

Institution: Institute of Zoology
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1. Context and mission

The Institute of Zoology (IoZ) is a world-leading research centre in conservation science. Our mission is to understand the biology of wildlife in a changing world, improving conservation outcomes and delivering benefits to people. Our research focuses strategically on five global conservation challenges. For each, improving our scientific knowledge offers potentially transformative conservation outcomes:

- **Wildlife Health**, to identify, understand and mitigate wildlife disease threats to biodiversity conservation and to human health and wellbeing.
- **Biology and Recovery of Small Populations**, to develop a holistic understanding of the drivers of extinction risk and the science to support conservation solutions.
- **Co-existence Between People and Wildlife**, to develop effective tools that foster biodiversity and human wellbeing, to achieve sustainable development alongside nature conservation.
- **Global Biodiversity Monitoring**, to understand the impact of anthropogenic threats on ecosystem structure, function, and stability, as well as generate indicators to track biodiversity change.
- **Mitigating and Adapting to Climate Change**, to understand species and ecosystem vulnerability to the climate crisis and identify the best nature-based solutions for mitigation.

Our environment is structured to address these five global conservation challenges. IoZ is the research division of the Zoological Society of London (ZSL), an international conservation NGO that houses living collections at two major zoos (London, Whipsnade), runs on-the-ground conservation programmes in >60 countries, and engages with policy makers and practitioners around the world. Within ZSL, IoZ forms the core of the Science Directorate, which also includes Science Resources and Meetings (incorporating ZSL's Publications and Science Communication team) and Wildlife Health Services (professional staff involved in animal health and welfare). The unique position of IoZ as a Higher Education Institute within a conservation NGO brings a variety of benefits to its research and its translation into impact, as well as its education and public engagement activities.

IoZ employs 68 research staff and hosts a vibrant postgraduate community of 75 PhD students and c.45 Masters students from three highly successful degree courses taught and led jointly with University College London, the Royal Veterinary College, and the Natural History Museum.

We take an end-to-end approach to the global environmental challenges our science addresses, undertaking fundamental science to generate critically important new knowledge while also working with a wide range of policy and practitioner networks to ensure our science has real-world impact. This enables IoZ to be a major global player in conservation science, despite our small size. This approach is supported by our relationship with ZSL, allowing us to integrate our science with ZSL's assets, staff and activities, bringing benefits and synergies to our research, education and impact.

Since 1988, IoZ has been supported by Special Funding arrangements with the Higher Education Funding Council for England, responsibility for which passed to Research England (RE) in April 2018. This funding is provided in recognition of the unique contribution we offer to the UK research base. RE conducted a review of IoZ's funding in 2018 which concluded that the Institute delivers "a clear public value and benefit [through] the high-quality contribution to science, provision of training and capacity building, public engagement, international conservation and policy impact"; moreover, "the overall excellence of the IoZ is unquestioned and the Institute is held in high esteem."

2. Strategy

2.1. Strategy for Research and Impact

Previously, our work was guided by the broad aims of our 2012-2016 Research Plan, that 'IoZ research ... continues to be driven by cutting edge issues in conservation science, while taking advantage of significant relevant funding opportunities'. Building on the successful fulfilment of these aims, we initiated a strategy review in 2016 to ascertain where our research is world-leading and our impact makes a significant difference. Through a series of participatory workshops involving all staff and PhD students, we identified the five global conservation challenges set out above. These have also played a critical role in shaping ZSL's new strategy, ZSL 200, which outlines ZSL's ambitions ahead of its 200th anniversary in 2026. ZSL 200's three focus areas, Wildlife Health, Wildlife Back from the Brink, and Wildlife and People, map directly onto IoZ's first three global conservation challenges.

The 2018 Research England (RE) review provided a valuable opportunity to agree a rolling Business Plan with RE to ensure we deliver on our strategic ambitions. Currently covering the 3-year period beginning 2019/20, the Plan identifies four broad aims: (1) to create knowledge through research, (2) to build capacity through training and teaching, (3) to accelerate the translation and use of research to maximise conservation impact, and (4) to inspire new and diverse audiences to care about and better understand wildlife and its conservation. The Business Plan includes a set of Key Performance Indicators against which progress will be measured, and the establishment of an Independent Science Advisory Board (ISAB).

Two key academic partners over the REF2021 period, and for our Business Plan going forward, are University College London (UCL) and the Royal Veterinary College (RVC). Historically, IoZ required a university conduit for its Special Funding. UCL adopted that role in 2011, after we transferred from the University of Cambridge due to the outstanding strategic science opportunities that UCL offered. Since then we have developed a thriving academic partnership with UCL encompassing collaborative research and impact (e.g., joint REF2021 impact case studies), research support (e.g., shared internal peer-review processes for new NERC/BBSRC grant applications), postgraduate research training (e.g., co-founders of the London DTP), postgraduate taught courses (e.g., a joint MRes course), and joint academic appointments (e.g., a UCL/ZSL chair appointed in 2014, and ZSL/UCL Springboard Fellowships launched in 2016). UCL provides additional support through the appointment of IoZ staff as Honorary Fellows, granting access to the UCL library (including electronic journals) and UCL's Research Staff Development Programme. Although our Special Funding now comes directly from RE, our UCL partnership remains central to achieving our goals, and we continue to invest in this relationship to foster joint research, impact, and scholarship. Similarly, our partnership with RVC has been in place for >25 years, delivering novel postgraduate programmes on wild animal health and biology. To support our future strategy, both UCL and RVC representatives will sit on the ISAB panel.

UCL and RVC are also partners on ZSL's proposal for a *National Institute for Biodiversity and Public Health*. This £200M initiative has developed out of pioneering research done by IoZ scientists at the interface between biodiversity conservation, wildlife health and human health, and represents a very significant strategic ambition. Recognising that the current global public health crisis is inextricably linked to pressures on biodiversity, it aims to create a globally unique transdisciplinary research and innovation hub, enabling us to identify and mitigate the eco-epidemiological and socio-economic drivers of biodiversity loss and associated zoonotic diseases. It will bring together a unique partnership between wildlife biology, animal and public health across the three institutions, and provide a national and international focus for integrated science that the COVID crisis has shown is absolutely essential.

As conservation scientists, the goal of achieving real-world change is central to our work and our environment is structured to support this. Our staff have extensive experience of translating science into impact, and are assisted in this activity by ZSL's Conservation and Policy Directorate, Press Office, and Public Engagement teams. Our key pathways to impact include collaborations

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with practitioners; providing impartial, evidence-based advice on biodiversity conservation policy to governmental and inter-governmental bodies; conservation action planning at regional, national and international scales; and working with ZSL and partners in >60 countries on evidence-based conservation initiatives, including species and habitat management, species translocations, disease surveillance, and biodiversity monitoring. Our work with UK Government includes a diverse range of issues, including the emergence and control of wildlife diseases and zoonoses, human-wildlife conflict, species reintroductions, and global biodiversity trends. In parallel, IoZ works internationally with global regulatory bodies (e.g., IUCN, United Nations, World Organisation for Animal Health), and conservation conventions (e.g., Convention on International Trade in Endangered Species, Convention on Biological Diversity). Our success at achieving impact is reflected by our contribution of five of the 11 Impact Case Studies (two jointly with UCL) in the UOA5 joint submission between UCL, IoZ and Birkbeck, despite contributing only 10% of the staff.

2.2. Integrity and Open Research

To achieve impact, conservation science must be trustworthy and available to end users. We therefore take our commitments to research integrity and open research very seriously. Research integrity is ensured through multiple approaches. As a small institution where staff and students share common interests, we have a strong philosophy of collegiality and collaboration which discourages working in isolation. In addition, our criteria for promotion value an individual's work across a suite of science competencies rather than simply the quantity of publications or grants. All new and amended research projects follow the ZSL Policy on the Use of Animals in Research, and require approval by ZSL's independent Ethics Committee, ensuring we only conduct work of the highest ethical standards. As honorary UCL staff members, our scientists can also access UCL's Research Integrity Training Framework. With respect to open science, staff and students are encouraged to consider open access publication, and all IoZ publications are deposited on UCL's Discovery open access repository, with the associated datasets published according to journal policies. We also deposit specific datasets and code to make them accessible to the wider conservation community (e.g., BirdLife's Seabird Tracking Database).

2.3. Interdisciplinary Research

By its nature, conservation science is an interdisciplinary endeavour. IoZ therefore has a strong interdisciplinary tradition. One interdisciplinary interface, between the environmental sciences and veterinary medicine, is core to our 'Wildlife Health' global conservation challenge. This work is supported by our employment of research staff with veterinary expertise, our veterinary pathology infrastructure, our research links with RVC, and specific initiatives to promote collaboration between IoZ scientists with wider ZSL veterinarians and curators, including the ZSL Mission Fund (a £500K fund to support cross-directorate projects) and a system for ZSL staff to act as CASE partners on IoZ's UKRI-funded PhD projects. Links between the natural and social sciences represent another vital interdisciplinary area that is central to our 'Co-existence between People and Wildlife' global conservation challenge. This work is supported by collaborations with social scientists in UCL's Anthropology and Geography departments, and other universities, as well as by our own Social Science Research Group. We have identified social science capacity as a priority area for growth through recruitment, collaborations, and Fellowships over the next three years.

3. People

In 2019/20, IoZ comprised 68 research staff, including 6 Professors, 11 Senior Research Fellows, 9 Research Fellows, 12 PDRAs, 7 PGRAs, 8 Research Associates and 15 technical support staff. Of these, 56% were female (38/68), including our Acting Director of Science. We also host a thriving PhD student community, with 75 students in 2019/20, of whom 59% were female (44/75). A total of 84 IoZ students were awarded doctoral degrees over the REF2021 period, 60% of whom were women (50/84).

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3.1. Equality, Diversity and Inclusion

We are committed to creating a fair and inclusive working environment for all staff and PhD students, and our policies and processes are designed to reflect this. To this end, we became members of the Athena Swan Charter in 2015 and secured a Bronze Award in 2018. Our subsequent equality and diversity activities have been shaped by the action plan associated with this award. Key initiatives have included: a new pay and progression framework with greater transparency and fairness; the introduction of a 'Return to Science' Fellowship that provides up to two years' salary for grant-funded staff returning to work after parental leave; mandatory equality and diversity training; and new procedures to improve recruitment processes, including gender-diverse interview panels and the monitoring of minority ethnic applications and appointments. Further initiatives that also encompass PhD students include: the introduction of mentoring and buddying schemes; a parent/carer network group and social committee; points-of-contact to combat any instances of bullying and harassment; and enhanced mental health and wellbeing support. This work is led by the Equality, Diversity and Inclusion (EDI) Committee, which includes staff across all levels of seniority and PhD students. We also recruited our first EDI Officer in Feb 2020 to support the Committee's work. The EDI Committee includes a Safeguarding Subcommittee; a Race, Ethnicity, and National Origin Working Group (focusing on increasing accessibility to science in marginalised groups); and additionally tackles issues related to disability and LGBTQ+, among others. One highlight has been 'Soapbox Science', an award-winning public outreach platform showcasing women in science. Founded in 2011 by Nathalie Pettorelli (IoZ) and Seirian Sumner (then IoZ, now UCL), the initiative has grown annually and now runs events in public spaces in 14 countries across five continents. Pettorelli and Sumner received a 'Points of Light' award for Soapbox Science from Prime Minister David Cameron in 2015.

IoZ is supported in its EDI work by ZSL's award-winning Human Resources team, who deliver key HR services as well as coordinating a range of staff and student training opportunities, in-person and online, covering hard, soft, and transferable skills. A confidential helpline by external provider CiC is available for staff and students offering support on a wide range of topics from financial difficulties to mental health. These services form part of ZSL's People and Culture Plan, in which 'Dignity and Respect at Work' and 'Equality and Diversity' are core policies. In addition, ZSL runs an online staff and student survey every 2-3 years to gauge how we are doing as an organisation and to identify any areas of concern. The survey is anonymous, and the results are reported back to everyone as well as guiding responses to any problems identified.

3.2. Staff

We aim to recruit and retain the very best conservation scientists, maintaining a dynamic balance of junior and senior staff while nurturing careers at all levels, in line with The Concordat to Support the Career Development of Researchers. New appointments are made strategically to ensure this balance, with a particular focus on outstanding early career researchers whose work is aligned with ours but also bring new and complementary skills to IoZ, including from conservation-relevant disciplines beyond the biological sciences.

Our new pay and progression system, introduced in 2016, is designed to support staff in their careers by encouraging the development of skills and excellence, and rewarding outstanding performance. It recognises five science staff grades (from Research Assistant to Professor) and considers performance across four key science competencies: research excellence, conservation impact, management and leadership, and teaching. The system allows for accelerated progression or the award of a contribution point where outstanding performance has been achieved but the full criteria for promotion are not met. Staff development is supported through annual Performance and Development Reviews (PDRs) which assess individual performance across the four science competencies, set SMART objectives linked to the promotion criteria, and review development needs. Among senior staff, PDRs include a 360-degree feedback process, involving evaluations from direct reports, peers, and line managers. Grading criteria and salary scales are aligned to UCL. Applications for promotion are reviewed by a Promotions Panel Committee chaired by the Director of Science which includes a UCL Head of Department.

Early Career Researchers (ECRs) are a key focus of many of our EDI initiatives, including the mentoring programme and 'Return to Science' Fellowships, but also benefit from targeted development opportunities including: PhD supervision and teaching opportunities (ECRs are encouraged to supervise PhD students in collaboration with senior staff, and can offer lectures to BSc and MSc students); facilitated access to ZSL's peer-reviewed journals' editorial boards (e.g., *Journal of Zoology*) as well as professional steering committees (e.g., IUCN Specialist Groups) through nominations by existing ZSL members; and attendance at in-house career development workshops co-run with other professional societies (e.g., British Ecological Society). The value we place on ECRs is highlighted by our ZSL/UCL Springboard Fellowships scheme. These 4-year fellowships support outstanding ECRs in conservation science to establish their independent careers under the joint mentorship of a more senior researcher at both institutions, thus also maximising their opportunity to build their professional networks.

Our success in creating an environment where staff can flourish is demonstrated by three indicators over the REF2021 period. First, the recruitment/promotion of female staff: 43% (3/7) of new Research Fellow appointments, and 50% (2/4) of promotions from Senior Research Fellow to Professor, were women. Second, the prestigious external fellowships we hosted, including a Royal Society Wolfson Research Merit Award (Cunningham), a Royal Society University Research Fellowship (Turvey), and a Wellcome Trust/Royal Society Sir Henry Dale Fellowship (Redding). Third, the destinations of departing staff, including the Head of Life Sciences, Natural History Museum (Norris), and Research Group Leaders at the Max Planck Institute for Chemical Ecology, Germany (Rowland), and International Institute for Applied Systems Analysis, Austria (Visconti).

3.3. Research Students

As an independent research institution we do not award postgraduate degrees, so our PhD students are co-registered at a partner university and have a university supervisor in addition to their two IoZ supervisors. This has significant benefits for the students, who have access to the expertise, resources, and doctoral training opportunities of both institutions. In addition, since all UK universities are potential partners, PhD projects are registered at the university that best serves their needs. Most of our students come through NERC Doctoral Training Partnerships (DTPs). IoZ is currently a member of four: (1) the London NERC DTP, led by UCL; (2) the SSCP DTP (Science and Solutions for a Changing Planet), led by Imperial College London; (3) the SCENARIO DTP (Science of the Environment: Natural and Anthropogenic Processes, Impacts and Opportunities), led by the University of Reading; and (4) the ARIES DTP (Advance Research and Innovation in the Environmental Sciences), led by the University of East Anglia. IoZ studentships are also funded by the BBSRC, the European Union, multiple international and UK university scholarships, and conservation charities. We co-supervise more students with UCL than any other university: 27/84 graduating students (34%) were registered at UCL over the REF2021 period. However, we also co-supervised 18 students (21%) with Imperial College London, and between 1-7 students with a further 23 universities, including Oxford, Cambridge, Bristol, Liverpool, Leeds, and Edinburgh.

Our students benefit from unrivalled access to the advice and experience of ZSL's conservation practitioners, both in the Conservation and Policy Directorate and the world-leading collections of London Zoo and Whipsnade Zoo. These networks provide the opportunity to undertake research with real-world impact, and many IoZ PhD projects are conducted in partnership with other ZSL directorates and/or external partners in the conservation sector. Where these involve RCUK studentships, such collaborations are usually formalised through CASE funding. Thus, 22/84 graduating PhD students (26%) were CASE-funded over the REF2021 period, with partners including the Amphibian and Reptile Conservation Trust, Bat Conservation Trust, Birdlife Australia, Durrell Wildlife Conservation Trust, and Wildlife Conservation Society, as well as ZSL.

Our PhD students are actively involved in the wider IoZ community, including PhD Student Lunches (networking events with ZSL colleagues), lunchtime Speed Talks (informal presentations by IoZ staff and students), and Science for Conservation seminars (external speakers). In addition, up until 2018 we held an annual one-day Student Conference at which PhD students across all

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years gave presentations, with awards for the best talks. Since 2019 we have merged this event with the annual staff Research Conference to create an integrated two-day ZSL Science Conference, providing the students with a more rewarding conference experience. Pastoral support for PhD students is provided through two Postgraduate Tutors, two ECR Agony Aunts/Uncles, four EDI Contact Points, and the ZSL (CiC) helpline.

IOZ PhD students have a completion rate of 90% (84/93 students in the REF2021 period). Among those graduates for whom information is available, 99% (81/82) went on to graduate-level employment, including 50% (41/82) taking up university research positions and 32% (26/82) gaining roles in the conservation sector.

4. Income, infrastructure and facilities

A major achievement by IoZ over the REF2021 period has been a 55% increase in its external research income, from £1.89M in 2013/14 to £2.92M in 2019/20. This has allowed us to maintain and grow a broad portfolio of income sources and to add significant value to the Special Funding we receive from Research England (RE). This Special Funding has remained steady over the same period, at £2.14M per annum (mean, range £2.02M-£2.24M). Overall, we have been able to access external (non-RE) funds totaling c.£17.9M across the REF2021 period, which in the context of our discipline is a considerable achievement. Our Research Income is summarised in Table 1 below (which we are unable to report in REF4b because we do not submit data to HESA).

IoZ is housed in the Nuffield and Wellcome buildings at ZSL's iconic London Zoo site in Regent's Park, a short walk from UCL's main campus in Bloomsbury. We have a range of in-house facilities to support our predominantly field-based research. These include basic wet and dry laboratories, constant-temperature animal housing rooms dedicated to Home Office-licensed animal experiments on wildlife disease, a pathology suite for determining the causes of wildlife mortality, and extensive storage capacity for a range of frozen and fixed-tissue archives, such as those of various wildlife health projects. During the REF2021 period we also invested £696K in specialist facilities for conservation genomics: a laboratory suite for ancient DNA studies, RNA extraction and genotyping, and next generation sequencing. Beyond IoZ, we access further specialist facilities as needed, either through ZSL (e.g., the Prince Philip Zoological Library and Archive, one of the major zoological libraries of the world) or through our external partners, especially UCL and RVC. PhD students share all these resources, and also benefit from IoZ's Student Hub: built in 2017, this £93K state-of-the-art space comprises a large, open-plan area with desks for 23 students, plus small and large AV-equipped meeting rooms.

A key IoZ resource is our unique collection of live, long-term, datasets. These are the product of our ability to take a longer-term view of research than is typically possible, enabling us to address global environmental challenges that require long-term study. The datasets encompass a range of threatened wild mammal, bird and amphibian populations; wildlife health projects such as the UK Cetaceans Strandings Investigation Programme; and our global biodiversity monitoring work, including the Living Planet Index (LPI) and Red List Databases. A 2018 review found that our long-term population studies represented >200 years of unbroken data that over the preceding 15 years had generated 191 publications; supported 9 fellowships, 10 PDRAs, and 36 PhD students; and leveraged c.£6M in external grants. Similarly, our LPI database consists of trends for >22,000 populations of >4,000 vertebrate species and our National Red Lists Database currently consists of 5,486 assessments. Since 2017, we have employed a dedicated Database Manager to develop and maintain these resources, not only to support our research but to provide access to a range of users in the wider conservation community.

Communicating science is a central part of IoZ's work and its ability to exchange knowledge and actualise impact. We are able to exploit our unique position within ZSL to engage with >1.4 million people visiting ZSL's London Zoo and Whipsnade Zoo annually, including c.150,000 children participating in ZSL's schools programme. IoZ staff and PhD students are supported by the ZSL Science Resources and Meetings team to present their research to a variety of audiences in an

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annual programme of ZSL events that includes 10-15 free public science lectures (2000 attendees) and two international symposia (350 attendees). These events are held in ZSL's recently refurbished Huxley Lecture Theatre. Some events may also run online, such as our 2018 dolphin dissection, viewed c.200,000 times. We have a dedicated Public Engagement Manager who coordinates external outreach opportunities and provides training and support. As a result, our staff and students regularly talk to the public about their research at annual outreach events such as Biology Week, New Scientist Live, the Royal Society Summer Science Exhibition, and Soapbox Science. The quality of our public engagement is illustrated by a 'New Researcher Outreach and Engagement Award' to one of our PhD students from the Royal Society of Biology in 2019.

Table 1. Institute of Zoology Research Income (REF4b)

Income Sources	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
BEIS Research Councils, The Royal Society, British Academy and The Royal Society of Edinburgh	£215,123	£254,705	£620,465	£535,832	£601,181	£276,938	£305,324
UK-based charities (open competitive process)	£124,817	£268,398	£211,452	£188,408	£210,960	£165,859	£59,967
UK-based charities (other)	£14,413	£137,757	£149,136	£32,613	£24,545	£108,391	£185,844
UK central government bodies/local authorities, health and hospital authorities	£940,578	£858,180	£927,595	£557,817	£754,372	£787,790	£955,848
Health research funding bodies	£0	£0	£0	£0	£0	£0	£0
UK central government tax credits for research and development expenditure	£0	£0	£0	£0	£0	£0	£0
UK industry, commerce and public corporations	£0	£0	£2,480	£60,941	£27,552	£2,450	£2,644
UK other sources	£2,678	£7,469	£63,579	£21,609	£32,677	£34,778	£7,281
EU government bodies	£147,159	£76,991	£92,722	£132,567	£196,300	£145,336	£16,148
EU-based charities (open competitive process)	£50,935	£7,739	£1,428	£0	£0	£0	£141,902
EU industry, commerce and public corporations	£991	£0	£0	£34,669	£26,498	£26,364	£25,484
EU (excluding UK) other	£0	£0	£938	£0	£9,284	£14,886	£0
Non-EU-based charities (open competitive process)	£210,518	£235,962	£569,004	£450,818	£1,041,209	£890,915	£843,591
Non-EU industry commerce and public corporations	£4,262	£15,184	£14,038	£22,752	£15,117	£8,098	£15,370
Non-EU other	£176,386	£168,680	£225,545	£316,793	£102,806	£290,555	£363,516
TOTAL	£1,887,859	£2,031,064	£2,878,380	£2,354,818	£3,042,500	£2,752,361	£2,922,920