass, and other objects (Mather, 1994). Predator defense (Pred Defen) is the use of a tool to defend oneself. Hermit crabs fortify themselves against octopus attack by transferring sea anemones to their shells (Ross, 1971), while sawfly larvae apply pine resin acid to their attackers (Eisner et al., 1974). Agonism (Agon) is the use of a tool in an aggressive encounter with another, often as a threat but not as defense against predation. An African black eagle (Dick & Fenton, 1979), white-faced capuchins (Chevalier-Skolnikoff, 1990), and elephants (Chevalier-Skolnikoff & Liska, 1993) engaged in agonism by directed throwing/dropping of objects at or on another individual. Finally, Other (Other) are those examples of tool use that do not easily fit into any of the previously described categories. A common blackbird was observed to use a twig to clear snow from the ground (Priddey, 1977) while white-handed gibbons have been observed to create their own swings in a cage (Rumbaugh, 1970). These, then, are the ten categories used in the catalog. In each column applicable to a specific entry, we indicate whether the observations were limited to Captive (C), Free Ranging (F), or Semi-free Ranging (S) animals or in a combination of these living conditions. Thus, if a particular species has been observed to use tools in all ten of the conditions described previously and in each of the living situations listed above, that species would have a 'C, F, S' in each of the ten columns. Similarly, observations of a given species limited to food capture in a free ranging living condition would have only an 'F' in that particular column.

We also indicate (a) whether the tool use is limited to captive animals, (b) whether the species has been observed to manufacture tools, (c) whether any of the tool use is considered true tools and (d) if the tool use observations were limited to just one subject (i.e., $N = 1$). It should be noted that we were forced to put a ‘?’ in some of these columns as the original research did not always indicate the number of subjects or whether the animal was captive.

Despite our best attempts to include all documented cases of both true and borderline tool use, there are probably examples that we have missed. We have limited our examples to published sources. Thus, tool use reported by others as ‘personal communication’ is not included. As stated previously, we have also excluded social interactions/behaviours, abodes, and abode construction as examples of tool use. Consequently, we limit our catalog entries to published reports of individuals utilizing objects in the ten categories described above. These observations of tool use, thus, represent a species’ material culture reported to date — less the excluded abodes (see McGrew, 1992a; van Schaik et al., 1999, 2003a; Malaivijitnond et al., 2007, for discussions of the evolution of material culture). We utilized numerous sources in compiling the catalog — including extensive database searches and published reviews (see Appendices B and C). From the reviews, we used the bibliographies to acquire copies of the original works to determine if the example should be included. For each of the taxa listed in the catalog, we have included representative references to every different type of tool use and/or every different population that we were able to locate. However, where multiple authors report the same behaviour, we have limited the number of entries. We have also limited the entries of any one author who has written extensively on tool use in a species to those references on different populations or different uses of tools. While we have endeavored to include every species and every different type of tool use reported, we have not tried to include every article ever written on animal tool use. Our goal was to provide a survey of the extent of tool use, not in-depth case studies of particular species.

There are three other catalog caveats. First, McGrew’s (1992b) statement that there is a positive correlation between the number of reports of tool use by a population, the length of the study, and the degree of habituation of the group undoubtedly applies to this catalog. Thus, it is not surprising that decades-long studies of continuously monitored chimpanzee populations report many examples of tool use and manufacture. On the other hand, while some species have been observed extensively and demonstrated very little

tool use (e.g., *Papio* primates), it is possible that even extensive observations may have missed population-specific tool use due to the specific individuals or classes of individuals observed (see, for example, Tebbich et al. (2002) on locale-specific tool use by *Cactospiza pallida* and Higuchi (1988) on individual variation in *Butorides striata* tool use dependent upon feeding-site quality). Second, the observation of tool manufacture is likely to be even more difficult and rare than the observation of tool use. Thus, an ‘N’ in the tool manufacture column does not prove that manufacture never occurs, merely that manufacture has not been observed. Finally, the indications of whether data reported for a species are actually limited to only one individual (i.e., $N = 1$), and, thus, an ‘anecdote’, are provided following Sarringhaus et al.’s (2005) caution that reports on tool use often gloss over this information. In doing so, the reported behaviour can easily become reified as a population/genus/species characteristic when no such pattern may actually exist. It is not that anecdotal information is not useful (see, for example, Reader & Laland’s (2002) and Lefebvre et al.’s (2004) use of such data to discuss innovations), but it should be identified. Thus, we have labeled the entries for species where the tool use was limited to only one individual by placing a ‘Y’ in the ‘ $N = 1$?’ column and these entries account for almost 28% of the catalog (see Table 1). However, any species with more than one citation cannot be classified as anecdotal ($N = 1$) since there are reports on more than one individual or population. However, it is still possible that each of those referenced studies reported on only one subject.

Discussion

In the following paragraphs, we summarize some of the patterns and trends we observed in the catalog. It should be noted that these summaries are speculations, not inferences. To test these patterns/trends would require the use of phylogenetic controls; that testing is beyond the scope of this manuscript.

One point that arises from even a cursory examination of the catalog is that tool use occurs in a wide variety of species and in a diversity of contexts. Three phyla of the animal kingdom, Arthropoda, Mollusca and Chordata, and seven classes, Insecta, Malacostraca, Gastropoda, Cephalopoda, Actinopterygii, Aves and Mammalia, are represented. Numerically, there are more Aves entries (including Passeriformes; $N = 277$) followed by Mammalia (including Primates; $N = 65$) and then Insecta ($N = 53$) (see Table 1

Table 1. Frequency data from tool use catalog (yes/present).

Phylum/class (N, No. of entries; G, No. of genera)	N = 1? Captive only?	Tool manuf.?	True tool use?	Food Prep	Food Extrac	Food Transp	Food Cap	Food Phys	Mate Attrac	Nest Const	Pred Defen	Agon	Other
Arthropoda/Insecta (N = 53; G = 30)	4	4	0	47	0	10	12	0	4	20	6	0	1
Arthropoda/Malacostraca (N = 6; G = 5)	1	3	3	6	0	0	1	0	0	0	4	2	0
Mollusca/Gastropoda (N = 3; G = 2)	0	2	0	3	0	0	0	0	0	0	1	0	2
Mollusca/Cephalapoda (N = 1; G = 1)	0	0	0	0	0	0	0	0	0	1	1	0	0
Chordata/Actinopterygii (N = 13; G = 11)	1	3	0	3	0	4	3	0	0	6	3	0	0
Chordata/Aves (N = 83; G = 58)	38	14	3	28	21	33	5	14	12	1	0	3	5
Chordata/Aves Passeriformes (N = 194; G = 100)	55	65	15	140	37	34	2	5	116	4	17	1	8
Chordata/Mammalia (N = 22; G = 19)	8	11	5	16	0	8	0	5	6	0	3	0	1
Chordata/Mammalia Primates (N = 43; G = 21)	10	18	16	41	8	18	9	22	18	1	0	2	14
Totals (N = 418; G = 247)	117	120	42	284	66	97	26	62	152	10	47	18	28

below). However, comparison across classes by number of entries alone is extremely limited as 11 of the entries for Insecta each represent an entire genus and, thus, hundreds of entries at the species level. Still, the distribution is informative. First, there has been a tendency over the years to focus upon primate tool use (chimpanzees, in particular). In fact, Marler's (1996) comparison of primate and avian tool use and manufacture showed that birds used tools in the same primary categories — food preparation/acquisition, against intruders/predators, sexual display/mate acquisition, and self-maintenance — and as often as primates. Similarly, Lefebvre et al. (2002) documented 125 cases (39 true, 86 borderline) of tool use in 104 avian species. Our catalog is consistent with these works as it demonstrates that Aves and Mammalia use tools in all ten of the categories, followed by Insecta with six, Actinopterygii with four, Malacostraca with three, and Gastropoda and Cephalopoda with only two each. This complete overlap in tool-use categories between Aves and Mammalia and 60% overlap with Insecta certainly speaks to the widespread distribution, and varied forms, of tool use within the animal kingdom.

However, even complete (100%) or extensive (60%) overlap in tool use categories does not mean that tool use by these classes is identical. For example, the distributions of tool use within the ten tool use categories differ for Aves and Mammalia. Aves used tools primarily (i.e., $\geq 20\%$ of entries) for physical maintenance (46.2%), food extraction (23.8%) and food preparation (20.9%), while Mammalia observations were primarily of food capture (41.5%), food extraction (40.0%), physical maintenance (36.9%) and agonism (24.6%). It is important, though, to remember the potential bias in tool use observations that arises from a concentration of long-term studies (McGrew, 1992b).

Second, the distribution of true tool use is also broad — occurring in all three phyla. Although comparisons are difficult, some patterns emerge. For Insecta, Malacostraca, Gastropoda and Mammalia, the proportion of true tool use is quite high (e.g., Mammalia: 87.7%; Insecta: 88.7%). However, for Cephalopoda, Aves and Actinopterygii the proportion is much lower (e.g., Aves: 60.6%), suggesting that much of the observed behaviour is borderline tool use. For the two orders, Primates and Passeriformes, the difference is striking (i.e., Primates: 95.3%, Passeriformes: 72.2%).

Finally, when the data are examined by the distribution of tool use categories we find that most animals use tools in only one category (84.7% of catalog entries). These data are summarized in Table 2. Lancaster (1968)

Table 2. Comparison of catalog entries by breadth of tool use.

Phylum/class/order	Number and % of entries by number of tool use categories										Total
	1	2	3	4	5	6	7	8	9	10	
Arthropoda/Insecta	53 (100)	0	0	0	0	0	0	0	0	0	53
Arthropoda/ Malacostraca	5 (83.3)	1 (16.7)	0	0	0	0	0	0	0	0	6
Mollusca/Gastropoda	3 (100)	0	0	0	0	0	0	0	0	0	3
Mollusca/ Cephalapoda	0 (100)	1	0	0	0	0	0	0	0	0	1
Chordota/ Actinopterygii	10 (76.9)	3 (23.1)	0	0	0	0	0	0	0	0	13
Chordota/Aves (w/o Passeriformes)	74 (89.2)	7 (8.4)	2 (2.4)	0	0	0	0	0	0	0	83
Chordota/Aves/ Passeriformes	167 (86.1)	21 (10.8)	4 (2.1)	1 (0.5)	1 (0.5)	0	0	0	0	0	194
Chordota/Mammalia (w/o Primates)	19 (86.4)	3 (13.6)	0	0	0	0	0	0	0	0	22
Chordota/Mammalia/ Primates	23 (53.5)	5 (11.6)	6 (14.0)	3 (7.0)	1 (2.3)	3 (7.0)	1 (2.3)	0 (2.3)	1	0	43
Total	354 (84.7)	41 (9.8)	12 (2.9)	4 (1.0)	2 (0.5)	3 (0.7)	1 (0.2)	0 (0.2)	1	0	418

noted that most tool-using animals use only one type of tool, and our catalog supports this view. In Table 1, the category with the highest number of entries is Physical Maintenance, followed by Food Extraction, Food Preparation, and Food Capture. These data tell us that not only are most of the taxa observed to use tools in only one context but, for most, they are doing so either in self-care or the acquisition/preparation of food.

If we expand the examination of taxa to include one or two types of tool use, then 97.1%–100% of the entries in all classes are accounted for with the exception of Mammalia where only 76.9% of the entries documented either one or two categories of tool use. Closer inspection reveals that it is the Primate order that is responsible for the difference between Mammalia and the other taxa. Without the Primates, all of the entries for Mammalia are with either one or two categories of tool use. For the Order Primates, one or two categories of tool use accounts for only 65.1% of tool use and it is entries demonstrating only one type of tool use in particular (53.5% compared to $\geq 76.9\%$ for all of the other classes/orders) that is responsible for

the difference. While Aves (without Passeriformes) has some entries demonstrating three categories of tool use, only the Passeriformes and Primates have entries with four or five — and only Primates has entries with greater than five. The proportion of entries with three or more tool use categories is much higher for the Primates than for other mammals, Aves, or Passeriformes. When combined, 34.8% of the Primates taxa use tools in three or more categories compared to the other mammals (0%), Aves without Passeriformes (2.4%), and the Passeriformes (3.1%). From these data, it appears that some primates have the edge in the breadth of their tool use.

Relevant to the patterns described in the previous paragraphs, Lefebvre et al. (2002: 961) argued that true tool using birds have a larger average brain size than borderline tool users, and that true and borderline tool using may be indicative of ‘different degrees of cognitive ability’. There are also data showing that tool use has a direct impact on the brain (e.g., Cardinali et al., 2009). *Corvus*, some members of which are reported in our catalog as using tools in four or five categories, is generally recognized as being a large-brained bird genus. Lefebvre et al. (2002) also stated that the independent, parallel co-evolution of large brains and tool use may have arisen not only in different vertebrate lines but, potentially, at least six times in different avian taxa. Within the primate family tree, tool use may have arisen at least three different times — on the great ape/human branch, the macaque/baboon branch, and the capuchin branch (van Schaik et al., 1999; Panger, 2007). The nine catalog entries with four or more tool-using categories observed within the Primates (see Table 2) represent seven primate genera — one from the capuchin branch, two from the macaque/baboon branch, and four from the ape/human branch. A detailed analysis of comparative brain development, phylogeny, and the degree and types of tool use exhibited by various animals is beyond the scope of this paper, but we believe our catalog may be a useful tool in these future discussions.

While it is tempting to think that breadth of tool usage is indicative of ‘better adapted’ forms, the true ‘adaptiveness’ of each type of tool use requires further study. Alcock (1972: 472) stated that woodpecker finches, sea otters, and humans, all ‘major tool-using species’, have invaded new niches. A meta-analysis of niche-expansion and tool use would be of considerable interest in this regard. Furthermore, the extensive studies of some species (e.g., New Caledonian crows, black-capped capuchin monkeys, woodpecker finches, long-tailed macaques) is particularly fertile ground for the study of

niche-construction through tool usage on the ‘ecological inheritance’ of a population (see Odling-Smee et al., 2003) or how an acquired characteristic such as tool usage may shape the environment which, in turn, acts selectively on the population. It is likely that innovation rate, positively correlated with variety of tool use, may have played a role in evolutionary diversification (Reader & Laland, 2002; Lefebvre et al., 2004), an idea that is currently being explored regarding the great ape-early hominin divergence. See, for example, Boesch et al.’s (2009) discussion of chimpanzees using complex, multi-function tools in collecting honey and similarities with tool use by early hominins. What is evident from our catalog is that observations of taxa demonstrating a breadth of tool usage are quite limited and, in that sense, these taxa are different.

In compiling this catalog, our primary goal was to present a concise, user-friendly, updated resource for researchers interested in animal tool use that would illustrate trends in animal tool use within and across taxonomic classifications. We did not expect to resolve the issue of what is or is not tool use but we believe this updated catalog to be a significant contribution. In creating the catalog, we have obviously used our definition of tool use and our interpretations of the available data, including some behaviours while excluding others. By highlighting breadth of tool use among Passeriformes and Primates, we made the choice to bring to the forefront this particular aspect of tool use and these two groups of tool users over others. It is these types of patterns and comparisons that make further exploration of animal tool use an exciting topic worthy of continued investigation.

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References

- Abma, E. (1951). Een mierenhoop-probleem. — *Natura* 48: 164.
Acharjyo, L. & Misra, R. (1972). On the feeding habits of the crabeating mongoose (*Herpestes urva*) in captivity. — *J. Bombay Nat. Hist. Soc.* 69: 411-412.

- Agbogba, C. (1985). Observations sur la récolte de substances liquides et de sucs animaux chez deux espèces d'*Aphaenogaster*: *A. senilis* et *A. subterranean* (Hym. Formicidae). — Insect. Soc. Paris 32: 427-434.
- Akerman, C. (1923). A comparison of the habits of a South African spider, *Cladomelea*, with those of an Australian *Dicrostichus*. — Ann. Natal Mus. 5: 83-88.
- Albignac, R. (1969). Notes ethologiques sur quelques carnivores Malgaches: le *Galidia elegans* I. *Geoffroy*. — Terre Vie 23: 202-215.
- Alcock, J. (1972). The evolution of the use of tools by feeding animals. — Evolution 26: 464-473.
- Aldersparre, A. (1936). Zum thema "Vögel und Ameisen". — Ornithol. Monatsber. 44: 129-135.
- Alexander, J.E. (1838). An expedition of discovery into the interior of Africa, through the hitherto undescribed countries of the Great Namaquas, Boschmans, and Hill Damaras. — H. Collburn, London.
- Allsop, K. (1949). "Anting" of green woodpecker. — Br. Birds 42: 390.
- Alp, R. (1993). Meat eating and ant dipping by wild chimpanzees in Sierra Leone. — Primates 34: 463-468.
- Alp, R. (1997). "Stepping-sticks" and "seat-sticks": new types of tools used by wild chimpanzees (*Pan troglodytes*) in Sierra Leone. — Am. J. Primatol. 41: 45-52.
- An Old Sportsman from Uitkyk N. (1867). Predation on ostrich nests. — The Kaffrarian Watchman, King William's Town.
- Anderson, J.R. (1985). Development of tool-use to obtain food in a captive group of *Macaca tonkeana*. — J. Human Evol. 14: 637-645.
- Anderson, J.R. (2002). Gone fishing: tool use in animals. — Biologist 49: 15-18.
- Anderson, J.R. & Henneman, M.-C. (1994). Solutions to a tool-use problem in a pair of *Cebus apella*. — Mammalia 58: 351-361.
- Anderson, J.R., Williamson, E.A. & Carter, J. (1983). Chimpanzees of Sapu Forest, Liberia: Density, nests, tools and meat-eating. — Primates 24: 594-601.
- Andersson, S. (1989). Tool use by the fan-tailed raven (*Corvus rhipidurus*). — Condor 91: 999.
- Antinucci, F. & Visalberghi, E. (1986). Tool use in *Cebus apella*: a case study. — Int. J. Primatol. 7: 351-363.
- Antevs, A. (1948). Behaviour of the gila woodpecker, ruby-crowned kinglet, and broad-tailed hummingbird. — Condor 50: 91-92.
- Arcadi, A.C., Robert, D. & Boesch, C. (1998). Buttress drumming by wild chimpanzees: temporal patterning, phrase integration into loud calls, and preliminary evidence for individual distinctiveness. — Primates 39: 505-518.
- Armbrust, W. (1958). Haltung und zucht von *Hoplosternum thoracatum*. — Aquarien Terrarien Z. 11: 91-100.
- Armbruster, L. (1921). Über Werkzeuggebrauch bei Tieren. — Naturwissenschaften 9: 303-305.
- Artaud, Y. & Bertrand, M. (1984). Unusual manipulatory activity and tool-use in a captive crab-eating macaque (*Macaca fascicularis*). — In: Current primate researches (Roonwal, M., Mohnot, S. & Rathore, N., eds). Department of Zoology, University of Jodhpur, Jodhpur, p. 423-428.
- Babitz, M.A. (2000). Object manipulation and tool use in Sulawesi crested black macaques. — Am. J. Primatol. 51 (Suppl. 1): 38.

- Baker, M. (1996). Fur rubbing: use of medicinal plants by capuchin monkeys (*Cebus capucinus*). — *Am. J. Primatol.* 38: 263-270.
- Balda, R.P. (2007). Corvids in combat: with a weapon? — *Wilson J. Ornithol.* 119: 100-102.
- Banks, S. (1982). Grey heron dunking and swallowing large rat. — *Br. Birds* 75: 181.
- Banschbach, V.S., Brunelle, A., Bartlett, K.M., Grivetti, L. & Yeaman, R.L. (2006). Tool use by the forest ant *Aphaenogaster rudis*: ecology and task allocation. — *Insect. Soc.* 53: 463-471.
- Barash, D.P., Donovan, P. & Myrick, R. (1975). Clam dropping behaviour of the glaucous-winged gull (*Larus glaucescens*). — *Wilson Bull.* 87: 60-64.
- Barber, J., Ellgaard, E.G., Thien, L.B. & Stack, A.E. (1989). The use of tools for food transportation by the imported fire ant, *Solenopsis invicta*. — *Anim. Behav.* 38: 550-552.
- Barlow, G.W. (1974). Contrasts in social behaviour between Central American cichlid fishes and coral-reef surgeon fishes. — *Am. Zool.* 14: 9-34.
- Barnes, D.M. (2005). Possible tool use by beavers, *Castor canadensis*, in a northern Ontario watershed. — *Can. Field Nat.* 119: 441-443.
- Bartlett, D. & Bartlett, J. (1973). The incredible flight of the snow goose. — *Animals* 15: 4-6.
- Bauer, H. (2001). Use of tools by lions in Waza National Park, Cameroon. — *Afr. J. Ecol.* 39: 317.
- Bayart, F. (1982). Un cas d'utilisation d'outil chez un macaque (*Macaca tonkeana*) élevé en semi-liberté. — *Mammalia* 46: 541-544.
- Beatty, H. (1951). A note on the behaviour of the chimpanzee. — *J. Mammal.* 32: 118.
- Beck, B.B. (1972). Tool use in captive hamadryas baboons. — *Primates* 13: 277-295.
- Beck, B.B. (1973a). Cooperative tool use by captive hamadryas baboons. — *Science* 182: 594-597.
- Beck, B.B. (1973b). Observation learning of tool use by captive Guinea baboons (*Papio papio*). — *Am. J. Phys. Anthropol.* 38: 579-582.
- Beck, B.B. (1976). Tool use by captive pigtailed macaques. — *Primates* 17: 301-310.
- Beck, B.B. (1980). Animal tool behaviour: the use and manufacture of tools by animals. — Garland STPM Publishing, New York, NY.
- de Beer, B. (1948). Secrets of the ant-lion. — *Afr. Wildlife* 2: 57-61.
- de Benedictus, P.A. (1966). The bill-brace feeding behaviour of the Galápaagos finch *Geospiza conirostris*. — *Condor* 68: 206-208.
- Benhar, E.E. & Samuel, D. (1978). A case of tool use in captive olive baboons (*Papio anubis*). — *Primates* 19: 385-389.
- Berg Jr., C.J. (1975). Behaviour and ecology of conch (Superfamily *Strombacea*) on a deep subtidal algal plain. — *Br. Mar. Sci.* 25: 307-317.
- Bermejo, M. & Illera, G. (1999). Tool-set for termite-fishing and honey extraction by wild chimpanzees in the Lossi Forest, Congo. — *Primates* 40: 619-627.
- Bermejo, M., Illera, G. & Pi, J.S. (1989). New observations on the tool-behaviour of chimpanzees from Mt. Assirik (Senegal, West Africa). — *Primates* 30: 65-73.
- Berrow, S.D., Kelly, T.C. & Myers, A.A. (1992). The diet of coastal breeding hooded crows *Corvus corone cornix*. — *Ecography* 15: 337-346.
- Bertagnolli, P. (1994). Tool-using by parrots: the palm cockatoo and the hyacinthine macaw. — *Avic. Mag.* 100: 68-73.
- Bharos, A.M.K. (1999). Attempt by redvented bulbul *Pycnonotus cafer* to feed on a young house gecko *Hemidactylus flaviviridis*. — *J. Bombay Nat. Hist. Soc.* 96: 320.

- Bierens de Haan, J.A. (1931). Werkzeuggebrauch und Werkzugerstellung bei einem niederen Affen (*Cebus hypoleucus* Humb.). — Z. Vergl. Physiol. 13: 639-695.
- Bindner Jr., C.M. (1968). Bald eagles use tools. — Fla. Nat. 41: 169.
- Bird, C.D. & Emery, N.J. (2009). Insightful problem solving and creative tool modification by captive nontool-using rooks. — Proc. Natl. Acad. Sci. 106: 10370-10375.
- Biro, D., Inoue-Nakamura, N., Tonooka, R., Yamakoshi, G., Sousa, C. & Matsuzawa, T. (2003). Cultural innovation and transmission of tool use in wild chimpanzees: evidence from field experiments. — Anim. Cogn. 6: 213-223.
- Boesch, C. & Boesch, H. (1990). Tool use and tool making in wild chimpanzees. — Folia Primatol. 54: 86-99.
- Boesch, C., Head, J. & Robbins, M.M. (2009). Complex tool sets for honey extraction among chimpanzees in Loango National Park, Gabon. — J. Human Evol. 56: 560-569.
- Boesch, C., Marchesi, P., Marchesi, N., Fruth, B. & Joulain, F. (1994). Is nut cracking in wild chimpanzees a cultural behaviour? — J. Human Evol. 26: 325-338.
- Boinski, S. (1988). Use of a club by a wild white-faced capuchin (*Cebus capucinus*) to attack a venomous snake (*Bothrops asper*). — Am. J. Primatol. 14: 177-179.
- Boinski, S., Quatrone, R.P. & Swartz, H. (2000). Substrate and tool use by brown capuchins in Suriname: ecological contexts and cognitive bases. — Am. Anthropol. 102: 741-761.
- Bolwig, N. (1961). An intelligent tool-using baboon. — S. Afr. J. Sci. 57: 147-152.
- Borsari, A. & Ottoni, E.B. (2005). Preliminary observations of tool use in captive hyacinth macaws (*Anodorhynchus hyacinthinus*). — Anim. Cogn. 8: 48-52.
- Boswall, J. (1977a). Notes on tool-using by Egyptian vultures *Neophron percnopterus*. — Bull. Br. Ornithol. Club 97: 77-79.
- Boswall, J. (1977b). Tool-using by birds and related behaviour I. — Avic. Mag. 83: 88-97.
- Boswall, J. (1977c). Tool-using by birds and related behaviour II. — Avic. Mag. 83: 146-159.
- Boswall, J. (1977d). Tool-using by birds and related behaviour III. — Avic. Mag. 83: 220-228.
- Boswall, J. (1978). Further notes on tool-using by birds and related behaviour. — Avic. Mag. 84: 162-166.
- Boswall, J. (1982). Tool-using and related behaviour in birds: more notes. — Avic. Mag. 89: 94-108.
- Boswall, J. (1983). Tool-using and related behaviour in birds: yet more notes. — Avic. Mag. 89: 170-181.
- Bourke, P.A. (1941a). Honeyeater and ants. — Emu 41: 163-164.
- Bourke, P.A. (1941b). "Anting" by rufous whistlers (*Pachycephala*). — Vic. Nat. 58: 64.
- Bowey, K. (1997). Grey heron catching a common starling in flight. — Br. Birds 90: 112-113.
- Bowman, R.I. (1961). Morphological differentiation and adaptation in the Galapagos finches. — Univ. Calif. Publ. Zool. 58: 1-326.
- Brampton, A.H. (1994). Carrion crow dunking nuts. — Br. Birds 87: 478.
- Breuer, T., Ndongou-Hockemba, M. & Fishlock, V. (2005). First observation of tool use in wild gorillas. — PLoS Biol. 3: 2041-2043.
- Brewer, S.M. & McGrew, W. (1990). Chimpanzee use of a tool-set to get honey. — Folia Primatol. 54: 100-104.
- Brockmann, H.J. (1985). Tool use in digger wasps (Hymenoptera: *Sphecinae*). — Psyche 92: 309-330.
- Brooke, R.K. (1979). Tool using by the Egyptian vulture to the detriment of the ostrich. — Ostrich 50: 119-120.

- Brown, L.H. & Urban, E.K. (1969). The breeding biology of the great white pelican *Pelecanus onocrotalus roseus* at Lake Shala, Ethiopia. — *Ibis* 111: 199-237.
- Cade, T.J. & Maclean, G.L. (1967). Transport of water by adult sandgrouse to their young. — *Condor* 69: 323-343.
- Caffrey, C. (2000). Tool modification and use by an American crow. — *Wilson Bull.* 11: 283-284.
- Caffrey, C. (2001). Goal-directed use of objects by American crows. — *Wilson Bull.* 113: 114-115.
- Caldwell, J.A. (1951). Food-washing in the water-rail. — *Br. Birds* 44: 418.
- Call, J. & Tomasello, M. (1994). The social learning of tool use by orangutans (*Pongo pygmaeus*). — *Human Evol.* 9: 297-313.
- Callegari, E. (1955). La “Mirmecosimpatia” è un fenomeno esteso anche ad altri gruppi di insetti. — *Riv. Ital. Ornitol.* 25: 147-148.
- Campbell, C.J. (2000). Fur rubbing behaviour in free-ranging black-handed spider monkeys (*Ateles geoffroyi*) in Panama. — *Am. J. Primatol.* 51: 205-208.
- Canale, G.R., Guidorizzi, C.E., Kierulff, M.C.M. & Gatto, C.A.F.R. (2009). First record of tool use by wild populations of the yellow-breasted capuchin monkey (*Cebus xanthosternos*) and new records for the bearded capuchin (*Cebus libidinosus*). — *Am. J. Primatol.* 71: 1-7.
- Cardinali, L., Frassinetti, F., Brozzoli, C., Urquizar, C., Roy, A. & Farnè, A. (2009). Tool-use induces morphological updating of the body schema. — *Curr. Biol.* 19: R478-R479.
- Carpenter, A. (1887). Monkeys opening oysters. — *Nature* 36: 53.
- Carpenter, C.R. (1940). A field study in Siam of the behaviour and social relations of the gibbons (*Hylobates lar*). — *Comp. Psychol. Monogr.* 16: 1-205.
- Chaffer, N. (1945). The spotted and satin bower birds: a comparison. — *Emu* 44: 161-181.
- Chamberlain, B.R. (1954). Brown thrasher anting. — *Chat* 18: 103.
- Chappell, J. & Kacelnik, A. (2002). Tool selectivity in a non-primate, the New Caledonian crow (*Corvus moneduloides*). — *Anim. Cogn.* 5: 71-78.
- Chasen, F.N. (1939). The birds of the Malay peninsula, a general account of the birds inhabiting the region from the isthmus of Kra to Singapore with the adjacent islands, Vol. 4. — H.F. & G. Witherby, London.
- Chevalier-Skolnikoff, S. (1990). Tool use by wild cebus monkeys at Santa Rosa National Park, Costa Rica. — *Primates* 31: 375-383.
- Chevalier-Skolnikoff, S. & Liska, J.O. (1993). Tool use by wild and captive elephants. — *Anim. Behav.* 46: 209-219.
- Chiang, M. (1967). Use of tools by wild macaque monkeys in Singapore. — *Nature* 214: 1258-1259.
- Chisholm, A.H. (1954). The use by birds of “tools” or “instruments”. — *Ibis* 96: 380-383.
- Clark, C., Clark, L. & Clark, L. (1990). “Anting” behaviour by common grackles and European starlings. — *Wilson Bull.* 102: 167-169.
- Clayton, N.S. & Jolliffe, A. (1996). Marsh tits *Parus palustris* use tools to store food. — *Ibis* 138: 554-554.
- Cleveland, A., Rocca, A.M., Wendt, E.L. & Westergaard, G.C. (2004). Transportation of tools to food sites in tufted capuchin monkeys (*Cebus apella*). — *Anim. Cogn.* 7: 193-198.
- Colin, P.L. (1972). Daily activity patterns and effects of environmental conditions on the behaviour of the yellowheaded jawfish, *Opistognathus aurifrons* with notes on its ecology. — *Zoologica* 57: 137-169.

- Colin, P.L. (1973). Burrowing behaviour of the yellowhead jawfish *Opistognathus aurifrons*. — *Copeia*: 84-90.
- Condor, P. & Everett, M. (1979). Clever crows. — *Br. Birds* 72: 295-296.
- Connor, J. (1992). The shell game. — *Living Bird* 12: 6-7.
- Cooper, A.S. (1981). Pied kingfisher *Ceryle rudis* catches crab at sea. — *Cormorant* 9: 135-136.
- Cooper, L.R. & Harlow, H.F. (1961). Note on a cebus monkey's use of a stick as a weapon. — *Psychol. Rep.* 8: 418.
- Coyer, J. (1995). Use of a rock as an anvil for breaking scallops by the yellowhead wrasse, *Halichoeres garnoti* (Lambridae). — *Bull. Mar. Sci.* 57: 548-549.
- Creutz, G. (1952). Einemsen ("anting") bei *Cinclus*. — *J. Ornithol.* 93: 174.
- Cristol, D.A. & Switzer, P.V. (1999). Avian prey-dropping behaviour. II. American crows and walnuts. — *Behav. Ecol.* 10: 220-226.
- Crook, J.H. (1960). Nest form and construction in certain West African weaver-birds. — *Ibis* 102: 1-25.
- Crous, R. (1994). An incidence of bait fishing in the squacco heron *Ardeola ralloides*. — *Babbler* 32: 26-27.
- Cunningham, C.L., Anderson, J.R. & Mootnick, A.R. (2006). Object manipulation to obtain a food reward in hoolock gibbons, *Bunopithecus hoolock*. — *Anim. Behav.* 71: 621-629.
- Curio, E. & Kramer, P. (1964). Vom mangrofefinken (*Cactospiza heliobates* Snodgrass and Heller): Ergebnisse der Deutschen Galapagos-expedition 1962/63 I. — *Z. Tierpsychol.* 21: 223-234.
- Dater, E.E. (1953). Anting of blue-winger warbler (*Vermivora pinus*) at Ramsey, New Jersey. — *Auk* 70: 89.
- Davis, A.J. (1939). Golden-crowned kinglet putting ants in its feathers. — *Chat* 3: 25-26.
- Davis Jr., W.E. (1993). Foraging behaviour of a western reef heron in North America. — *Colonies Waterbirds* 8: 70-73.
- Davis Jr., W.E. (1995). Downy woodpecker and white-breasted nuthatch use "vice" to open sunflower seeds: is this an example of tool use? — *Bird Observ.* 23: 339-342.
- Davis Jr., W.E. (2004). Black-crowned night-heron vibrates bill in water to attract fish. — *Southeast. Nat.* 3: 127-128.
- Deblauwe, I., Guislain, P., Dupain, J. & van Elsckker, L. (2006). Use of a tool-set by *Pan troglodytes troglodytes* to obtain termites (*Macrotermes*) in the periphery of the Dja Biosphere Reserve, southeast Cameroon. — *Am. J. Primatol.* 68: 1191-1196.
- Dick, J.A. & Fenton, M.B. (1979). Tool-using by a black eagle? — *Bokmakierie* 31: 17.
- Dow, D.D. (1980). Primitive weaponry in birds: the Australian brush-turkey's defence. — *Emu* 80: 91-92.
- Drennen, D.J. (1995). Ring-billed gulls (*Larus delawarensis*) feeding on mussels. — *Ala. Birdlife* 41: 7-9.
- Drinkwater, H. (1958). Black-crowned night heron using bill motion to lure prey. — *Wilson Bull.* 70: 201-202.
- Ducoing, A.M. & Thierry, B. (2005). Tool-use learning in Tonkean macaques (*Macaca tonkeana*). — *Anim. Cogn.* 8: 103-113.
- Duerden, J.E. (1905). On the habits and reactions of crabs bearing actinians in their claws. — *Proc. Zool. Soc. Lond.* 73: 494-511.

- Duerden, J.E. (1908). The Egyptian vulture. — *J. S. Afr. Ornithol. Union* 4: 40-41.
- Duyck, I. & Duyck, J. (1984). Koolmees *Parus major* gebruikt instrument bij het voedsel-zoeken. — *Wielewaal* 50: 416.
- van Duzer, E.M. (1939). Observation on the breeding habits of the cut-lips minnow, *Exoglossum maxillingua*. — *Copeia*: 65-75.
- Ebert, E.E. (1968). A food habits study of the southern sea otter, *Enhydra lutris nereis*. — *Calif. Fish Game* 54: 33-42.
- Edmonds, J. (1991). Burnt offerings. — *Bird Observ.* 10: 131.
- Eibl-Eibesfeldt, I. (1961). Über den Werkzeuggebrauch des Spechtfinke *Camarhynchus pallidus* (Slater und Slavin). — *Z. Tierpsychol.* 18: 342-346.
- Eisenberg, J. & Kleiman, D. (1977). The usefulness of behaviour studies in developing captive breeding programmes for mammals. — In: *International zoo yearbook*, Vol. 17 (Olney, P., ed.). Zoological Society of London, London, p. 81-89.
- Eisner, T. & Davis, J.A. (1967). Mongoose throwing and smashing millipedes. — *Science* 155: 577-579.
- Eisner, T., Johnessee, J.S., Carrel, J., Hendry, L.B. & Meinwald, J. (1974). Defensive use by an insect of a plant resin. — *Science* 184: 996-999.
- Ellis, D.H. & Brunson, S. (1993). Tool use by the red-tailed hawk (*Buteo jamaicensis*). — *J. Raptor Res.* 27: 128.
- Ellis, J. (1975). Orangutan tool use at Oklahoma City Zoo. — *Keeper* 1: 5-6.
- Epstein, R. & Medalie, S.D. (1983). The spontaneous use of a tool by a pigeon. — *Behav. Anal. Lett.* 3: 241-247.
- Erlwein, K.M. (1996). Hairy and red-bellied woodpeckers use bark crevices to break open seeds. — *Kingbird* 46: 200-201.
- Erwin, J. (1974). Laboratory-reared rhesus monkeys can use their tails as tools. — *Percept. Motor Skills* 39: 129-130.
- Evans, H.E. (1959). Observations on the nesting behaviour of digger wasps of the genus *Ammophila*. — *Am. Midl. Nat.* 62: 449-473.
- Fay, J.M. & Carroll, R.W. (1994). Chimpanzee tool use for honey and termite extraction in Central Africa. — *Am. J. Primatol.* 34: 309-317.
- Fellers, J.H. & Fellers, G.M. (1976). Tool use in a social insect and its implications for competitive interactions. — *Science* 192: 70-72.
- Fernandes, M.E. (1991). Tool use and predation of oysters (*Crassostrea rhizophorae*) by the tufted capuchin, *Cebus apella apella*, in brackish water mangrove swamps. — *Primates* 32: 529-531.
- Fisher, C. (1979). Stonechat hammering snail on wall. — *Br. Birds* 1979: 38.
- Fisher, E.M. (1939). Habits of the southern sea otter. — *Mammalogy* 20: 21-36.
- Fitch-Snyder, H. & Carter, J. (1993). Tool use to acquire drinking water by free-ranging long-tailed macaques (*Macaca silenus*). — *Lab. Prim. Newslett.* 32: 1-4.
- Fitzwater, W.D. (1967). The house crow (*Corvus splendens*, Vieillot) feeding on the Indian desert gerbil (*Meriones hurrianae*, Jerdon). — *J. Bombay Nat. Hist. Soc.* 64: 111.
- Fleming, R.L. (1955). The bone-dropping behaviour of the Lammergeyer. — *J. Bombay Nat. Hist. Soc.* 52: 933-935.
- Fontaine, B., Moisson, P.Y. & Wickings, E.J. (1995). Observations of spontaneous tool making and tool use in a captive group of western lowland gorillas (*Gorilla gorilla gorilla*). — *Folia Primatol.* 65: 219-223.

- Forrest, T.G. (1982). Acoustic communication and baffling behaviours of crickets. — Fla. Entomol. 65: 33-44.
- Fox, E.A. & bin'Muhammad, I. (2002). Brief communication: new tool use by wild Sumatran orangutans (*Pongo pygmaeus abelii*). — Am. J. Phys. Anthropol. 119: 186-188.
- Fox, E.A., van Schaik, C.P., Sitompul, A. & Wright, D.N. (2004). Intra- and interpopulational differences in orangutan (*Pongo pygmaeus*) activity and diet: implications for the invention of tool use. — Am. J. Phys. Anthropol. 125: 162-174.
- Foxall, C.D. & Drury, D. (1987). Green-backed heron 'bait fishing' in Nairobi National Park. — Bull. E. Afr. Nat. Hist. Soc. 17: 11.
- Fragaszy, D.M., Izar, P., Visalberghi, E., Ottoni, E.B. & De Oliveira, M.G. (2004). Wild capuchin monkeys (*Cebus libidinosus*) use anvils and stone pounding tools. — Am. J. Primatol. 64: 359-366.
- Fricke, H.W. (1971). Fische als feinde tropischer seeigel. — Mar. Biol. 9: 328-338.
- Fricke, H.W. (1975). Lösen einfacher Probleme bei einem Fisch. — Z. Tierpsychol. 38: 18-33.
- Frisch, J.A. (1940). Did the Peckhams witness the invention of a tool by *Ammonphila urnaria*? — Am. Midl. Nat. 24: 345-350.
- Furlong, E.E., Boose, K.J. & Boysen, S.T. (2008). Raking it in: the impact of enculturation on chimpanzee tool use. — Anim. Cogn. 11: 83-97.
- Gaddis, P. (1981). Tool use by a mountain chickadee. — Cont. Birdlife 2: 19-20.
- Galat-Luong, A. (1984). L'utilisation spontanée d'outils pour le toilettage chez des Cercopithecidae Africains captifs. — Rev. Ecol. (Terre Vie) 39: 231-236.
- Galdikas, B.M. (1982). Orang-utan tool-use at Tanjung Puting Reserve, Central Indonesian Borneo (Kalimantan Tengah). — J. Human Evol. 10: 19-33.
- Galdikas, B.M. (1989). Orangutan tool use. — Science 243: 152.
- Gannon, R.A. (1930). Observations on the satin bower-bird with regard to the material used by it in painting its bower. — Emu 30: 39-41.
- Gatinot, B.L. (1974). Note sur l'observation d'une utilisation spontanée d'outil chez *Erythrocebus patas* en captivité. — Mammalia 38: 557-558.
- Gayou, D.C. (1982). Tool use by green jays. — Wilson Bull. 94: 593-594.
- George, N.J. (1973). Baya (*Ploceus philippinus*) feeding on frogs. — J. Bombay Nat. Hist. Soc. 70: 381-382.
- Gertsch, W.J. (1955). The North American bolas spiders of the genera *Mastophora* and *Agatostichus*. — Bull. Am. Mus. Nat. Hist. 106: 225-254.
- Gibson, C. (1992). Jackdaws feeding on horse-chestnuts. — Br. Birds 85: 138.
- Gold, K.C. (2002). Ladder use and clubbing by a bonobo (*Pan paniscus*) in Apenheul Primate Park. — Zoo Biol. 21: 607-611.
- Gonzalez-Kirchner, J.P. & Sainz de la Maza, M. (1992). Sticks used by wild chimpanzees: a new locality in Rio Muni. — Folia Primatol. 58: 99-102.
- Goodall, J. (1964). Tool-using and aimed throwing in a community of free-living chimpanzees. — Nature 201: 1264-1266.
- Goodge, W.R. (1959). Locomotion and other behaviour of the dipper. — Condor 61: 4-17.
- Goodman, A.E. & Fisk, E.J. (1973). Breeding behaviour of captive striped owls (*Rhinoptynx clamator*). — Avic. Mag. 79: 158-162.
- Goodwin, D. (1953a). Interspecific differences in the anting movements of some corvine birds. — Ibis 95: 147-149.

- Goodwin, D. (1953b). Observations on captive lanceolated jays. — *Avic. Mag.* 59: 122-133.
- Gore, M.E.J. (1981). Fiscal shrike kills prey by impaling it on thorn. — *Bull. E. Afr. Nat. Hist. Soc. Nov/Dec*: 115.
- Gorman, G. (1998). Syrian woodpecker using wall crevice as an 'anvil'. — *Br. Birds* 91: 378.
- Gould, J. (1848). *An introduction to the birds of Australia*. — Taylor, London.
- Green, C. (1972). Use of tool by orange-winged sittella. — *Emu* 72: 185-186.
- Greenhood, W. & Norton, R.L. (1999). Novel feeding technique of the woodpecker finch. — *J. Field Ornithol.* 70: 104-106.
- Grobecker, D.B. & Pietsch, T.W. (1978). Crows use automobiles as nutcrackers. — *Auk* 95: 760-761.
- Groskin, H. (1943). Scarlet tanagers "anting". — *Auk* 60: 55-59.
- Gruber, A. (1969). A functional definition of primate tool-making. — *Man* 4: 573-579.
- Grummt, W. (1963). Werkzeuggebrauch beim Wasserbüffel (*Bubalus arnee f. bublais L.*). — *Zool. Garten* 27: 262-263.
- Guillaume, P. & Meyerson, I. (1934). Recherches l'usage de l'instrument chez les singes, III: l'intermediaire independant de l'objet. — *J. Psychol.* 31: 497-554.
- Gumert, M.D., Kluck, M. & Malaivijitnond, S. (2009). The physical characteristics and usage patterns of stone axe and pounding hammers used by long-tailed macaques in the Andaman Sea region of Thailand. — *Am. J. Primatol.* 71: 594-608.
- Hall, K.R.L. (1963). Tool-using performances as indicators of behavioural adaptability. — *Curr. Anthropol.* 4: 479-494.
- Hall, K.R.L. & Schaller, G.B. (1964). Tool-using behaviour of the California sea otter. — *J. Mammal.* 45: 287-299.
- Hamilton III, W.J., Buskirk, R.E. & Buskirk, W.H. (1975). Defensive stoning by baboons. — *Nature* 256: 488-489.
- Hammond, N. (1997). House sparrows, chaffinch and spotted flycatchers eating damselflies. — *Br. Birds* 90: 368.
- Haney, J.C. (1982). Seed-cracking attempts by a Carolina wren. — *The Migrant* 53: 12-13.
- Hannah, A.C. & McGrew, W.C. (1987). Chimpanzees using stones to crack open oil palm nuts in Liberia. — *Primates* 28: 31-46.
- Harber, D.D. & Jones, M. (1947). Great black-backed gull dropping rat. — *Br. Birds* 40: 317.
- Harcourt, C.H. (1981). An examination of the function of urine washing in *Galago senegalensis*. — *Z. Tierpsychol.* 55: 119-128.
- Hart, B.L. & Hart, L.A. (1994). Fly switching by Asian elephants: tool use to control parasites. — *Anim. Behav.* 48: 35-46.
- Hart, B.L., Hart, L.A., McCoy, M. & Sarath, C.R. (2001). Cognitive behaviour in Asian elephants: use and modification of branches for fly switching. — *Anim. Behav.* 62: 839-847.
- Hartman, C.G. (1905). Observations on the habits of some solitary wasps of Texas. — *Bull. Univ. Texas* 65: 1-72.
- Hauser, M., Pearson, H. & Seelig, D. (2002). Ontogeny of tool use in cottontop tamarins, *Saguinus oedipus*: innate recognition of functionally relevant features. — *Anim. Behav.* 64: 299-311.
- Harvey, R. (2000). Tool use by green heron. — *Conn. Warbler* 20: 29.
- Heinrich, B. (1988). Raven tool use. — *Condor* 90: 270-271.
- Henry, P.-Y. & Aznar, J.-C. (2006). Tool-use in *Charadrii*: active bait fishing by a Herring Gull. — *Waterbirds* 29: 233-234.

- Henry, P.-Y., Bénéat, T. & Maire, P. (1998). Consommation de jeunes grenouilles «vertes» *Rana kl. escugenta* par un Chevalier gambette *Tringet tetanus*. — Nos Oiseaux 45: 57-58.
- Henschel, J.R. (1995). Tool use by spiders: stone selection and placement by corolla spiders (*Ariadna Segestriidae*) of the Namib Desert. — *Ethology* 101: 187-199.
- Henty, C.J. (1986). Development of snail-smashing by song thrushes. — *Br. Birds* 79: 277-281.
- Hernandez-Aguilar, R.A., Moore, J. & Pickering, T.R. (2007). Savanna chimpanzees use tools to harvest the underground storage organs of plants. — *Proc. Natl. Acad. Sci. USA* 104: 19210-19213.
- Heselden, R.G., Parr, J., Berrow, S. & Copley, N. (1996). Black wheatear killing lizard by dashing it against stone. — *Br. Birds* 89: 317.
- Heymann, E. (1995). Urine washing and related behaviour in wild moustached tamarins, *Saguinus mystax (Callitrichidae)*. — *Primates* 36: 259-264.
- Hicks, T.C., Fouts, R.S. & Fouts, D.H. (2005). Chimpanzee (*Pan troglodytes troglodytes*) tool use in the Ngotto Forest, Central African Republic. — *Am. J. Primatol.* 65: 221-237.
- Higuchi, H. (1988). Individual differences in bait-fishing by the green-backed heron *Ardeola striata* associated with territory quality. — *Ibis* 130: 39-44.
- Hihara, S., Obayashi, S., Tanaka, M. & Iriki, A. (2003). Rapid learning of sequential tool use by macaque monkeys. — *Physiol. Behav.* 78: 427-434.
- Hill, R.W. (1946). Bronzed grackle “anting” with mothballs. — *Wilson Bull.* 58: 112.
- Hindwood, K.A. (1966). Australian birds in colour. — A.H. & A.W. Reed, Sydney, NSW.
- Hirata, S., Myowa, M. & Matsuzawa, T. (1998). Use of leaves as cushions to sit on wet ground by wild chimpanzees. — *Am. J. Primatol.* 44: 215-220.
- Hobbs, J.N. (1971). Use of tools by the while-winged cough. — *Emu* 71: 84-85.
- Hobhouse, L. (1926). Mind in evolution. — Macmillan, London.
- Hohmann, G. (1988). A case of simple tool use in wild liontailed macaques (*Macaca silenus*). — *Primates* 29: 565-567.
- Hölldobler, B. & Wilson, E.O. (1977). Weaver ants. — *Sci. Am.* 237: 146-154.
- Hornaday, W. (1934). The minds and manners of wild animals. — Scribner's, New York, NY.
- Houk, J.L. & Geibel, J.J. (1974). Observation of underwater tool use by sea otter, *Enhydra lutris* Linnaeus. — *Calif. Fish Game* 60: 207-208.
- Howell, T.R. (1979). Breeding biology of the Egyptian plover, *Pluvianus aegyptius*. — *Univ. Calif. Publ. Zool.* 113: 1-76.
- del Hoyo, J., Elliot, A. & Sargatal, J. (1996). Handbook of the birds of the world, Vol. 3. — Lynx Education, Barcelona.
- Huffman, M.A. & Kalunde, M.S. (1993). Tool-assisted predation on a squirrel by a female chimpanzee in the Mahale Mountains, Tanzania. — *Primates* 34: 93-98.
- Humle, T. & Matsuzawa, T. (2002). Ant-dipping among the chimpanzees of Bossou, Guinea, and some comparisons with other sites. — *Am. J. Primatol.* 58: 133-148.
- Humle, T. & Matsuzawa, T. (2004). Oil palm use by adjacent communities of chimpanzees at Bossou and Nimba Mountains, West Africa. — *Intl. J. Primatol.* 25: 551-581.
- Hundley, M.H. (1963). Notes on the methods of feeding and the use of tools in the Geospizinae. — *Auk* 80: 372-373.
- Hunt, G.R. (1996). Manufacture and use of hook-tools by New Caledonian crows. — *Nature* 379: 249-251.

- Hunt, G.R. & Gray, R.D. (2004). Direct observations of pandanus-tool manufacture and use by a New Caledonian crow (*Corvus moneduloides*). — *Anim. Cogn.* 7: 114-120.
- Hunt, G.R., Rutledge, R.B. & Gray, R.D. (2006). The right tool for the job: what strategies do wild New Caledonian crows use? — *Anim. Cogn.* 9: 307-316.
- Hunt, G.R., Sakuma, F. & Shibata, Y. (2002). New Caledonian crows drop candle-nuts onto rock from communally used forks on branches. — *Emu* 102: 283-290.
- Hunter Jr., M.L., Calhoun, A. & Wilcove, D.S. (2004). Goliath heron fishing with an artificial bait? — *Waterbirds* 27: 312-313.
- Hutchinson, C.E. (1903). A bolas throwing spider. — *Sci. Am.* 89: 172.
- Iliny, G. (1982). Egyptian vultures and dabb lizards. — *Israel Land Nat.* 8: 37.
- van Impe, J. (1978). Mediterranean gull dropping bivalves. — *Br. Birds* 71: 128-129.
- Ingolfsson, A. & Estrella, B.T. (1978). The development of shell-cracking behaviour in herring gulls. — *Auk* 95: 577-579.
- Inoue-Nakamura, N. & Matsuzawa, T. (1997). Development of stone tool use by wild chimpanzees (*Pan troglodytes*). — *J. Comp. Psychol.* 111: 159-173.
- Ivor, H.R. (1941). Observations on anting by birds. — *Auk* 58: 415-416.
- Ivor, H.R. (1943). Further studies of anting by birds. — *Auk* 60: 51-55.
- Ivor, H.R. (1955). The enigma of anting. — *Natl. Geogr. Mag.* 110: 105-119.
- Izawa, K. & Mizuno, A. (1977). Palm-fruit cracking behaviour of wild black-capped capuchin (*Cebus apella*). — *Primates* 18: 773-792.
- Jackson, J. (1985). The “dunking” habit of common grackles. — *Am. Birds* 39: 261-262.
- Jackson, T.A. (1942). Use of the stick as a tool by young chimpanzees. — *J. Comp. Psychol.* 34: 223-235.
- Jacobsen, K. (1911). Der rabe in Ameisenbad. — *Mitt. Vogelwelt* 11: 238.
- Janes, S.W. (1976). The apparent use of rocks by a raven in nest defense. — *Condor* 78: 409.
- Janzen, M.J., Janzen, D.H. & Pond, C.M. (1976). Tool-using by the African grey parrot. — *Biotropica* 8: 70.
- Jewett, S.G. (1924). An intelligent crow. — *Condor* 26: 72.
- Johnsingh, A.J.T. (1979). A note on the predation of jungle myna (*Acridotheres fuscus* Waagler) on field mouse. — *J. Bombay Nat. Hist. Soc.* 76: 159.
- Johnston, A.F. (1985). Anting-like behaviour of dipper with fish. — *Br. Birds* 78: 242.
- Johnson, I.W. (1976). Washing of food by spotless crake. — *Notornis* 23: 357.
- Jones, C. & Pi, J.S. (1969). Sticks used by chimpanzees in Rio Muni, West Africa. — *Nature* 223: 100-101.
- Jones, C.G. (1979). Birds dunking food. — *Br. Birds* 72: 189-190.
- Jones, T.B. & Kamil, A.C. (1973). Tool-making and tool-using in the northern blue jay. — *Science* 180: 1076-1078.
- Jordan, C. (1982). Object manipulation and tool-use in captive pygmy chimpanzees (*Pan paniscus*). — *J. Human Evol.* 11: 35-39.
- Jordheim, S.O. (1965). Unusual feeding behaviour of yellowlegs. — *Blue Jay* 23: 25.
- Judson, O.P. & Bennett, A.T.D. (1992). ‘Anting’ as food preparation: formic acid is worse on an empty stomach. — *Behav. Ecol. Sociobiol.* 31: 437-439.
- Karrer, R. (1970). The use of the tail by an Old World monkey. — *Primates* 11: 171-175.
- Katz, S.J. (1980). Tool-using behaviour of the pocket gopher, *Thomomys bottae* (*Geomysidae*). — *Southwest. Nat.* 25: 270-271.
- Kawai, M. (1965). Newly-acquired pre-cultural behaviour of the natural troop of Japanese monkeys on Koshima islet. — *Primates* 6: 1-30.

- Keenan III, W.J. (1981). Green heron fishing with mayflies. — *Chat* 45: 41.
- Keenleyside, M.H.A. & Prince, C.E. (1976). Spawning-site selection in relation to parental care of eggs in *Aequidens paraguayensis* (Pisces: Cichlidae). — *Can. J. Zool.* 54: 2135-2139.
- Kent, B.W. (1981). Prey dropped by herring gulls (*Larus argentatus*) on soft sediments. — *Auk* 98: 350-354.
- Kenyon, K.W. (1958). The sea otter. — *Ann. Rep. Regents Smithsonian Inst.*: 339-407.
- Kilham, L. (1968). Reproductive behaviour of white-breasted nuthatches. I. Distraction display, bill-sweeping, and nest hole defense. — *Auk* 85: 477-492.
- Kilham, L. (1974). Covering of stores by white-breasted and red-breasted nuthatches. — *Condor* 76: 108-109.
- Kiliaan, H.P.L. (1972). The possible use of tools by polar bears to obtain their food. — *Årbok*: 177-178.
- King, B. (1978). Chat's method of eating caterpillars. — *Br. Birds* 71: 463.
- King, W.B. & Kepler, C.B. (1970). Active anting in the Puerto Rican tanager. — *Auk* 87: 376-378.
- Kitahara-Frisch, J., Norikoski, K. & Hara, K. (1987). Use of a bone fragment as a step towards secondary tool use in captive chimpanzee. — *Primate Rep.* 18: 33-37.
- Koenig, W.D. (1985). Dunking of prey by Brewer's blackbirds: a novel source of water for nestlings. — *Condor* 87: 444-445.
- Köhler, W. (1925). The mentality of apes. — K. Paul, Trench, Trubner & Co., London.
- Kooij, M. & von Zon, J.C.J. (1964). Gooinende seriëma's. — *Artis* 9: 197-201.
- Kortlandt, A. (1967). Experimentation with chimpanzees in the wild. — In: *Neue ergebnisse der Primatologie. Progress in primatology. First congress of the International Primatological Society, Frankfurt A. M. 26-30 Juli 1* (Starck, D., Schneider, R. & Kuhn, H., eds). Fischer, Stuttgart, p. 208-224.
- Kortlandt, A. (1986). The use of stone tools by wild-living chimpanzees and earliest hominids. — *J. Human Evol.* 15: 77-132.
- Kortlandt, A. & Holzhaus, E. (1987). New data on the use of stone tools by chimpanzees in Guinea and Liberia. — *Primates* 28: 473-496.
- Kortlandt, A. & Kooij, M. (1963). Prothominid behaviour in primates. — *Symp. Zool. Soc. Lond.* 10: 61-88.
- Köster, F. & Köster, H. (1983). Twelve days among the "vampire finches" of Wolf Island. — *Not. Galápagos* 38: 4-10.
- Krützen, M., Mann, J., Heithaus, M.R., Connor, R.C., Bejder, L. & Sherwin, W.B. (2005). Cultural transmission of tool use in bottlenose dolphins. — *Proc. Nat. Acad. Sci. USA* 102: 8939-8943.
- Kumar, S., Kumara, H.N. & Singh, M. (2008). Observations on tool use in captive lion-tailed macaque (*Macaca silenus*). — *Curr. Sci.* 94: 925-928.
- Kushlan, J.A. (1973). Bill-vibrating: a prey-attracting behaviour of the snowy egret, *Leucophoyx thula*. — *Am. Midl. Nat.* 89: 509-512.
- Kyes, R.C. (1988). Grooming with a stone in sooty mangabeys (*Cercocebus atys*). — *Am. J. Primatol.* 16: 171-175.
- Labeledz, T.E. (1980). Yellow-bellied sapsucker feeding on hackleberry seeds. — *Nebr. Bird Rev.* 48: 89.
- Lancaster, J.B. (1968). On the evolution of tool-using behaviour. — *Am. Anthropol.* 70: 56-66.

- Lang, E.M. (1974). Werkzeuggebrauch beim Brillenbären (*Ursus ornatus*). — Zool. Garten 44: 324-328.
- Laskey, A.R. (1948). Bronzed grackle anointing plumage with orange-skin. — Wilson Bull. 60: 244-245.
- Lavallee, A. (1999). Capuchin (*Cebus apella*) tool use in a captive naturalistic environment. — Int. J. Primatol. 20: 399-414.
- Law, J.E. (1929). Another Lewis woodpecker stores acorns. — Condor 31: 233-238.
- van Lawick-Goodall, J. (1970). Tool-using in primates and other vertebrates. — In: Advances in the study of behaviour, Vol. 3 (Lehrman, D.S., Hinde, R.A. & Shaw, E., eds). Academic Press, New York, NY, p. 195-249.
- van Lawick-Goodall, J. & van Lawick, H. (1966). Use of tools by the Egyptian vulture, *Neophron percnopterus*. — Nature 212: 1468-1469.
- van Lawick-Goodall, J., van Lawick, H. & Packer, C. (1973). Tool-use in free living baboons in the Gombe National Park, Tanzania. — Nature 241: 212-213.
- Lefebvre, L., Nicolakakis, N. & Boire, D. (2002). Tools and brains in birds. — Behaviour 139: 939-973.
- Lefebvre, L., Reader, S.M. & Sol, D. (2004). Brains, innovations and evolution in birds and primates. — Brain Behav. Evol. 63: 233-246.
- Leshem, Y. (1979). Golden eagles in our backyard. — Israel Land Nat. 5: 70-75.
- Leshem, Y. (1985). Shell-dropping by ospreys. — Br. Birds 78: 143.
- Levey, D.J., Duncan, R.S. & Levins, C.F. (2004). Use of dung as a tool by burrowing owls. — Nature 431: 39.
- Lin, N. (1964-1965). The use of sand grains by the pavement ant *Tetramorium caespitum* while attacking Halictine bees. — Bull. Brooklyn Entomol. Soc. 59-60: 30-34.
- Lindblom, G. (1920). The Akamba in British East Africa, 2nd edn. — K.W. Appelbergs Boktryckeri, Uppsala.
- Lockwood, D. (1962). I, the aboriginal. — Rigby, Adelaide, SA.
- Löhr, H. (1983). Zur Feindabwehr der Wacholderdrossel (*Turdus pilaris*). — J. Ornithol. 124: 271-279.
- Londie, T. & Maffioli, B. (1978). La cornacchia gingia *Corvus corone cornix*, a Milano. — Rev. Ital. Ornitol. 59: 241-258.
- Longman, H.A. (1922). The magnificent spider: *Dicrostichus magnificus* rainbow. Notes on cocoon spinning and method of catching prey. — Proc. Roy. Soc. Queensland 33: 91-98.
- Lonsdorf, E.V. (2005). Sex differences in the development of termite-fishing skills in the wild chimpanzees, *Pan troglodytes schweinfurthii*, of Gombe National Park, Tanzania. — Anim. Behav. 70: 673-683.
- Lovell, H.B. (1958). Bait-fishing by a green heron. — Wilson Bull. 70: 280-281.
- Lucas, J.R. (1982). The biophysics of pit construction by antlion larvae (*Myrmeleon*, Neuroptera). — Anim. Behav. 30: 651-664.
- Luchtemeyer, E.A. (1969). Unusual behaviour of robin, *Turdus migratorius*, and red-winged blackbirds, *Agelaius phoeniceus*. — Fla. Nat. 42: 135.
- Luling, K.H. (1966). The archer fish. — Sci. Am. 209: 100-109.
- Lunt, N., Hulley, P.E. & Craig, A.J.F.K. (2004). Active anting in captive Cape white-eyes *Zosterops pallidus*. — Ibis 146: 360-362.
- Lydekker, R. (1910). Library of natural history, Vol. 1: Mammals. — Saalfield, New York, NY.

- Mackay, S. (1997). Ravens again. — *Bird Observ.* 10: 776.
- MacLean, G.L. (1968). Field studies of the sandgrouse in the Kalahari Desert. — *Living Bird* 7: 209-235.
- Malaivijitnond, S., Lekprayoon, C., Tandavanittj, N., Panha, S., Cheewatham, C. & Hamada, Y. (2007). Stone-tool usage by Thai long-tailed macaques (*Macaca fascicularis*). — *Am. J. Primatol.* 69: 227-233.
- Mann, J., Sargeant, B.L., Watson-Capps, J.J., Gibson, Q.A., Heithaus, M.R., Connor, R.C. & Patterson, E. (2008). Why do dolphins carry sponges? — *PLoS One* 3: e3868.
- Mannu, M. & Ottoni, E.B. (2009). The enhanced tool-kit of two groups of wild bearded capuchin monkeys in the Caatinga: tool making, associative use, and secondary tools. — *Am. J. Primatol.* 71: 242-251.
- Maple, T. (1974). Do crows use automobiles as nutcrackers. — *West. Birds* 5: 97-98.
- Marais, E.N. (1969). *The soul of the ape*. — Atheneum, New York, NY.
- Marks, J.S. & Hall, C.S. (1992). Tool use by bristle-thighed curlews feeding on albatross eggs. — *Condor* 94: 1032-1034.
- Marler, P. (1996). Are primates smarter than birds? — In: *Current ornithology*, Vol. 13 (Nolan Jr., V. & Ketterson, E.D., eds). Plenum, New York, NY, p. 1-32.
- Maron, J.L. (1982). Shell-dropping behaviour of Western gulls (*Larus occidentalis*). — *Auk* 99: 565-569.
- Marshall, A.J. (1954). *Bowerbirds: their displays and breeding cycles, a preliminary statement*. — Clarendon Press, Oxford.
- Marshall, A.J. (1960). Bower-birds. — *Endeavour* 19: 202-208.
- Marshall, B.E. (1982). A possible example of tool usage by the Marabou stork. — *Ostrich* 53: 181.
- Masataka, N., Koda, H., Urasopon, N. & Watanabe, K. (2009). Free-ranging macaque mothers exaggerate tool-using behaviour when observed by offspring. — *PLoS One* 4: e4768.
- Mather, J.A. (1994). Home choice and modification by juvenile *Octopus vulgaris* (Mollusca, Cephalopoda): specialized intelligence and tool use. — *J. Zool.* 233: 359-368.
- Matsusaka, T., Nishie, H., Shimada, M., Kutsukake, N., Zamma, K., Nakamura, M. & Nishida, T. (2006). Tool-use for drinking water by immature chimpanzees of Mahale: prevalence of an unessential behaviour. — *Primates* 47: 113-122.
- McAtee, W.L. (1944). Red-eyed towhee anting. — *Auk* 61: 298.
- McBeath, N.M. & McGrew, W.C. (1982). Tools used by wild chimpanzees to obtain termites at Mt. Assirik, Senegal: the influence of habitat. — *J. Human Evol.* 11: 65-72.
- McDonald, J.D. (1974). *Birds of Australia*. — Reed, Sydney, NSW.
- McDonald, N.H.E. (1970). Cases of high intelligence of white-winged choughs. — *Sunraysia Nat. Res. Trust Rep.* 7: 61-63.
- McDonald, P. (1984). Tool use by the ant, *Novomessor albisetosus* (Mayr). — *J.N.Y. Entomol. Soc.* 92: 156-161.
- McGrew, W.C. (1992a). *Chimpanzee material culture: implications for human evolution*. — Cambridge University Press, New York, NY.
- McGrew, W.C. (1992b). Tool-use by free-ranging chimpanzees — the extent of diversity. — *J. Zool.* 228: 689-694.
- McGrew, W.C. & Collins, D.A. (1985). Tool use by wild chimpanzees (*Pan troglodytes*) to obtain termites (*Macrotermes herus*) in the Mahale Mountains, Tanzania. — *Am. J. Primatol.* 9: 47-62.

- McGrew, W.C., Marchant, L., Wrangham, R. & Klein, H. (1999). Manual laterality in anvil use: wild chimpanzees cracking *Strychnos* fruits. — *Laterality* 4: 79-87.
- McGrew, W.C. & Rogers, M.E. (1983). Chimpanzees, tools, and termites: New record from Gabon. — *Am. J. Primatol.* 5: 171-174.
- McGrew, W.C., Tutin, C.E. & Midgett Jr., P.S. (1975). Tool use in a group of captive chimpanzees I. Escape. — *Z. Tierpsychol.* 37: 145-162.
- McGrew, W.C. & Tutin, C.E.G. (1973). Chimpanzee tool use in dental grooming. — *Nature* 241: 477-478.
- McKay, G.M. (1973). Behaviour and ecology of the Asiatic elephant in southeastern Ceylon. — *Smithsonian Contrib. Zool.* 125: 1-113.
- McKeown, K.C. (1936). Spider wonders of Australia. — Angus & Robertson, Sydney, NSW.
- McMahan, E.A. (1982). Bait-and-capture strategy of a termite-eating assassin bug. — *Insect. Soc.* 29: 346-351.
- McMahan, E.A. & Mendez, R.A. (1983). Bugs angle for termites: with stealth and artifice, the assassin bug lures termites out of their well-guarded nests. — *Nat. Hist.* 92: 40-47.
- McMillan, M. (1992). How to feed the muppets — soak the bones. — *Bird Observ.* 12: 726.
- Meinzer, W. (1993). The roadrunner. — Texas Tech University Press, Lubbock, TX.
- Menzel Jr., E.W. (1972). Spontaneous invention of ladders in a group of young chimpanzees. — *Folia Primatol.* 17: 87-106.
- Mercader, J., Panger, M. & Boesch, C. (2002). Excavation of a chimpanzee stone tool site in the African rainforest. — *Science* 296: 1452-1455.
- Meyerriecks, A.J. (1972). Tool-using by a double-crested cormorant. — *Wilson Bull.* 84: 482-483.
- Michener, G.R. (2004). Hunting techniques and tool use by North American badgers preying on Richardson's ground squirrels. — *J. Mammal.* 85: 1019-1027.
- Mienis, H.K. (1993). A change in the nut-cracking technique used by hooded crows in Kibbutz Netzer Sereni, Israel. — *Bull. Ornithol. Soc. Mid. East* 30: 20.
- Miller, L. & Quiatt, D. (1983). Tool use by a captive orangutan. — *Lab. Primate News.* 22: 10.
- Millikan, G.C. & Bowman, R.L. (1967). Observations on Galápagos tool-using finches in captivity. — *Living Bird* 6: 23-42.
- Mitchell, H. (1972). Further recording of a tool-using bird. — *Aust. Bird Watcher* 4: 237.
- Mitchell, T.L. (1993). Tool use by a white-breasted nuthatch. — *Bull. Ok. Ornithol. Soc.* 26: 6-7.
- Montevicchi, W.A. (1978). Corvids using objects to displace gulls from nests. — *Condor* 80: 349.
- Moore, G.J.H. (1992). Egg predation by blackheaded gull. — *Notornis* 39: 93.
- Morand-Ferron, J., Lefebvre, L., Reader, S.M., Sol, D. & Elvin, S. (2004). Dunking behaviour in Carib grackles. — *Anim. Behav.* 68: 1267-1274.
- Moreno, J., Soler, M., Møller, A.P. & Linden, M. (1994). The function of stone carrying in the black wheatear, *Oenanthe leucura*. — *Anim. Behav.* 47: 1297-1309.
- Morrill, W.L. (1972). Tool using behaviour of *Pogonomyremex badius* (Hymenoptera: Formicidae). — *Fla. Entomol.* 55: 59-60.
- Morris, D. (1954). The snail-eating behaviour of thrushes and blackbirds. — *Br. Birds* 47: 33-49.
- Morse, D.H. (1968). The use of tools by brown-headed nuthatches. — *Wilson Bull.* 80: 220-224.

- de A. Moura, A.C. & Lee, P.C. (2004). Capuchin stone tool use in Caatinga Dry Forest. — *Science* 306: 1909-1909.
- Mulcahy, N.J. & Call, J. (2006). Apes save tools for future use. — *Science* 312: 1038-1040.
- Murie, O.J. (1940). Notes on the sea otter. — *J. Mammal.* 21: 119-131.
- Nakamichi, M. (1999). Spontaneous use of sticks as tools by captive gorillas (*Gorilla gorilla gorilla*). — *Primates* 40: 487-498.
- Nakamichi, M. (2004). Tool-use and tool-making by captive, group-living orangutans (*Pongo pygmaeus abelii*) at an artificial termite mound. — *Behav. Process.* 65: 87-93.
- Nellman, H. & Trendelenburg, W. (1926). Ein Beitrag zur Intelligenzprüfung niederer Affen. — *Z. Vergl. Physiol.* 4: 142-200.
- Nero, R. (1951). Red-wing, *Agelaius phoeniceus*, anting. — *Auk* 68: 108.
- Nice, M.M. (1945). Cowbirds anting. — *Auk* 62: 302-303.
- Nickerson, J.C., Snyder, D.E. & Oliver, C.C. (1979). Acoustical burrows constructed by mole crickets. — *Ann. Entomol. Soc. Am.* 72: 438-440.
- Nicklas, M.B. (1974). Bird behaviour. — *Chat* 38: 88.
- Nihei, Y. (1995). Variations of behaviour of carrion crows *Corvus corone* using automobiles as nutcrackers. — *Jpn. J. Ornithol.* 44: 21-35.
- Nihei, Y. (1998). Nutcracking behaviour of carrion crows *Corvus corone* using automobiles: an approach from the schema theory of cognitive psychology. — *Jpn. J. Psychon. Sci.* 16: 93-99.
- Nishida, T. (1980). The leaf-clipping display: a newly-discovered expressive gesture in wild chimpanzees. — *J. Human Evol.* 9: 117-128.
- Nishida, T. & Nakamura, M. (1993). Chimpanzee tool use to clear a blocked nasal passage. — *Folia Primatol.* 61: 218-220.
- Nishida, T. & Uehara, S. (1980). Chimpanzees, tools, and termites: another example from Tanzania. — *Curr. Anthropol.* 21: 671-672.
- Nishimura, T., Okayasu, N., Hamada, Y. & Yamagiwa, J. (2003). A case report of a novel type of stick use by wild chimpanzees. — *Primates* 44: 199-201.
- Norris, D. (1975). Green heron (*Butorides virescens*) uses feather lure for fishing. — *Am. Birds* 29: 652-654.
- Noske, R.A. (1985). Left-footedness and tool-using in the varied sittella *Daphoenositta chrysoptera* and crested shrike-tit *Falcunculus frantatus*. — *Corella* 9: 63-64.
- Odling-Smee, F.J., Laland, K.N. & Feldman, M.W. (2003). Niche construction: the neglected process in evolution. — *Monographs in Population Biology*, 37. Princeton University Press, Princeton, NJ.
- O'Hara, S.J. & Lee, P.C. (2006). High frequency of postcoital penis cleaning in Budongo chimpanzees. — *Folia Primatol.* 77: 353-358.
- Okanoya, K., Tokimoto, N., Kumazawa, N., Hihara, S. & Iriki, A. (2008). Tool use training in a species of rodent: emergence of an optimal motor strategy and functional understanding. — *PLoS One* 3: e1860. doi: 10.1371/journal.pone.0001860.
- Oldham, C. (1930). The shell-smashing habits of gulls. — *Ibis*: 239-243.
- O'Malley, R.C. & McGrew, W.C. (2000). Oral tool use by captive orangutans (*Pongo pygmaeus*). — *Folia Primatol.* 71: 334-341.
- Orenstein, R.I. (1972). Tool-use by new Caledonian crow (*Corvus moneduloides*). — *Auk* 89: 674-676.
- Osborn, S.A.H. (1998). Anting by an American dipper (*Cinclus mexicanus*). — *Wilson Bull.* 110: 423-425.

- Osmaston, B.B. (1936). Do birds employ ants to rid themselves of ectoparasites? — *J. Bombay Nat. Hist. Soc.* 39: 182-183.
- Otnes, G. (1977). Unusual feeing behaviour of a great blue heron. — *Loon* 49: 233-234.
- Ottoni, E.B., Dogo de Resende, B. & Izar, P. (2005). Watching the best nut-crackers: what capuchin monkeys (*Cebus apella*) know about others' tool-using skills. — *Anim. Cogn.* 24: 215-219.
- Ottoni, E.B. & Mannu, M. (2001). Semifree-ranging tufted capuchins (*Cebus apella*) spontaneously use tools to crack open nuts. — *Int. J. Primatol.* 22: 347-358.
- Oyen, O.J. (1979). Tool-use in free-ranging baboons of Nairobi National Park. — *Primates* 20: 595-597.
- Page, D. (1978). Pied flycatcher hammering snail on road. — *Br. Birds* 71: 113.
- Panger, M.A. (2007). Tool use and cognition in primates. — In: *Primates in perspective* (Campbell, C., Fuentes, A., MacKinnon, K., Panger, M. & Bearder, S., eds). Oxford University Press, New York, NY, p. 655-677.
- Parks, J.M. & Bressler, S.L. (1963). Observations of joint feeding activities of certain fish-catching birds. — *Auk* 80: 198-199.
- Parks, K.A. & Novak, M.A. (1993). Observations of increased activity and tool use in captive rhesus monkeys exposed to troughs of water. — *Am. J. Primatol.* 29: 13-25.
- Paroni, C.A. (1954). Birds' "anting" antics. — *Gull* 36: 44.
- Parra, G.J. (2007). Observations of an Indo-Pacific humpback dolphin carrying a sponge: object play or tool use? — *Mammalia* 71: 147-149.
- Peckham, G.W. & Peckham, E.G. (1898). On the instincts and habits of the solitary wasps. — *Wisc. Geolog. Nat. Hist. Surv.* 2: 1-245.
- Pepper-Edwards, D.L. & Notley, E. (1991). Observations of a captive black-breasted buzzard *Hamirostra melanosternon* using stones to break open eggs. — *Aust. Bird Watcher* 14: 103-106.
- Pergande, T. (1892). Peculiar habit of *Ammophila gryphus* Sm. — *P. Entomol. Soc. Wash.* 2: 256-259.
- Perry, R. (1972). *At the turn of the tide: a book of wild birds.* — Taplinger, New York, NY.
- Peters, H. (2001). Tool use to modify calls by wild orang-utans. — *Folia Primatol.* 72: 242-244.
- Petit, O. & Thierry, B. (1993). Use of stones in a captive group of Guinea baboons (*Papio papio*). — *Folia Primatol.* 61: 160-164.
- Pettet, A. (1975). Defensive stoning by baboons. — *Nature* 258: 549.
- Phillips, K.A. (1998). Tool use in wild capuchin monkeys (*Cebus albifrons trinitatis*). — *Am. J. Prim.* 46: 259-261.
- Phillips, R.A. (1978). Common crow observed catching living fish. — *Migrant* 49: 85-86.
- Pi, J.S. (1974). An elementary industry of the chimpanzees in the Okorobikó Mountains, Rio Muni (Republic of Equatorial Guinea), West Africa. — *Primates* 15: 351-364.
- Pickford, M. (1975). Defensive stoning by baboons. — *Nature* 258: 549-550.
- Pierce, J.D. (1986). A review of tool use in insects. — *Fla. Entomol.* 69: 95-104.
- Pillai, N.G. (1941). Bird "bathing" in ants. — *J. Bombay Nat. Hist. Soc.* 42: 935-936.
- Pitochelli, J. (1985). Apparent insight learning by some common grackles breeding in Central Park, New York, NY. — *Kingbird Winter*: 32-34.
- Plooi, F.X. (1978). Tool-use during chimpanzees bushpig hunt. — *Carnivore* 1: 103-106.
- Pollack, D. (1998). Spontaneous tool use in a vervet monkey (*Cercopithecus aethiops sabaues*). — *Am. J. Primatol.* 45: 201.

- Porter, S. (1936). The kea. — *Avic. Mag. Ser. 5* 1: 186-189.
- Post, W. & Browne, M.M. (1982). Active anting by the yellow-shouldered blackbird. — *Wilson Bull.* 94: 89-90.
- Potter, E.F. (1970). Anting by wild birds, its frequency and probable purpose. — *Auk* 87: 692-713.
- Poulsen, H. (1956). A study of anting behaviour in birds. — *Dansk Ornithol. Forenings Tidsskrift* 50: 267-298.
- Pouydebat, E., Berge, C., Gorce, P. & Coppens, Y. (2005). Use and manufacture of tools to extract food by captive *Gorilla gorilla gorilla*: experimental approach. — *Folia Primatol.* 76: 180-183.
- Powell, R.W. & Kelly, W. (1977). Tool use in captive crows. — *Bull. Psychon. Soc.* 10: 481-483.
- Pranty, B. (1995). Tool use by brown-headed nuthatches in two Florida slash pine forests. — *Fla. Field Nat.* 23: 33-34.
- Priddey, M.W. (1977). Blackbird using tool. — *Br. Birds* 70: 262-263.
- Priestley, C.F. (1947). Rook feeding on mussels. — *Br. Birds* 40: 176.
- Prozesky-Schulze, L., Prozesky, O.P.M., Anderson, F. & van der Merwe, G.J.J. (1975). Use of a self-made sound baffle by a tree cricket. — *Nature* 255: 142-143.
- Pruetz, J.D. & Bertolani, P. (2007). Savanna chimpanzees, *Pan troglodytes verus*, hunt with tools. — *Curr. Biol.* 17: 412-417.
- Pulich, W.M. (1969). Unusual feeding behaviour of three species of birds. — *Wilson Bull.* 81: 472.
- Purser, G.L. (1959). House sparrows soaking bread to soften it. — *Br. Birds* 52: 199-200.
- Radford, A.P. (1979). Starling eating feather. — *Br. Birds* 72: 188.
- Rajan, S.A. & Balasubramanian, P. (1989). Tool using behaviour in an Indian house crow *Corvus splendens*. — *J. Bombay Nat. Hist. Soc.* 86: 450.
- Rand, A.L. (1954). A Phillipine kingfisher uses a tool. — *Silliman J.* 1: 83-85.
- Rand, A.L. (1967). A common grackle learning to soak bread. — *Wilson Bull.* 79: 455-456.
- Rasa, O.A.E. (1973). Prey capture, feeding techniques, and their ontogeny in the African dwarf mongoose, *Helogale undalata rufula*. — *Z. Tierpsychol.* 32: 449-488.
- Reader, S.M. & Laland, K.N. (2002). Social intelligence, innovation and enhanced brain size in primates. — *Proc. Natl. Acad. Sci. USA* 99: 4436-4441.
- Reader, S.M., Morand-Ferron, J., Côté, I. & Lefebvre, L. (2002). Unusual feeding behaviours in five species of Barbadian birds. — *El Pitirre* 15: 117-123.
- Redshaw, M.E. (1975). Cognitive, manipulative and social skills in gorillas: Part II, The second year. — *Ann. Rep. Jersey Wildlife Pres. Trust* 12: 56-60.
- Reid, D. & Reid, S. (1996). *Corvus coronoides* — not just a pretty face. — *Bird Observ.* 7: 766.
- Reid, J.B. (1982). Tool-use by a rook (*Corvus frugilegus*), and its causation. — *Anim. Behav.* 30: 1212-1216.
- Rékási, J. (1980). Über die nahrung de weißstorchs (*Ciconia ciconia*) in der Gatschka (Süd-Ungarn). — *Ornithol. Milleilungen* 32: 154-155.
- Reymond, E. (1948). Myrmécophilie chez la perdix bartavelle. — *Oiseaux* 19: 288.
- Richard-Hansen, C., Bello, N. & Vie, J.C. (1998). Tool use by a red howler monkey (*Alouatta seniculus*) towards a two-toed sloth (*Choloepus didactylus*). — *Primates* 39: 545-548.
- Richards, A.J. (1977). Predation of snails by migrant songthrushes and redwinds. — *Bird Study* 24: 53-54.

- Richardson, H. & Verbeek, N.A.M. (1987). Diet selection by yearling northwestern crows (*Corvus caurinus*) feeding on littleneck clams (*Venerupis japonica*). — *Waterbirds* 24: 285-286.
- Riehl, C. (2001). Black-crowned night heron fishes with bait. — *Waterbirds* 24: 285-286.
- Roberts, G.J. (1982). Apparent baiting behaviour by a black kite. — *Emu* 82: 53-54.
- Roberts, N.L. (1961). Kookaburra and rat. — *Emu* 61: 221.
- Robinson, H.C. (1927). The birds of the Malay peninsula: a general account of the birds inhabiting the region from the isthmus of Kra to Singapore with the adjacent islands, Vol. 1. — H.F. & G. Witherby, London.
- Robinson, S.K. (1994). Use of bait and lures by green-backed herons in Amazonian Peru. — *Wilson Bull.* 106: 567-569.
- Rodrigues, M.R. & Lindshield, S.L. (2007). Scratching the surface: observations of tool use in wild spider monkeys. — *Am. J. Phys. Anthropol.* 44 (Suppl.): 201-202.
- Rogers, L.J. & Kaplan, G. (1994). A new form of tool use by orang-utans in Sabah, East Malaysia. — *Folia Primatol.* 63: 50-52.
- Rolando, A. & Zunino, M. (1992). Observations of tool use in corvids. — *Ornis Scand.* 23: 201-202.
- Ross, D.M. (1971). Protection of hermit crabs (*Dardanus* spp.) from octopus by commensal sea anemones (*Calliactis* spp.). — *Nature* 230: 401-402.
- Ross, H.H. (1964). Evolution of caddisworm cases and nests. — *Am. Zool.* 4: 209-220.
- Rumbaugh, D. (1970). Learning skills of anthropoids. — In: *Primate behaviour: developments in field and laboratory research*, Vol. 1 (Rosenblum, L.A., ed.). Academic Press, New York, NY, p. 1-70.
- Santos, L.R., Mahajan, N. & Barnes, J.L. (2005). How prosimian primates represent tools: experiments with two lemur species (*Eulemur fulvus* and *Lemur catta*). — *J. Comp. Psychol.* 119: 394-403.
- Santos, L.R., Pearson, H.M., Spaepen, G.M., Tsao, F. & Hauser, M. (2006). Probing the limits of tool competence: experiments with two non-tool-using species (*Cercopithecus aethiops* and *Saguinus oedipus*). — *Anim. Cogn.* 9: 94-109.
- Sanz, C.M. & Morgan, D.B. (2007). Chimpanzee tool technology in the Goulougo Triangle, Republic of Congo. — *J. Human Evol.* 52: 420-433.
- Sanz, C.M., Morgan, D.B. & Gulick, S. (2004). New insights into chimpanzees, tools, and termites from the Congo Basin. — *Am. Nat.* 164: 567-581.
- Sarringhaus, L.A., McGrew, W.C. & Marchant, L.F. (2005). Misuse of anecdotes in primatology: lessons from citation analysis. — *Am. J. Primatol.* 65: 283-288.
- van Schaik, C.P., Ancrenaz, M., Borgen, G., Galdikas, B., Knott, C., Singleton, I., Suzuki, A., Utami, S.S. & Merrill, M. (2003a). Orangutan cultures and the evolution of material culture. — *Science* 299: 102-105.
- van Schaik, C.P., Deaner, R.O. & Merrill, M.Y. (1999). The conditions for tool use in primates: implications for the evolution of material culture. — *J. Human Evol.* 36: 719-741.
- van Schaik, C.P., Fox, E.A. & Fechtman, L.T. (2003b). Individual variation in the rate of use of tree-hole tools among wild orang-utans: implications for hominin evolution. — *J. Human Evol.* 44: 11-23.
- van Schaik, C.P. & Knott, C.D. (2001). Geographic variation in tool use on *Neesia* fruits in orangutans. — *Am. J. Phys. Anthropol.* 114: 331-342.

- Schaller, G. (1961). The orang-utan in Sarawak. — *Zoologica* 46: 73-82.
- Schardien, B.J. & Jackson, J.A. (1982). Killdeers feeding on frogs. — *Wilson Bull.* 94: 85-87.
- Schöning, C., Ellis, D., Fowler, A. & Sommer, V. (2007). Army ant prey availability and consumption by chimpanzees (*Pan troglodytes vellerosus*) at Gashaka (Nigeria). — *J. Zool.* 271: 125-133.
- Schrauf, C., Huber, L. & Visalberghi, E. (2008). Do capuchin monkeys use weight to select hammer tools? — *Anim. Cogn.* 11: 413-422.
- Schultz, A. (1961). Some features influencing the social life of primates in general and of early man in particular. — In: *Social life of early man* (Washburn, S., ed.). Aldine, Chicago, IL, p. 58-90.
- Sedgwick, E.H. (1946). Little shrike-thrush “anting”. — *Emu* 46: 132.
- Sedgwick, E.H. (1947a). Magpies “anting”. — *West. Aust. Nat.* 1: 21.
- Sedgwick, E.H. (1947b). Feeding of butcher-birds. — *Emu* 47: 68-69.
- Seibt, U. & Wickler, W. (1978). Marabou storks wash dung beetles. — *Ethology* 46: 324-327.
- Shackleton, W. & Shackleton, E. (1947). Anting by the indigo bunting. — *Ky. Warbler* 23: 1-4.
- Shepherd, W. (1910). Some mental processes of the rhesus monkeys. — *Psychol. Monogr.* 7: 1-61.
- Sherrow, H.M. (2005). Tool use in insect foraging by the chimpanzees of Ngogo, Kibale National Park, Uganda. — *Am. J. Primatol.* 65: 377-383.
- Shuster, G. & Sherman, P.W. (1998). Tool use by naked mole-rats. — *Anim. Cogn.* 1: 71-74.
- Sibson, R.B. (1974). Rock wren using an anvil. — *Notornis* 21: 305.
- Sick, H. (1957). Anting by two tanagers in Brazil. — *Wilson Bull.* 69: 187-188.
- Siegfried, W.R. (1977). Mussel-dropping behaviour of kelp gulls. — *S. Afr. J. Sci.* 73: 337-341.
- Sielmann, H. (1958). *My year with the woodpeckers*. — Barrie and Rockcliff, London.
- Simmons, K.E.L. (1950). Food-washing by common sandpiper. — *Br. Birds* 43: 229-230.
- Sinclair, J.C. (1984). Baiting behaviour in a captive lesser blackbacked gull *Larus fuscus*. — *Cormorant* 12: 105-106.
- Sinha, A. (1997). Complex tool manufacture by a wild bonnet macaque, *Macaca radiata*. — *Folia Primatol.* 68: 23-25.
- Sivasubramanian, C. (1991). Frog and lizard in the dietary of the Indian robin *Saxicoloides fulvicata* (L.). — *J. Bombay Nat. Hist. Soc.* 88: 458.
- Skutch, A.F. (1948). Antiby by some Costa Rican birds. — *Wilson Bull.* 60: 115-116.
- Sladen, W.J.L. (1958). The Pygoscelid penguins, Parts I and II, Report 17, Falkland Islands Dependencies Survey. — Her Majesty's Stationary Office, London.
- Slee, J.E. (1992). Little raven eating toast. — *Bird Observ.* 12: 723.
- Smith, G.A. (1970). Tool-using by birds. — *Avic. Mag.* 76: 171.
- Smolker, R., Richards, A., Connor, R., Mann, J. & Berggren, P. (1997). Sponge carrying by dolphins (Delphinidae, *Tursiops* sp.): a foraging specialization involving tool use? — *Ethology* 103: 454-465.
- Smythies, B.E. (1953). *The birds of Burma*, 2nd revised edition. — Oliver & Boyd, Edinburgh.
- Southern, W.E. (1963). Three species observed anting on a wet lawn. — *Wilson Bull.* 75: 275-276.
- St. Amant, R. & Horton, T. (2008). Revisiting the definition of animal tool use. — *Anim. Behav.* 75: 1199-1208.

- Stanford, C.B., Gambaneza, C., Nkurunungi, J.B. & Goldsmith, M.L. (2000). Chimpanzees in Bwindi-Impenetrable National Park, Uganda, use different tools to obtain different types of honey. — *Primates* 41: 337-341.
- Starin, E.D. (1990). Object manipulation by wild red colobus monkeys living in the Abuko Nature Reserve, The Gambia. — *Primates* 31: 385-391.
- Stirling, I. (1974). Midsummer observations on the behaviour of wild polar bears (*Ursus maritimus*). — *Can. J. Zool.* 52: 1191-1198.
- Stoinski, T.S. & Beck, B.B. (2001). Spontaneous tool use in captive, free-ranging golden lion tamarins (*Leontopithecus rosalia rosalia*). — *Primates* 42: 319-326.
- Stone, R.C. (1954). "Anting" by wryneck. — *Br. Birds*, 47: 312.
- Strong, R.M. (1914). On the habits and behaviour of the herring gull, *Larus argentatus* Pont (concluded). — *Auk* 31: 178-199.
- Struhsaker, T.T. (1975). The red colobus monkey. — University of Chicago Press, Chicago, IL.
- Struhsaker, T.T. & Hunkeler, P. (1971). Evidence of tool-using by chimpanzees in the Ivory Coast. — *Folia Primatol.* 15: 212-219.
- Struhsaker, T.T. & Leleand, L. (1977). Palm-nut smashing by *Cebus a. apella* in Columbia. — *Biotropica* 9: 124-126.
- Sugihara, G. & Heston, K. (1981). Field notes on winter flocks of the ocellated turkey (*Agriocharis ocellata*). — *Auk* 98: 396-398.
- Sugiyama, Y. (1981). Observations on the population dynamics and behaviour of wild chimpanzees at Bossou, Guinea, in 1979-1980. — *Primates* 22: 435-444.
- Sugiyama, Y. (1985). The brush-stick of chimpanzees found in south-west Cameroon and their cultural characteristics. — *Primates* 26: 361-374.
- Sugiyama, Y. (1995a). Drinking tools of wild chimpanzees at Bossou. — *Am. J. Primatol.* 37: 263-269.
- Sugiyama, Y. (1995b). Tool-use for catching ants by chimpanzees at Bossou and Monts Nimba, West Africa. — *Primates* 36: 193-205.
- Sugiyama, Y. (1997). Social tradition and the use of tool-composites by wild chimpanzees. — *Evol. Anthropol.* 6: 23-27.
- Sumita, K., Kitahara-Frisch, J. & Norikoshi, K. (1985). The acquisition of stone-tool use in captive chimpanzees. — *Primates* 26: 168-181.
- Suzuki, A. (1966). On the insect-eating habits among wild chimpanzees living in the savanna woodland of western Tanzania. — *Primates* 7: 481-487.
- Suzuki, S., Kuroda, S. & Nishihara, T. (1995). Tool-set for termite-fishing by chimpanzees in the Ndoki Forest, Congo. — *Behaviour* 132: 219-235.
- Tanaka, T. & Ono, Y. (1978). The tool use by foragers of *Aphaenogaster famelica*. — *Nihon Seitai Gakkaishi* 28: 49-58.
- Taylor, N. (1975). Parrot uses back-scratcher. — *Field* 11 Sept.
- Tebbich, S., Taborsky, M., Fessl, B. & Dvorak, M. (2002). The ecology of tool-use in the woodpecker finch (*Cactospiza pallida*). — *Ecol. Lett.* 5: 656-664.
- Tebbich, S., Taborsky, M., Fessl, B., Dvorak, M. & Winkler, H. (2004). Feeding behaviour of four arboreal Darwin's finches: adaptations to spatial and seasonal variability. — *Condor* 106: 95-104.
- Tedards, A.M. (1967). Anting by a prothonotary warbler. — *Chat* 31: 77.
- Tehsin, R. (1989). Feeding behaviour of the white breasted kingfisher *Halcyon smyrensis* (L.). — *J. Bombay Nat. Hist. Soc.* 86: 449.

- Teichert, C. & Serventy, D.L. (1947). Deposit of shells transported by birds. — *Am. J. Sci.* 245: 322-328.
- Teleki, G. (1973). The predatory behaviour of wild chimpanzees. — Bucknell University Press, Lewisburg, PA.
- Terres, J.K. (1962). Anting behaviour of a wood thrush with a snail. — *Wilson Bull.* 74: 187.
- Thomas, J.W. (1957). Anting performed by scaled quail. — *Wilson Bull.* 69: 280.
- Thomas, R.H. (1941). "Anting" by summer tanager. — *Auk* 58: 102.
- Thomsen, L.R., Campbell, R.D. & Rosell, F. (2007). Tool-use in a display behaviour by Eurasian beavers (*Castor fiber*). — *Anim. Cogn.* 10: 477-482.
- Tilt, R.A. (1962). Predation by the grey shrike thrush. — *Emu* 62: 65-66.
- Timms, A.M. & Keenleyside, M.H.A. (1975). The reproductive behaviour of *Aequidens paraguayensis* (Pisces, Cichlidae). — *Z. Tierpsychol.* 39: 8-23.
- Tokida, E., Tanaka, I., Takefushi, H. & Hagiwara, T. (1994). Tool-using Japanese macaques: use of stones to obtain fruit from a pipe. — *Anim. Behav.* 47: 1023-1030.
- Tonooka, R. (2001). Leaf-folding behaviour for drinking water by wild chimpanzees (*Pan troglodytes verus*) at Bossou, Guinea. — *Anim. Cogn.* 4: 325-334.
- Topoff, H. (1977). The pit and the antlion. — *Nat. Hist.* 86: 44-54.
- Tutin, C.E.G. & Fernandez, M. (1992). Insect-eating by sympatric lowland gorillas (*Gorilla g. gorilla*) and chimpanzees (*Pan t. troglodytes*) in the Lopé Reserve, Gabon. — *Am. J. Primatol.* 28: 29-40.
- Tutin, C.E.G., Ham, R. & Wrogemann, D. (1995). Tool-use by chimpanzees (*Pan troglodytes troglodytes*) in the Lopé Reserve, Gabon. — *Primates* 36: 181-192.
- Tutt, D. (1990). Rock pipit breaking snail shell. — *Br. Birds* 83: 239.
- Uehara, S. (1982). Seasonal changes in the techniques employed by wild chimpanzees in the Mahale Mountains, Tanzania, to feed on termites (*Pseudacanthotermes spiniger*). — *Folia Primatol.* 37: 44-76.
- Ueno, Y. & Fujita, K. (1998). Spontaneous tool use by a Tonkean macaque (*Macaca tonkeana*). — *Folia Primatol.* 69: 318-324.
- Uys, C.J. (1966). At the nest of the cape raven. — *Bokmakierie* 18: 38-41.
- Vader, W. (1979). Celptoparasitism on bar-tailed godwits by common gulls. — *Fauna* 32: 62-65.
- Valderrama, X., Robinson, J.G., Attygalle, A.B. & Eisner, T. (2000). Seasonal anointment with millipedes in a wild primate: a chemical defense against insects? — *J. Chem. Ecol.* 26: 2781-2790.
- Vander Werf, E.A. (2005). Elepaio "anting" with a garlic snail and *Schinus* fruit. — *J. Field Ornithol.* 76: 134-137.
- Vestjens, W.J.M. (1973). Feeding of white ibis on freshwater mussels. — *Emu* 73: 71-72.
- Vierke, J. (1973). Das Wassersprucken der Art Gattung *Colisa* (Pisces: Anabantidae). — *Bonner Zool. Beitr.* 24: 62-104.
- Visalberghi, E. (1990). Tool use in *Cebus*. — *Folia Primatol.* 54: 146-154.
- Visalberghi, E. (1993). Tool use in a South American monkey species: an overview of the characteristics and limits of tool use in *Cebus apella*. — In: *The use of tools by human and non-human primates* (Berthelet, A. & Chavaillon, J., eds). Oxford University Press, Oxford, p. 118-135.
- Visalberghi, E., Frigaszy, D., Ottoni, E., Izar, P., de Oliveira, M.G. & Andrade, F.R.D. (2007). Characteristics of hammer stones and anvils used by wild bearded capuchin monkeys (*Cebus libidinosus*) to crack open palm nuts. — *Am. J. Phys. Anthropol.* 132: 426-444.

- Wade, L.S. (1975). A sea otter possibly feeding on pismo clams. — *J. Mammal.* 56: 720-721.
- Waga, I.C., Dacier, A.K., Pinha, P.S. & Tavares, M.C.H. (2006). Spontaneous tool use by wild capuchin monkeys (*Cebus libidinosus*) in the Cerrado. — *Folia Primatol.* 77: 337-344.
- Wallace, A.R. (1869). *The Malay archipelago: the land of the orang-utan, and the bird of paradise.* — Harper & Brothers, New York, NY.
- Walsh, J.F., Grunewald, J. & Grunewald, B. (1985). Green-backed herons (*Butorides striatus*) possibly using a lure and using apparent bait. — *J. Ornithol.* 126: 439-442.
- Walsh, J.F. & Walsh, B. (1983). Possible thrush “anvils” in Upper Volta. — *Malimbus* 5: 54-55.
- Ward, D. (1991). The size selection of clams by African black oystercatchers and kelp gulls. — *Ecology* 72: 513-522.
- Watanabe, K., Urasopon, N. & Malaivijitnond, S. (2007). Long-tailed macaques use human hair as dental floss. — *Am. J. Primatol.* 69: 940-944.
- Watkin, R. (1950). Food-washing by blackbird. — *Br. Birds* 43: 156.
- Watts, D.P. (2008). Tool use by chimpanzees at Ngogo, Kibale National Park, Uganda. — *Int. J. Primatol.* 29: 83-94.
- Weldon, P.J. & Hoffman, D.L. (1975). Unique form of tool-using in two gastropod molluscs (Trochidae). — *Nature* 256: 720-721.
- Wellenstein, C. & Wiegmann, D.D. (1986). Prey handling by anhingas. — *Fla. Field Nat.* 14: 74-75.
- Wemmer, C. & Johnson, G. (1976). Egg-breaking behaviour in a yellow-throated marten, *Martes flavigula* (Mustelidae, Carnivora). — *Z. Säugertierkd.* 41: 58-60.
- Wenny, D. (1998). Three-striped warbler (*Basileuterus tristriatus*) “anting” with a caterpillar. — *Wilson Bull.* 110: 128-131.
- Westergaard, G.C. (1988). Lion-tailed macaques (*Macaca silenus*) manufacture and use tools. — *J. Comp. Psychol.* 102: 152-159.
- Westergaard, G.C. (1992). Object manipulation and the use of tools by infant baboons (*Papio cynocephalus anubis*). — *J. Comp. Psychol.* 106: 398-403.
- Westergaard, G.C. (1993). Development of combinatorial manipulation in infant baboons (*Papio cynocephalus anubis*). — *J. Comp. Psychol.* 107: 34-38.
- Westergaard, G.C., Greene, J.A., Babitz, M.A. & Suomi, S.J. (1995). Pestle use and modification by tufted capuchins (*Cebus apella*). *Int. J. Primatol.* 16: 643-651.
- Westergaard, G.C. & Suomi, S. (1994). Use and modification of bone tools by capuchin monkeys. — *Curr. Anthropol.* 35: 75-77.
- Westergaard, G.C. & Suomi, S. (1995). The production and use of digging tools by monkeys: a nonhuman primate model of a hominid subsistence activity. — *J. Anthropol. Res.* 51: 1-8.
- Wheeler, G.C. & Wheeler, E.H. (1924). The use of a tool by a sphecicid wasp. — *Science* 59: 486.
- Wheeler, R. (1943). Birds and their prey. — *Emu* 43: 143.
- Wheeler, R. (1946). Pacific gull and mussels. — *Emu* 45: 307.
- Wheeler, W.M. (1930). *Demons of the dust.* — W.W. Norton, New York, NY.
- Whitaker, L.M. (1957). A résumé of anting, with particular reference to a captive orchard oriole. — *Wilson Bull.* 69: 195-262.
- Whiten, A., Goodall, J., McGew, W.C., Nishida, T., Reynolds, V., Sugiyama, Y., Tutin, C.E.G., Wrangham, R.W. & Boesch, C. (1999). Cultures in chimpanzees. — *Nature* 399: 682-685.

- Whitesides, G.H. (1985). Nut cracking by wild chimpanzees in Sierra Leone, West Africa. — *Primates* 26: 91-94.
- Whyte, I.J. (1981). Anting in blue-eared glossy starlings. — *Ostrich* 52: 185.
- Wible, M.W. (1975). Food washing by grackles. — *Wilson Bull.* 87: 282-283.
- Wickler, W. & Seibt, U. (1997). Aimed object-throwing by a wild African elephant in an interspecific encounter. — *Ethology* 103: 365-368.
- Williams, R.E. (1947). "Anting" by a blackbird. — *Br. Birds* 40: 84-85.
- Wittiger, L. & Sunderland-Groves, J.L. (2007). Tool use during display behaviour in wild Cross River gorillas. — *Am. J. Primatol.* 69: 1307-1311.
- Woinarski, J.C.Z., Fisher, A., Brennan, K., Morris, I., Willan, R.C. & Chatto, R. (1998). The chestnut rail *Eulabeornis castonavenstris* on Wessel and English Company Islands: notes on unusual habits and the use of anvils. — *Emu* 98: 74-48.
- Wood, G.A. (1984). Tool use by the palm cockatoo *Probosciger aterrimus* during display. — *Corella* 8: 94-95.
- Wood, J.G., McCosh, J. & March, D. (1875). Wood's Bible animals. A description of the habits, structure, and uses of every living creature mentioned in the scriptures. — Bradley W. Garretson, Philadelphia, PA.
- Wood, P. (1986). Fishing green backed heron. — *Bokmakierie* 38: 105.
- Worch, E.A. (2001). Simple tool use by a red-tailed monkey (*Cercopithecus ascanius*) in Kibale Forest, Uganda. — *Folia Primatol.* 72: 304-306.
- Yamagiwa, J., Yumoto, T., Ndunda, M. & Maruhashi, T. (1988). Evidence of tool-use by chimpanzees (*Pan troglodytes schweinfurthii*) for digging out a bee-nest in the Kahuzi-Biega National Park, Zaire. — *Primates* 29: 405-411.
- Yamakoshi, G. (1998). Dietary responses to fruit scarcity of wild chimpanzees at Bossou, Guinea: possible implications for ecological importance of tool use. — *Am. J. Phys. Anthropol.* 106: 283-295.
- Yamakoshi, G. & Sugiyama, Y. (1995). Pestle-pounding behaviour of wild chimpanzees at Bossou, Guinea: a newly observed tool-using behaviour. — *Primates* 36: 489-500.
- Yamamoto, S., Yamakoshi, G., Humle, T. & Matsuzawa, T. (2008). Invention and modification of a new tool use behaviour: ant-fishing in trees by a wild chimpanzee (*Pan troglodytes verus*) at Bossou, Guinea. — *Am. J. Primatol.* 70: 699-702.
- Young, H.G. (1987). Herring gull preying on rabbits. — *Br. Birds* 80: 630.
- Zach, R. (1978). Selection and dropping of whelks by northwestern crows. — *Behaviour* 67: 123-148.
- Zach, R. (1979). Shell dropping: decision-making and optimal foraging in northwestern crows. — *Behaviour* 68: 106-117.
- Zickefoose, J. & Davis Jr., W.E. (1998). Great blue heron (*Ardea herodias*) uses bread as bait for fish. — *Colon. Waterbirds* 21: 87-88.
- Zuberbühler, K., Gyax, L., Harley, N. & Kummer, H. (1996). Stimulus enhancement and spread of a spontaneous tool use in a colony of long-tailed macaques. — *Primates* 37: 1-12.

Appendix A: Animal tool use catalog

Key: Y = Yes; N = No; C = Captive; F = Free ranging; S = Semi-free ranging; Food Prep = Food Preparation; Food Extrac = Food Extraction; Food Trans = Food Transport; Food Cap = Food Capture; Phys Main = Physical Maintenance; Nest Const = Nest Construction; Pred Defen = Predator Defense; Agon=Agonism; Other = Other.

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References
						Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Food Attrac	Nest Const	
Phylum: Arthropoda, Class: Insecta													
<i>Amnophila aberti</i>	Digger wasp	N	N	N	Y							F	Evans, 1959; Brockmann, 1985
<i>Amnophila aureonotata</i>	Digger wasp	N	N	N	Y							F	Evans, 1959; Brockmann, 1985
<i>Amnophila breviceps</i>	Digger wasp	Y	N	N	Y							F	Brockmann, 1985
<i>Amnophila gryphus</i>	Sand wasp	N	N	N	N							F	Pergande, 1892; Wheeler & Wheeler, 1924
<i>Amnophila hari</i>	Digger wasp	N	N	N	Y							F	Evans, 1959
<i>Amnophila juncea</i>	Digger wasp	N	N	N	Y							F	Evans, 1959
<i>Amnophila pictipennis</i>	Digger wasp	N	N	N	Y							F	Brockmann, 1985
<i>Amnophila placida</i>	Digger wasp	N	N	N	Y							F	Evans, 1959
<i>Amnophila procera</i>	Digger wasp	N	N	N	Y							F	Hartman, 1905; Evans, 1959
<i>Amnophila urnaria</i>	Digger wasp	N	N	N	Y							F	Evans, 1959; Brockmann, 1985
<i>Amnophila wrightii</i>	Digger wasp	Y	N	N	Y							F	Brockmann, 1985
<i>Amnophila xanthoptera</i>	Digger wasp	N	N	N	Y							F	Brockmann, 1985 Evans, 1959
<i>Aphaenogaster famelica</i>	Japanese ant	N	N	N	Y				C, F				Tanaka & Ono, 1978
<i>Aphaenogaster fulva</i>	Myrmicine ant	N	N	N	Y				F				Fellers & Fellers, 1976; Forrest, 1982
<i>Aphaenogaster rudis</i>	Forest ant	N	N	N	Y				C, F				Fellers & Fellers, 1976; Banschbach et al., 2006

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References	
						Food Prep	Food Extrac	Food Trans	Food Main	Food Phys	Mate	Nest	Pre- Defen	Agon	Other		
<i>Aphaenogaster senilis</i>	Myrmicine ant	N	Y	N	Y												Agbogba, 1985
<i>Aphaenogaster subterranea</i>	Myrmicine ant	N	Y	N	Y												Agbogba, 1985
<i>Aphaenogaster tennesseensis</i>	Myrmicine ant	N	N	N	Y				F								Fellers & Fellers, 1976
<i>Aphaenogaster treatatae</i>	Myrmicine ant	N	N	N	Y				F								Fellers & Fellers, 1976
<i>Ariadna segestridae</i>	Corolla spider	N	N	N	Y					F							Henschel, 1995
<i>Camponotus</i> spp.	Weaver ant	N	N	N	Y								F				Hölldobler & Wilson, 1977
<i>Cladomelea akermani</i>	African bola spider	N	N	N	Y					F							Akerman, 1923
<i>Dendromyrex</i> spp.	Weaver ant	N	N	N	Y									F			Hölldobler & Wilson, 1977
<i>Dicrostichus furcatus</i>	Hairy imperial spider	N	N	N	Y					F							McKeown, 1936
<i>Dicrostichus magnificus</i>	Angler spider	N	N	N	Y					F							Longman, 1922
<i>Glossoma</i> spp.	Caddisfly larvae	N	N	N	Y												Ross, 1964
<i>Grylotalpa vinacea</i>	Burrowing cricket	N	N	N	N									F			Forrest, 1982
<i>Hydropsyche</i> spp.	Caddisfly larvae	N	N	N	Y												Ross, 1964
<i>Lanipromyia</i> spp.	Worm-lion	N	N	N	Y					F							Wheeler, 1930
<i>Linnephilus</i> spp.	Caddisfly larvae	N	N	N	Y												Ross, 1964
<i>Mastophora cornigera</i>	Bola spider	N	N	N	Y					F							Gertsch, 1955
<i>Myrmeleon crudelis</i>	Antlion	N	Y	N	Y									C			Lucas, 1982
<i>Myrmeleon immaculatus</i>	Antlion	N	N	N	Y									F			Topoff, 1977
<i>Myrmeleon</i> spp.	Antlion	N	N	N	Y									F			Wheeler, 1930; De Beer, 1948

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact. use?	True tool use?	Tool use category										References										
						Food Prep		Food Extrac		Food Trans		Food Cap		Food Main			Food Phys		Food Mate		Food Nest		Food Agon		Food Other	
						Prep	Food	Extrac	Food	Trans	Food	Cap	Main	Phys	Mate		Nest	Const	Defen	Agon	Other					
<i>Neodiprion sertifer</i>	Sawfly	N	N	N	N																Eisner et al., 1974					
<i>Novomessor albisetosus</i>	Ant	N	N	N	Y				F												McDonald, 1984					
<i>Ochrotrichia</i> spp.	Caddisfly larvae	N	N	N	Y																Ross, 1964					
<i>Oecanthus burmeisteri</i>	African tree cricket	Y	N	N	N									F							Prozesky-Schulze et al., 1975					
<i>Oecophylla</i> spp.	Weaver ant	N	N	N	Y																Hölldobler & Wilson, 1977					
<i>Ordgarius cornigerus</i>	American bola spider	N	N	N	Y							F									Hutchinson, 1903					
<i>Podalonia pubescens</i>	Digger wasp	N	N	N	Y																Brockmann, 1985					
<i>Pogonomymex badius</i>	Florida harvester ant	Y	N	Y	Y					F											Morrill, 1972					
<i>Polyrhachis</i> spp.	Weaver ant	N	N	N	Y																Hölldobler & Wilson, 1977					
<i>Rhyacophila</i> spp.	Caddisfly larvae	N	N	N	Y																Ross, 1964					
<i>Salvavata variegata</i>	Assassin bug	N	N	N	Y							F									McMahon, 1982;					
																					McMahon & Mendez, 1983					
<i>Scapteriscus acletus</i>	Mole cricket	N	N	N	N											F					Nickerson et al., 1979;					
																					Forrest, 1982					
<i>Scapteriscus vicinus</i>	Mole cricket	N	N	N	N																Nickerson et al., 1979;					
																					Forrest, 1982					
<i>Solenopsis invicta</i>	Fire ant	N	Y	N	Y																Barber et al., 1989					
<i>Sphex ichneumoneus</i>	Great golden digger wasp	N	N	N	Y																Brockmann, 1985					
<i>Sphex pensylvanicus</i>	Steel-blue cricket hunter wasp	N	N	N	Y																Brockmann, 1985					

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References	
						Food Prep	Food Extrac	Food Trans	Food Main	Phys Attrac	Mate Const	Nest Const		Agon Defen
<i>Sphex urnarius</i>	Thread-waisted wasp	N	N	N	Y						F			Peckham & Peckham, 1898; Frisch, 1940 Lin, 1964-1965
<i>Tetramorium caespitum</i>	Pavement ant	N	N	N	Y								F ¹	
<i>Vermillio</i> spp.	Worm-lion	N	N	N	Y				F					Wheeler, 1930
Phylum: Arthropoda, Class: Malacostraca														
<i>Dardanus arrosor</i>	Hermit crab	N	Y	N	Y									Ross, 1971
<i>Dardanus callidus</i>	Hermit crab	N	Y	N	Y									Ross, 1971
<i>Dromia</i> spp.	Decorator crab	N	N	Y	Y									Duerden, 1905
<i>Melia tessellate</i>	Melia crab	N	N	Y	Y				C, F					Duerden, 1905
<i>Polydectes cupitifera</i>	Teddy bear crab	Y	Y	N	Y									Duerden, 1905
<i>Stenorhynchus</i> spp.	Decorator crab	N	N	Y	Y									Duerden, 1905
Phylum: Mollusca, Class: Gastropoda														
<i>Tegula brunnea</i>	Brown turban snail	N	Y	N	Y									Weldon & Hoffman, 1975
<i>Tegula funebris</i>	Black turban snail	N	Y	N	Y									Weldon & Hoffman, 1975
<i>Xenophora conchyliophora</i>	American carriersnail	N	N	N	Y									Berg, 1975
Phylum: Mollusca, Class: Cephalopoda														
<i>Octopus vulgaris</i>	Common octopus	N	N	N	N						F			Mather, 1994
Phylum: Chordata, Class: Actinopterygii														
<i>Aequidens coeruleopunctatus</i>	South American cichlid	N	N	N	Y						F			Barlow, 1974
<i>Aequidens paraguayensis</i>	South American cichlid	N	Y	N	Y						C			Timms & Keenleyside, 1975; Keenleyside & Prince, 1976

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References		
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Mate Attrac	Nest Const		Pred. Defen	Agon
<i>Aquila verreauxii</i>	African black eagle	Y	N	N	Y										Dick & Fenton, 1979
<i>Ardea cinerea</i>	Grey heron	N	N	N	N	C, F									Jones, 1979; Banks, 1982; Bowey, 1997
<i>Ardea goliath</i>	Goliath heron	Y	N	N	N	F									Hunter et al., 2004
<i>Ardea herodias</i>	Great blue heron	Y	N	N	N	F									Otnes, 1977; Zickefoose & Davis Jr., 1998
<i>Ardeola ralloides</i>	Squacco heron	N	N	N	N					F					Crous, 1994
<i>Athene cucularia</i>	Burrowing owl	N	N	N	Y					F					Levey et al., 2004
<i>Buteo jamaicensis</i>	Red-tailed hawk	Y	N	N	N	F									Ellis & Brunson, 1993
<i>Butorides/Ardeola striata</i>	Green-backed heron	N	N	N	N					F					Walsh et al., 1985; Wood, 1986;
<i>Butorides virescens</i>	Green heron	N	N	N	N					F					Foxall & Drury, 1987; Robinson, 1994
<i>Cacatua moluccensis</i>	Moluccan cockatoo	Y	Y	N	Y										Lovell, 1958; Norris, 1975; Keenan III, 1981;
<i>Cacatua sanguinea</i>	Bare-eyed cockatoo	Y	Y	N	Y						C				Harvey, 2000 Boswall, 1983
<i>Cacatua sulphurea</i>	Lesser sulphur-crested cockatoo	Y	Y	N	Y						C				Smith, 1970
<i>Callidris alpina</i>	Dunlin	N	N	N	N										Boswall, 1982
<i>Callidris ferruginea</i>	Curlew sandpiper	N	N	N	N	F									del Hoyo et al., 1996
<i>Callipepla squamata</i>	Scaled quail	Y	N	N	Y										del Hoyo et al., 1996
<i>Cariama cristata</i>	Crested cariama	N	Y	N	N		C								Thomas, 1957 Kooij & van Zon, 1964

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References		
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Mate Attrac	Nest Const		Pred. Defen	Agon
<i>Himantopus melanosterna</i>	Black-breasted buzzaard	N	N	N	Y										Chisholm, 1954; Pepper-Edwards & Nottley, 1991 Stone, 1954
<i>Jynx torquilla</i>	Eurasian wryneck	Y	N	N	Y										Strong, 1914; Oldham, 1930; Ingolfsson & Estrella, 1978; Kent, 1981; Young, 1987;
<i>Larus argentatus</i>	Herring gull	N	N	N	N	C	F	F	F						Connor, 1992; Henry & Aznar, 2006 Oldham, 1930 Dremmen, 1995 Moon, 1992; Siegfried, 1977; Ward, 1991 Sinclair, 1984
<i>Larus canus</i>	Common gull	N	N	N	N					F					Barash et al., 1975
<i>Larus delawarensis</i>	Ring-billed gull	N	N	N	N					F					
<i>Larus dominicanus</i>	Kelp/Southern black-backed gull	N	N	N	N					F					
<i>Larus fuscus</i>	Lesser black- backed gull	Y	Y	N	N										
<i>Larus glaucescens</i>	Glaucous- winged gull	N	N	N	N					F					
<i>Larus marinus</i>	Great black- backed gull	Y	N	N	N		F								Harber & Johns, 1947
<i>Larus melanocephalus</i>	Mediterranean gull	Y	N	N	N					F					van Impe, 1978
<i>Larus occidentalis</i>	Western gull	N	N	N	N					F					Maron, 1982
<i>Larus pacificus</i>	Pacific gull	N	N	N	N					F					Wheeler, 1946; Teichert & Serventy, 1947
<i>Leptoptilos crumeniferus</i>	Marabou stork	N	N	N	Y	F	F	F							Seibt & Wickler, 1978; Marshall, 1982

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References			
						Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Phys Attrac	Mate Const		Nest Defen	Agon	Other
<i>Leucophoyx thula</i>	Snowy egret	N	N	N	N					F				Parks & Bressler, 1963; Kushlan, 1973		
<i>Limosa lapponica</i>	Bar-tailed godwit	N	N	N	N	F								Vader, 1979		
<i>Limosa limosa</i>	Black-tailed godwit	N	N	N	N	F								del Hoyo et al., 1996		
<i>Melanerpes carolinensis</i>	Red-bellied woodpecker	Y	N	N	N		F							Erlwein, 1996		
<i>Melanerpes lewis</i>	Lewis's woodpecker	Y	N	N	N		F							Law, 1929		
<i>Melanerpes/Centu- rus uropygialis</i>	Gila woodpecker	Y	N	Y	Y		F	F						Anteys, 1948		
<i>Meleagris ocellata</i>	Ocellated turkey	Y	N	N	Y				F					Sugihars & Heston, 1981		
<i>Milvus migrans</i>	Kitehawk/Black kite	Y	N	N	N				F					Lockwood, 1962; Roberts, 1982		
<i>Neophron percnopterus</i>	Egyptian vulture	N	N	N	Y	F	F							Alexander, 1838; An Old Sportsman from Uityk, 1867; Wood et al., 1875; Duerden, 1908; Lindblom, 1920; van Lawick-Goodall & van Lawick, 1966; Brown & Urban, 1969; Brooke, 1979; Ilany, 1982		
<i>Nestor notabilis</i>	Kea	N	Y	N	Y									Porter, 1936		
<i>Numenius tahitiensis</i>	Curllew	N	N	N	Y		F							Marks & Hall, 1992		
<i>Nycticorax nycticorax</i>	Black-crowned night heron	N	N	N	N				F					Drinkwater, 1958; Riehl, 2001; Davis Jr., 2004		
<i>Pandion haliaetus</i>	Osprey	N	N	N	N		F							Leshem, 1985		
<i>Phalacrocorax auritus</i>	Double-crested cormorant	Y	N	N	Y									F ⁹ Meyerricks, 1972		

(Continued.)

Genus species	Common name	N = 1? Captive only?	Tool manu- fact.?	True tool use?	Tool use category										References		
					Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Food Attrac	Phys Mate	Nest Const	Pred. Defen	Agon		Other	
<i>Picoides pubescens</i>	Downy woodpecker	N	N	N		F											Davis Jr, 1995
<i>Picoides villosus</i>	Hairy woodpecker	Y	N	N		F											Erlwein, 1996
<i>Picus viridis</i>	Green woodpecker	Y	N	Y						F							Allsop, 1949
<i>Pluvianus aegyptius</i>	Egyptian plover	Y	N	N						F							Howell, 1979
<i>Podargus strigoides</i>	Tawny frogmouth	Y	N	N		F											Wheeler, 1943
<i>Porzana tabuensis</i>	Spotless crane	Y	N	N		F											Johnson, 1976
<i>Proboseiger aterrimus</i>	Black palm cockatoo	N	N	Y		F								F			Wallace, 1869; Wood, 1984; Bertagnolio, 1994
<i>Psittacus erithacus</i>	African grey parrot	N	Y	Y								C					Taylor, 1975; Janzen et al., 1976; Boswall, 1982
<i>Pterocles burchelli</i>	Spotted sandgrouse	N	N	N						F							Maclean, 1968
<i>Pterocles namaqua</i>	Namaqua sandgrouse	N	N	N						F							Maclean, 1968
<i>Rallus aquaticus</i>	Water-rail	Y	N	N		F											Caldwell, 1951
<i>Rhinopteryx clamator</i>	Striped owl	Y	Y	Y										C			Goodman & Fisk, 1973
<i>Sphyrapicus varius</i>	Yellow-bellied sapsucker	Y	N	N						F							Labeledz, 1980
<i>Threskiornis molucca</i>	White ibis	N	N	N		F											Vestjens, 1973
<i>Tringa melanoleuca/flavipes</i>	Greater yellowlegs	N	N	N		F											Jordheim, 1965
<i>Tringa totanus</i>	Common redshank	Y	N	N		F											Henry et al., 1998
<i>Tyrannus dominicensis</i>	Gray kingbird	Y	N	N		F											Reader et al., 2002
Phylum: Chordata, Class: Aves, Order: Passeriformes																	
<i>Acridotheres cristatellus</i>	Crested jungle mynah	Y	Y	Y										C			Poulsen, 1956

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References				
						Food								Nest	Pred.	Agon	Other
						Prep	Extrac	Trans	Cap	Main	Attrac	Const					
<i>Copsychus malabaricus</i>	White-rumped shama	N	Y	N	Y					C				Poulsen, 1956			
<i>Copsychus saularis</i>	Oriental magpie robin	Y	Y	N	Y					C				Poulsen, 1956			
<i>Corcorax melanorhamphus</i>	White-winged chough	N	N	N	Y	F	F							McDonald, 1970; Hobbs, 1971			
<i>Corvus albicollis</i>	Cape raven	Y	N	N	N	F								Uys, 1966			
<i>Corvus brachyrhynchos</i>	American crow	N	N	Y	Y	F	F	F		F				Maple, 1974; Powell & Kelly, 1977; Grobecker & Prietsch, 1978; Montevicchi, 1978; Phillips, 1978; Cristol & Switzer, 1999; Caffrey, 2000, 2001; Balda, 2007			
<i>Corvus caurinus</i>	Northwestern crow	N	N	N	Y		C, F							Jewett, 1924; Zach, 1978, 1979; Richardson & Verbeek, 1987			
<i>Corvus corax</i>	Northern/Common raven	N	N	Y	Y					F				Jacobsen, 1911; Janes, 1976; Heinrich, 1988			
<i>Corvus cornix</i>	Hooded crow	N	N	N	N		F							Perry, 1972			
<i>Corvus corone</i>	Hooded/carrion crow	N	N	Y	Y	C, F	F	F		F				Goodwin, 1953a; Londei & Maffroti, 1978; Condor & Everett, 1979; Jones, 1979; Berrow et al., 1992; Rolando & Zunino, 1992; Mienis, 1993; Brampton, 1994; Nihei, 1995, 1998			

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References	
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Food Attrac	Mate Const	Nest Defen	Agon	Other		
<i>Corvus coronoides</i>	Australian raven	Y	N	N	N	F											Reid & Reid, 1996
<i>Corvus frugilegus</i>	Rook	N	N	Y	Y		C, F					C		F			Priestley, 1947; Goodwin, 1953a; Reid, 1982; Bird & Emery, 2009 Edmonds, 1991; McMillan, 1992; Slec, 1992 Gibson, 1992 Orenstein, 1972; Hunt, 1996; Chappell & Kacelnik, 2002; Hunt et al., 2002, 2006; Hunt & Gray, 2004 Mackay, 1997
<i>Corvus mellori</i>	Little raven	N	N	N	N	F											
<i>Corvus monedula</i>	Jackdaw	N	N	N	N		F										
<i>Corvus moneduloides</i>	New Caledonian crow	N	N	Y	Y		C, F										
<i>Corvus orru</i>	Torresian crow	N	N	N	N	F											
<i>Corvus ossifragus</i>	Fish crow	Y	N	N	Y												Montevicchi, 1978 Andersson, 1989
<i>Corvus rhipidurus</i>	Fan-tailed raven	Y	N	N	Y		F										
<i>Corvus splendens</i>	House crow	N	N	Y	Y	F	F										Fitzwater, 1967; Rajan & Balasubramanian, 1989 Gould, 1848 Sedgwick, 1947a
<i>Cracticus</i> spp.	Butcherbird	N	N	N	N	F											
<i>Cracticus tibicen</i>	Australian magpie	Y	N	N	Y									F			Sedgwick, 1947b
<i>Cracticus torquatus</i>	Grey butcherbird	N	N	N	N		F										
<i>Cyanocitta cristata</i>	Blue jay	N	N	Y	Y							C	C, F				Ivor, 1941, 1955; Potter, 1970; Jones & Kamil, 1973 Balda, 2007 Goodwin, 1953a
<i>Cyanocitta stelleri</i>	Steller's jay	Y	N	N	Y												
<i>Cyanocorax becheii</i>	Purplish- backed jay	?	N	N	Y									F			

(Continued.)

Genus species	Common name	N = 1? only?	Cap- tive only?	Tool manu- fact.?	True use?	Tool use category							References			
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Mate Attrac	Nest Const		Pred. Defen	Agon	Other
<i>Ficedula hypoleuca</i>	Pied flycatcher	Y	N	N	N										Page, 1978	
<i>Fringilla coelebs</i>	Chaffinch	N	Y	N	Y					C					Poulsen, 1956	
<i>Fringilla montifringilla</i>	Brambling	N	Y	N	Y					C					Poulsen, 1956	
<i>Garrulax albogularis</i>	White-throated laughingthrush	N	N	N	Y				F						Callegari, 1955	
<i>Garrulax/Dryonastes caerulatus</i>	Gray-sided laughingthrush	Y	Y	N	Y					C					Osmaaton, 1936	
<i>Garrulax chinensis</i>	Black-throated laughingthrush	N	Y	N	Y					C					Poulsen, 1956	
<i>Garrulax/ Trochalopteron erythrocephalus</i>	Chestnut-crowned laughingthrush	Y	Y	N	Y					C					Osmaaton, 1936	
<i>Garrulax leucolophus</i>	White-crested laughingthrush	N	Y	N	Y					C					Poulsen, 1956	
<i>Garrulax/Dryonastes ruficollis</i>	Rufous-necked laughingthrush	Y	Y	N	Y					C					Poulsen, 1956	
<i>Garrulus glandarius</i>	Eurasian jay	Y	Y	N	Y					C					Poulsen, 1956	
<i>Garrulus lanceolatus</i>	Lanceolated jay	N	Y	N	Y					C					Goodwin, 1953b	
<i>Geospiza conirostris</i>	Large cactus finch	N	N	N	Y										F ³ DeBenedictis, 1966	
<i>Geospiza difficilis</i>	Sharp-beaked ground finch	N	N	N	N										F ⁶ Köster & Köster, 1983	
<i>Gracula religiosa</i>	Hill mynah	Y	Y	N	Y					C					Poulsen, 1956	
<i>Heterophasia capistrata</i>	Rufous sibia	N	Y	N	Y					C					Poulsen, 1956	
<i>Hylocichla mustelina</i>	Wood thrush	N	N	N	Y					C, F					Ivor, 1941; Terres, 1962	
<i>Icterus galbula</i>	Baltimore oriole	N	Y	N	Y					C					Ivor, 1955	
<i>Icterus jamacaii</i>	Campo troupial	N	Y	N	Y					C					Poulsen, 1956	
<i>Icterus spurius</i>	Orchard oriole	Y	Y	N	Y					C					Whitaker, 1957	

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References				
						Food								Nest	Pred.	Agon	Other
						Prep	Food Extrac	Trans	Cap	Main	Attrac	Const					
<i>Junco hyemalis</i>	Slate-colored junco	N	N	N	Y				C, F					Ivor, 1941;			
<i>Lampornis caudatus</i>	Long-tailed glossy starling	N	Y	N	Y				C					Potter, 1970			
<i>Lampornis chalybaeus</i>	Greater blue-eared starling	N	N	N	Y				C, F					Poulsen, 1956			
<i>Lampornis superbus</i>	Superb starling	N	Y	N	Y				C					Poulsen, 1956;			
<i>Lanius collaris</i>	Fiscal shrike	Y	N	N	N	F								Whyte, 1981			
<i>Lanius excubitor</i>	Northern shrike	N	N	N	Y	F								Poulsen, 1956			
<i>Leiothrix argentauris</i>	Silver-eared mesia	N	Y	N	Y				C					Ivor, 1941;			
<i>Leiothrix lutea</i>	Pekin robin	N	N	N	Y				C, F					Poulsen, 1956			
<i>Malimbus nitens</i>	Gray's malimbe	N	N	N	N					C, F				Crook, 1960			
<i>Malimbus rubricollis</i>	Red-headed malimbe	N	N	N	N					F				Crook, 1960			
<i>Malimbus scutatus</i>	Red-vented malimbe	N	N	N	N					F				Crook, 1960			
<i>Meliphaga lewini</i>	Lewin's honeyeater	Y	N	N	Y				F					Bourke, 1941a			
<i>Melospiza melodia</i>	Song sparrow	N	N	N	Y				C, F					Ivor, 1941;			
<i>Minla cyanouroptera</i>	Blue-winged siva	N	Y	N	Y				C					Mayr, 1948			
<i>Mionectes oleagineus</i>	Ochre-bellied flycatcher	Y	N	N	Y				F					Poulsen, 1956			
<i>Molothrus ater</i>	Brown-headed cowbird	N	N	N	Y				F					Skutch, 1948			
<i>Myiophonus caeruleus</i>	Blue whistling-thrush	N	N	N	N						F			Nice, 1945			
<i>Neositta chrysoptera</i>	Orange winged sittella	Y	N	N	Y				F					Smythies, 1953			
<i>Nesospingus speculiferus</i>	Peurto Rican tanager	N	N	N	Y				F					Green, 1972			
<i>Niltava sundara</i>	Rufous-bellied niltava	N	Y	N	Y				C					King & Kepler, 1970			
														Poulsen, 1956			

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(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	Tool use?	True use?	Tool use category										References	
							Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Phys Attrac	Mate Const	Nest Defen	Agon	Other		
<i>Oenanthe leucura</i>	Black wheatear	N	N	N	Y	Y	F											Moreno et al., 1994; Heselden et al., 1996 King, 1978
<i>Oenanthe oenanthe</i>	Northern wheatear	Y	N	N	N	N	F											
<i>Pachycephala rufiventris</i>	Rufous whistler	N	N	N	Y	Y							F					Bourke, 1941b
<i>Paradoxornis gularis</i>	Gray-headed parrotbill	Y	Y	N	Y	Y							C					Poulsen, 1956
<i>Paroaria capitata</i>	Yellow-billed cardinal	N	Y	N	Y	Y							C					Poulsen, 1956
<i>Parus gambeli</i>	Mountain chickadee	Y	N	Y	Y	Y		F										Gaddis, 1981
<i>Parus major</i>	Great tit	Y	N	N	Y	Y		F										Duyck & Duyck, 1984
<i>Parus palustris</i>	Marsh tit	N	Y	Y	Y	Y	C			C								Clayton & Jolliffe, 1996
<i>Passer domesticus</i>	House sparrow	N	N	N	Y	Y	F						F					Purser, 1959; Potter, 1970; Hammond, 1997
<i>Passerella iliaca</i>	Fox sparrow	?	Y	N	Y	Y								C				Ivor, 1941
<i>Passerina amoena</i>	Lazuli bunting	N	Y	N	Y	Y								C				Poulsen, 1956
<i>Passerina cyanea</i>	Indigo bunting	N	N	N	Y	Y								C, F				Ivor, 1941; Shackleton & Shackleton, 1947
<i>Passerina leclancherii</i>	Orange-breasted bunting	Y	Y	N	Y	Y								C				Poulsen, 1956
<i>Pheucticus ludovicianus</i>	Rose-breasted grosbeak	?	Y	N	Y	Y								C				Ivor, 1941
<i>Pheucticus melanocephalus</i>	Black-headed grosbeak	?	Y	N	Y	Y								C				Ivor, 1943
<i>Pica pica</i>	Magpie	N	N	N	Y	Y		F						F				Goodwin, 1953a; Rolando & Zumino, 1992

(Continued.)

Genus species	Common name	N = 1?	Cap- itive only?	Tool manu- fact.?	True tool use?	Tool use category										References	
						Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Phys	Mate	Nest	Pred.	Agon		Other
<i>Pipilo erythrophthalmus</i>	Eastern towhee	N	N	N	Y						F						McAtee, 1944; Potter, 1970
<i>Piranga olivacea</i>	Scarlet tanager	N	N	N	Y						F						Groskin, 1943
<i>Piranga rubra</i>	Summer tanager	Y	N	N	Y						F						Thomas, 1941
<i>Pitta erythrogaster</i>	Red-bellied pitta	N	N	N	N					F							McDonald, 1974
<i>Pitta guajana</i>	Banded pitta	?	N	N	N					F							Chasen, 1939
<i>Pitta moluccensis</i>	Blue-winged pitta	?	N	N	N					F							Robinson, 1927
<i>Pitta sordida</i>	Hooded pitta	?	N	N	N					F							Robinson, 1927
<i>Pitta versicolor</i>	Noisy pitta	N	N	N	N					F							Hindwood, 1966
<i>Ploceus aurantius</i>	Orange weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus brachypterus</i>	Black-necked weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus castaneofuscus</i>	Chestnut-and-black weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus cucullatus</i>	Village weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus luteatus</i>	Little weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus melanocephalus/capitalis</i>	Black-headed weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus monarchus</i>	Monarch weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus nigerrimus</i>	Vieillot's black weaver	N	N	N	N							F					Crook, 1960
<i>Ploceus philippinus</i>	Baya	N	N	N	N					F							George, 1973
<i>Ploceus rubiginosus</i>	Chestnut weaver	Y	Y	N	Y						C						Poulsen, 1956
<i>Ploceus tricolor</i>	Yellow-mantled weaver	N	N	N	N								F				Crook, 1960
<i>Ploceus vitellinus</i>	Vitelline masked weaver	N	N	N	N								F				Crook, 1960
<i>Pomatorhinus erythrogeus</i>	Rusty-cheeked scimitar-babbler	Y	Y	N	Y									C			Poulsen, 1956

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Mate Attrac	Nest Const	Agon Defen	Other		
<i>Serripicus chrysocephalus</i>	Regent bowerbird	N	N	N	N						F					Marshall, 1960
<i>Sitta canadensis</i>	Red-breasted nuthatch	N	N	N	Y										F ⁵	Kilham, 1968
<i>Sitta carolinensis</i>	White-breasted nuthatch	N	N	Y	Y		F							F	F ⁵	Kilham, 1968, 1974; Mitchell, 1993
<i>Sitta pusilla</i>	Brown-headed nuthatch	N	N	Y	Y		F									Morse, 1968; Pranty, 1995
<i>Sporophila aurita</i>	Variable seedeater	Y	N	N	Y					F						Skutch, 1948
<i>Sturnus contra</i>	Asian pied starling	N	Y	N	Y					C						Poulsen, 1956
<i>Sturnus roseus</i>	Rosy starling	N	Y	N	Y					C						Poulsen, 1956
<i>Sturnus vulgaris</i>	Common starling	N	N	N	Y					C, F					F ¹²	Ivor, 1955; Southern, 1963; Potter, 1970; Radford, 1979; Clark et al., 1990; Judson & Bennett, 1992
<i>Tangara cyanicollis</i>	Blue-necked tanager	Y	N	N	Y					F						Sick, 1957
<i>Tangara cyanoventris</i>	Gilt-edged tanager	N	N	N	Y					F						Sick, 1957
<i>Tangara fastuosa</i>	Seven-colored tanager	Y	Y	N	Y					C						Poulsen, 1956
<i>Thryothorus ludovicianus</i>	Carolina wren	Y	N	N	N								F			Haney, 1982
<i>Toxostoma rufum</i>	Brown thrasher	Y	N	N	Y					F						Chamberlain, 1954
<i>Turdus ericetorum/ philomelos</i>	Song thrush	N	N	N	Y					C, F						Morris, 1954; Poulsen, 1956; Henty, 1986

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References				
						Food Prep		Food Extrac		Food Trans		Food Cap		Food Mate			Nest Const		Agon Defen	
						Food	Prep	Food	Extrac	Food	Trans	Food	Cap	Food	Mate		Nest	Const	Agon	Other
Phylum: Chordata, Class: Mammalia (except Order Primates)																				
<i>Ailuropoda melanoleuca</i>	Giant panda	N	Y	N	Y								C			Eisenberg & Kleiman, 1977				
<i>Bubalus bubalis</i>	Water buffalo	Y	Y	Y	Y								C			Grummit, 1963				
<i>Castor canadensis</i>	Beaver	Y	N	Y	Y									F		Barnes, 2005				
<i>Castor fiber</i>	Eurasian beaver	N	N	N	Y										F	Thomsen et al., 2007				
<i>Elephas maximus</i>	Asian elephant	N	N	N	Y								F			McKay, 1973; Chevalier-Skolnikoff & Liska, 1993; Hart & Hart, 1994; Hart et al., 2001				
<i>Enhydra lutris</i>	Sea otter	N	N	N	Y					F						Fisher, 1939; Murie, 1940; Kenyon, 1958; Hall & Schaller, 1964; Ebert, 1968; Houk & Geibel, 1974; Wade, 1975				
<i>Galidia elegans</i>	Ring-tailed mongoose	N	N	N	N					F						Albignac, 1969				
<i>Helogale undulata</i>	African dwarf mongoose	N	Y	N	N					C						Rasa, 1973				
<i>Herpestes urva</i>	Crabeating mongoose	N	Y	N	N					C						Achariyo & Misra, 1972				
<i>Heterocephalus glaber</i>	Naked mole rat	N	Y	N	Y									C		Shuster & Sherman, 1998				
<i>Loxodonta africana</i>	African elephant	N	N	Y	Y								F		F	Chevalier-Skolnikoff & Liska, 1993; Wickler & Seibt, 1997				

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References												
						Food Prep		Food Extrac		Food Trans		Food Cap		Food Main			Food Phys		Food Mate		Food Nest		Food Pred.		Food Agon		Food Other	
<i>Martes flavigula</i>	Yellow-throated marten	Y	Y	N	N																			Wemmer & Johnson, 1976				
<i>Mungos mungo</i>	African banded mongoose	Y	Y	N	N																			Eisner & Davis, 1967				
<i>Octodon degus</i>	Common degu	N	Y	N	Y																			Okanoya et al., 2008				
<i>Panthera leo</i>	African lion	Y	N	N	Y																			Bauer, 2001				
<i>Souisa chinensis</i>	Indo-Pacific humpbaek dolphin	Y	N	N	Y																			Parra, 2007				
<i>Taxidea taxus</i>	North American badger	N	N	N	Y																			Michener, 2004				
<i>Thomomys bottae</i>	Pocket gopher	Y	Y	N	Y																			Katz, 1980				
<i>Tursiops</i> spp.	Bottlenose dolphin	N	N	Y	Y																			Smolker et al., 1997; Krützen et al., 2005; Mann et al., 2008 Hornaday, 1934				
<i>Ursus arctos</i>	Alaskan brown bear	Y	Y	N	N																							
<i>Ursus maritimus</i>	Polar bear	N	N	Y	Y																							
<i>Ursus ornatus</i>	Spectacled bear	N	Y	N	Y																							
Phylum: Chordata, Class: Mammalia, Order: Primates																												
<i>Alouatta senicullus</i>	Red howler	Y	N	Y	Y																				Richard-Hansen et al., 1998			
<i>Ateles geoffroyi</i>	Spider monkey	N	N	N	Y																				Campbell, 2000; Rodrigues & Lindshield, 2007			
<i>Bunopithecus hoolock</i>	Hoolock gibbon	N	Y	N	Y																				Cunningham et al., 2006			

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category							References	
						Food Prep	Food Extrac	Food Trans	Phys Cap	Mate Main	Nest Attrac	Pred. Const		Agon Defen
<i>Cebus albifrons</i>	White-fronted capuchin	N	N	Y	Y		F							Phillips, 1998
<i>Cebus apella</i>	Black-capped/ Brown/Tufted capuchin	N	N	Y	Y	C, F, S	C	F						Cooper & Harlow, 1961; Izawa & Mizuno, 1977; Strusaker & Leland, 1977; Antinucci & Visalberghi, 1986; Visalberghi, 1990, 1993; Fernandes, 1991; Anderson & Hennehan, 1994; Westergaard & Suomi, 1994, 1995; Westergaard et al., 1995; Lavallee, 1999; Boinski et al., 2000; Cleveland et al., 2004; de A. Moura & Lee, 2004; Otoni & Mannu, 2001; Otoni et al., 2005; Schrauf et al., 2008 Bierens de Haan, 1931; Boinski, 1988; Chevalier-Skolnikoff, 1990; Baker, 1996 Fragaszy et al., 2004; Waga et al., 2006; Visalberghi et al., 2007; Mannu & Otoni, 2009 Valderrama et al., 2000 Canale et al., 2009
<i>Cebus capucinus</i>	White-faced capuchin	N	N	Y	Y	F		F	F			F	F	
<i>Cebus libidinosus</i>	Bearded capuchin	N	N	Y	Y	F		F	F					
<i>Cebus olivaceus</i>	Wedge-capped capuchin	N	N	N	Y				F					
<i>Cebus xanthosternus</i>	Yellow-breasted capuchin	N	N	N	Y				F					
<i>Cercocebus atys</i>	Sooty mangabey	N	Y	N	Y							C		Galat-Luong, 1984; Kyes, 1988
<i>Cercocebus galeritus</i>	Agile mangabey	Y	Y	N	Y							C		Guillaume & Meyerson, 1934

(Continued.)

Genus species	Common name	N = 1? Cap- tive only?>	Tool manu- fact.?	True tool use?	Tool use category										References		
					Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Phys Attrac	Mate	Nest Const	Pred.	Agon		Other	
<i>Cercopithecus ascanius</i>	Red-tailed monkey	Y	N	N	Y						F						Worch, 2001
<i>Cercopithecus aethiops</i>	Vervet monkey	N	Y	N	Y				C	C							Galat-Luong, 1984; Pollack, 1998; Santos et al., 2006
<i>Cercopithecus campbelli</i>	Lowe's mona monkey	Y	Y	N	Y					C							Galat-Luong, 1984
<i>Colobus badius</i>	Red colobus	N	N	Y	Y									F			Struhsaker, 1975; Starin, 1990
<i>Erythrocebus patas</i>	Patas monkey	Y	Y	N	Y				C								Gatinot, 1974
<i>Eulemur fulvus</i>	Brown lemur	N	Y	N	Y				C								Santos et al., 2005
<i>Galago senegalensis</i>	Lesser bushbaby	Y	N	N	N									F ¹⁸			Harcourt, 1981
<i>Gorilla gorilla</i>	Gorilla	N	N	Y	Y		C		C	C				C, F	F ¹⁶		Kortlandt & Kooij, 1963; Redshaw, 1975; Fontaine et al., 1995; Nakamichi, 1999; Breuer et al., 2005; Pouydebat et al., 2005; Wittiger & Sunderland-Groves, 2007
<i>Hylobates lar</i>	White-handed gibbon	N	N	Y	Y		F	F						F	C ²²		Carpenter, 1940; Rumbaugh, 1970
<i>Leontopithecus rosalia</i>	Golden lion tamarin	N	Y	N	Y		C			C							Stoinski & Beck, 2001
<i>Lemur catta</i>	Ring-tailed lemur	N	Y	N	Y												Santos et al., 2005

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References		
						Food Prep	Food Extrac	Food Trans	Food Cap	Phys Main	Mate Attrac	Nest Const	Pred. Defen	Agon	Other			
<i>Macaca fascicularis</i>	Long-tailed macaque	N	N	Y	Y	S, F	F	C	C	C	C	C, F					C ²⁵	Carpenter, 1887; Chiang, 1967; Karrer, 1970; Artaud & Bertrand, 1984; Zuberbühler et al., 1996; Malaivijitnond et al., 2007; Watanabe et al., 2007; Masataka et al., 2009; Gumert et al., 2009
<i>Macaca fuscata</i>	Japanese macaque	N	N	Y	Y	F	F			C								Kawai, 1965; Tokida et al., 1994; Hihara et al., 2003
<i>Macaca mulatta</i>	Rhesus macaque	N	Y	N	Y	C		C										Shepherd, 1910; Hobhouse, 1926; Parks & Novak, 1993; Erwin, 1974
<i>Macaca nemestrina</i>	Pigtailed macaque	N	Y	N	Y					C								Beck, 1976
<i>Macaca nigra</i>	Sulawesi macaque	Y	Y	Y	Y		C											Babitz, 2000
<i>Macaca radiata</i>	Bonnet macaque	Y	N	Y	Y							F						Sinha, 1997
<i>Macaca silenus</i>	Liontailed macaque	N	N	Y	Y	F	C	C, S										Hohmann, 1988; Westergaard, 1988; Fitch-Snyder & Carter, 1993; Kumar et al., 2008
<i>Macaca tonkeana</i>	Tonkean macaque	N	N	N	Y		C		S	C								Bayart, 1982; Anderson, 1985; Ueno & Fujita, 1998; Ducoing & Thierry, 2005
<i>Mandrillus leucophaeus</i>	Drill	N	Y	N	Y					C								Armbruster, 1921; Galat-Luong, 1984
<i>Mandrillus sphinx</i>	Mandrill	Y	Y	N	Y													Schultz, 1961
<i>Pan paniscus</i>	Bonobo	N	Y	N	Y		C	C	C	C								Jordan, 1982; Gold, 2002; Mulcahy & Call, 2006

(Continued.)

Genus species name	N = 1?	Cap- tive only?	Tool man- fact.?	True tool use?	Tool use category										References
					Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Phys Attrac	Mate Const	Nest Const	Agon Defen	Other	
<i>Pan troglodytes</i>	N	N	Y	Y	F	F	C, F	F	C, F	C, F	F	F	F ¹⁹ , C ²⁰	Jackson, 1942; Beatty, 1951; Goodall, 1964; Suzuki, 1966; Kortlandt, 1967, 1986; Jones & Pi, 1969; Strusaker & Hunkeler, 1971; Menzel, 1972; McGrew & Tutin, 1973; Teleki, 1973; Pi, 1974; McGrew et al., 1975, 1999; Ploof, 1978; Nishida, 1980; Nishida & Uehara, 1980; Sugiyama, 1981, 1985, 1995a, 1995b, 1997; McBeath & McGrew, 1982; Uehara, 1982; Anderson et al., 1983; McGrew & Rogers, 1983; McGrew & Collins, 1985; Sumita et al., 1985; Whitesides, 1985; Hannah & McGrew, 1987; Kitahara-Frisch et al., 1987; Kortlandt & Holzhaus, 1987; Yamagiwa et al., 1988; Bermejo et al., 1989; Boesch & Boesch, 1990; Brewer & McGrew, 1990; Gonzalez-Kirchner & Sainz de la Maza, 1992; Tutin & Fernandez, 1992; Alp, 1993, 1997; Huffman & Kalunde, 1993; Nishida & Nakamura, 1993; Boesch et al., 1994, 2009; Fay & Carroll, 1994; Suzuki et al., 1995; Tutin et al., 1995; Yamakoshi & Sugiyama, 1995; Inoue-Nakamura & Matsuzawa, 1997; Arcadi et al., 1998; Hirata et al., 1998; Yamakoshi, 1998; Bermejo & Illera, 1999; Whiten et al., 1999; Stanford et al., 2000; Tonooka, 2001; Humle & Matsuzawa, 2002, 2004; Mercader et al., 2002; Biro et al., 2003; Nishimura et al., 2003; Sanz et al., 2004; Hicks et al., 2005; Lonsdorf, 2005; Sherrow, 2005; Deblauwe et al., 2006; Matsusaka et al., 2006; O'Hara & Lee, 2006; Hernandez-Aguilar et al., 2007; Pruett & Bertolani, 2007; Sanz & Morgan, 2007; Schöning et al., 2007; Furlong et al., 2008; Watts, 2008; Yamamoto et al., 2008	

(Continued.)

Genus species	Common name	N = 1?	Cap- tive only?	Tool manu- fact.?	True tool use?	Tool use category										References	
						Food Prep	Food Extrac	Food Trans	Food Cap	Food Main	Food Phys	Food Mate	Nest	Agon	Other		
<i>Papio anubis</i>	Olive baboon	N	N	N	Y	F	F	F	C	C	F	F	F	F	F ²¹	van Lawick-Goodall et al., 1973; Pettet, 1975; Pickford, 1975; Benhar & Samuel, 1978; Oyen, 1979; Westergaard, 1992, 1993 Nellman & Trendelenburg, 1926	
<i>Papio cynocephalus</i>	Yellow baboon	Y	Y	N	Y				C							Beck, 1972, 1973a	
<i>Papio hamadryas</i>	Hamadryas baboon	N	Y	N	Y				C							Beck, 1973b; Petit & Thierry, 1993	
<i>Papio papio</i>	Guinea baboon	N	Y	N	Y				C						C ²³	Bolwig, 1961; Marais, 1969;	
<i>Papio ursinus</i>	Chaema baboon	N	N	Y	Y	F			C						F	Hamilton III et al., 1975	
<i>Pongo pygmaeus</i>	Orangutan	N	N	Y	Y	F	C, F	C, F	C, F	C, F	F				C, F	F ¹⁷	Schaller, 1961; Ellis, 1975; Galdikas, 1982, 1989; Miller & Quiatt, 1983; Call & Tomasello, 1994; Rogers & Kaplan, 1994; O'Malley & McGrew, 2000; Peters, 2001; van Schaik & Knott, 2001; Fox & bin Muhammad, 2002; van Schaik et al., 2003a, b; Fox et al., 2004; Nakamichi, 2004; Mulcahy & Call, 2006
<i>Presbytis cristatus</i>	Silvered leaf monkey	N	N	Y	Y										F	Lydekker, 1910	
<i>Saguinus mystax</i>	Moustached tamarin	N	N	N	N										F ¹⁸	Heymann, 1995	
<i>Saguinus oedipus</i>	Cotton-top tamarin	N	Y	N	Y	C			C							Hauser et al., 2002; Santos et al., 2006	

- ¹ Dropped grains of sand directly on social halictine bee (*Lasioglossum zephyrum*) that was guarding an underground nest. Sand was used as weapon by the ants against the bees guarding the nest (elimination of foraging competition).
- ² Peel bark from branches that is then inserted into the nest as a perch.
- ³ Placed the base of the upper mandible against a large rock, and kick gravel from beneath itself with its feet, moving the legs in rapid succession as if it were running, the bill being used as a brace.
- ⁴ Caught small trout (*Salmo trutta*) rubbed it wings with the fish, with a second fish preened neck and breast feathers, upper wing coverts and carpal areas.
- ⁵ Covered stores of food with lichens and bits of bark.
- ⁶ Used 'bill-bracing technique' for stealing a masked booby (*Sula dactylatra*) egg. One individual used its bill as a lever shoving it under the egg and lifting, while another individual anchored its bill in the soft ground and then against a nearby stone and kicked the egg forcefully with both feet at the same time. Succeeded in moving an egg away from nest.
- ⁷ Took food that had been placed out for stray cats and hid it under roof tiles for later consumption.
- ⁸ Wring moss in beak to give chicks water.
- ⁹ Used a feather loosened in the moulting process to apply secretion from uropygial gland to extended wing using sweeping motions.
- ¹⁰ Used cup to bail water.
- ¹¹ Used 8 cm forked twig to remove snow from ground in order to search for insects.
- ¹² Carried a 6–7 inch feather to bird bath, immersed the feather, then swallowed it.
- ¹³ Used pipe to bail water.
- ¹⁴ Used small stones to right itself. Small stones were transferred to the posterior portion of the foot where they accumulated and allowed snail to right itself.
- ¹⁵ 2.5 year old deserted by mother attempted to cover the remains of a kill with bits of snow and ice.
- ¹⁶ Used branch as walking stick to test water depth while crossing a pool. Also used detached branch as bridge to cross swamp. Threw grass/branch towards observers. Used logs as ladders.
- ¹⁷ Used a branch as a hook to pull a distant branch closer. Made a protective pad of leaves to protect hands and feet from thorns of *Erythrina* sp. Used leaves to amplify vocalizations. Used tools for sexual stimulation.
- ¹⁸ Wet hands and feet with urine. Concluded that urine washing was a means of improving grip.
- ¹⁹ Used leaves of parasol tree (*Musanga cecropioides*) as a leaf cushion, as well as leaves of the carapa tree (*Carapa procera*).
- ²⁰ Used poles as ladders to escape from outdoor enclosure. Manufactured pitons from saplings to aid in escape from enclosure.
- ²¹ Adult male used a twig (5 mm in diameter and 10 cm long) to extract and separate 'bite sized' stone fragments from a rock and clay matrix.
- ²² Created swings in cage by hanging rope and hose on mesh and bars.
- ²³ Stones used as hammers to break cement.
- ²⁴ Used branch as ladder and another as a club.
- ²⁵ Used a piece of cloth to transport other objects.

Appendix B: Databases consulted in compiling catalog

Database	Web address
Biological Sciences	http://csaweb103v.csa.com/factsheets/biolclust-set-c.php
Biosis Previews	http://library.dialog.com/bluesheets/html/bl0005.html
EBSCO Host/Academic Search Premier	http://support.ebsco.com/help/index.php?help_id=DB: 687
Environmental Sciences	http://csaweb105v.csa.com/factsheets/envclust-set-c.php?
JSTOR	http://www.jstor.org
Medline	http://www.oclc.org/us/en/support/documentation/firstsearch/databases/dbdetails/details/MEDLINE.htm
Primate Lit	http://primatelit.library.wisc.edu/
PsycInfo	http://csaweb105v.csa.com/factsheets/psycinfo-set-c.php?
Science Direct	http://www.sciencedirect.com/science/
Searchable Ornithological Research Archive (SORA)	http://elibrary.unm.edu/sora/
Web of Science	http://thomsonreuters.com/products_services/scientific/ Web_of_Science
Zoological Record Online	http://library.dialog.com/bluesheets/html/bl0185.html

Appendix C: Reviews consulted in compiling catalog

Author (year)	Citation
Alcock, J. (1972)	The evolution of the use of tools by feeding animals. — <i>Evolution</i> 26: 464-473.
Anderson, J.R. (2002)	Gone fishing: Tool use in animals. — <i>Biologist</i> 49: 15-18.
Beck, B. (1980)	Animal tool behaviour: The use and manufacture of tools by animals. — Garland STPM Publishing, NY.
Boswall, J. (1977b)	Tool-using by birds and related behaviour I — <i>Avic. Mag.</i> 83: 88-97.
Boswall, J. (1977c)	Tool-using by birds and related behaviour II — <i>Avic. Mag.</i> 83: 146-159.
Boswall, J. (1977d)	Tool-using by birds and related behaviour III — <i>Avic. Mag.</i> 83: 220-228.
Boswall, J. (1978)	Further notes on tool-using by birds and related behaviour. — <i>Avic. Mag.</i> 84: 162-166.
Boswall, J. (1982)	Tool-using and related behaviour in birds: More notes. — <i>Avic. Mag.</i> 89: 94-108.
Boswall, J. (1983)	Tool-using and related behaviour in birds: Yet more notes. — <i>Avic. Mag.</i> 89: 170-181.
Chisholm, A.H. (1954)	The use by birds of “tools” or “instruments”. — <i>Ibis</i> 96: 380-383.
Hall, K.R.L. (1963)	Tool-using performances as indicators of behavioural adaptability. — <i>Curr. Anthropol.</i> 4: 479-494.
Lefebvre, L., Nicolakakis, N. & Boire, D. (2002)	Tools and brains in birds. — <i>Behaviour</i> 139: 939-973.
Marler, P. (1996)	Are primates smarter than birds? — In: <i>Current ornithology</i> , Vol. 13 (Nolan Jr., V. & Ketterson, E.D., eds). Plenum, New York, NY, p. 1-32.
Morand-Ferron, J., Lefebvre, L., Reader, S.M., Sol, D. & Elvin, S. (2004)	Dunking behaviour in Carib grackles. — <i>Anim. Behav.</i> 68: 1267-1274.
Panger, M.A. (2007)	Tool use and cognition in primates. — In: <i>Primates in perspective</i> (Campbell, C., Fuentes, A., MacKinnon, K., Panger, M. & Bearder, S., eds). Oxford University Press, New York, NY, p. 655-677.
Pierce, J.D. (1986)	A review of tool use in insects. — <i>Fla. Entomol.</i> 69: 95-104.
Potter, E.F. (1970)	Anting by wild birds, its frequency and probable purpose. — <i>Auk</i> 87: 692-713.
van Lawick-Goodall, J. (1970)	Tool-using in primates and other vertebrates. — In: <i>Advances in the study of behaviour</i> , Vol. 3 (Lehrman, D.S., Hinde, R.A. & Shaw, E., eds). Academic Press, New York, NY, p. 195-249.
Whitaker, L.M. (1957)	A résumé of anting, with particular reference to a captive orchard oriole. — <i>Wilson Bull.</i> 69: 195-262.