

<b>Institution:</b> University of Birmingham		
<b>Unit of Assessment:</b> 5 – Biological Sciences		
<b>Title of case study:</b> Changing global policy and practice to improve the welfare and conservation of captive great apes		
<b>Period when the underpinning research was undertaken:</b> 1999–present		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Professor Susannah Thorpe	Professor	2003 – present
Dr Jackie Chappell	Reader	2004 – present
Dr Julia Myatt	Senior Lecturer	2014 – present
<b>Period when the claimed impact occurred:</b> 2015 - present		
<b>Is this case study continued from a case study submitted in 2014?</b> No		
<b>1. Summary of the impact</b>		
<p><b>Changes in global conservation practice</b> have been informed by a unique, research-based tool that optimises the welfare for apes in zoos (&gt;300 in UK alone) and helps to rehabilitate sanctuary apes for reintroduction into the wild where possible (~1300 orangutans and ~1000 chimpanzees). The pioneering research has <b>influenced charitable and other organisations</b> across the zoo sector, galvanising them in the UK as the Great Ape Welfare group, which has successfully pursued <b>research-informed changes to legislation</b> in the redrafting of the Secretary of State’s Standards of Modern Zoo Practice. The research also features in the European Association of Zoos and Aquariums orangutan <b>best practice guidelines</b>, which are used to steer husbandry across their 300 European members.</p>		
<b>2. Underpinning research</b>		
<p>Effective conservation is central to achieving the UN’s Global Goals for Sustainable Development and its Environment Programme’s Aichi Biodiversity Targets. Since all great apes are endangered, sanctuary and zoo populations are critical to conservation, but practitioners often lack important research knowledge on wild ape behavioural ecology. Research by Thorpe (Professor, expertise in locomotor-ecology), Chappell (Reader, expertise in cognition) and the broader research group at the University of Birmingham have used observational and experimental methods under field and zoo conditions to underpin the following Key Findings (KF):</p>		
<p><b>KF1: Forest canopies are physically and cognitively demanding environments for apes</b></p> <p>Arboreal travel on flexible and discontinuous branches to access foods that are sparsely distributed over space and time imposes considerable safety risks and energetic demands on wild-living great apes (1, 2). Mastery of the physical/cognitive skills to survive and thrive in the wild, such as complex locomotion (1, 2), nest building (3) and finding/processing enough food builds cumulatively from infancy until early adulthood (5). Many skills require frequent practice to refine (1).</p>		
<p><b>KF2: Captive habitats are comparatively simple, but an intervention that replicates the mechanical challenges of forest life allows apes to express key wild-type behaviours</b></p> <p>Few captive great apes exhibit the range of physically and cognitively advanced behaviours needed to survive and thrive in natural habitats because of the comparative simplicity of captive environments (4); social problems may also develop (4). To solve these problems, the Enclosure</p>		

Design Tool (EDT) for zoo chimpanzees was developed (2015–16) by working in collaboration with Myatt (Senior Lecturer in social behaviour, British and Irish Association of Zoos and Aquariums, the professional body for UK Zoos) and 4 leading UK zoos (Twycross, Chester, Paignton and Blair Drummond). The EDT enables end users to identify absent/under-represented wild-type behaviours and, importantly, the enclosure modifications needed to elicit them. Uniquely, these modifications replicate the mechanical challenges of forest environments, creating enclosures that *behave naturally*, rather than looking natural. For example, the development of an EDT for group-living sanctuary chimpanzees with Ape Action Africa (2018; 4) demonstrated that the approach:

1. **Radically increases the expression of natural behaviours and fitness:** e.g., increasing the time chimpanzees spent foraging by 63%, increasing the time they spent off the ground by from 8%–54% and increasing the percentage of this off-ground time moving on energetically demanding flexible supports from 4%–65%.
2. **Substantially reduces group aggression and chimp-induced injuries** by quartering the number of attacks and threats from 60 to 14.

### **KF3: The EDT enhances the natural behavioural profiles of sanctuary orangutans being released back into the wild**

An EDT modified for rehabilitant orangutans was developed in 2017 with the Bornean Orangutan Survival Foundation to elicit natural skills in adult males. These are often too large and aggressive to complete the rehabilitation process with other orangutans, which eliminates their chance of release. It was demonstrated that this barrier could be overcome by applying the EDT process to their cages (6). In particular, the approach was shown to radically increase:

1. **Expression of natural behaviours**, by doubling the time orangutans spent manipulating food, nests and other objects to 40% and eliciting previously absent cognitively demanding behaviours, such as weaving nests.
2. **Fitness and behavioural diversity**, by more than doubling time spent in locomotion, doubling the frequency of complex wild-type climbing and clambering behaviours in the majority of individuals, and eliciting previously absent complex tree sway behaviours.

### **3. References to the research**

1. Thorpe, S.K.S., and Crompton, R.H. (2006) 'Orangutan positional behavior and the nature of arboreal locomotion in Hominoidea', *American Journal of Physical Anthropology*, 131 (3): 384–401.
2. Thorpe, S.K.S., Holder, R., and Crompton, R.H. (2009) 'Orangutans employ unique strategies to control branch flexibility', *Proceedings of the National Academy of Sciences*, 106 (31): 12646–12651.
3. van Casteren, A., Sellers, W.I., Thorpe, S.K.S., Coward, S., Crompton, R.H., and Ennos, A.R. (2012) 'Nest Building Orangutans Demonstrate Engineering Know-How to Produce Safe, Comfortable Beds', *Proceedings of the National Academy of Sciences*, 109: 6873–6877.
4. Neufuss, J., Chappell, J.M., Myatt, J.P., and Thorpe, S.K.S. (2019) 'Final Report and Analysis of Post-Modification Results for the Sanctuary Chimpanzee Enclosure Design Tool (EDT) at Ape Action Africa, University of Birmingham, UK: Authors.
5. Chappell, J.M., Phillips, A., van Noordwijk, M., and Thorpe, S.K.S. (2015) 'The ontogeny of gap crossing behaviour in Bornean orangutans' (*Pongo pygmaeus wurmbii*)', *PLOS ONE*, 10: 7 e0130291
6. Thorpe, S.K.S., Saunders, E.L.R., and Chappell, J.M. (2018) 'Final Report and Analysis of Post-Modification Results for the Sanctuary Orangutan Enclosure Design Tool (EDT) at Samboja Lestari, University of Birmingham, UK: Authors.

Grants and project funding

- Thorpe, S.K.S., and Chappell J.M. (2019) The EDT as an evidence-based assessment and monitoring tool for the key phases of orangutan rehabilitation and release.  
**The ARCUS Foundation \$475k**
- Thorpe, S.K.S. (2019) Translating BBSRC research to improve the robusticity and validity of the zoo inspection and regulation process for great apes in the UK.  
**BBSRC IAA Awards £46.2k**
- Thorpe, S.K.S. (2017) Creating better links between great ape researchers and zoos and sanctuaries to increase wild-type behaviours in captive animals.  
**NERC Knowledge Exchange Fellowship NE/R00272X/1 £198k**
- Thorpe, S.K.S., and Chappell, J.M. (2016) Enclosure Design Tool (EDT) to elicit wild-type behaviours in captive apes.  
**The ARCUS Foundation G-PGM-1610-1983 \$100k**
- Thorpe, S.K.S., Myatt, J.P., Tennie, C., and Chappell, J.M. (2015) An Enclosure Design Tool to enable zoos to create integrated, wild-type enclosures for great apes.  
**NERC NE/M021300/1 £122k**
- Thorpe, S.K.S., Crompton, R.H., Ennos, R.A., and Sellers, W.I. (2008) Compliant interactions and limb mechanics during arboreal locomotion in tropical forest environments.  
**NERC NE/F003307/1 £527k**

**4. Details of the impact**Improving conservation practice for great apes

Great apes are an endangered 'flagship species' that engineer tropical ecosystems and catalyse stewardship of some of the most threatened forest habitats on Earth. The Enclosure Design Tool (EDT) is a unique, research-based tool used in zoos (KF1-3) and sanctuaries globally to **substantially improve apes' welfare and conservation value**, in addition to ensuring that reintroduced apes don't undermine existing populations when they are released into the wild (S1, S2). As a result of the EDT (KF1-3), we have **changed *in situ* conservation practice at a global scale**. Working directly with key ape conservation agencies, such as Pan African Sanctuary Alliance (represents 33 ape sanctuaries in 13 African countries) and the Orangutan Veterinary Advisory Group (OVAG; represents SE Asian orangutan Rehabilitation Centres), we have achieved unparalleled influence. For example, OVAG's 5-Year Strategy commits to supporting roll-out of the EDT (S1) to steer release decisions by *all* SE Asian orangutan sanctuaries (based on KF3). This is attested by the Co-convenor of the OVAG, who confirmed that:

The EDT is a vital tool [...] it provides sanctuary colleagues with the practical skills and understanding necessary to study and protect orangutans in all settings [...]. The EDT team [...] are champions of scientific openness and co-operation which has led to rapid practitioner trust and uptake of the tool (S1).

As a result, the EDT is now in use at:

- Bornean Orangutan Survival Foundation (BOSF, hold >650 orangutans, rehabilitate >50% of orangutans returned to the wild);
- Sumatran Orangutan Conservation Programme (hold 75 orangutans, 286 released since 2002, only Rehabilitation Centre in Sumatra);
- Chimpfunshi Wildlife Orphanage Trust (>10% global chimp sanctuary population);
- Ape Action Africa (AAA, holds >10% global chimp sanctuary population);

- Twycross Zoo's new chimpanzee enclosure (awarded British and Irish Association of Zoos and Aquariums 'Gold Award for Enclosure Design', 2019; S5);
- Amersfoort Zoo (Netherlands).

With further requests from:

- 6 African sanctuaries for chimpanzees and gorillas;
- 5 orangutan rehabilitation centres;
- Other global zoos (e.g., Chester, Amsterdam, Perth).

#### Impacts on practitioners to improve the welfare of great apes

Animal welfare is at the heart of the EDT. It has led to significant **changes in practice** at zoos and sanctuaries, such as BOSF and AAA, including improved feeding protocols, enclosure design and re-introduction procedures (S2, S3). Expert testimony from key professionals at these organisations highlight the **positive physical and mental welfare outcomes achieved** both in captivity (KF3) and after reintroduction. This is shown by evidence of those working with and observing great apes, and illustrated in the following statements:

The Animal Welfare Coordinator for the BOSF stated that: "The EDT substantially improved the orangutans' welfare by increasing their wild type behavioural repertoire and activity levels in the sanctuary. This will improve their well-being and their capacity to survive and adapt successfully when they are re-released into the wild." (S2)

The Director of AAA stated that: "After the modifications aggression between them has decreased; [...] we are seeing far fewer wounds, less fights and the group is more stable" (S3).

The CEO of BIAZA stated that: "The chimps have been a lot calmer, they're a lot happier. This is definitely part of what we would like to continue in the future, for all our chimps" (S4).

Taken together and resulting directly from EDT, there have been dramatic improvements in practitioner practices with regard to the care of great apes, which in turn improved their physical and mental welfare.

#### Impacts on policy and guidelines by setting best practice in the zoo sector

The pioneering research underpinning the EDT has **influenced charitable and other organisations** in the zoo sector. It has enabled Thorpe to assemble key stakeholders into an influential advisory body, providing the robust evidence base needed to underpin change in policy and practice. Organisations which Thorpe has brought together include, British and Irish Association of Zoos and Aquariums (BIAZA), DEFRA, RSPCA, International Union for the Conservation of Nature Primate Specialist Group and the European Association of Zoos and Aquariums (EAZA). This collaboration was formally constituted as a body, by the establishment of the *Great Ape Welfare group* (GAWg) in 2019. GAWg's mission is to drive positive welfare outcomes for zoo-based great apes and to be a model for BIAZA development of groups for other species (S5). GAWg has already **achieved changes to legislation** by authoring the great ape welfare recommendations, which are based on KF1–3, as part of a rare major overhaul of the 'Secretary of State's Standards of Modern Zoo Practice' (legislative document for regulation of UK zoos). Final publication is due in 2021 and the legislation will raise minimum legal husbandry standards for >300 great apes in 22 UK zoos (S5–7). The Irish Zoo Licensing Authority has also expressed interest in using GAWg expertise to develop recommendations for the 'Irish Standards of Modern Zoo Practice' (S5). That this is the case is attested to by the CEO of BIAZA:

GAWg has been a tremendous success [...]. To influence the Secretary of State's Standard's [...] was a great achievement [...] that will substantially improve legal minimum standards of captive care for all UK zoo-housed great apes (S5).

The success of GAWg in **impacting policy by the use of research-based critical evidence** was attested to by EAZA Animal Welfare Coordinator, who described GAWg's effectiveness as an "excellent example (of) collaboration 'in action'" (S9). This success led them to invite Thorpe to deliver a Plenary Presentation at the Animal Welfare Forum (2020), with the aim of highlighting examples of research to application, the benefits of strong collaborations between researchers and practitioners, and to "advise delegates on how to develop this within their own [...] groups" (S9). EDT concepts have also since been used **to define best practice** in EAZA Orangutan Best Practice Guidelines (S8), which are used to steer husbandry across their 300 European members.

Moving forward, EDT concepts will guide sanctuaries' management decisions through a chapter in the Pan African Sanctuary Alliance updated Husbandry Manual (2021, S1) and are a case study of best practise for rigorous assessment of welfare in 'State of the Apes': a book formulated by major conservation organisations (ARCUS Foundation, UN's Great Ape Survival Partnership) to drive stakeholder (e.g., United Nations, World Health Organisation, World Organisation for Animal Health) policy and practice in the management of global great ape populations (S1).

#### 5. Sources to corroborate the impact

- S1. Testimonial from Co-convenor of the Orangutan Veterinary Advisory Group [Dated 11 June 2020]
- S2. Testimonial from Animal Welfare Coordinator for Bornean Orangutan Survival Foundation at the time of the study;
- S3. Video interview with Programme Manager at Ape Action Africa ([Enclosure Design Tool - University of Birmingham](#))
- S4. Video interview with Director of Ape Action Africa ([Enclosure Design Tool - University of Birmingham](#))
- S5. Testimonial from CEO of BIAZA;
- S6. Appendix 5.9 – Updated Secretary of State's Standards for Modern Zoo Practice;
- S7. Testimonial from Veterinary Advisor for DEFRA [Dated 21 September 2020]
- S8. [EAZA Orangutan Best Practice Guidelines](#), Edition 1, 31 July 2018
- S9. Letter of Invitation to deliver plenary at EAZA Animal Welfare forum, 2020 [Dated 28 June 2019]