



COLCHESTER ZOO

Elephant Conservation, Research and Education  
February 2022



# Elephant Conservation at Colchester Zoo

## ACTION FOR THE WILD

Charity No. 1105621

### What is Action for the Wild?

Colchester Zoo created its Action for the Wild charity in 2004 and has since donated £3.5 million to conservation projects globally.

Of this £3.5 million, £2.93 million has been donated since 2005 to the set up and running costs of the UmPhafa Private Nature Reserve, South Africa. The remaining £572,000 has been donated to a mixture of projects over the years.

Each year, the Action for the Wild trustees consider our support of target projects for the following year.

### Priority projects include:

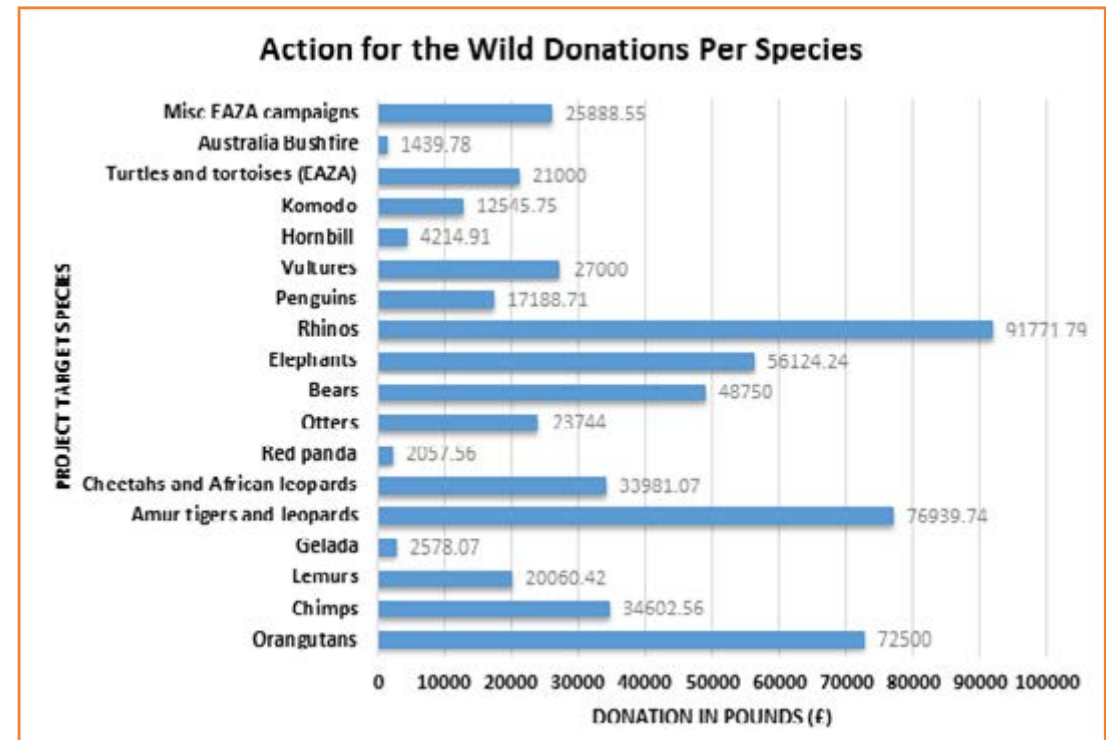
- Wildlife conservation projects in species-range countries
- Habitat / prey protection projects in species-range countries
- Education activities in species-range countries
- Scientific techniques for species conservation monitoring
- Human / wildlife conflict resolution

The project needs to address a globally-recognised conservation priority and should focus on threatened species and benefit wild populations of this species.

Zoos around the world work with elephants in an in-situ and ex-situ capacity. For Colchester Zoo, in-situ support is provided by our charity, Action for the Wild, and ex-situ support is provided via our participation in the African Elephant EEP (EAZA Ex-situ programme).

We house a herd of four elephants at Colchester Zoo and our Curator of Living Collections sits on the species committee for the African Elephant EEP and, between 2017 and 2021, was co-chair of the BIAZA Elephant sub-group and, as a result, also sat on the Elephant Welfare Group.

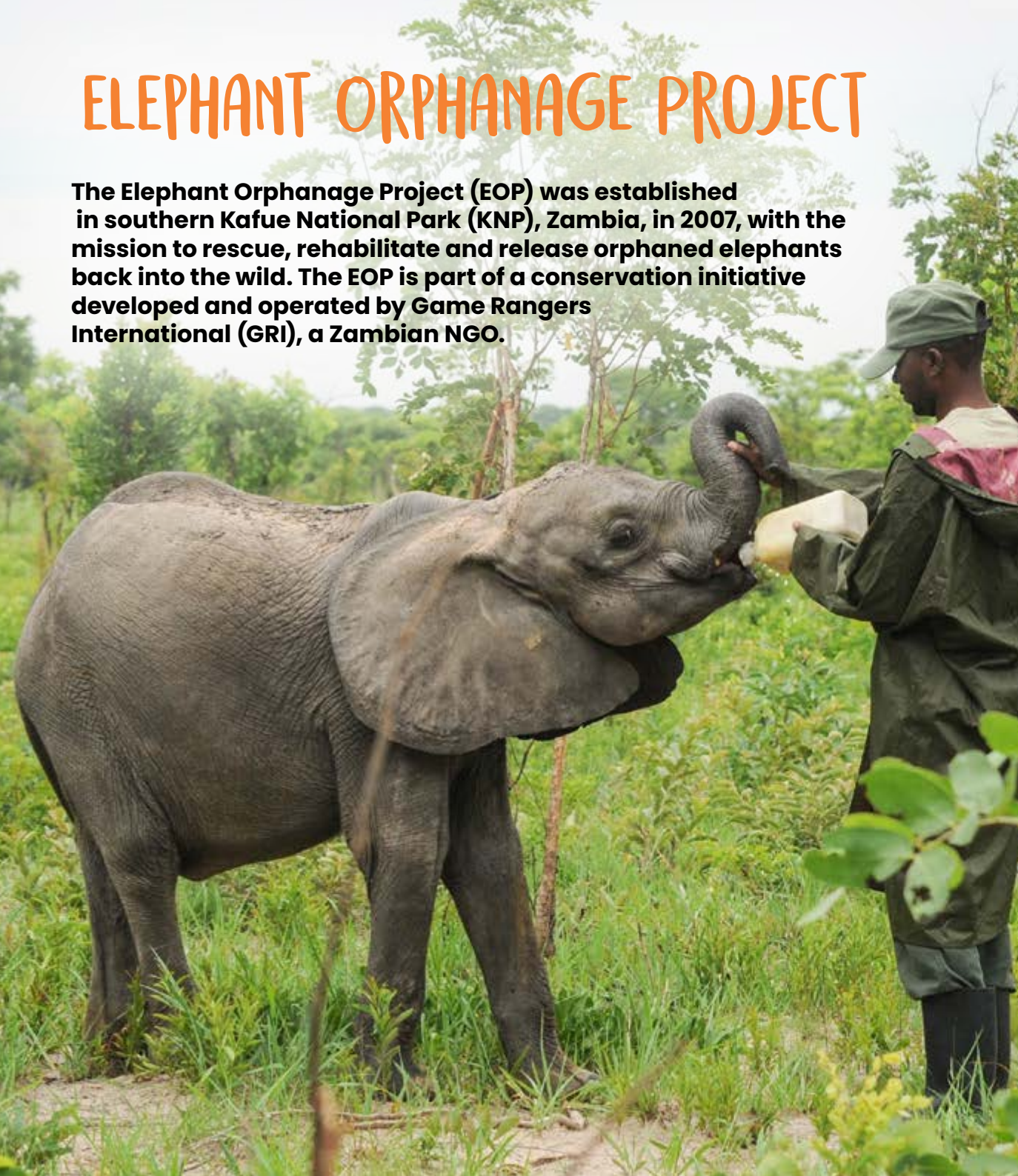
### Which target species has Action for the Wild donated to?





# ELEPHANT ORPHANAGE PROJECT

**The Elephant Orphanage Project (EOP) was established in southern Kafue National Park (KNP), Zambia, in 2007, with the mission to rescue, rehabilitate and release orphaned elephants back into the wild. The EOP is part of a conservation initiative developed and operated by Game Rangers International (GRI), a Zambian NGO.**



The need for the Elephant Orphanage Project is growing rapidly as poaching is still on the rise and there is an increasing loss of elephants due to conflicts occurring, as human expansion and farming is increasingly prevalent nearer to parklands and often blocks elephant migration routes.

The EOP herd currently numbers 23 individuals at varying degrees of the rehabilitation and release process.

## **Key activities and successes in 2021:**

- Batoka (13years) has been fully integrated back into wild elephant herds since February 2020
- Three orphaned elephants graduated from the elephant nursery to release facility in 2021.
- EOP rescued and rehabilitated two new orphans, both thriving at the Lilayi Elephant Nursery.
- The Human Elephant Conflict Ranger Unit responded to 113 incidents of community support.
- Tafika has remained a free-roaming elephant, not entering the boma, and spending his nights away from the facility demonstrating his increasing confidence.

Colchester Zoo acts as a technical partner to this project to assist with ensuring best practice in elephant welfare. Colchester Zoo Action for the Wild first began financially contributing to EOP in 2010 and has since donated £54,000, with a further £10,000 pledged for 2021. Such funds go towards elephant costs (elephant food, veterinary supplies and fees and other kit and equipment), and to additionally support an elephant keeper. Their fantastic team of keepers provide day-to-day care of the orphans and are directly involved in the rescue of new orphaned calves, often spending many days away from home and their families to ensure the health and wellbeing of newly rescued calves, who are extremely vulnerable.





# Elephant Research at Colchester Zoo

Colchester Zoo is dedicated to encouraging, supporting and conducting research that improves captive animal management, benefits conservation programmes and contributes to the body of scientific knowledge about animals and their natural habitats.

Colchester Zoo's research includes both animal-based studies and visitor studies. Animal-based studies can focus on behaviour, welfare, nutrition, husbandry, environmental enrichment, ecology, reproduction and conservation. All animal-based research undertaken in the Zoo is non-invasive and mostly conducted through observation of the animals in their captive environment.

## **Research studies assist Colchester Zoo in a number of ways:**

- Helping to develop successful animal management practices by assessing the effect of factors, such as enclosure design, diet and social grouping on the animals.
- Benefiting the conservation of species and habitats, by improving the success of captive breeding programmes and in-situ programmes.
- Promoting conservation through education by assessing visitor attitudes and perceptions.





**Various research studies have been conducted on the elephants at Colchester Zoo, looking at the effects of captive management and promotion of elephant welfare in captivity, as well as assisting in methodology development to promote elephant conservation in situ.**

**Tail hair, toenail, faeces, plasma and urine samples were collected quarterly from our elephants at Colchester Zoo to help develop methodology to assess the mineral status of elephants.**

Sach, F. et al (2020), Potential bio-indicators for assessment of mineral status in elephants Scientific Reports | (2020) 10:8032 <https://doi.org/10.1038/s41598-020-64780-0>  
<https://www.nature.com/articles/s41598-020-64780-0>

**Abstract:** The aim of this study was two-fold: (1) identify suitable bio-indicators to assess elemental status in elephants using captive elephant samples, and (2) understand how geochemistry influences mineral intake. Tail hair, toenail, faeces, plasma and urine were collected quarterly from 21 elephants at five UK zoos. All elephant food, soil from enclosure(s), and drinking water were also sampled. Results aimed to define the most suitable bio-indicators to assess captive animal health and encourage onward application to wildlife management.

**Samples collected in zoo elephants can contribute towards research and conservation of wild counterparts. Using the mineral status methodology determined from samples of zoo elephants, a subsequent paper was published to inform drivers for elephant movement at the Palabora Copper Mining Complex, where there is unfortunately considerable human-elephant conflict.**

Sach, F. et al (2020,) Spatial geochemistry influences the home range of elephants, Science of the Total Environment 729: 139066 <https://doi.org/10.1016/j.scitotenv.2020.139066>

**Abstract:** The unique geochemistry surrounding the Palabora Mining Company (PMC) land may act as a micronutrient hotspot, attracting elephants to the area. Understanding the spatial influence of geochemistry on the home range size of African elephants is important for elephant population management and conservation. The home ranges of collared elephants surrounding the PMC were significantly smaller ( $P=0.001$ ) than conspecifics in surrounding reserves, suggesting that their resource needs were met within these smaller areas.







**48 tail hairs were sampled from Colchester elephants to enable method development to characterise elephant tail hairs via scanning electron microscopy and laser ablation techniques to reflect changes in elemental chemistry. Using this kind of imagery to visualise the structure of an elephant tail hair and laser ablation to assess mineral and potential toxic element status (PTE) of the animal is novel.**

Sach, F. et al (2022), Method development to characterise elephant tail hairs by LA ICP MS to reflect changes in elemental chemistry, Environ Geochem Health <https://doi.org/10.1007/s10653-022-01207-x>

**Abstract:** This paper evaluated analytical methods used to generate time-series data from elephant tail hairs, which can be used to reflect changing exposure to environmental geochemistry. This novel approach to characterise the tail hair enabled time-series analysis to reflect changes in environmental exposure which may result from seasonal or geochemical spatial variation and could inform elephant movement patterns.

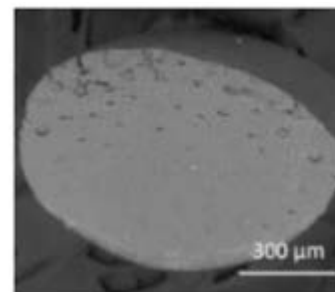


IMAGE (RIGHT) - Scanning electron microscopy (SEM) images (cross-sectional and surface) of Colchester Zoo elephant tail hair



**Acoustic samples have been collected on Colchester Zoo's elephants, as part of Dr Hannah Mumby's Cambridge University research group. The project was specifically interested in bull elephant vocalisations and sought to explore the role of vocal recognition.**

By trialling equipment and recording techniques at Colchester Zoo, the group were able to refine methodology for future in-situ fieldwork, such as

Wierucka K, Henley MD, Mumby HS. 2021, Acoustic cues to individuality in wild male adult African savannah elephants (*Loxodonta africana*) PeerJ 9:e10736 | <https://doi.org/10.7717/peerj.10736>



Capturing sound at Colchester Zoo's elephant paddock



**Colchester Zoo hosted representatives from the Metropolitan Police and provided advice on elephant and tusk physiology to assist in their work to develop a portable fingerprinting kit to retrieve fingerprints off of poached ivory.**

K.A. Weston-Ford, et al., The Retrieval of Fingerprint Friction Ridge Detail from Elephant Ivory using Reduced-Scale Magnetic and Non-magnetic Powdering Materials Sci. Justice (2015), <http://dx.doi.org/10.1016/j.scijus.2015.10.003>

**Abstract:** An evaluation of reduced-size particle powdering methods for the recovery of usable fingermark ridge detail from elephant ivory is presented for the first time as a practical and cost-effective tool in forensic analysis. This research contributes to the understanding and potential application of smaller scale powdering materials for the development of ridge detail on hard, semi-porous biological material typically seized in wildlife-related crimes.







Cameras were set up all around our enclosure taking thermal pictures of our elephants; from different distances, at different angles, and whilst the elephants are doing different things, such as training or reaching up to eat food. The images of our African elephants can also be compared to those of the Asian elephants at ZSL Whipsnade Zoo to detect the differences in size and shape of the different species.

## HEAT Project

Colchester Zoo has recently been involved in innovative work to contribute to the conservation of wild elephants via the use of thermal cameras to identify the heat signature of elephants, spearheading the creation of the **HEAT (Human-Elephant Alert Technologies) Project**.



The thousands of thermal photographs collected are being used to “train” camera technology to recognise what an elephant looks like. Our footage yielded some fantastic photos, perfect for confusing and then teaching the “model”, with our keepers in close proximity to the elephants whilst training and our elephants reaching up to feed off branches, thus presenting a different body shape for the technology to recognise so that it doesn’t falsely identify the image as that of a human.

The ultimate aim is for the development of a low cost camera system that can be used in the field. It will be able to detect elephants 24/7 as it can “see” the thermal shape of elephants (even in the dark), sending an alert to communities living around elephants so they can avoid any conflict situations. Human-elephant conflict is a major conservation concern in elephant range countries and there is no other low-cost solution available that is capable of generating early warning alerts 24/7, so we are honoured to participate in this study.

In West Africa, a team from Bristol Zoo are going to trial the cameras and another project in India is looking to fund the building of cameras as well.



Colchester Zoo has participated in numerous studies to improve knowledge and welfare of elephants in captivity, particularly those conducted as part of the Elephant Welfare Group research portfolio to produce evidence-based guidelines to improve the management and welfare of elephants in the UK.

[www.elephantwelfareproject.org](http://www.elephantwelfareproject.org)

### Colchester Zoo elephant keepers tested and now utilise a new elephant behavioural welfare assessment tool:

Yon, L. et al (2019), Development of a behavioural welfare assessment tool for routine use with captive elephants, PLoS One Feb 6;14(2):e0210783. DOI: 10.1371/journal.pone.0210783

**Abstract:** This report describes the development of a new elephant behavioural welfare assessment tool designed for routine use by elephant keepers. This novel behavioural welfare assessment tool can be used by elephant-holding facilities for routine behavioural welfare monitoring, which can inform adjustments to individual welfare plans for each elephant in their collection, to help facilities further assess and improve captive elephant welfare. This study provides an example of how an evidence-based behavioural welfare assessment tool for use by animal caretakers can be developed within the constraints of zoo-based research, which could be applied to a range of captive species.

---

### Social interaction data was collected on our elephants:

Williams, E. (2019), Social Interactions in Zoo-Housed Elephants: Factors Affecting Social Relationships Animals 9(10): 747 DOI:10.3390/ani9100747

**Abstract:** In the wild, elephants live in large, complex social groups. Herds consist of a mixed structure of related females and their calves. One area of concern regarding the maintenance of zoo elephants has been the inability to provide them with social groupings that reflect wild group structure, and whether this impacts on their welfare. Here, we investigated whether a number of factors at the individual and zoo level affected the frequency of social interactions in zoo elephant herds. Findings support the recommendations that elephants should be housed in related herds with multiple ages wherever possible, but they also highlight that unrelated elephants can still form compatible and successful social groups. A greater understanding of factors that may contribute to the success of zoo-elephant social groups is important for individual and herd welfare as it will enable evidence-based decisions which have minimal impact on social structures to be executed. This knowledge will enable proactive management.





## Body condition photographs and life history data were provided to:

Schiffmann, C. (2019), Body Condition Scores (BCS) in European zoo elephants' (*Loxodonta africana* and *Elephas maximus*) lifetimes – a longitudinal analysis, *Journal of Zoo and Aquarium Research* 7(2) 74–86

**Abstract:** Diet and feeding regimes are key factors in further improving zoo elephant welfare. Together with the encouragement of physical activity, they support the management of weight and the prevention of obesity, which is considered a common concern in zoo elephants. Besides weight monitoring, visual body condition scoring (BCS) has proven a practical tool for the assessment of (zoo) elephants' physical condition. The study of the European zoo elephant population describes how various life circumstances and management adaptations are reflected in the BCS of individual elephants, and in population-wide BCS over time.

**These studies are just some of the research studies conducted on Colchester Zoo's elephants and embody the diversity of contributions that zoo elephants play in increasing our knowledge and understanding of this species, both in-situ and ex-situ, ultimately helping to drive efforts to improve their conservation status in the wild.**





# E.A.Z.A

(Elephant TAG Research Fund)

Colchester Zoo has also helped fund vital ex-situ elephant research. £2,475 has been provided to the European Association of Zoos and Aquaria (EAZA) Taxon Advisory Group (TAG) elephant herpes virus research projects to look at transmission of the Elephant Endotheliotropic Herpes Virus (EEHV) in elephant herds and investigate the possibility of developing a vaccine to protect against it.

EEHV is a devastating infectious disease posing a significant threat to the long term conservation of Asian elephants. This is a very prevalent issue in elephant management and continues to be the focus of largescale effort to combat the virus:

[www.bbc.co.uk/news/science-environment-60222464](http://www.bbc.co.uk/news/science-environment-60222464)







Approximately 100 animals, predominantly between the age of 3 months & 15 years of age, have died from the virus since its discovery in captive Asian elephants, although it is found in both wild and captive animals.

Research was initiated to understand why some elephants can resist the virus while others are more susceptible.

**Research also included:**

- Transmission in elephant herds and investigating the possibility of a vaccine.
- Working towards a better epidemiological understanding of the virus and to validate a molecular test for the purpose of regular monitoring.







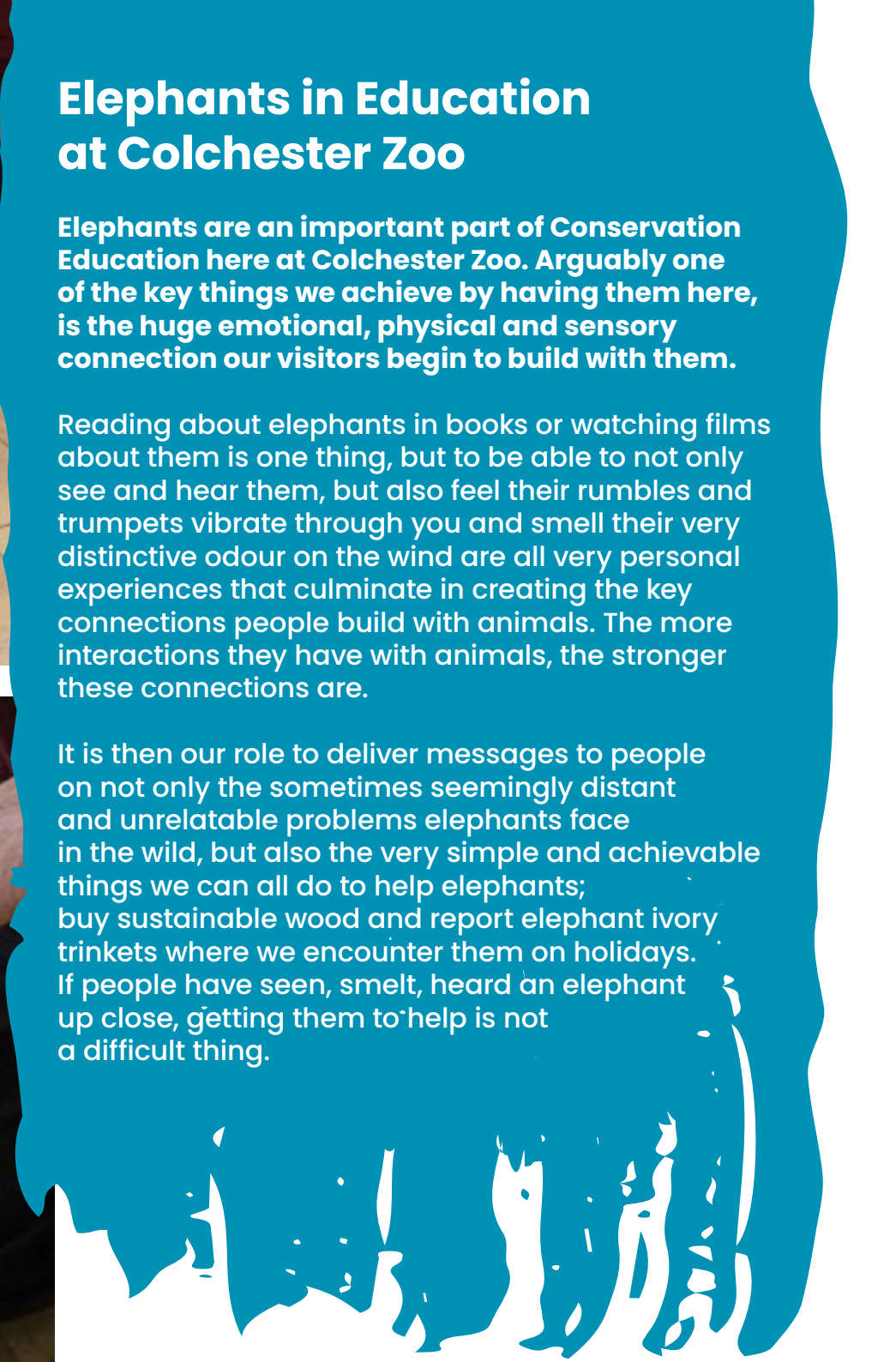
## Elephants in Education at Colchester Zoo

Elephants are an important part of Conservation Education here at Colchester Zoo. Arguably one of the key things we achieve by having them here, is the huge emotional, physical and sensory connection our visitors begin to build with them.

Reading about elephants in books or watching films about them is one thing, but to be able to not only see and hear them, but also feel their rumbles and trumpets vibrate through you and smell their very distinctive odour on the wind are all very personal experiences that culminate in creating the key connections people build with animals. The more interactions they have with animals, the stronger these connections are.

It is then our role to deliver messages to people on not only the sometimes seemingly distant and unrelatable problems elephants face in the wild, but also the very simple and achievable things we can all do to help elephants; buy sustainable wood and report elephant ivory trinkets where we encounter them on holidays. If people have seen, smelt, heard an elephant up close, getting them to help is not a difficult thing.

Touch and discover hands-on sessions with key elephant bio-facts.





**60,000 school and college students visit the zoo each year.**

To see a child from an inner-city react to seeing the elephant they have only seen in a story book is amazing – this is where their journey of discovery starts. We build on this by referring to elephants in many of our school conservation education sessions. We discuss their amazing ears (among other adaptations) and the methods for losing heat in our adaptation sessions, we look at confiscated ivory in our endangered species sessions and look at their strength in our ‘We’re going on an African safari’ session. We also guide 100s of animal science and care university and college students through elephant health, diet, enclosure design and enrichment in many of our Animal Care modules. In addition to this, students have the chance to go behind the scenes to see how we manage elephants.

Through the zoo website we also have lots of opportunities to engage with people from further afield about elephants. Elephants make frequent appearances in resources on classification, adaptation, conservation, enclosure design, etc.

**Elephants appear in...**

**15 education sessions across all age ranges reaching between 7,000 – 8,000 students each year. We have elephants referred to in detail in 12 online packs that some 1,000 people download.**



Education sessions about elephants both out at the animals' enclosure and in an inside setting

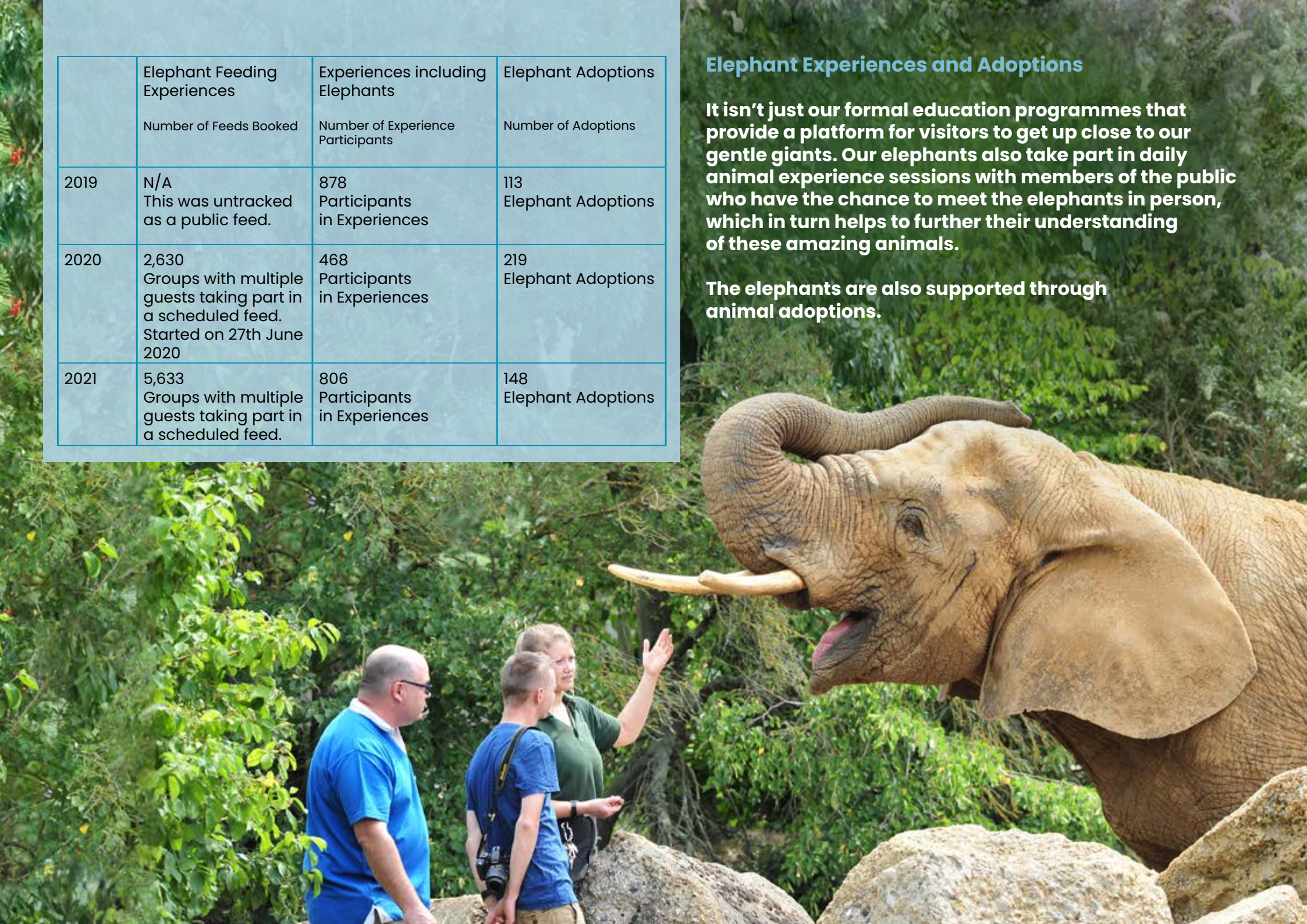


Elephant Feeding Experiences	Experiences including Elephants	Elephant Adoptions
Number of Feeds Booked	Number of Experience Participants	Number of Adoptions
2019 N/A This was untracked as a public feed.	878 Participants in Experiences	113 Elephant Adoptions
2020 2,630 Groups with multiple guests taking part in a scheduled feed. Started on 27th June 2020	468 Participants in Experiences	219 Elephant Adoptions
2021 5,633 Groups with multiple guests taking part in a scheduled feed.	806 Participants in Experiences	148 Elephant Adoptions

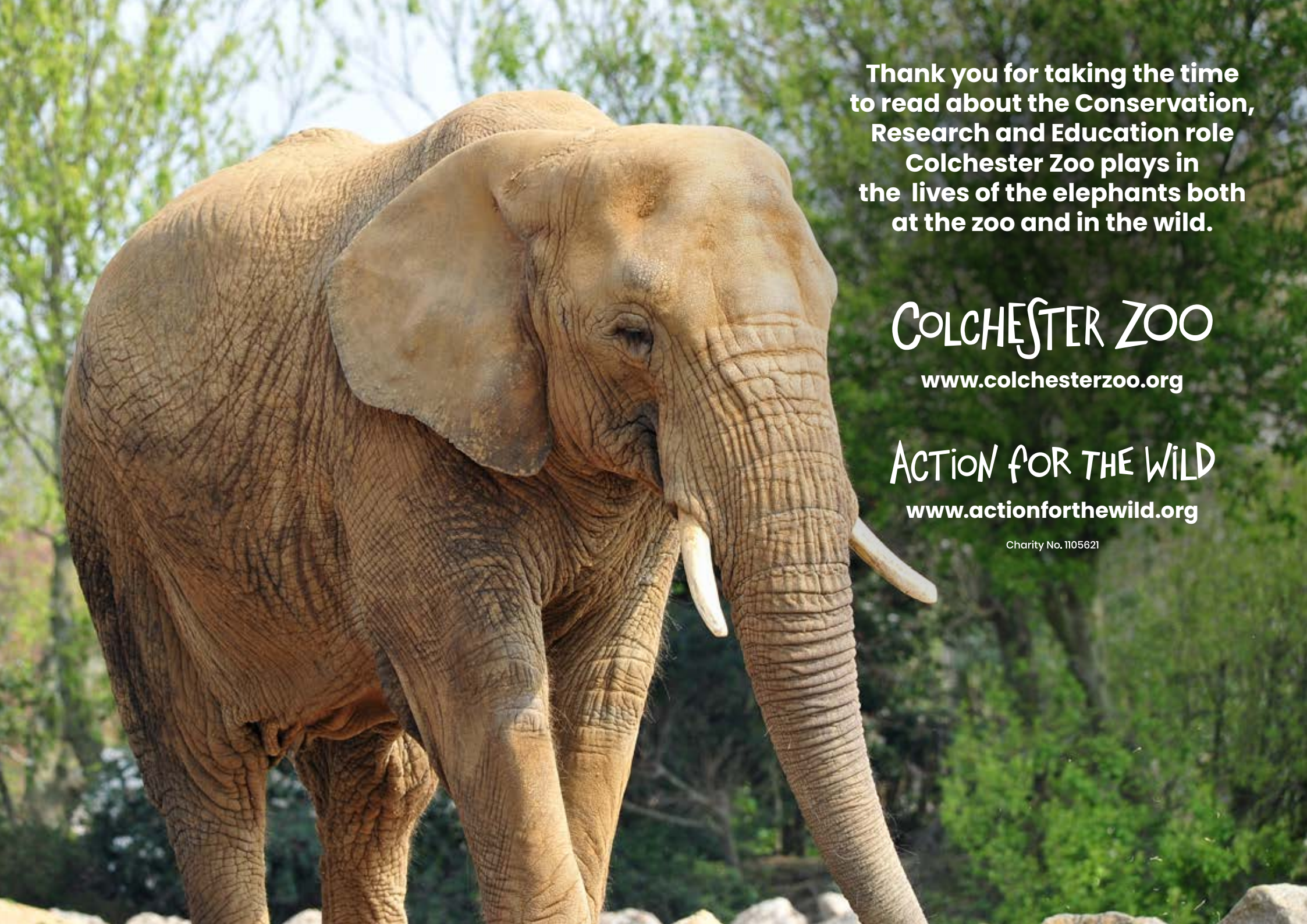
## Elephant Experiences and Adoptions

**It isn't just our formal education programmes that provide a platform for visitors to get up close to our gentle giants. Our elephants also take part in daily animal experience sessions with members of the public who have the chance to meet the elephants in person, which in turn helps to further their understanding of these amazing animals.**

**The elephants are also supported through animal adoptions.**







**Thank you for taking the time  
to read about the Conservation,  
Research and Education role  
Colchester Zoo plays in  
the lives of the elephants both  
at the zoo and in the wild.**

**COLCHESTER ZOO**

[www.colchesterzoo.org](http://www.colchesterzoo.org)

**ACTION FOR THE WILD**

[www.actionforthewild.org](http://www.actionforthewild.org)

Charity No. 1105621