

Affordances of Small Animals for Young Children: A Path to Environmental Values of Care

Inger Lerstrup

University of Copenhagen, Denmark

Louise Chawla

University of Colorado Boulder, USA

Harry Heft

Denison University, USA

Submitted December 14, 2020; accepted October 25, 2021

ABSTRACT

Employing the theoretical framework of ecological psychology, this article uses observations of children in a Danish forest preschool to identify features of the forest that the children engaged with frequently, with a particular focus on affordances of “small animals.” The article describes children’s fascination and interactions with creatures like insects, worms, snails and frogs, and how activities in varied green settings provide important opportunities for young children to handle small forest creatures, talk about them with other people, and learn to care for them. We discuss how interactions with small creatures may contribute to children’s long-term disposition to protect forests and biodiversity, and how to increase opportunities for children to engage with small animals in the everyday settings of their lives. We conclude that these affordances of creatures may prepare young children to understand and support Sustainable Development Goal #15 (SDG #15), which calls to people to protect terrestrial ecosystems and prevent biodiversity loss.

Keywords: Children, small animals, affordances, development, biodiversity

From the perspective of ecological psychology, meaningful action possibilities of environmental features are called “affordances” (Gibson, 1979; Heft, 1988; Lerstrup & Konijnendijk van den Bosch, 2017). The concept of affordances has commonly been applied to environmental opportunities for physical activities such as running, jumping, climbing, and constructing things. Affordances refer to relations between humans and their environment, such as people’s relations with physical artefacts, plants, animals, other humans, and features of the landscape (Gibson, 1979).

The observations shared in this article indicate that children in forest preschools are, indeed, drawn to forests’ affordances for full bodied movements and the use of materials for creative play and construction; social interactions with other students and teachers; and also engagement with small animals. The latter, however, have not received much attention in the research literature. This study focuses on the significance of small forest creatures for children in Danish outdoor preschools by examining children’s interactions with live animals and their residues like bones and feathers. Additionally, the study noted children’s interactions with their peers and preschool staff. This investigation was part of a more extensive Danish multi-method study of preschool children in outdoor

environments (Lerstrup & Konijnendijk van den Bosch, 2017; Lerstrup & Møller, 2016; Lerstrup & Refshauge, 2016), with the aim of informing landscape designers who create green settings for preschools.

We begin with a brief introduction to nature preschools and a review of research that examines the influence of these settings on the development of caring for the natural world. Following that overview, we consider studies of the developmental backgrounds of people who feel connected to nature and take action to protect it. We then examine the concept of affordances, especially as it relates to engaging with animate features of the environment, and present the research questions.

Early Life Experiences Associated with Care for the Natural World

Nature preschools began in Denmark in the 1950s, using the forest and other natural surroundings as their classroom (Lerstrup, 2016). By 2015, thousands of nature preschools and forest kindergartens had been established across Scandinavia, Germany, the United Kingdom, Australia, New Zealand, North America, and many Asian countries (Sobel et al., 2016). Despite this long history and these numbers, there are no studies that follow graduates of these schools longitudinally to determine whether they show more care for the natural world than people who attended conventional early childhood programs. Nevertheless, four bodies of research suggest that forest preschool experiences are likely to prepare people for conservation values and behaviors: 1) outcome evaluations of nature preschools; 2) qualitative studies that track children's development in nature-based programs; 3) studies of "significant life experiences" in the lives of people who show active care for the environment; and 4) studies of associations between connecting with nature and environmental knowledge and behavior.

The first body of research includes a number of studies that compare student outcomes, such as readiness for primary school, among those who experienced nature preschools versus conventional preschools with built playgrounds and limited time outdoors. They show that children in nature preschools perform at least as well, and most often better, on measures of motor skills, curiosity, creativity, problem-solving, initiative, self-regulation, and peer relations (Burgess & Ernst, 2020; Ernst & Burcak, 2019; Lerstrup, 2016; Müller et al., 2017; Wojciehowski & Ernst, 2018; Zamzow & Ernst, 2020). Fewer studies measure environmental awareness, ecological knowledge, or care for nature in contrasting preschool settings.

Two studies, however, demonstrate that children in nature preschools or preschools that frequently take children out in nature are more likely to express connection with nature and care for other living things than children in conventional programs. This was the outcome when Giusti et al., (2014) used an "affiliation with the biosphere" interview to compare similar groups of five-year-olds in nature-rich versus nature-deficit preschools in Stockholm, Sweden. Additionally, Elliot et al., (2014) used a "relatedness to nature" interview to compare children in a forest kindergarten with a conventional kindergarten in the same school in British Columbia, Canada. Similarly, when five-year-olds in a preschool in Mersin, Turkey were given four weeks of activities and free play in natural areas, their scores on a "biophilia interview" rose significantly (Yilmaz et al., 2020). The study that compared forest kindergarten and conventional kindergarten students in British Columbia found no differences, however, in environmental behaviors (Elliot et al., 2014); and a similar comparison of new classes in the same school found no differences in either relatedness to nature or environmental behavior (Müller et al., 2017). The researchers suggested that this lack of differences reflected a ceiling effect in a province generally characterized by high levels of pro-environmental values and behaviors.

The second body of research includes qualitative studies that observe children's development in nature-based preschool programs over time. These studies lack comparison groups, but they show how children express curiosity and care for wild creatures and the places where they live. Four ethnographic studies of this kind show children eagerly learning about their environment and its creatures through direct exploration and inquiry, as well as learning from each other and program staff (Elliot et al., 2014; Kharod & Arreguin-Anderson, 2018; Jørgensen, 2016; McClain & Vandermaas-Peeler, 2016). In each study, children demonstrated concern and care for wild animals; or over time they were able to overcome initial aversion to insects or small creatures like slugs and snails and show fascination and even care. Observing one- to six-year-olds in Norwegian preschools on a small island and in a forest, Jørgensen

(2016) noted that animals that caught children's interest were mainly small creatures that they could observe closely and explore "literally hands-on" (p. 1145).

The third body of research takes up the concept of "significant life experiences" that produce "an active and informed citizenry" who work to maintain "a varied, beautiful, and resource-rich planet" (Tanner, 1980, p. 20). These investigations involved diverse samples and multiple methods: retrospective interviews and analyses of autobiographies of people whose lives express committed action to protect the environment; interviews and surveys that compare people with high and low levels of pro-environmental action; and a few longitudinal studies. (See reviews by Chawla, 1998; Chawla & Derr, 2012; D'Amore & Chawla, 2020; Sward & Marcinkowski, 2001; Wells & Lekies, 2012). The most frequently mentioned formative experiences are extended time in nature beginning in childhood; role models of care for nature in the form of family members and teachers; participating in environmental organizations; witnessing the destruction of wild habitats; and nature books and films. The most common experience associated with valuing and caring for nature is sheer time spent in natural areas in childhood and youth (Chawla & Derr, 2012; Wells and Lekies, 2012). This outcome was evident again in a longitudinal study that took measures of 118 young people in rural upstate New York at ages 6 and 18 (Evans, et al., 2018). When the children were 6, the researchers surveyed their mothers about their child's outdoor play habits, as well as the mother's level of education, values, and environmental attitudes and behaviors. When the youth reached 18, they gave self-reports about their environmental behaviors and attitudes. Spending more time playing outdoors in their rural region at age 6 was the strongest predictor of pro-environmental responses at age 18.

The fourth body of research, on connection to nature, includes measures of nature connection for two- through five-year-olds, which emphasize enjoying nature, interest in it, wanting to play in nature, and expressing care for nature (Beery et al, 2020; Chawla, 2020). Experiences associated with high levels of nature connection in childhood include, most prominently, easy access and extended time spent outdoors in nature as well as adults who promote children's engagement with nature and empathy for living things (Chawla, 2020). Both children and adults who report high levels of nature connection are more likely to report that they are taking action to protect the natural world (Chawla, 2020).

All four forms of research reviewed here—outcome evaluations of nature preschools, observations of children in nature-based programs, significant life experiences of people who actively care for the natural world, and childhood connection to nature—suggest that when children spend extended time outdoors in forest preschools and see their classmates and teachers exemplify respect for forest creatures, they will develop a disposition of care for nature. This conclusion is consistent with ideas developed by Jørgensen (2016), Beery and Jørgensen (2018), and Myers and Saunders (2002) based on their studies of children in nature and children with animals.

Observing young children in island and forest preschools in Norway, Jørgensen (2016) concluded that children in these settings were developing an "ecological consciousness" that is "a matter of multi-sensory openness toward the landscape and the otherness of other living organisms, including the places where these organisms live" (p. 1142). Beery and Jørgensen (2018) claimed that this kind of interactive, multisensory experience during childhood nature exploration promotes biodiversity understanding. They argued that it is "a point of departure for the development of ecological ideas and embodied environmental understanding," making ideas like "biodiversity" personally relevant (p. 21).

Myers and Saunders (2002) proposed that when children learn to know and care for individual animals, they become prepared to care for the habitats these animals inhabit, and with time, whole species and ecosystems. From the earliest months of life, they noted, infants are attracted to animals and quickly learn to read them as social others, given their animacy, bodily coherence, and in the case of higher animals, communication of emotions and potential for interactive relationships. This attentiveness to animals includes noticing their habits and needs. Consistent with the idea of expanding boundaries of care, when Myers and Saunders (2002) conducted focus groups with children aged 6-12 about their animal experiences and interest in helping animals, they found that by the ages of 8-10, children extended feelings of care for individual animals to generalized care for the habitats that their species rely on for survival.

Affordances and Animate Life

The theoretical framework adopted in this study is the ecological psychology of James Gibson (1979), and in particular his concept of affordances. Affordances are possibilities for action in the environment, or in the words of Lerstrup and Konijnendijk van den Bosch (2017), “the meaningful action possibilities of the environment” (p. 49). In contrast to the long-standing tradition among psychologists and philosophers to conceptualize the individual perceiver as a spectator who passively stands at a remove from the world, Gibson aligned himself with those, such as Darwin, who adopt an active, purposive approach to organisms, including humans, in dynamic interactions with their habitats (Heft, 2001; 2010; 2013).

Darwin demonstrated that there is continuity, as well as differences, across species, and that there are some basic functions nearly all species share. Prominent among these is animacy. Living things move around their niches exploring, seeking out resources, avoiding hazards, and sometimes altering them in ways to promote their patterns of living (Odling-Smee, et al., 2003). What they experience foremost are the affordances of the environment.

In an examination of observational studies of the activities of children in their nearby environments, Heft (1988) found that the affordances the children engaged in could be organized into a number of categories, such as graspable objects, surfaces for walking and running, barriers for hiding, and structures for climbing. In these observational studies, attention was mostly limited to children’s activities in relation to inanimate features, with the exception of their interaction with other persons. Engagement with nonhuman animate organisms, if it occurred, was not reported. As a result, what has been omitted thus far in studies of children’s activities in environments are affordances stemming *from* nonhuman animate organisms.

What perceptually distinguishes animate versus inanimate features? The first difference is that animate organisms generate their own movement. They crawl, tumble, wriggle, run, burrow, fly. Second, and perhaps more critical for the children described in this study, they move in relation to the actions of other animate beings, such as the child’s own actions. In those cases, other animals afford reciprocal engagement. When children engage with animate things, the prospect exists for the animate thing to respond to children’s actions in turn, creating dialogical possibilities—the affordance of reciprocal, ongoing exchange.

These considerations bring us to the core issue examined here: whether opportunities to engage with animate creatures, particularly in the company of preschool peers and teachers, can promote the development of care toward the natural world. Although people can exhibit caring for inanimate features of the environment like rocks or rivers, perhaps engagement with individual living creatures establishes a foundation for caring for the environment broadly as well as the ecosystems where creatures live. With this possibility in mind, we examined the collected data about interactions of young children with small creatures in their forest preschool environment by asking the following questions:

1. What kind of activities do preschool children perform with small creatures?
2. What do preschool children appear to gain from their acquaintance with these creatures?
3. What are the ethos and practices of the outdoor preschool staff with regard to the treatment of wild creatures?

In the discussion, we consider how the practices in relation to small creatures in Danish outdoor preschools may influence the children’s long-term disposition to protect forests and biodiversity.

METHODS AND ANALYSIS

The material reported here is drawn from three sub-studies of a broader project conducted by the first author. The main goal of the project was to study the affordances of natural areas that attract preschool children’s attention and activity. In the process, it became evident that small wild creatures constitute important affordances that have been largely neglected by previous research. Therefore, for this article, all three sub-studies were reviewed to extract and

re-examine observations and statements related to “small creatures” as a newly identified class of affordances that deserves research attention.

Sub-study 1. Observations of a Danish forest preschool group during self-directed activities, or free play, at different forest sites. The group consisted of 21 children aged 3-5 and three staff members. At the beginning of each school day, the children moved on foot to different sites in a forest that is owned and cultivated by a foundation. They started out from their base, a house at the city’s edge where their parents dropped them off in the morning and picked them up in the afternoon, where they stayed before and after their hours in the forest. The first author accompanied them in the forest on 24 days in all weathers and seasons in 2011, as they spent five or more hours outside each day. Following processes of anthropological fieldwork, the observations were collected in field notes and video recordings (Gulløv & Højlund, 2003). In addition, the staff was interviewed on site.

The preschool leader and staff in the extensively studied forest preschool gave the first author permission to be present during school life for a year, and parents gave signed permission for the use of photos and video clips for research and education.

The fieldwork data from sub-study 1 was analyzed by the first author by viewing and reviewing the videotapes and reading and rereading the field notes, making a qualitative analysis through the theoretical perspective of ecological psychology. The focus of this analysis was the relationship between children’s activities and action possibilities of the environment, or “affordances.” The analysis was compared with the prior taxonomy of affordance possibilities of outdoor environments for young children Heft (1988). The taxonomy consisted of 10 categories of environmental features, and the most distinctive and attractive activities that each class affords for preschool children. For example, “sloping terrain” affords various action possibilities, but rolling, sliding and clambering up were distinctive for this class, and “loose objects” affords the distinctive activities of arranging, modifying and using objects as tools, props or treasures. Most of the features of the forest environment examined in Lerstrup and & Konijnendijk, (2017) coincided with Heft’s taxonomy, but new classes were added. One was creatures, which the children could look for, handle, and care for, which is our focus here.

Sub-study 2. A survey was sent to 353 outdoor preschools in Denmark in 2011, asking quantitative and qualitative questions about preschool organization, goals, funding, staffing and advantages and disadvantages of staying outdoors in green settings. The return rate was 50%. At each school, one staff member was chosen to respond to the survey.

Sub-study 3. One- to two-day visits to 10 outdoor preschools in Denmark in 2012-13. During these visits, the first author made observations and conducted semi-structured interviews with staff, asking about preschool organization, goals, budgeting, and staffing, as well as advantages and disadvantages of operating outdoors.

The findings from all three sub-studies were discussed with forest preschool staff in 2018, when analyses were completed, to verify that conclusions derived from the data were consistent with the staff’s experience. In the Results that follow, children’s interactions with creatures are described and connected to responses from the staff survey and staff interviews.

Results

Results of the three sub-studies described above were integrated in order to offer a coherent overview of the findings. They are presented in the following order: 1. Activities observed; 2. Expressions of attraction, wonder, and awe; 3. Sensory learning; 4. Factual learning; 5. Inspiration for talk and reflection; 6. Respect and care; and 7. Staff ethos and practice.

1. Activities Observed

Activities with animals were grouped under the headings of “exploring,” “performing,” and “creating.” In real life, these three types of activities are often mixed together or rapidly follow each other, yet they remain distinguishable.

These three categories form a useful structure to present an overview of the children's engagement with small animals.

A. Exploring. Exploring included expeditions to look for animals and animal signs and following animal tracks or traces (Figure 1). But also hearing or seeing animals from afar; searching for them under logs and stones and in water, grass, rotten wood and soil; detecting them; and observing them more closely (Figure 2). It also included investigating animal residues, such as bones, feathers, egg shells, snake slough, deer hair, deer and hare scat, owl pellets, and dead animals such as birds, moles, mice, shrew mice, insects, and fallow deer. These discoveries led to many reflections, questions and conversations, and often sent children in search of more knowledge through discussions with peers and staff and consulting natural history books and posters.



Figure 1. *Example of exploring activities: Looking for creatures happens daily. Photo by Inger Lerstrup.*



Figure 2. *Example of exploring activities: A ladybird on a stick is examined closely and reflected over. Photos by Inger Lerstrup.*

B. Performing. Performing included handling animals, catching them, picking them up, placing them, counting them, experimenting, and, subsequently, letting them loose. It included holding animals firmly, but gently (see Figure 3, initial frames), passing animals from hand to hand without damaging them (see Figure 4, latter frames), placing them in observation jars, and feeding them. It often included observing others interacting with animals, and cycles of trying and training until mastering the process of detecting, following, catching and handling a variety of animals. Experiments often included e letting frogs or grasshoppers loose and catching them again, stretching earthworms, observing which snail was the fastest, or letting small creatures sail on bark boats. An important rule for the preschool program was to release animals back into their habitat in due time. This rule was difficult for some children to follow and was often accompanied by the display of strong emotions.



Figure 3. *Example of performing activities (initial frames): A frog is held gently, but sufficiently firmly to prevent it from escaping for a moment. Photos by Inger Lerstrup.*



Figure 4. *Example of performing activities (latter frames): A frog is held by a child and carefully taken over by another child. Photo by Inger Lerstrup.*

C. Creating. Creating included making nests and landscapes for small creatures, arranging and rearranging animal residues, imagining and talking about being animals, and acting out animal roles. All kind of residues were used for the creation of soups, stews, cakes, miniature landscapes, assemblages and pictures (Figure 5). Although groups of children often imagined they were animal families of birds or mice that they observed in the forest, they chose more often to be pets like dogs or cats or powerful animals like lions, tigers, and dinosaurs.

2. Attraction, Wonder and Awe

What children do with animals and animal residues can be observed and recorded, but it is more difficult to pin down what children feel and gain from their acquaintance with small creatures. To cast light on this subject, the staff survey collected from 178 outdoor preschools included the following question: *“What are, in your opinion, the most important reasons to stay outdoors in green settings with the children?”* Staff members often connected activities in green settings with joy, wonder and new discoveries:

“Joy of nature at an early age.”

“We feel lots of wonder, while nature is always changing and will constantly offer new experiences as the seasons change, the weather, the plants and the creatures.”



Figure 5. Example of creating activities: feathers are gathered for a “play brew.” Photo by Inger Lerstrup.

These statements confirmed observations in the field. Watching children engage with small creatures, the first author noted their attraction, fascination and joy. All of the children showed signs of excitement when they saw or heard any animal or any signs of animals, calling for the other children and the teachers in enthusiastic voices and often jumping with joy. In general, the children were quick to detect changes or new things in their daily environment, and they were most interested in things and places that were different and unique, ones that offered

possibilities for exploration and action. Children appeared to be most attracted to creatures that exhibited agency or ones that elicited the children's own agency. Children treated creatures like treasures, and each interaction appeared to ignite wonder and awe.

Although fascination was apparent, children expressed it in a variety of ways. They often responded to observations of animals with laughter—like the way children often laugh with delight when they run. Some children wanted to hold all kinds of small creatures. Other children were fond of some creatures, such as butterflies and ladybugs, but exhibited expressions of disgust with others, such as snails, earthworms, spiders, and dead mice. A few children wanted initially to smash or crush *any* small creeping creature.

By following a group of children over a year, it was possible to observe how relations with animals evolved over time. Children noticed other children's behaviors and staff reactions. Over time, disgust or fear changed to interest, and later to enthusiasm or at least tolerance. For example, some children found interaction with previously frightening creatures a challenge worth overcoming as the following field note demonstrates:

A four-year-old girl came running and shouting triumphantly, "Inger, Inger, I am no longer afraid of spiders!"

Inger: "Oh, wow, so you can look at a spider now without screaming?"

Girl, smiling broadly and nodding: "Yes!"

Inger: "And hold it in your hand?"

Girl, shyly: "No. Not yet. But now I can hold the glass with the spider inside."

Some children looked for small creatures every day all year long, even in winter when they mostly found signs of creatures versus the creatures themselves. Others searched intermittently, especially when they saw signs of an animal they did not already know. According to the field observations and staff confirmations, all children in the program engaged and handled small creatures.

3. Sensory Learning

Learning consists not only of gaining factual knowledge, but also the attunement to sources of sensory experiences. Learning is embodied broadly speaking, and not solely an intellectualized, detached process.

Surveyed preschool teachers mentioned hands-on experiences as an important reason to take learning outdoors:

"Tactile sensing (mud, needles, branches, creatures)."

"We get lots of first-hand experiences of plants and creatures that we meet, feel, smell and see."

"We taste, smell, touch and use the life in the forest to obtain knowledge about animals and plants."

Field observations showed children in the forest engaged in first-hand multisensory experiences with small creatures rather than adopting the stance of a spectator. In the process, they learned how to handle different kinds of animals, such as spiders, giant centipedes, dung beetles, frogs, ladybugs and woodlice. By the time the children were ready to leave preschool for primary school, most of them had experiences with the feeling of an earthworm, snail slime, frog's legs or beetle feet on their hands. They had also experienced touching bones, feeling and studying bones and bone fragments from different animals, handling and scrutinizing the contents of owl pellets, and smelling the musky trail of a fox and a decomposing dead mole.

4. Factual learning

In the survey, preschool teachers mentioned that children gained knowledge about weather, seasons, vegetation, and creatures of the forest as reasons for learning in green settings:

"Knowledge and experiments around nature and wildlife."

"Knowledge of nature, plants, creatures, following the seasons of the year."

"Knowledge about the shifting seasons, wildlife, etc."

"Knowledge about nature... a rich vocabulary of terms about nature."

"Knowledge about nature, playing on the forest floor, smelling the forest ground, experiencing the animal life of the forest... experiencing how tadpoles become frogs, eating nature..."

According to the field observations, children knew the voices of a number of birds and they knew the names and life cycles of ants, snails, butterflies, frogs, salamanders, birds, and dragonflies. They obtained their knowledge about small creatures from direct experiences and dialog with peers and teachers in the forest. According to staff interviews, children's access to factual knowledge about animals and ecosystems relied primarily on the degree to which peers and staff in different preschools valued this kind of knowledge, sought it out, and passed it on. Sometimes children shared knowledge from their families, but more often, parents stated that when their family was outdoors, their child pointed out natural phenomena that they did not know about themselves.

In addition, in response to the survey question about reasons to learn outdoors in green settings, many teachers spoke about understanding *seasons and life processes*:

"Understanding of nature and the shifting seasons."

"They get a deep knowledge of soil, fire, air and water. They get knowledge about the processes from soil to table."

"We follow the life cycle: small creatures live and die."

"They get knowledge about the connections in nature."

"They get understanding of the wholeness."

Small creatures were valued because they provided direct experiences of animal life cycles and they were a means of learning about ecosystems and natural phenomena like the weather, seasons, life and death. According to the field observations, discussions about creatures were often connected to the seasons. Shiny dung beetles and tadpoles appeared in the spring. Small frogs hopped on land in the summer. Snails were plentiful in the fungi in autumn, and the sounds of goldcrests were heard in the spruces during winter when other birds were silent. The children observed and talked about when specific birds arrived in the spring, when they flew back and forth with grass and sticks in their beaks to make nests, when eggshells were found on the ground, and when flocks of birds flew south in autumn.

Understanding life cycles were also supported by intentionally designed curriculum practices. At the preschool program where practices were followed throughout the school year, for example, frog eggs and butterfly eggs were gathered and brought to the preschool building so children could follow the development from egg to tadpole to frog and from egg to larva to pupa to butterfly.

5. Inspiration for talk and reflection.

In response to the survey question about reasons for learning in green settings, a teacher explained how the combination of time, shared experiences, and animal life, such as an earthworm in action, led to awareness and talk:

"Because it is totally fantastic – to have time for the immersion it takes to lay still on your stomach and observe the earthworm crawling out of its hole, along the soil surface and into another hole, while we talk about worms and are ever so quiet."

In the field observations, finding creatures and signs of creatures fueled reflection and dialog between children and between children and staff members (Figure 6).



Figure 6. *What is this? A child brings a gall to show the others for shared speculations. Photo by Inger Lerstrup.*



Figure 7. *Bones are exhibited and discussed by a group of children. Among the topics were the origin of the bones, to which animal they belonged, where the bones were placed on the animal, and how and why it died. Another topic was what the bones could be used for, such as hammers or magnifying glasses. Photos by Inger Lerstrup.*

Possibilities for dialog were countless. Children discussed with their peers or with staff members how to find, catch and handle small creatures. They speculated on what to do with them, where they lived, how they reproduced and

took care of their offspring, what they ate, where they slept, how and where they survived winter, how they died, what they might think, and more. Sometimes, the children's motive to talk about the creatures seemed to be fueled by the exhibits they made of their treasures and findings of the day (Figure 5).

When the children found dead animals, they invariably discussed life and death, often with references to the death of a dear pet or grandparent. This led to discussions about what happens with dead bodies, human and animal, how things rot and decay, how this may create food for worms and manure for vegetation, and how some creatures die while others will be born and grow.

6. Respect and Care

Many preschool teachers understood that learning in green settings with access to a variety of creatures was a way to build a deep and positive relation between the children, wild creatures, and their habitats. They connected animal experiences to empathy, compassion, solidarity, respect, care, responsibility for the environment, and protection of the environment and all its creatures, including other humans. Many teachers echoed the following survey statements:

"They learn to take care of nature, to feel compassion for all life forms."

"Solidarity with nature, we rely on it, and the other way around."

"Respect for and understanding of nature."

"They get a feeling of responsibility for the animals and insects that surround us."

"Nature is a fountain of resources that the children learn to use—they learn to find joy in nature and get respect for nature, each other and living beings."

"Attention to yourself and others, care for small creatures, care for each other."

Observations in the field showed how children took and interest and cared about the creatures they handled (Figure 8). Children also wanted to help small creatures (fig 9). During extended observations, it was evident that children's developing relationship with forest creatures was a joint venture that involved the setting, their peers, the staff, and preschool culture.

6. Staff Ethos and Practices

The ethos of outdoor preschool staff in relation to animals and ecosystems can be described by the way staff members explained natural phenomena to children and how they taught children to handle small creatures.

A. Staff relations to green settings. In Denmark, there is no common education for staff in outdoor preschool pedagogics and no national organization for outdoor preschools. Despite this lack of national coordination, when the first author visited 10 outdoor preschools for 1-2 days in different parts of Denmark and did extended observations in another, a number of similar practices were evident. The way staff taught children to handle living animals was similar as well as their often-repeated principle that animals were the true inhabitants and owners of the forest. In cases in field observations or interviews were staff heard referring to animals in human terms like "baby snails" or "grandmother birds." Instead, it seemed as if the outdoor preschools chose to support the feeling of 'sameness' by telling how the creatures performed tasks common for all animate beings like what they eat, where they stay summer and winter and how they get offspring. Staff noted animal roles of predator and prey. When children in one of the preschools saw an animal catch its prey, the staff explained that it had small birds in the nest to feed. In another preschool, staff told a tale about the owl and buzzard forgetting their role of keeping the mouse population in the forest at a reasonable level.



Figure 8. *Children have gathered grass to make a nest for a small creature. Photo by Inger Lerstrup.*



Figure 9. *A child is gently helping a dung beetle to turn around from the back. Photo by Inger Lerstrup.*

Sometimes staff differed on whether it was best to answer children's questions about animals with scientific facts or let the children imagine a number of answers. Primarily, staff differed in how they treated death and decay. When a dead bird or mole was found, the children in some preschools would dig a hole, make a burial with songs and speeches, produce a cross of sticks to put on top, and decorate the grave site with flowers, moss and stones. In other preschools, the carcass would be preserved in glycerol, or buried for later digging up and investigation of the bones.

Likewise, explanations about game hunting differed. In many preschools, staff never mentioned hunting or explained it as a necessary wildlife management strategy for deer population. On the other hand, in a preschool located in a farming region, a group of hunters met in the preschool hut for their lunch and later showed the children the dead game that they had killed (Figure 10). They invited the children to touch the animals and even take out the guts of a hare. Several of the oldest children accepted the invitation (Figure 11).



Figure 10. Hunters exhibit their game of the day and invite the preschool to have a look. Some children needed a staff hand to hold, others wanted to view, touch and smell the game including deer, fox, hare and fowl. Photo by Inger Lerstrup.



Figure 11. Some children accepted the invitation to help hold the hare when it was drawn and skinned, others watched with fascination mixed with terror. Photo by Inger Lerstrup.

B. Staff rules for handling living creatures. Staff sought to teach respectful and caring behavior and skills by example. As staff members remarked:

"Our children should be together with adults that treat nature with respect, so that the children get to know how to behave. Apart from this, respect for nature will follow from knowledge and good experiences in nature."

"We have great respect for every living being, and we borrow the creatures while we are in the forest, but we let them free again."

"We have many frogs/reptiles and we try to take care of them by having a specific place, where they can be held/investigated."

"We tell them that noise scares the animals in nature."

Despite rules that the children were not allowed to ill-treat animals or examine them in ways that led to damage, staff acknowledged that they did not see and control everything:

"If children are going to learn how to handle creatures and get first-hand experience, some creatures will die."

"We try to have a sensible approach to children's experiments with creatures – we don't allow frogs to be drowned or snails to be smashed and the like, and protest, when we see it, but we don't see everything!"

"When we examine small creatures with the children, we handle them in an exemplary manner, knowing that secretly they will test how long an earthworm may become when you stretch it. This is the children's universe, and you have to respect it."

Children were, however, allowed to smack mosquitos, and when a child discovered a tick, it was removed and killed immediately.

In the preschool that was observed across a year, staff members generally had an accepting and caring attitude towards small creatures, and supported the children's interests by supplying them with buckets, magnifying glasses, nets, handbooks and stories. They also shared information about their own engagement, experiences, and knowledge. When children complained about ants, flies, bees, or mosquitos, staff reminded them that the creatures live in the environment. Teachers emphasized that WE are the guests, or that the forest belongs to the animals; essentially, WE are visitors. This was often followed by an invitation to take a closer look at the animals or an offering of a piece of interesting information about a specific species.

C. Preschool culture related to creatures. In the preschool observed over the course of a year, children and staff often chose games and told stories that involved animals. For example, during morning circle time, staff often played singing games about animals, such as, "Come, come, come and watch a bird's nest." During this song, the children pretended to be fledglings in a nest, visited by a mother bird carrying a worm. Subsequently, when the children passed a field with a few gulls, one child joyfully jumped up and down when he saw a gull with something in its beak, exclaiming, "See, see, it is going home to the small birds in the nest!" Each day before the children went home, a staff member told a story. Many of these tales included animals, such as goats, foxes, wolves, bees, hares, or doves. In the tales, the animals often had a helping role. Children often acted out these stories during play time after hearing these tales. According to the staff interviews, staff sometimes dramatized the life stages of an animal over the course of a week, such as ladybugs or dragonflies. These songs, stories and projects seemed to engage the children imaginatively in animals' lives.

Discussion

This article considers whether experiences in early childhood in outdoor preschools can be relevant to SDG #15, which calls on people to protect terrestrial ecosystems, including sustainably managing forests and preserving biodiversity. With SDG#15 in mind, we focused on findings from a study of children in Danish outdoor preschools, closely observing the children's interactions with small forest creatures and visiting, interviewing and surveying outdoor preschool staff. Furthermore, we considered the relationships with animals that preschool staff encouraged by living and learning in this setting where they were taught that wild animals were the forest's true inhabitants and owners and people were visitors. Using the concept of affordances, or "the meaningful action possibilities of the environment" (Lerstrup & Konijnendijk van den Bosch, 2017), our analysis indicates that the affordances of small creatures for preschool children are many and varied, and appear to prepare children to value forest ecosystems as a "home" that diverse forms of animal life require.

Like children described in other preschool settings with wildlife (Elliot et al., 2014; Jørgensen, 2016; Kharod & Arreguin-Anderson, 2018), children in the forest were fascinated by living beings and became experienced in finding and handling small creatures. Through these hands-on experiences, they became acquainted with the look, feel, smell, and sound of a variety of beings. The creatures roused curiosity, and seemed to foster empathy and care, if not immediately, then with growing familiarity. Living beings afforded opportunities for discussions and reflections about the life habits and habitats of different species, life cycles, predator-prey relationships, decay and decomposition, and seasonal changes. At the same time, the children were learning how everything fits together within the forest ecosystem. These are basic ecological principles; but for these children, they were not abstract ideas, but sensuous, embodied knowledge gained during free play and exploration. This kind of knowledge fits the descriptions of an "ecological consciousness" and "embodied environmental understanding" presented by Jørgensen (2016) and Beery and Jørgensen (2018). Current literature related to nature preschool outcomes, significant life experiences, and connection to nature suggests that the time the children spent outdoors in nature, in the company of peers and teachers who demonstrated interest and appreciation for diverse living things, will contribute to life-long tendencies to care for the natural world.

In considering SDG #15, it is relevant the children observed were not in wilderness areas where they were taught to look and listen but leave no trace. The preschool observed across the seasons stayed in a well-managed and cultivated forest with other visitors where they were allowed to explore, construct, dig, and create. In general, staff valued the presence of small creatures and both staff and peers served as role models for how to handle small animals with respect. Although the concept of "co-existence" may have been too abstract for this age, the children were learning through their own experience that trees, understory vegetation, wildlife, forest workers, occasional visitors and children can co-exist in green settings.

Strengths, Limitations and Implications for Further Research

The theoretical framework of ecological psychology that this study applied is well suited for investigating experiences in the environment as it emphasizes the agency of living beings as they engage with the environment, identifying affordances. Ecological psychology provides a language for recognizing children as inquirers and explorers in the environment, who develop skills and competencies, further learning and psychological growth as they engage with the environment. Research on children's connection with nature shows that as children develop feelings of competency and comfort in nature, they become more likely to express motivation to protect the natural world (Chawla, 2020).

This study demonstrates the power of extended observations of preschool children's developing relationships with forest creatures supported by data from a survey collected from outdoor preschools and visits and interviews with staff at outdoor preschools. Together, the data provides a deep understanding of affordances of creatures for preschoolers.

At the same time, the fact that this study was confined to Danish outdoor preschools is a limitation. In order to determine whether young children's relations with wild creatures develop in similar ways in other places and other

types of ecosystems, similar multi-method studies are needed in other countries with different cultural perspectives and practices related to children and nature, and with different geographies that might contain more dangerous animals and outdoor risks.

The study of children's relations with wild animals in outdoor preschools will also benefit from more outcome evaluations that include measures of knowledge about ecological principles and local biodiversity, connection to nature, and motivation to protect wild animals and the places where they live. Longitudinal studies that follow graduates of nature preschools as they move forward in their lives may yield a better understanding of whether their early experiences in nature continue to influence their relations with the environment.

Conclusion

The presence of many diverse creatures in preschool settings enables children to experience a forest's complexity and know its inhabitants. The concept of affordances serves as a useful guide to the design of green settings for children, given its focus on the possibilities for meaningful action that the physical environment provides. This study has shown young children's attraction to animals in their environment and the particular value of small creatures that they can hold, examine closely, and engage with. The most important impact of small creatures in green settings of everyday life may be that they fascinate children, inspire varied activities, give room for curiosity, wonder, and awe, and fuel asking, talking, reflecting, and imagining. The study reveals how young children in Danish outdoor preschools, supported by peers and staff members, become comfortable, competent and caring toward wild creatures. It describes children's embodied learning about life cycles, seasons, the niches that different species inhabit, and other features of ecosystems. It argues that embodied experiences of a variety of animals in a green setting creates a foundation for young children to later understand ideas about biodiversity and ecological processes. This knowledge, connectedness and care they feel for individual animals at an early age may later be extended to whole species and ecosystems and thereby constitute a solid ground for life-long affection and willingness to care for, protect, and restore the varied ecosystems of forests and woodlands and the diverse life they harbor -- in other words, to understand and support UN Sustainable Development Goal #15.

References

- Beery, T., Chawla, L., & Levin, P. (2020). Being and becoming in nature: Defining and measuring connection to nature in young children. *International Journal of Early Childhood Environmental Education*, 7(3), 3-22.
- Beery, T. & Jørgensen, K. A. (2018). Children in nature: Sensory engagement and the experience of biodiversity. *Environmental Education Research*, 24(1), 13-25.
- Burgess, E. & Ernst, J. (2020). Beyond traditional school readiness: How nature preschools help prepare children for academic success. *International Journal of Early Childhood Environmental Education*, 7(2), 17-33.
- Chawla, L. (1998). Significant life experiences revisited. *Journal of Environmental Education*, 29(3), 11-21.
- Chawla, L. (2020). Childhood nature connection and constructive hope: A review of research on connecting with nature and coping with environmental loss. *People and Nature*, 2, 619-642.
<http://dx.doi.org/10.1002/pan3.10128>
- Chawla, L. & Derr, V. (2012). The development of conservation behaviors in childhood and youth. In S. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (pp. 527-555). Oxford University Press.
- D'Amore, C. & Chawla, L. (2020). Significant life experiences that connect children with nature: A research review and applications to a family nature club. In A. Cutter-Mackenzie-Knowles, K. Malone & E. Barratt Hacking (Eds.), *Research handbook on childhood nature* (pp. 800-825). Springer.
- Elliot, E., Eycke, K. T., Chan, S., & Müller, U. (2014). Taking kindergartners outdoors: Documenting their explorations and assessing the impact on their ecological awareness. *Children, Youth and Environments*, 24(2), 102-122.
<https://doi.org/10.7721/chilyoutenvi.24.2.0102>
- Ernst, J. & Burcak, F. (2019). Young children's contributions to sustainability: The influence of nature play on curiosity, executive function skills, creative thinking, and resilience. *Sustainability* (Switzerland), 11(15), Article 4212.
- Evans, G. W., Otto, S., & Kaiser, F. G. (2018). Childhood origins of young adult environmental behavior. *Psychological Science*, 1-9. <https://doi.org/10.1177/0956797617741894>

- Gibson, J. J. (1979). *The ecological approach to visual perception*. Houghton Mifflin.
- Giusti, M., Barthel, S., & Marcus, L. (2014). Nature routines and affinity with the biosphere: A case study of preschool children in Stockholm. *Children, Youth and Environments*, 24(3), 16-42.
<https://doi.org/10.7721/chilyoutenvi.24.3.0016>
- Gulløv, E. & Højlund, S. (2003). *Feltarbejde blandt børn: Metodologi og etik i etnografisk børneforskning* (Fieldwork among Children: Methodology and Ethics in Anthropological Research with Children). Hans Reizel Publishing House.
- Heft, H. (1988). Affordances of children's environments: A functional approach to environmental design. *Children's Environmental Quarterly*, 15(3), 29-37.
- Heft, H. (2001). *Ecological psychology in context: James Gibson, Roger Barker, and the legacy of William James' radical empiricism*. Mahwah, NJ: Lawrence Erlbaum.
- Heft, H. (2010). Affordances and the perception of landscape: An inquiry into environmental perception and aesthetics. In C.W. Thompson, P. Aspinall, & S. Bell (Eds.), *Innovative Approaches to Researching Landscape and Health* (pp. 9-32). Routledge.
- Heft, H. (2013). The tension between the psychological and ecological sciences: Making psychology more ecological. In T. Pearce, G. Barker, & E. Desjardins (Eds.), *Entangled Life: Organism and Environment in the Biological Sciences*. (pp. 51 – 77). Springer.
- Jørgensen, K. A. (2016). Bringing the jellyfish home: Environmental consciousness and sense of wonder in young children's encounters with natural landscapes and places. *Environmental Education Research*, 22(8), 1139-1157.
- Kharod, D., & Arreguin-Anderson, M. G. (2018). From aversion to affinity in a preschooler's relations with nature. *Ecopsychology*, 10(4), 317-327. <https://doi.org/10.1089/eco.2018.0044>
- Lerstrup, I. (2016). *Green settings for children in preschool: Affordance-based considerations for design and management*. Thesis for the Department of Geosciences and Natural Resource Management, Faculty of Science, University of Copenhagen.
- Lerstrup, I. & Konijnendijk van den Bosch, C. (2017). Affordances of outdoor settings for children in preschool: Revisiting Heft's functional taxonomy. *Landscape Research*, 42(1), 47-62.
- Lerstrup, I. & Møller, M. S. (2016). Affordances of Ditches for Children in Preschool. *Children, Youth and Environments* 26(2), 43-60
- Lerstrup, I. & Refshauge, A. D. (2016). Characteristics of forest sites used by a Danish forest preschool. *Urban Forestry and Urban Greening*, 20, 387.
- McClain, C. & Vandermaas-Peeler, M. (2016). Outdoor explorations with pre-schoolers. *International Journal of Early Childhood Environmental Education*, 4(1), 37-53.
- Müller, U., Temple, V. A., Smith, B., Kerns, K., Ten Eycke, K., Crane, J., & Sheehan, J. (2017). Effects of nature kindergarten attendance on children's functioning. *Children, Youth and Environments*, 27(2), 47-69.
- Myers, G. & Saunders, C. (2002). Animals as links towards developing caring relationships with the natural world. In P. H. Kahn & S. R. Kellert (Eds.), *Children and nature* (pp. 153-178). Cambridge, MIT Press.
- Odling-Smee, F. J., Laland, K., & Feldman, M. (2003). *Niche construction: The neglected process in evolution*. Princeton University Press.
- Sobel, D., Bailie, P. E., Finch, K., Kenny, E. K., & Stives, A. (2016). *Nature preschools and forest kindergartens: The handbook for outdoor learning*. Redleaf Press.
- Sward, L. & Marcinkowski, T. (2001). Environmental sensitivity: A review of the research. In H. Hungerford, W. Bluhm, T. Volk & J. Ramsey (Eds.), *Essential readings in environmental education* (pp. 277-288). Stipes Publishing.
- Tanner, T. (1980). Significant life experiences. *Journal of Environmental Education*, 11(4), 20-24.
- Wells, N. M. & Lekies, K. (2012). Children and nature: Following the trail to environmental attitudes and behaviors. In J. L. Dickinson & R. Bonney (Eds.), *Citizen science: Public participation in environmental research* (pp. 201-213). Comstock Publishing Associates.
- Wojciechowski, M. & Ernst, J. (2018). Creative by nature: Investigating the impact of nature preschools on young children's creative thinking. *International Journal of Early Childhood Environmental Education*, 6(1), 3-20.
- Yilmaz, S., Çiğ, O., & Yilmaz-Bolat, E. (2020). The impact of a short-term nature-based education program on young children's biophilic tendencies. *Ilkogretim Online-Environmental Education Online*, 19(3), 1729-1739.
<https://doi.org/10.17051/ilkonline.2020.734968>

Zamzow, J. & Ernst, J. (2020). Supporting school readiness naturally: Exploring executive function growing in nature preschools. *International Journal of Early Childhood Environmental Education*, 7(2), 6-16.

Inger Lerstrup, PhD, retired from University of Copenhagen. She can be reached at inger@lerstrup.dk.

Louise Chawla is Professor Emerita at University of Colorado Boulder. She can be reached at louise.chawla@colorado.edu.

Harry Heft is Professor Emeritus at Denison University. He can be reached at heft@denison.edu.