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An untapped resource: social media accounts show problem solving in numerous new animal species

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Abstract

Problem solving in animals is often studied by measuring an animal's ability to solve man-made puzzles, such as puzzle feeders. Outside of scientific studies, puzzle feeders are also presented to captive animals housed in zoos, aquaria, and sanctuaries as a form of enrichment. Footage of these interactions is commonly posted on social media accounts to increase public engagement with the institution. However, because these puzzle feeders are not presented to animals for research purposes, the problem-solving abilities of numerous species may not be recorded in the scientific literature. Therefore, we searched through three social media platforms (Facebook, Instagram and X) for footage of captive animals solving problems to determine if social media could be a useful tool for behavioural scientists. For each video, we recorded what species was featured, what the puzzle was, how it was solved, and whether this was the first documentation of problem solving for the species (to the best of our knowledge). We found 111 records of successful problem solving across 74 species, including mammals ($n = 57$), birds ($n = 13$), and reptiles ($n = 4$). Overall, this was the first record of problem solving in 29 of these species. We suggest that social media could be a useful tool for researchers studying problem solving, particularly of mammalian and avian species.

Keywords

behaviour, cognition, enrichment, problem solving, welfare.

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1. Introduction

Problem-solving ability is a growing area of animal behaviour and cognition research, largely because it is expected to be important for an animal's survival (Cole & Quinn, 2012). Problem solving is defined as an animal's ability to move itself or an object to overcome a barrier and access a reward (Rowell et al., 2021). Animals can solve problems innovatively (using a new behaviour or an existing behaviour in a new context; Reader & Laland, 2003), by using a learned behaviour (Anderson, 1993) or accidentally through trial and error (Tecwyn et al., 2012).

While there are often differences in problem-solving abilities documented between species (Benson-Amram et al., 2016), the problem-solving abilities of the majority of species have not been documented. This is partially due to the challenges of conducting behavioural studies on many species of animals (Rowe & Healy, 2014). For example, for wild-living animals, studying problem solving in the wild has logistical difficulties (e.g., expensive to travel and difficult to access habitat; Desai & Potter, 2006) or the nature of the animals themselves may make research difficult (e.g., rare, elusive, occupy large territories; Pritchard et al., 2016). Similarly, it can be expensive and require many resources (e.g., facilities, funding, staff) for researchers to establish captive colonies of animals, particularly large-bodied or long-lived animals, or animals with specialised requirements. Therefore, it is often more practical to study already established captive populations of animals, such as those in zoos.

Properly managed and accredited zoos, aquaria, gardens, and sanctuaries (hereafter referred to as 'zoos') allow species of wild animals to be closely observed by people in an environment designed to facilitate natural behaviours (Rabin, 2003). These institutions generally provide their animals with enrichment items or tasks, including puzzle feeders (e.g., a ball to roll around to release pieces of food) and foraging challenges (e.g., finding food hidden throughout enclosure) to prevent boredom and encourage a wider, and more natural, range of behaviours (Meehan & Mench, 2007). Problem-solving behaviours of the animals during these activities is therefore commonly observed by staff members and is easy to record. This often-entertaining footage is shared with the public on social media to increase public engagement and highlight the positive actions the institution is taking to care for its animals. For example, many zoos provide holiday-themed enrichment items to their animals, and post footage of

this to encourage visitation over the holiday season (e.g., Cincinnati Zoo & Botanical Garden: www.facebook.com/photo/?fbid=744568294360269&set=a.639373024879797). However, these records have previously not been considered as evidence of problem solving by the scientific community because the footage was not obtained as part of a formal experimental design. Consequently, the scientific literature may have missed many species that can, and do, solve problems.

Therefore, we aimed to gauge whether social media is a viable resource for obtaining evidence of problem solving in captive animals. It is relatively easy to locate problem solving footage on social media, so we searched social media accounts on Facebook, Instagram and X (formerly Twitter) for records of animals successfully solving problems. Our intent was not to do an exhaustive search of all available social media accounts. Rather, we aimed to explore the potential for social media to be an untapped repository of observations of new species being recorded solving puzzles. As this was an exploratory survey, we made no a priori predictions on patterns of problem solving or species occurrences.

2. Methods

We searched social three media platforms (Facebook, Instagram, and X) for accredited zoo accounts or posts tagged with key words including 'zoo enrichment', 'animal enrichment', and 'animals solving puzzles'. Due to the large extent of content available, only posts from August 2021 until August 2023 were considered. To broaden our search, we also searched through the last two years of posts on accounts/pages of the top zoos in the world (found using Google searches) and zoos that were prominent on social media.

We watched all videos in these search results. If an animal was recorded solving a problem, we recorded (1) where it was located (if known), (2) the species recorded, (3) the type of problem, (4) how the problem was solved and (5) whether this was the first account of problem solving in this species (to our knowledge), or where the species had previously been described solving a problem (literature search). Videos had to show the problem being solved, not just the animal interacting with a problem, to be considered. We could not extract any information about how long it took to solve the problem, or how the animals interacted with the problem (e.g., latency to approach, total time interacting) as (1) the videos were often edited and

made up of multiple sequences clipped together to fit into the platform's time limits, (2) we did not know how long the animal had access to the puzzle feeder before the video was recorded and (3) we did not know if this was the first instance the puzzle feeders were given to these individuals. We therefore only recorded whether the problem was successfully solved. In addition, we did not record the number of solutions possible in complex puzzles (e.g., puzzle boards with multiple food wells) as we could not necessarily tell this information from all the videos viewed (e.g., sometimes the animal's body obscured the puzzle). Species in videos were identified by reading the post's description and/or searching the zoo's website for a species list. We used Google Scholar to search for previous scientific accounts of problem solving specifically for each species by searching the species name with 'innovation' or 'problem solving'.

3. Results

We collected 111 records of animals solving problems on social media from 41 accredited institutions and multiple accounts of businesses/individuals (Table 1). Details on the location of the animals and a link to the video record can be found in Table A1 in the Appendix. The animals recorded included birds (13 species), mammals (57 species), and reptiles (4 species). Overall**,** to the best of our knowledge, these records include the first accounts of problem solving in 29 species (39% of records) across these three taxonomic groups (Table 1). Multiple videos showing the presentation of different puzzle types were found for 23 species and these videos therefore often showed different solving behaviours (e.g., pushing, pulling) being used within each species (Table 1).

4. Discussion

We searched through two years of posts on social media platforms to investigate whether social media was a viable resource for observing problem solving in captive animals. We documented records of problem solving in 74 species of mammals, birds, and reptiles using key word searches and by searching through prominent social media accounts, many of which had not been previously recorded. This suggests that there is value in monitoring social media platforms for problem solving studies. As a problem can be solved through trial and error learning (Tecwyn et al., 2012), an animal does

Table 1.
Records of problem solving in animals from Facebook, Instagram and X posts between August 2021 and August 2023.

Species	Puzzle type	Solving method	First solving?
Aves			
African pied crow (*Corvus albus*)	Dog casino drawers	Used beak to pull open drawers	X
Bald eagle (*Haliaeetus leucocephalus*)	Dog casino drawers	Used beak to pull open drawers	X
Chicken (*Gallus gallus domesticus*)	Dog Twister (sliding plastic tiles on puzzle board)	Pecked tiles to move them	X
	Dog Spin N Eat	Scratched with feet to roll feeder	
Common raven (*Corvus corax*)	Cylinder covering food and tile tasks on puzzle board	Used beak to lift cylinder and slide tiles	Jønsson et al. (2012)
	Cardboard box wrapped in paper with food inside box	Used beak to remove paper and tear through carboard	
	Puzzle board with tiles to slide	Used beak to slide tiles and swivel pieces	
	Dog Tornado – layers of tiles to spin around	Pushed tiles with beak to reveal food	
Harris hawk (*Parabuteo unicinctus*)	Egg carton with food inside	Used beak to life up lid to reveal food	Colbert-White et al. (2013)
	Puzzle board with cylinders covering food reward. Rope attached to cylinders	Used beak to pull rope and lift cylinder	
	Multiple puzzle boards	Used beak and feet to manipulate moving pieces	
	Dog brick puzzle board (sliding tiles and lifting flaps)	Used beak to pull rope and flap open to reveal food	

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Hooded vulture (*Necrosyrtes monachus*)	Tile puzzle board	Used beak to slide tiles	X
Kea *Nestor notabilis*	Cylinder see-saw with food inside	Tipped with beak and food came out	Gajdon et al. (2006)
Laggar falcon *Falco jugger*	DogSmart puzzle board (pillar tasks)	Picked up pillar with beak	X
Mitred parakeet *Psittacara mitratus*	Puzzle board with swivel pieces covering food	Used beak to push swivel pieces	X
	Puzzle board with flaps to lift up to reveal food	Used beak to lift flap	
Palm nut vulture *Gypohierax angolensis*	Puzzle board with cylinders covering food reward. Rope attached to cylinders	Used beak to pull out piece covering food	X
Rock pigeon *Columba livia*	Buggin' out puzzle board (swivel pieces and tiles)	Pecking to slide tiles	Bouchard et al. (2007)
Striated caracara *Phalcoboenus australis*	Cylinders covering food rewards on puzzle board	Used beak to pull out piece covering food	Harrington et al. (2023)
	Drawers to pull open	Used beak to pull out piece covering food	
	Spinning tiles to move to reveal food	Used beak and feet to spin tiles	
Sulphur-crested cockatoo *Cacatua galerita*	Pegs holding seeds back in a gravity feeder	Used beak to pull pegs out so seeds fell down	Klump et al. (2021)

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Mammalia			
Aardvark (*Orycteropus afer*)	Cardboard box with food inside	Used snout/mouth to lift up lid	X
African wild dog (*Lycaon pictus*)	Floating bowl on water with food inside	Pulled rim of bowl closer to edge of pond so could reach food	Benson-Amram et al. (2016)
Amur leopard (*Panthera pardus orientalis*)	Weighted half sphere with pole on top. Meat attached to top and device rocked and wobbled as animal interacted with it	Stretched up and used forepaws to grab meat after moving base	O'Connor et al. (2014)
Amur tiger (*Panthera tigris altaica*)	Carboard box with meat inside	Used snout and paws to push open/tear open box	Benson-Amram et al. (2016)
	Ball with holes filled with food attached to bungee cord and hanging	Used forepaws and mouth to move feeder until food could be pulled out	
Andean bear (*Tremarctos ornatus*)	Ball with small hole filled with food pieces	Rolled ball around until food came out	Benson-Amram et al. (2016)
Asian elephant (*Elephas maximus*)	Popcorn in upright tube hanging above	Used trunk to blow air into tube, lifting food out	Foerder et al. (2011)
	Ball with small hole and food inside	Rolled ball until food fell out	
	Hollow containers with food inside and small holes	Used trunks to move container until food came out	
	Feed bags with food inside	Held bag down with foot and used trunk to pull up and tear open	

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Asian small-clawed otters (*Aonyx cinereus*)	Floating feeding platform with clamps for holding food, holes for stuffing food into	Used forearms to extract food	Schmelz et al. (2017)
	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Using paws to move covering pieces	
	Hollow ball with food inside and small holes	Used forearms to get food out through holes	
Binturong (*Arctictis binturong*)	Ball with food inside on end of rope hanging from branch	Pulled rope up to get to ball	Benson-Amram et al. (2016)
Black and white ruffed lemur (*Varecia variegata*)	Cardboard milk cartoon with small opening and food inside	Lifted and tipped carton until food came out	Kittler et al. (2018)
Black-capped squirrel monkey (*Saimiri boliviensis*)	Cardboard roll with one end open and one end closed.	Manipulated roll to find open end and reached in for food	Hopper et al. (2014)
	Paper wrapped around treats to make Christmas cracker	Chewed through paper	
Brown capuchin (*Sapajus apella*)	Food wrapped in non-edible material and stuffed into cardboard roll	Pulled out and unwrapped	Renner et al. (2017)
	PVC pipe able to spin around on stand. Small hole in one end and food inside	Used hands to spin pipe until food fell out	
Brown-nosed coati (*Nasua nasua*)	Closed egg carton with food inside	Opened lid with hands and mouth	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Canada lynx (*Lynx canadensis*)	Paper bag hanging from tree with food inside	Tore through bottom of bag with claws and teeth	Worsley (2013)
Chimpanzee (*Pan troglodytes*)	Cardboard boxes with food inside	Used mouth and hands to tear open boxes	Hopper et al. (2014)
Clouded leopard (*Neofelis nebulosa*)	Hollow log hanging vertically with food inside holes	Used paws to hold log and snout to extract meat	O'Connor et al. (2014)
Common marmoset (*Callithrix jacchus*)	Puzzle board with pieces to slide and swivel	Used hands to swivel piece	Cameron & Rogers (1999)
Cotton-top tamarin (*Saguinus oedipus*)	Dog Hide n Slide puzzle board	Used hands to slide tiles	Hauser et al. (1999)
Dingo (*Canis lupus dingo*)	Ball with small hole filled with food pieces	Rolled ball around until food came out	Smith & Litchfield (2010)
Domestic dog (*Canis lupus familiaris*)	Stack of plastic boards with treats on them. Had to swivel boards to reveal food	Used snout to swivel boards to reveal food	Topál et al. (1997)
	Board with half spheres covering food	Used paws to swivel spheres to reveal food	
	Tiles to slide on a puzzle board	Used snout and front paws to slide tiles	
Domestic ferret (*Mustela putorius furo*)	Dog Worker puzzle board (sliding tiles)	Used snout to slide tiles	Scott & Wiebers (1996)
Dwarf mongoose (*Helogale parvula*)	Cylinders covering food rewards on puzzle board	Used hands to pull cylinder out with digging motion	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Eastern hoolock gibbon (*Hoolock leuconedys*)	Multi-puzzle board (sliding and twisting)	Used hand to slide tiles and swivel cover	Cunningham et al. (2006)
Eurasian otter (*Lutra lutra*)	Dog Hide n Slide on plank of wood floating in water	Used snout to slide tiles	X
	Dog Hide n Slide puzzle on plank of wood on ground	Used snout to slide tiles	
European pine marten (*Martes martes*)	Dog Worker puzzle board (sliding tiles)	Used snout and hands to slide	X
European rabbit (*Oryctolagus cuniculus*)	Dog Hide n Slide puzzle board	Used snout to slide tiles and swivel pieces	Clavel et al. (2020)
Fennec fox (*Vulpes zerda*)	Spinning cylinders on pole	Used snout and forepaws to push cylinders so they would spin and drop food	X
Goat (*Capra aegagrus hircus*)	Dog brick puzzle board (sliding tiles and lifting flaps)	Used snout and front hooves to slide tiles and lift flaps	Caicoya et al. (2023)
	Hanging plastic containers with holes in them and food inside	Used head to lift up and move around containers until food fell out	
Grant's plains zebra (*Equus quagga boehmi*)	Dog treat tumble (ball with food inside that falls out of small holes)	Pushed ball with snout until food fell out	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Grizzly bear (*Ursus arctos horribilis*)	Multiple puzzles – hollow PVC pipes with food inside, small holes covered with balls/rings; bucket with food covered by lid with holes in it	Used forepaws and snout to move pieces up/down pipe to get food. Tipped bucket over with paws to get food to fall out	Benson-Amram et al. (2016)
Guinea pig (*Cavia porcellus*)	Rainy Day puzzle board (tiles and swivels)	Used snout to push swivelling cover	X
	Board with plastic pieces covering food	Bit plastic cover and pulled it off board to reveal food	
Horse (*Equus ferus caballus*)	Dog Tornado – layers of tiles to spin around	Used snout/lips to swivel pieces to reveal food	Esch et al. (2019)
House cat (*Felis catus*)	Buggin' out puzzle board (swivel pieces and tiles)	Used forepaws to push swivel pieces	Howard (2018)
Javan langur (*Trachypithecus auratus*)	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Used paws to swivel piece covering food	X
Kinkajou (*Potos flavus*)	Dog Hide n Slide puzzle board	Used snout and hands to push swivel pieces covering food	X
Llama (*Lama glama*)	Treat Tumble (ball with food inside that comes out through small holes)	Used snout to roll ball until food fell out	Caicoya et al. (2023)
	Dog treat tumble (ball with food inside that falls out of small holes)	Pushed ball with snout until food fell out	
Lowland tapir (*Tapirus terrestris*)	Hanging cylinder with food inside and small holes at base	Pushed cylinder so it rotated enough for food to fall out	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Maned wolf (*Chrysocyon brachyurus*)	Cardboard box with food inside	Tore through box to get food	Benson-Amram et al. (2016)
Meerkat (*Suricata suricatta*)	Hollow ball filled with food. Small holes cut into ball	Rolled ball to make food fall through hole	Thornton & Samson (2012)
	Hollow PCP pipe with food inside. Holes drilled along pipe, blocked with fabric	Pulled fabric out of holes and rotated pipe until able to pull out mealworms	
	Mealworms hidden under wood shavings in a box	Sniffed and dug up wood shavings to find food	
	Kong toy with crickets inside	Used forepaws to push/rock Kong so crickets fell out of hole	
Nilgiri marten (*Martes gwatkinsii*)	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Used paws to swivel covering piece to expose food	X
North American raccoon (*Procyon lotor*)	Plastic bottle spinning on stick. Lid open and small food inside	Spinning bottle until food falls out	Stanton et al. (2017)
	Tile puzzle board	Used hands to slide tiles	
Ocelot (*Leopardus pardalis*)	Swinging hollow log with food inside	Tipping end until food slid out	O'Connor et al. (2014)
Pileate gibbon (*Hylobates pileatus*)	Tiles to move on board that cover food rewards	Lifted tiles up with hands	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Polar bear (*Ursus maritimus*0	Small cylinder with food inside. Both ends open but too small for snout/hands to go inside	Picked up one side of cylinder with mouth and tipped it so food fell out	Benson-Amram et al. (2016)
Red panda (*Ailurus fulgens*)	Paper mâché bowl hiding food pieces	Knocked bowl off food	Benson-Amram et al. (2016)
	Puzzle board with plastic half-balls covering food rewards	Used snout to roll ball and expose food	
	PVC pipe able to spin around on stand. Small hole in one end and food inside	Used hands to spin pipe until food fell out	
	Dog Twister (sliding plastic tiles on puzzle board)	Pushing tiles with paw	
	Dog Tornado – layers of tiles to spin around	Used paws to slide tiles and tip puzzle	
Reticulated giraffe (*Giraffa reticulata*)	Dog Spin N Eat	Used lips and tongue to roll feeder	X
Ringtail lemur (*Lemur catta*)	Dog Spin N Eat	Using hands to spin piece holding food	Kittler et al. (2018)
	Flaps to lift up to access food underneath	Used hands to lift flap	
	Dog treat tumble (ball with food inside that falls out of small holes)	Used arms to roll ball	
Sloth bear (*Melursus ursinus*)	PVC pipes with holes, food inside	Used paws and mouth to move pipe around until food fell out	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Snow leopard (*Panthera uncia*)	Weighted half sphere with pole on top. Meat attached to top and device rocked and wobbled as animal interacted with it	Stretched up and used forepaws to grab meat after base had fallen over	Benson-Amram et al. (2016)
Southern white rhinoceros (*Ceratotherium simum simum*)	Cardboard box with food inside	Pressed head down on box until it ripped open	X
Striped skunk (*Mephitis mephitis*)	Wobble puzzle feeder	Moved side to side until food fell into centre	Pesendorfer et al. (2018)
Sumatran orangutan (*Pongo abelii*)	Tube with food inside Food inside small tube	Used stick to extract food Used finger to reach inside and pull it out	Laumer et al. (2018)
Sun bear (*Helarctos malayanus*)	Hollow ball filled with food. Small holes cut into ball Cardboard box with food inside	Rolled ball to make food fall through hole Used forepaws to open box	X
Sunda slow loris (*Nycticebus coucang*)	Paper cups with food inside, stacked together	Pulled cup off of stack	X
Vervet monkey (*Chlorocebus pygerythrus*)	Coconut shells on rope smeared with jam	Pulled rope up to grab shell	X

Table 1.
(Continued.)

Species	Puzzle type	Solving method	First solving?
Western lowland gorilla (*Gorilla gorilla gorilla*)	Hollow PCP pipe with food inside. Holes drilled along pipe Wire cage with bowls of food inside	Used stick to reach into pipe and access food Used fingers to move bowls and then stick to extract food	Parker & Gibson (1994)
Wolverine (*Gulo gulo*)	Cardboard box with food inside	Used snout/paws to tear open box	Benson-Amram et al. (2016)
Yellow mongoose (*Cynictis penicillate*)	Rainy Day puzzle board (tiles and swivels)	Used snout and hands to slide tiles and swivel pieces	Dabhelia (2022)
Reptilia			
Bearded dragon (*Pogona* spp.)	Buggin' out puzzle board (swivel pieces and tiles)	Used arms to dig and face to push tile	X
California kingsnake (*Lampropeltis californiae*)	Puzzle board with pieces to slide and swivel	Used snout to slide tile	X
Eastern blue-tongue lizard (*Tiliqua scincoides*)	Buggin' out puzzle board (swivel pieces and tiles)	Used snout to move pieces	X
Green tree monitor (*Varanus prasinus*)	Dog Hide and Slide puzzle board	Used snout to slide tile	Cooper et al. (2020)

New records of problem solving in a species are indicated with 'X'.

not have to solve a problem spontaneously or innovatively to be considered capable of problem solving (Rowell et al., 2021). It is therefore not necessary to have a complete understanding of the individual's behavioural history to document problem solving, and a recorded observation from an institution, such as a zoo, can still sufficiently demonstrate an individual's ability to solve a problem. With this knowledge, researchers can then work with zoos to continue investigating problem solving in more detail in the species known to solve problems (e.g., individual variation, or consistency in solving over time). Alternatively, a more rigorous search of social media content could be undertaken through a citizen science project to find other records of problem solving, or to investigate other animal behaviour questions (e.g., whether behaviour towards a puzzle changes over time). Importantly, problem solving in captive animals should not be discounted as "ecologically irrelevant" because, while the problems presented may not be encountered in the wild, they still provide valuable insights on cognitive (e.g., learning, Aplin et al., 2013), behavioural (e.g., motivation, van Horik & Madden, 2016) and mechanical (e.g., range of motion, Rowell et al., 2021) processes that are inherent to the individual or species, as well as the capacity of the species, as a whole, to solve problems.

We found large differences in solving records between taxa, with higher numbers of mammals solving puzzle feeders ($n = 57$) than birds ($n = 13$) or reptiles ($n = 4$), and no records of fish, insects, or amphibians even receiving foraging puzzles. The lower number of social media records in these groups is likely not because these taxa are incapable of solving problems, as solving success has been documented in the scientific literature (e.g., various bird species, Sol et al., 2002; multiple monitor lizard species, Cooper et al., 2020; guppies (*Poecilia reticulata*), Varracchio et al., 2024; brilliant-thighed poison frogs (*Allobates femoralis*), Munteanu et al., 2016; leaf-cutting ants (*Atta colombica*0, Dussutour et al., 2009). Instead, it may suggest that (1) puzzle feeders are not frequently presented to non-mammalian species as standard husbandry practice (Varracchio et al., 2024), (2) zoos do not post videos of these animals using their enrichment items, possibly because they may not generate public interest (Snaddon et al., 2008); or (3) our search criteria inadvertently excluded organisations specializing more in aquatic species, such as aquaria. The limit in search results could also be due to the date limitation of the search parameters, as there are older records of fish solving problems on social media (e.g., weather loach *Misgurnus anguillicaudatus*

at the Bristol Zoological Society, https://twitter.com/BrisZooSociety/status/1273276766937927687). Therefore, while useful for studying problem solving in mammals and birds, social media may not be useful for studying problem solving in 'lower interest' groups unless more specific search parameters are used, or further work with zoos and aquaria are conducted.

Zoos present animals with foraging tasks to enhance their welfare and wellbeing, and this desktop survey found a large number of puzzle feeder records ($n = 111$) across many species ($n = 74$). However, it is still unknown what impact puzzle feeders have on animals in captivity broadly. Some studies have reported a positive effect of puzzle feeders on behaviour, including increased foraging behaviour and/or general activity levels (e.g., golden lion tamarins (*Leontopithecus rosalia*), Sanders & Fernandez, 2022; grey parrots (*Psittacus Erithacus*), van Zeeland et al., 2013) and decreased abnormal behaviours (e.g., multiple bear species, Swaisgood et al., 2001; Wagman et al., 2018), but this is not always the case. For example, the presence of puzzle feeders did not impact foraging activity levels of squirrel monkeys (*Saimiri sciureus*) (Spring et al., 1997), rhesus macaques *Macaca mulatta* (Lee et al., 2008), or gorillas (*Gorilla gorilla*) (Clark et al., 2019). Additionally, behavioural responses to puzzle feeders are not always straightforward, and can be difficult to interpret (e.g., puzzle feeders increased activity levels but also increased aggression in chimpanzees *Pan troglodytes*, Padrell et al., 2022). Finally, the physiological responses of animals to puzzle feeders is poorly understood (Meehan & Mench, 2007), making it challenging to directly determine whether feeders are improving an animal's welfare and affective state. For example, an increase in heart rate is often seen in response to both fear and excitement (Paul et al., 2005). Further research into the effects of puzzle feeders on captive animal welfare is therefore required.

5. Conclusion

Overall, social media appears to be an untapped and useful resource for identifying problem solving in animals, particularly for mammals. This suggests that further work should be done with zoos and their staff to increase the number of species that are exposed to puzzle feeders, to understand the impact of puzzle feeders on animal welfare, and to encourage the posting of videos of 'less popular' species, which could further increase the new records of solving successes. This also shows the potential for community education

and participation in research using social media. We argue that social media provides researchers with a cheap and easily accessible resource for documenting problem solving in animals and could provide a rich avenue for engaging in citizen science projects in the future.

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Table A1.
Records of problem solving in animals from Facebook, Instagram and X posts between August 2021 and August 2023.

Species	Location	Link	Puzzle type	Solving method	First solving?
Aves					
African pied crow (*Corvus albus*)	Unknown	https://www.instagram.com/p/CVp6iSOsuL8/	Dog casino drawers	Used beak to pull open drawers	X
Bald eagle (*Haliaeetus leuco-cephalus*)	Unknown	https://www.instagram.com/p/Ce1MKe-lGF6/	Dog casino drawers	Used beak to pull open drawers	X
Chicken (*Gallus gallus domesti-cus*)	Unknown	https://www.instagram.com/p/Crvw-AYovKr/	Dog Twister (sliding plastic tiles on puzzle board)	Pecked tiles to move them	X
	Unknown	https://www.instagram.com/p/Cp7kx8iItnb/	Dog Spin N Eat	Scratched with feet to roll feeder	
Common raven (*Corvus corax*)	Brookfield Zoo	https://www.instagram.com/p/CritZ9hN-Iw/	Cylinder covering food and tile tasks on puzzle board	Used beak to lift cylinder and slide tiles	Jønsson et al. (2012)
	Philadelphia Zoo	https://www.instagram.com/p/CipugVGMyeq/	Cardboard box wrapped in paper with food inside box	Used beak to remove paper and tear through carboard	
	Philadelphia Zoo	https://www.instagram.com/p/Cri0ub8thn5/	Puzzle board with tiles to slide	Used beak to slide tiles and swivel pieces	
	Coda Falconry Raptor Centre	https://www.instagram.com/p/B3VErCKBa8b/	Dog Tornado – layers of tiles to spin around	Pushed tiles with beak to reveal food	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Harris hawk (*Parabuteo unicinctus*)	WildCare Inc	https://fb.watch/nlQDZ2Ufs0/	Egg carton with food inside	Used beak to life up lid to reveal food	Colbert-White et al. (2013)
	Unknown	https://www.instagram.com/p/BlVw8oKgAXr/	Puzzle board with cylinders covering food reward. Rope attached to cylinders	Used beak to pull rope and lift cylinder	
	Unknown	https://www.instagram.com/p/CZW06_rMRkp/	Multiple puzzle boards	Used beak and feet to manipulate moving pieces	
	Unknown	https://www.instagram.com/p/CdQIuztMasH/	Dog brick puzzle board (sliding tiles and lifting flaps)	Used beak to pull rope and flap open to reveal food	
Hooded vulture (*Necrosyrtes monachus*)	Unknown	https://www.instagram.com/p/CdWTNNAI-OF/	Tile puzzle board	Used beak to slide tiles	X
Kea (*Nestor notabilis*0	Prague Zoo	https://www.facebook.com/watch/?v=1055197518986285	Cylinder see-saw with food inside	Tipped with beak and food came out	Gajdon et al. (2006)
Laggar falcon (*Falco jugger*)	Salthaven Wildlife Rehabilitation Centre	https://www.instagram.com/p/CbU0UH4sLQl/	DogSmart puzzle board (pillar tasks)	Picked up pillar with beak	X
Mitred parakeet (*Psittacara mitratus*)	Unknown	https://www.instagram.com/p/CJWo45nlqrT/?img_index=1	Puzzle board with swivel pieces covering food	Used beak to push swivel pieces	X
	Unknown	https://www.instagram.com/p/CJ2PGqMFL_G/?img_index=1	Puzzle board with flaps to lift up to reveal food	Used beak to lift flap	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Palm nut vulture (*Gypohierax angolensis*)	Unknown	https://www.instagram.com/p/BrF_rvLA6st/	Puzzle board with cylinders covering food reward. Rope attached to cylinders	Used beak to pull out piece covering food	X
Rock pigeon (*Columba livia*)	Unknown	https://www.instagram.com/p/CmZHg4dszHt/	Buggin' out puzzle board (swivel pieces and tiles)	Pecking to slide tiles	Bouchard et al. (2007)
Striated caracara (*Phalcoboenus australis*)	Intl. Centre for Birds of Prey	https://www.instagram.com/p/B8NCkUCnceT/	Cylinders covering food rewards on puzzle board	Used beak to pull out piece covering food	Harrington et al. (2023)
		https://www.instagram.com/p/BumkPF_hfMa/	Drawers to pull open	Used beak to pull out piece covering food	
		https://www.instagram.com/p/BUGk818lf60/	Spinning tiles to move to reveal food	Used beak and feet to spin tiles	
Sulphur-crested cockatoo (*Cacatua galerita*)	Unknown	https://fb.watch/nlPX8CSZoH/	Pegs holding seeds back in a gravity feeder	Used beak to pull pegs out so seeds fell down	Klump et al. (2021)
Mammalia					
Aardvark (*Orycteropus afer*)	Jersey Zoo	https://www.instagram.com/p/Cmb9BNiIGVX/	Cardboard box with food inside	Used snout/mouth to lift up lid	X
African wild dog (*Lycaon pictus*)	Brookfield Zoo	https://www.instagram.com/p/CfMNRDnMcCC/	Floating bowl on water with food inside	Pulled rim of bowl closer to edge of pond so could reach food	Benson-Amram et al. (2016)

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Amur leopard (*Panthera pardus orientalis*)	Philadelphia Zoo	https://www.instagram.com/p/CsHr5EksN2T/	Weighted half sphere with pole on top. Meat attached to top and device rocked and wobbled as animal interacted with it	Stretched up and used forepaws to grab meat after moving base	O'Connor et al. (2014)
Amur tiger (*Panthera tigris altaica*)	Moscow Zoo	https://www.instagram.com/p/CYLtipxKT9D/	Carboard box with meat inside	Used snout and paws to push open/tear open box	Benson-Amram et al. (2016)
	Brookfield Zoo	https://www.instagram.com/p/Ck1H0NVLyI8/	Ball with holes filled with food attached to bungee cord and hanging	Used forepaws and mouth to move feeder until food could be pulled out	
Andean bear (*Tremarctos ornatus*)	Philadelphia Zoo	https://twitter.com/i/status/1688686848695009280	Ball with small hole filled with food pieces	Rolled ball around until food came out	Benson-Amram et al. (2016)
Asian elephant (*Elephas maximus*)	Cincinnati Zoo	https://www.facebook.com/cincinnatizoo/videos/4788397411246627/	Popcorn in upright tube hanging above	Used trunk to blow air into tube, lifting food out	Foerder et al. (2011)
	Bioparco di Roma	https://www.instagram.com/p/Cv1yTlAI2AV/	Ball with small hole and food inside	Rolled ball until food fell out	
	The Elephant Sanctuary	https://www.instagram.com/p/ChKjn29sEN-/	Hollow containers with food inside and small holes	Used trunks to move container until food came out	
	The Elephant Sanctuary	https://www.instagram.com/p/CZNNPAeJbhB/	Feed bags with food inside	Held bag down with foot and used trunk to pull up and tear open	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Asian small-clawed otters (*Aonyx cinereus*)	Dartmoor Zoological Society	https://www.facebook.com/watch/?ref=search&v=1262933050872445&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Floating feeding platform with clamps for holding food, holes for stuffing food into	Used forearms to extract food	Schmelz et al. (2017)
	Jerusalem Biblical Zoo	https://www.instagram.com/p/Cuee1ZgKHlr/	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Using paws to move covering pieces	
	Animal Adventure Park	https://www.facebook.com/reel/649779168897142	Hollow ball with food inside and small holes	Used forearms to get food out through holes	
Binturong (*Arctictis binturong*)	Perth Zoo	https://twitter.com/i/status/1496334543514648578	Ball with food inside on end of rope hanging from branch	Pulled rope up to get to ball	Benson-Amram et al. (2016)
Black and white ruffed lemur (*Varecia variegata*)	Perth Zoo	https://twitter.com/i/status/1424586278260154368	Cardboard milk cartoon with small opening and food inside	Lifted and tipped carton until food came out	Kittler et al. (2018)

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Black-capped squirrel monkey (*Saimiri boliviensis*)	Perth Zoo	https://www.facebook.com/watch/?ref=search&v=666173357819173&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Cardboard roll with one end open and one end closed.	Manipulated roll to find open end and reached in for food	Hopper et al. (2014)
	Pairi Daiza	https://www.instagram.com/p/ClYEN1IAjYm/	Paper wrapped around treats to make Christmas cracker	Chewed through paper	
Brown capuchin (*Sapajus apella*)	Hamilton Zoo	https://www.facebook.com/watch/?ref=search&v=220917262661090&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Food wrapped in non-edible material and stuffed into cardboard roll	Pulled out and unwrapped	Renner et al. (2017)
	Perth Zoo	https://twitter.com/i/status/1432551040432414720	PVC pipe able to spin around on stand. Small hole in one end and food inside	Used hands to spin pipe until food fell out	
Brown-nosed coati (*Nasua nasua*)	Perth Zoo	https://twitter.com/i/status/1515537616644493313	Closed egg carton with food inside	Opened lid with hands and mouth	X
Canada lynx (*Lynx canadensis*)	Columbus Zoo and Aquarium	https://www.instagram.com/p/CwS-HVduyKJ/	Paper bag hanging from tree with food inside	Tore through bottom of bag with claws and teeth	Worsley (2013)

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Chimpanzee (*Pan troglodytes*)	Zoológico de São Paulo	https://www.instagram.com/p/CvMzYeTL3Lp/	Cardboard boxes with food inside	Used mouth and hands to tear open boxes	Hopper et al. (2014)
Clouded leopard (*Neofelis nebulosa*)	Brookfield Zoo	https://www.instagram.com/p/Cvhn_r7ts8B/	Hollow log hanging vertically with food inside holes	Used paws to hold log and snout to extract meat	O'Connor et al. (2014)
Common marmoset (*Callithrix jacchus*)	Unknown	https://www.instagram.com/p/CrjbpQxMRGw/	Puzzle board with pieces to slide and swivel	Used hands to swivel piece	Cameron & Rogers (1999)
Cotton-top tamarin (*Saguinus Oedipus*)	Unknown	https://www.instagram.com/p/CWik0kwsMs1/	Dog Hide n Slide puzzle board	Used hands to slide tiles	Hauser et al. (1999)
Dingo (*Canis lupus dingo*)	Perth Zoo	https://twitter.com/i/status/1515537616644493313	Ball with small hole filled with food pieces	Rolled ball around until food came out	Smith & Litchfield (2010)
Domestic dog (*Canis lupus familiaris*)	Baker Animal Hospital	https://www.facebook.com/BakerAnimalHospital/videos/2091471171245545	Stack of plastic boards with treats on them. Had to swivel boards to reveal food	Used snout to swivel boards to reveal food	Topál et al. (1997)
	Animal Care Center of St. John	https://www.facebook.com/reel/252268432755074	Board with half spheres covering food	Used paws to swivel spheres to reveal food	
	Behavior Vets	https://www.facebook.com/reel/232010452738114	Tiles to slide on a puzzle board	Used snout and front paws to slide tiles	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Domestic ferret (*Mustela putorius furo*)	Unknown	https://www.instagram.com/p/Cv2RYD9oBxx/	Dog Worker puzzle board (sliding tiles)	Used snout to slide tiles	Scott & Wiebers (1996)
Dwarf mongoose (*Helogale parvula*)	ZSL London Zoo	https://www.instagram.com/p/CaKf_HRoo_0/	Cylinders covering food rewards on puzzle board	Used hands to pull cylinder out with digging motion	X
Eastern hoolock gibbon (*Hoolock leuconedys*)	Gibbon Conservation Centre	https://www.instagram.com/p/Cb43N2RMAjx/	Multi-puzzle board (sliding and twisting)	Used hand to slide tiles and swivel cover	Cunningham et al. (2006)
Eurasian otter (*Lutra lutra*)	Namsskogan Familiepark&Hotell	https://www.instagram.com/p/CcsFJVQMmh6/	Dog Hide n Slide on plank of wood floating in water	Used snout to slide tiles	X
	Namsskogan Familiepark&Hotell	https://www.instagram.com/p/CYosO_OtZqX/	Dog Hide n Slide puzzle on plank of wood on ground	Used snout to slide tiles	
European pine marten (*Martes martes*)	ParaZOO	https://www.instagram.com/p/Cipe0lBsQQQ/	Dog Worker puzzle board (sliding tiles)	Used snout and hands to slide	X
European rabbit (*Oryctolagus cuniculus*)	Unknown	https://www.instagram.com/p/Cc-I5Fati2j/	Dog Hide n Slide puzzle board	Used snout to slide tiles and swivel pieces	Clavel et al. (2020)

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Fennec fox (*Vulpes zerda*)	Los Angeles Zoo	https://www.instagram.com/p/CkgTkKxga8z/	Spinning cylinders on pole	Used snout and forepaws to push cylinders so they would spin and drop food	X
Goat *Capra* (*aegagrus hircus*)	Unknown	https://www.instagram.com/p/ChM09FdseIa/	Dog brick puzzle board (sliding tiles and lifting flaps)	Used snout and front hooves to slide tiles and lift flaps	Caicoya et al. (2023)
	Reid Park Zoo	https://x.com/ReidParkZoo/status/1462813657985953797?s=20	Hanging plastic containers with holes in them and food inside	Used head to lift up and move around containers until food fell out	
Grant's plains zebra (*Equus quagga boehmi*0	Ventura Wildlife Park	https://www.instagram.com/p/B5qhtn3H4BK/	Dog treat tumble (ball with food inside that falls out of small holes)	Pushed ball with snout until food fell out	X
Grizzly bear (*Ursus arctos horribilis*)	Washington State University College of Agricultural, Human, and Natural Resource Sciences	https://fb.watch/nlQ1ppfn3T/	Multiple puzzles – hollow PVC pipes with food inside, small holes covered with balls/rings; bucket with food covered by lid with holes in it	Used forepaws and snout to move pieces up/down pipe to get food. Tipped bucket over with paws to get food to fall out	Benson-Amram et al. (2016)
Guinea pig (*Cavia porcellus*)	Unknown	https://www.instagram.com/p/Cd0OCa6MNWW/	Rainy Day puzzle board (tiles and swivels)	Used snout to push swivelling cover	X
	Unknown	https://www.facebook.com/reel/1312045189006441	Board with plastic pieces covering food	Bit plastic cover and pulled it off board to reveal food	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Horse (*Equus ferus caballus*)	Unknown	https://www.instagram.com/p/CYMGjFDMqXu/	Dog Tornado – layers of tiles to spin around	Used snout/lips to swivel pieces to reveal food	Esch et al. (2019)
House cat (*Felis catus*)	Unknown	https://www.instagram.com/p/CeGPXvwNxAt/	Buggin' out puzzle board (swivel pieces and tiles)	Used forepaws to push swivel pieces	Howard (2018)
Javan langur (*Trachypithecus auratus*)	Jerusalem Biblical Zoo	https://www.instagram.com/p/Cuee1ZgKHlr/	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Used paws to swivel piece covering food	X
Kinkajou (*Potos flavus*)	Amazing Animals Wildlife Preserve	https://www.instagram.com/p/CdiMA0xMXAM/	Dog Hide n Slide puzzle board	Used snout and hands to push swivel pieces covering food	X
Llama (*Lama glama*)	Unknown	https://www.instagram.com/p/CWN-HotMOlN/	Treat Tumble (ball with food inside that comes out through small holes)	Used snout to roll ball until food fell out	Caicoya et al. (2023)
	Ventura Wildlife Park	https://www.instagram.com/p/B5qhtn3H4BK/	Dog treat tumble (ball with food inside that falls out of small holes)	Pushed ball with snout until food fell out	
Lowland tapir (*Tapirus terrestris*)	Brookfield Zoo	https://www.instagram.com/p/CnmeJwlMVf_/	Hanging cylinder with food inside and small holes at base	Pushed cylinder so it rotated enough for food to fall out	X

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Maned wolf (*Chrysocyon brachyurus*)	Los Angeles Zoo	https://twitter.com/i/status/1658585521235304448	Cardboard box with food inside	Tore through box to get food	Benson-Amram et al. (2016)
Meerkat (*Suricata suricatta*)	Halls Gap Zoo	https://www.facebook.com/watch/?ref=search&v=3226378127476925&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Hollow ball filled with food. Small holes cut into ball	Rolled ball to make food fall through hole	Thornton & Samson (2012)
	Zoo Boise	https://www.facebook.com/watch/?ref=search&v=1318338865322038&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Hollow PCP pipe with food inside. Holes drilled along pipe, blocked with fabric	Pulled fabric out of holes and rotated pipe until able to pull out mealworms	
	Cincinnati Zoo	https://www.facebook.com/reel/1343135199966529	Mealworms hidden under wood shavings in a box	Sniffed and dug up wood shavings to find food	
	Philadelphia Zoo	https://www.instagram.com/p/CfjrZmblSjS/	Kong toy with crickets inside	Used forepaws to push/rock Kong so crickets fell out of hole	
Nilgiri marten (*Martes gwatkinsii*)	Jerusalem Biblical Zoo	https://www.instagram.com/p/Cuee1ZgKHlr/	Wooden log with small holes. Food inside, hole covered with small piece of wood that can be swivelled out of the way	Used paws to swivel covering piece to expose food	X

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
North American raccoon (*Procyon lotor*)	Shy Wolf Sanctuary	https://twitter.com/i/status/1654101755133669377	Plastic bottle spinning on stick. Lid open and small food inside	Spinning bottle until food falls out	Stanton et al. (2017)
	Unknown	https://www.instagram.com/p/CUhx3tRN_C1/	Tile puzzle board	Used hands to slide tiles	
Ocelot (*Leopardus pardalis*)	Greenville Zoo	https://www.facebook.com/watch/?ref=search&v=1354337301282417&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Swinging hollow log with food inside	Tipping end until food slid out	O'Connor et al. (2014)
Pileate gibbon (*Hylobates pileatus*)	Gibbon Conservation Centre	https://www.instagram.com/p/B-tcMyqHtur/	Tiles to move on board that cover food rewards	Lifted tiles up with hands	X
Polar bear (*Ursus maritimus*)	Brookfield Zoo	https://www.instagram.com/p/CjTfVY2JOwb/	Small cylinder with food inside. Both ends open but too small for snout/hands to go inside	Picked up one side of cylinder with mouth and tipped it so food fell out	Benson-Amram et al. (2016)
Red panda (*Ailurus fulgens*)	Cincinnati Zoo	https://www.facebook.com/watch/?v=135566636139562	Paper mâché bowl hiding food pieces	Knocked bowl off food	Benson-Amram et al. (2016)
	Perth Zoo	https://twitter.com/i/status/1470989552819085315	Puzzle board with plastic half-balls covering food rewards	Used snout to roll ball and expose food	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
	Perth Zoo	https://twitter.com/i/status/1439061422449823751	PVC pipe able to spin around on stand. Small hole in one end and food inside	Used hands to spin pipe until food fell out	
	Smithsonian Zoo	https://www.instagram.com/p/CRbgxkWlzcs/	Dog Twister (sliding plastic tiles on puzzle board)	Pushing tiles with paw	
	Smithsonian Zoo	https://www.instagram.com/p/Ctoim9pNcHf/	Dog Tornado – layers of tiles to spin around	Used paws to slide tiles and tip puzzle	
Reticulated giraffe (*Giraffa reticulata*)	Highpoint Haven	https://www.instagram.com/p/CoPmK4bo2kY/	Dog Spin N Eat	Used lips and tongue to roll feeder	X
Ringtail lemur (*Lemur catta*)	Amazing Animals Wildlife Preserve	https://www.instagram.com/p/CtTz82toNK4/	Dog Spin N Eat	Using hands to spin piece holding food	Kittler et al. (2018)
	Moscow Zoo	https://www.instagram.com/p/CY6EL7-KxqS/	Flaps to lift up to access food underneath	Used hands to lift flap	
	Ventura Wildlife Park	https://www.instagram.com/p/B5qhtn3H4BK/	Dog treat tumble (ball with food inside that falls out of small holes)	Used arms to roll ball	
Sloth bear (*Melursus ursinus*)	Philadelphia Zoo	https://www.instagram.com/p/CnZkFLvLBeV/	PVC pipes with holes, food inside	Used paws and mouth to move pipe around until food fell out	X

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Snow leopard (*Panthera uncia*)	Philadelphia zoo	https://www.instagram.com/p/CpNc5HJt3d7/	Weighted half sphere with pole on top. Meat attached to top and device rocked and wobbled as animal interacted with it	Stretched up and used forepaws to grab meat after base had fallen over	Benson-Amram et al. (2016)
Southern white rhinoceros (*Ceratotherium simum simum*)	Perth Zoo	https://twitter.com/i/status/1430008246065057793	Cardboard box with food inside	Pressed head down on box until it ripped open	X
Striped skunk (*Mephitis mephitis*)	Amazing Animals Wildlife Preserve	https://www.instagram.com/p/CsZkPgUNpaA/	Wobble puzzle feeder	Moved side to side until food fell into centre	Pesendorfer et al. (2018)
Sumatran orangutan (*Pongo abelii*)	Cincinnati Zoo	https://www.facebook.com/cincinnatizoo/videos/461040152684542	Tube with food inside	Used stick to extract food	Laumer et al. (2018)
	Pairi Daiza	https://www.instagram.com/p/CbmR2biI52t/	Food inside small tube	Used finger to reach inside and pull it out	

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Sun bear (*Helarctos malayanus*)	Perth Zoo	https://www.facebook.com/watch/?ref=search&v=222671916709935&external_log_id=5e7bebe5-34ce-415a-b0f3-48141f6088cd&q=zoo%20enrichment	Hollow ball filled with food. Small holes cut into ball	Rolled ball to make food fall through hole	X
	Edinburgh Zoo	https://www.facebook.com/watch/?v=1255159858251964	Cardboard box with food inside	Used forepaws to open box	
Sunda slow loris (*Nycticebus coucang*)	Perth Zoo	https://twitter.com/i/status/1674375745487921152	Paper cups with food inside, stacked together	Pulled cup off of stack	X
Vervet monkey (*Chlorocebus pygerythrus*)	Werribee Open Range Zoo	https://twitter.com/i/status/1589113177333276673	Coconut shells on rope smeared with jam	Pulled rope up to grab shell	X
Western lowland gorilla (*Gorilla gorilla gorilla*)	Cincinnati Zoo	https://www.facebook.com/reel/594437259539293	Hollow PCP pipe with food inside. Holes drilled along pipe	Used stick to reach into pipe and access food	Parker & Gibson (1994)
	Cincinnati Zoo	https://www.facebook.com/cincinnatizoo/videos/898573657754065	Wire cage with bowls of food inside	Used fingers to move bowls and then stick to extract food	
Wolverine (*Gulo gulo*)	Moscow Zoo	https://www.instagram.com/p/CYBifLtKeey/	Cardboard box with food inside	Used snout/paws to tear open box	Benson-Amram et al. (2016)

Table A1.
(Continued.)

Species	Location	Link	Puzzle type	Solving method	First solving?
Yellow mongoose (*Cynictis penicillate*)	Unknown	https://www.instagram.com/p/CgrUsS8Mezb/	Rainy Day puzzle board (tiles and swivels)	Used snout and hands to slide tiles and swivel pieces	Dabhelia (2022)
Reptilia					
Bearded dragon (*Pogona* spp.)	Unknown	https://www.instagram.com/p/CsoEyhUgnSP/	Buggin' out puzzle board (swivel pieces and tiles)	Used arms to dig and face to push tile	X
California kingsnake (*Lampropeltis californiae*)	Unknown	https://www.instagram.com/p/CVIamRot-K_/	Puzzle board with pieces to slide and swivel	Used snout to slide tile	X
Eastern blue-tongue lizard (*Tiliqua scincoides*)	Unknown	https://www.instagram.com/p/CaKTc1-sYG7/	Buggin' out puzzle board (swivel pieces and tiles)	Used snout to move pieces	X
Green tree monitor (*Varanus prasinus*)	Unknown	https://www.instagram.com/p/Chhbxfesif6/	Dog Hide and Slide puzzle board	Used snout to slide tile	Cooper et al. (2020)

New records of problem solving in a species are indicated with 'X'.