

Applicant: **Polaszek, Andrew**
Organisation: **The Natural History Museum**
Funding Sought: **£10,000.00**
Funding Awarded: **£10,000.00**

IES\R3\223124

Biodiversity of ecosystem service providers - pollinators and parasitoids in Iraq

Pollinators are well-known as being necessary for the production of almost half of our food crops. Typical examples are bees. Parasitoids are less well-known. They resemble parasites in living off other animal or plants, but differ from them by always killing the thing they live on (the "host"). Parasitoids are also very important for food production because the insects they kill include many important crop pests. When we can identify and understand the roles of pollinators and parasitoids we can start to develop environmentally-friendly ways of crop production. At the same time we can reduce the input of fertilisers and pesticides which harm the environment.

In Iraq, and in the Middle East generally, very little is known about both groups. This project aims to fill that knowledge gap by extensive surveys, collecting and observing pollinators and parasitoids in 3 very different areas of Iraq: the cooler and greener northeast, the marsh delta in the south, and the dry central area. We will collect during an entire season, with some collecting methods (traps) running continuously. Specimens will be identified by experts at the Natural History Museum in London, University of Kerbala, and by external specialists. DNA sequences will also be collected - these often help with identifying species that are difficult to separate from each other. Finally, high-quality photographs will also be made for each species.

All this information will be made publicly available so that in the future, those developing environmentally-friendly methods of crop production can use this major resource.

IES\R3\223124

Biodiversity of ecosystem service providers - pollinators and parasitoids in Iraq

Section 1 - Understanding our Promotion

How did you hear about this Scheme?

- The Royal Society website

Section 2 - Eligibility Criteria

Please confirm whether you meet the eligibility criteria for the programme as follows:

Do you and your co-applicant hold a PhD or equivalent research experience?

- Yes

Is the co-applicant currently based overseas (i.e. not in the UK)?

- Yes

Have you held or do you hold an International Exchanges or Newton Mobility Grant award?

- Yes

Has the final report for that award been submitted?

- Yes

Is this a new collaboration?

Please note that a new collaboration is when the applicant and co-applicant have never worked together previously on any project. This scheme is not intended to support continued research activities between a UK applicant and a co-applicant who was a former colleague or PhD student, or to support other existing or recent collaborations between the applicant and co-applicant. Rather, the scheme is intended to stimulate new collaborations between researchers in the UK and overseas.

- Yes

Section 3 - Contact Details

PRIMARY APPLICANT DETAILS

Title Dr
Name Andrew
Surname Polaszek
Website (Work) <https://www.nhm.ac.uk/our-science/departments-and-staff/staff-directory/andrew-polaszek.html>
Tel (Mobile) +447786114918
Email (Work) a.polaszek@nhm.ac.uk
Address Natural History Museum
Natural History Museum
London
London
SW7 5BD
United Kingdom of Great Britain and Northern
Ireland (the)

COLLABORATOR DETAILS

Role	Head of Department
Title	Professor
Name	Ken
Surname	Norris
Organisation	The Natural History Museum
Tel (Mobile)	07983528414
Email (Work)	k.norris@nhm.ac.uk
Address	Cromwell Road South Kensington LONDON SW7 5BD United Kingdom of Great Britain and Northern Ireland (the)

CO-APPLICANT DETAILS

Title Dr
Name ALI
Surname KAREEM
Tel (Mobile) 00964781045655
Email (Work) ali.kareem@uokerbala.edu.iq
Address Plant Protection Dept
Faculty of Agriculture- University of Kerbala
Karbala
Karbala
56001
Iraq

COLLABORATOR DETAILS

Role	Head of Department Overseas
Title	Professor
Name	Thamer Kareem
Surname	Khudir
Tel	009647735363430
Email (Work)	dr.thamer.kudir@uokerbala.edu.iq
Address	Faculty of Agriculture University of Kerbala Karbala City 56001 Iraq

GMS ORGANISATION

Type	Museum
Name	The Natural History Museum
Phone	020 79425668
Address	Cromwell Road South Kensington LONDON SW7 5BD United Kingdom of Great Britain and Northern Ireland (the)

Section 4 - Lead Applicant Career Summary

Title of Current Position

Please state the title of your current position.

Principal Researcher

Current Employer

Please enter the official organisation name of your current employer.

Natural History Museum

Current Department

Science

Current Position Start Date

Please enter the date when your current position started.

01 February 2008

Current Position End Date

Please enter the date when your current position is expected to finish.

31 December 2050

Field of Specialisation

Please enter details of your field(s) of specialisation.

Entomology, Systematics, Biocontrol

Summary of your Current Research

Please provide an outline summary of your present research.

Insect systematics and evolution, particularly evolution of host/parasitoid relationships in plant feeders and parasitoids. Conservation of natural enemies and pollinators. Applied entomology with reference to the tropics, biological control and integrated pest management. Insect identification and information database systems. Reformation and modernisation of animal systematics and nomenclature, including the development of a universal register for animal names and nomenclatural acts (see www.zoobank.org). The ecological impact of invasive insects and their natural enemies, especially in relation to agroecosystems. Outreach and education on the beneficial aspects of insects.

The Natural History Museum is a world-leading organisation in bio- and geosciences. Our unique strengths include very extensive reference collections (including 30 million+ insect specimens) and cutting edge resources for DNA sequencing.

The University of Kerbala, though a very young institution, is currently a leader in higher education due to its innovative approach to administration, human resources development, and capacity to excel in research and education on various levels of sciences and humanities. It is both a leading institution in Iraq as well as in the region.

When did you, or when are you, expecting to receive confirmation of your PhD?

01 August 1987

Applicant Career History

Please list all of your appointments since your PhD and the dates in reverse chronological order, stating if part-time (and percentage part-time) when necessary.

2014-present Principal Researcher, Dept of Life Sciences.

2012-2014 Head, Terrestrial Invertebrates Division.

2010-2012 Keeper (Head of Dept) Entomology, Natural History Museum, London.

2008-2010 Researcher, Hymenoptera Division, Entomology Dept.

2004-2007 Executive Secretary, International Commission on Zoological Nomenclature.

2004-2007 Researcher, ALARM Project, Natural History Museum.

2000-2003 Entomological consultant, Entomology Dept, Natural History Museum, London, and School of Biological Sciences, Imperial College, London.

1990-1994 Principal Investigator and Project Leader. Dept of Entomology, Wageningen Agricultural University, The Netherlands.

1985-1990 & CABI Bioscience, Principal Scientific Officer. Head, Agricultural Entomology.

1995-2000

Impact of Covid-19

The Society appreciates that the impact of the coronavirus pandemic on researchers and their work will be varied. Please provide a summary of how the pandemic has affected your research activities. (500 words max)

Some restrictions on access to the workplace (NHM) at the beginning of lockdown, but due to the need for maintaining liv populations of insects, maximum accessibility was granted by request of NHM Director to DCMS.

Very many restrictions on planned fieldwork and conference attendance.

Collaborators' activities (especially in Kenya for Darwin Initiative project) severely affected, requiring a 1-year extension to that project, which itself impacted on other planned activities.

Applicant Qualifications

Please list all your qualifications in reverse chronological order.

Imperial College London: London

1982-09-01 to 1987-04-01 | PhD, DIC (Pure and Applied Biology)

Newcastle University: Newcastle upon Tyne

1979-09-01 to 1982-06-01 | Agricultural Zoology (Faculty of Agriculture)

List your Key and/or Relevant Publications

Revision of the World Species of *Megaphragma* Timberlake (Hymenoptera: Trichogrammatidae)

Insects

2022-06-20 | journal-article

Telenomus nizwaensis (Hymenoptera: Scelionidae), an important egg parasitoid of the pomegranate butterfly *Deudorix livia* Klug (Lepidoptera: Lycaenidae) in Oman

PLOS ONE

2021-05-05 | journal-article

How to escape from insect egg parasitoids: a review of potential factors explaining parasitoid absence across the Insecta

Proceedings of the Royal Society B: Biological Sciences

2020-07-29 | journal-article

Metaphycus macadamiae (Hymenoptera: Encyrtidae) – a biological control agent of macadamia felted coccid *Acanthococcus ironsidei* (Hemiptera: Eriococcidae) in Hawaii

PLOS ONE

2020-04-08 | journal-article

Goniozus omanensis (Hymenoptera: Bethyilidae) an important parasitoid of the lesser date moth *Batrachedra amydraula* Meyrick (Lepidoptera: Batrachedridae) in Oman

PLOS ONE

2019-12-11 | journal-article

Applicant Research Funding

Please list all your current and previous research funding in reverse chronological order.

< 5 k

2022 £2,000 Conference attendance (Ent. Soc. America).

2020 £1,500 Anglo-Omani Society. Publication.

2019 £3,000 – Training New Zealand researcher

2018 £4,619 – Hawaiian Macadamia Nut Growers Association.

2017 £4,000 Training two Omani researchers.

2016 £4,200 Anglo-Omani Society. Fieldwork.

2014 £1,788 Anglo-Omani Society. Training two Omani students.

2013 £3,000 Paul & Louise Cook Charitable Foundation – expedition to Kalimantan

2013 £1,500 Anglo-Omani Society. Collecting in Oman.

2011 £2,100 Royal Society (International Travel Grants) International Society Sugar Cane Technologists conference

2010 £900 Royal Society (Joint International Projects) Revision of Megaphragma (Hym: Trichogrammatidae)
- The world's smallest insects
2009 £4,000 Royal Society (International Travel Grants) Morphological and molecular characterisation of Encarsia species of Mexico
2003 £3,080 John Spedan Lewis Foundation ICZN web project
2002 £2,000 British Council – Rapid Biodiversity Assessment, Campania, Italy (extension).
2000 £1,000 (British Council) Windsor Treaty award (Anglo-Portuguese cooperation)
1996 £1,420 preparation of data sheets for CABI Crop Compendium.
1994 Short-term visitors grant to Smithsonian Institution, Washington D.C., U.S.A., to study systematics of whitefly biological control agents.
1991 £3,000 (ETH: Eidgenössische Technische Hochschule, Zurich, Switzerland) for taxonomic studies of African rice stem borer.

£5k - £60k

2022 £5,453 United States Geological Survey; description of Ooencyrtus.
2021 £7,796. FAO East African Regional Office; training on mealybug parasitoids
2019 £5,000 CABI Bioscience; Fall Armworm biocontrol in Africa
2018 £11,463 Bill & Melinda Gates Foundation; African Cassava Whitefly Project
2014 £28,583 NERC Advanced Training Award.
2008 £14,000 Various donors - Systema Naturae 250 symposium, Paris, August 26-27.
2008 £11,000 BBSRC - BB/DO15634/1 Biodiversity on Farms: a complex systems approach
2007 £35,000 NSF - Planetary Biodiversity Inventory (2007-2012).
2007 £10,000 Paul and Louise Cooke Endowment Ltd - ICZN Development Programme
2007 £12,000 Taylor & Francis Ltd - Development of ZooBank database
2006 £12,000 Taylor & Francis Ltd - Development of ZooBank database
2004 £50,000 ICZN Appeal Fund (various donors)
2004 £17,000 EU FP7 ALARM Project
2004 £7,000 (ABRS) Revision of Australian Encarsia species.
2002 £8,000 (Fauna Europaea) Databasing of Hymenoptera.
2002 £10,000 (CTA) Development of legume pod borer relational database CD.
2001 (second) K.C. Wong Fellowship for postdoctoral collaboration (Dr Xiao Hui).
2001 £5,000 British Council – Rapid Biodiversity Assessment, Campania, Italy.
1998 £19,687 (DFID) Illustrated identification guide to Orius (Anthocoridae).
1998 £26,645 (DFID) 3 year project on rice insect diversity, Bangladesh.
1997 £32,486 (CTA) Publication of English and French versions of African stem borer handbook.
1996 K.C. Wong Fellowship for postdoctoral collaboration (Prof. Jian Huang).
1996 £15,000 (CABI partnership facility) for feasibility study on tropical legume pod borers.
1996 £8,000 (ODA) RNRRS project: Sustainable management of Bemisia tabaci and tomato leaf curl virus (TLCV) on tomato in India.
1995 £10,900 (DGIS) for editorial assistance on publication of cereal stem borer handbook

£60k-£400k

2019 £236,658 Darwin Initiative (DEFRA); Scale insect pests in Kenya
2014 £136,000 Bill & Melinda Gates Foundation; African Cassava Whitefly Project
2005 £75,000 Wellcome Trust for ICZN Development Programme
1998 £147,000 (DFID) 3 year project on legume pod borers, pantropical
1990 £300,000 (DGIS: Directorate General for International Cooperation, Netherlands Ministry of Foreign Affairs) for 3 year project on cereal stem borers and their parasitoids in Africa.

Section 5 - Co-applicant Overseas Career Summary

Please enter your full name, including title below.

Ali Abdulhusien Kareem

Title of Current Position

Please state your current position title.

Assistance Professor in Taxonomy and genetic diversity of Insect

Current Employer

Please enter the official organisation name of your current employer.

University of Kerbala

Current Department

Department of Plant Protection

Country/Territory

Iraq

Current Position Start Date

Please enter the date when your current position started.

01 September 2005

Current Position End Date

Please enter the date when your current position is expected to finish.

31 December 2050

Field of Specialisation

Please enter details of your field(s) of specialisation.

Population Structure, Genetic Diversity and Molecular taxonomy of Insects

Summary of your Current Research

Please provide an outline summary of your present research.

Taxonomy and molecular identification of pollinators and natural enemies such as parasitoid wasps in Iraq are poorly known. We work in plant protection Dept. Faculty of the Agriculture University of Kerbala with team survey the benefits of insects such as bees and parasitoid wasps and identify them. We survey collection these insects from Karbala city and its neighbour cities. We have done some good work regarding receding new species in the Iraq list which is important in the biological control of pests. The work needs to extend and support by funds and expert taxonomists. We hope can get this collaboration with Natural History Museum in London and led by Dr Andrew Polaszek to help develop the work for Iraq growers benefits.

I have listed some publications regarding our current work.

When did you, or when are you, expecting to receive confirmation of your PhD?

02 October 2018

Co-Applicant Career History

Please list all of your appointments since your PhD and the dates in reverse chronological order, stating if part-time (and percentage part-time) when necessary.

2018 – present) senior lecturer at Plant Protection Dep. Agriculture college, Kerbala University, Iraq.

(2014 – 2018) undergraduate demonstration in the following practical modules at the School of Natural and Environmental

Sciences/ Newcastle University:

- Evolutionary and Population Genetics
- Animal Kingdom
- Field Identification Skills
- Molecular Evolution and Systematics • Crop Pests
- Microbiology 1

(2013 – 2018) School of Biology, Newcastle University as a PhD candidate with the project titled

((Population genetic

structure and symbionts of whitefly *Trialeurodes vaporariorum* and *Bemisia tabaci* (Hemiptera:

Aleyrodidae), in the UK and

Iraq)). My research interest to use some molecular approach such as mtDNA and Microsatellite markers to assess genetic

diversity and population genetic structure of whitefly species. Also using markers based on PCR to detect the obligate and

facultative maternally inherited endosymbionts based on PCR. <http://www.ncl.ac.uk/biology/postgraduate/research>

/phd-projects/kareem/

(2011 – 2012) Deputy of Dean Agriculture College/ Kerbala University

(2005 – 2011) Academic staff and member of the scientific council in the Plant Protection Department - Agriculture College/

Kerbala University. Working with a large University teaching students wishing to achieve a degree in their chosen field. My

role required met to produce detailed lesson and work with a specific curriculum to gain the following:

Principles of Entomology.

- Structure & Insect Taxonomy. • Insect Physiology. • Economic Insects
- Bee Breeding.
- Biological Control.

Impact of Covid-19

The Society appreciates that the impact of the coronavirus pandemic on researchers and their work will be varied. Please provide a summary of how the pandemic has affected your research activities. (500 words max)

The pandemic has affected access to the Lab and survey collection. During that time I am spending time reading and writing the paper research on previous results of my research. I was working at home and created my lab to doing so practical work by identifying the insect and photographing them.

Co-Applicant Qualifications

Please list all your qualifications in reverse chronological order.

Faculty of Agriculture - University of Kerbala 2005- 2013

Newcastle University: Newcastle upon Tyne

2014-05-08 to 2018-10-02 | PhD (School of Natural and Environmental Sciences)

Assistant Professor in Entomology

Plant Protection Dept. Faculty of Agriculture , University of Kerbala, Karbala Iraq
2018- until now

List your Key and/or Relevant Publications

DIVERSITY OF PARASITIC WASPS (INSECTA: HYMENOPTERA) IN THE SHOMALI SUB-DISTRICT OF BABYLON GOVERNORATE, IRAQ
International Journal of Agricultural and Statistical Sciences
2021 | journal-article

First report of the parasitoid wasp *Platygaster oebalus* (Hymenoptera: Platygasteridae) from Iraq
IOP Conference Series: Earth and Environmental Science
2020 | conference-paper

New record of *Dichrogaster modesta* (Gravenhorst, 1829) (hymenoptera: Ichneumonidae: Cryptinae) in Iraq
Ecology, Environment and Conservation
2020 | journal-article

Reporting *Synechocryptus bovei* (Brullé, 1846) (Hymenoptera: Ichneumonidae: Cryptinae) first time in Iraq
IOP Conference Series: Earth and Environmental Science
2020 | conference-paper

New report of Hoverfly parasite *Diplazon laetatorius* (Fabricius, 1781) (Ichneumonidae - Hymenoptera) from Iraq
IOP Conference Series: Earth and Environmental Science
2019 | conference-paper

Section 6 - Research Proposal

Title

Please give the full title of your research proposal.

Biodiversity of ecosystem service providers - pollinators and parasitoids in Iraq

Start Date

Please enter the proposed start date for your research

10 March 2023

End Date

Please enter the proposed end date for your research

07 March 2025

Host Organisation

Please select the organisation where the award will be held from the drop down list below.

Natural History Museum

Subject Group

Subject Area RS

Please select one or more subject area(s) that most clearly defines the research area of the research proposal from the subject sub-category list below.

- Ecology (incl. behavioural ecology)
- Taxonomy and Systematics
- Agricultural Science
- Entomology

Abstract

Please provide a scientific summary of your proposal. This should be a summary of the proposed research, briefly outlining the background and summarising the aims of your project

Pollinators and parasitoids represent two critical ecosystem service providers that need to be understood if essential reforms in agricultural practices are to be implemented. Enhancing the roles of both reduces our reliance on artificial inputs into agricultural production, such as fertilisers and pesticides. Our extensive knowledge of European species, especially pollinators, is enabling the development of sustainable practices, including regenerative agriculture, in which their roles are crucial. The same is true for parts of Asia, but in the Middle East, including Iraq, very little is known about pollinator species composition and activity, and almost nothing about parasitoids.

The project proposes to focus on surveying the 3 main bioclimatic regions: i.e. the Mediterranean (in terms of climate) northeast, the marsh delta in the south, and the central arid to semiarid lowlands, including Karbala. Extensive collecting will be undertaken over a single season using Malaise and yellow pan traps for continuous monitoring, a tried and tested method for collecting large numbers of day-flying insects. Sweep nets have been used successfully to collect both target groups, including one specially adapted to collect very large numbers of parasitoids in a comparatively short time (i.e. 1000s over a 30 minute period when abundant). Pollinators will also be collected directly from plants visited, and their degree of plant specificity will be monitored, at least to the oligolectic vs polylectic level. Parasitoid collecting will be supplemented by rearing from hosts, especially when these are agricultural pests, using emergence cages used successfully in 2 completed projects on which the UK applicant was PI and Co-I respectively (Darwin Initiative on scale insect pest in Kenya; Gates Foundation African Cassava Whitefly Project). Iraqi scientists will be trained in the entire workflow from field collection using all techniques described, as well as specimen preparation, preservation and identification to the appropriate level. DNA barcoding will be undertaken routinely at the BOLD facility in Guelph (Canadian Centre for DNA Barcoding - CCDB). The UK applicant has recently successfully barcoded several 100 pollinator species from Oman, UAE and Ethiopia in collaboration with CCDB.

Specimens will be identified at the Natural History Museum, London, University of Kerbala, and by external specialists. High-quality images will be prepared of identified specimens.

Species-level data on identity, distribution, host and/or host plant, DNA data and high-quality images will be deposited in the CCDB-BOLD database, open access.

These data will facilitate the development of sustainable agricultural production system in Iraq.

Lay Summary

Pollinators are well-known as being necessary for the production of almost half of our food crops. Typical examples are bees. Parasitoids are less well-known. They resemble parasites in living off other animal or plants, but differ from them by always killing the thing they live on (the "host"). Parasitoids are also very important for food production because the insects they kill include many important crop pests. When we can identify and understand the roles of pollinators and parasitoids we can start to develop environmentally-friendly ways of crop production. At the same time we can reduce the input of fertilisers and pesticides which harm the environment.

In Iraq, and in the Middle East generally, very little is known about both groups. This project aims to fill that knowledge gap by extensive surveys, collecting and observing pollinators and parasitoids in 3 very different areas of Iraq: the cooler and greener northeast, the marsh delta in the south, and the dry central area. We will collect during an entire season, with some collecting methods (traps) running continuously. Specimens will be identified by experts at the Natural History Museum in London, University of Kerbala, and by external specialists. DNA sequences will also be collected - these often help with identifying species that are difficult to separate from each other. Finally, high-quality photographs will also be made for each species.

All this information will be made publicly available so that in the future, those developing environmentally-friendly methods of crop production can use this major resource.

Research Proposal

Please provide details of your research proposal in the field below.

Introduction.

The aim of this project is to start to fill the very extensive gaps that currently exist in our knowledge and understanding of two major ecosystem service providers in Iraq, and by extension the Middle East.

Pollinators and parasitoids are critical for food security and environmental health in all terrestrial ecosystems, and especially agroecosystems.

Given the exploratory nature of this task, a qualitative fact-finding project is proposed. Data gathering will be based on field surveys, which while representing snapshots of organismal biodiversity, will also provide both a baseline for future comparative studies, as well as national and regional biogeographic data.

Methods.

The starting point of this study will be the collection of the target insect groups using the most advanced and effective techniques currently available. These methods have been tried and tested by the UK applicant for decades, and shown to be highly effective in a wide range of terrestrial habitats, both natural and modified.

Several methods are effective for the collection of both target groups, and these include Malaise and yellow pan traps. Screen-sweeping and rearing from hosts are most effective for parasitoids, with the latter having the major benefit of providing at least some biological data. Hand net capture of pollinators most often provides at least a record of flower visitation, even when this does not always equate to actual pollination. Malaise trapping has the advantage of continuous collection, with the minimum of servicing, and with the latter requiring minimal technical expertise, which can therefore be done remotely.

Host-rearing of parasitoids can be carried out effectively utilising rearing units used recently during a Gates Foundation project on whiteflies and their parasitoids (<https://cassava.nri.org/projects/38-african-cassava-whitefly-outbreak-causes-and-sustainable-solutions>), as well as recent training in Kenya.

Suitable collection sites have been identified close to Kerbala (local host institute) as well as in the southern marsh region (collaboration with Univ. Basra), and in the Sulaimania region of Iraqi Kurdistan.

Outputs.

In Iraq, and in the Middle East generally, very little is known about both groups. This project aims to fill that knowledge gap by extensive surveys, collecting and observing pollinators and parasitoids in 3 very different areas of Iraq: the cooler and greener northeast, the marsh delta in the south, and the dry central area. We will collect during an entire season, with some collecting methods (traps) running continuously. Specimens will be identified by experts at the Natural History Museum in London, University of Kerbala, and by external specialists. DNA sequences will also be collected - these often help with identifying species that are difficult to separate from each other. Finally, high-quality photographs will also be made for each species.

All this information will be made publicly available so that in the future, those developing environmentally-friendly methods of crop production can use this major resource.

Participants

List other project participants from both teams, their current academic role/post and why you wish to include them on the project.

Dr Joseph Monks

Academic post: Permanent full-time curator of Hymenoptera at Natural History Museum, London.

Specialism: Bees of the Middle East and Africa.

Dr Michael Geiser

Academic post: Permanent full-time curator of Coleoptera at Natural History Museum, London.

Specialism: Beetles of the Middle East, Asia and Africa.

Mr Raad K. Aljaafari MSc

Academic post: Researcher, Univ. Kerbala.

Specialism: Plant protection

Sienaa Al-Zurfi

Academic post: Researcher, Univ. Kerbala.

Specialism: Plant protection

Benefits to individuals/institution

Please describe clearly the planned outcomes and any potential benefits that will result from the proposed collaboration for you, the co-applicant and the respective organisations.

The project outcomes will complement the UK PI's developing expertise on Middle East (ME) parasitoids and pollinators. This in turn will facilitate the development of future agroecosystem-specific management strategies for the ME region.

The Natural History Museum in London will thereby be recognised as a centre of expertise in this critical research area, enabling future funding from a range of national and international sources.

The co-applicant (Iraq), his team and University of Kerbala will become established as national and regional authorities on ecosystem service providers. This will facilitate financial and other support for future research in the subject area.

A basis of collaboration between NHM, University of Kerbala and other Iraqi partners could attract longer-term support from international partners such as FAO and CGIAR institutes.

Benefits to UK

Describe any potential benefits to the UK, and UK research that will result from the proposed research.

The UK Natural History Museum will benefit directly from the expansion of its ME reference collection of economically important insects.

The global goodwill generated by a major collaboration between a leading UK research organisation and a leading Iraqi university (and its Iraqi partner institutes) will go a substantial way to improve international relations between UK, Iraq and the region.

Benefits to Overseas Country/ Territory

Describe any potential benefits to the overseas country/territory and/or country of origin that will result from the proposed research.

Iraq and the ME region will benefit directly from the data generated by the project. Information regarding parasitoids and pollinators will feed directly into crop management programmes based on the sustainable integration of natural enemies and pollinators, encouraging the avoidance of artificial inputs, especially pesticides.

Section 7 - Data Management and Data Sharing

Outline of Data Management and Data Sharing Plan

If the proposed research will generate data that is of significant value to the research community, then please provide details of your data management and sharing plan.

The data outputs generated by the project will be of major value to the public, primarily in the ME region, but will be utilised by crop production specialists, farmers and extension workers.

Despite the specialised nature of the data outputs, there is no reason not to have all outputs open-access and publicly available.

Data will be accessible on several mirrored sites that have demonstrated proven longevity.

Fieldwork

Will you be conducting fieldwork as part of your research?

Yes

Fieldwork

Please provide all details of any proposed fieldwork to be carried out. Please ensure you provide details of location, duration and justification for the fieldwork.

Fieldwork will be undertaken throughout the duration of the project. There are currently no restrictions under Iraqi legislation on the collection of insects in agricultural or other areas.

The Natural History Museum has the strictest standards regarding incorporation of specimens into the national collection. All specimens require the minimum of a Material Transfer Agreement signed by authorised parties.

Fieldwork

Please upload documents related to the following (if applicable):

1. Permission

Any mandatory documents that show local support has been assured by way of permission from the government concerned to travel to and work in the country.

2. Collection of specimens

Any mandatory documents that show:

- Specific permission has been obtained from the host country to collect and to export specimens and material
- The director of the museum or other decision makers where these specimens will be deposited has indicated his/her desire or willingness to have such specimens and material.

No Response

Section 8 - Use of Animals in Research

Does your proposal involve the use of animals or animal tissue?

Yes

Does your proposal comply with the Society's Policy and Position statement on the use of animals in research?

Yes

Does your proposal include procedures to be carried out on animals in the UK under the Animals (Scientific Procedures) Act?

No

Does your proposal involve the use of animals or animal tissue outside the UK?

No

Have the following necessary approvals been given by:

- The Home Office (in relation to personal, project and establishment licenses)?
- Animal Welfare and Ethical Review Body?

Not required

If your project involves the use of animals, what would be the severity of the procedures?

Mild

Why is animal use necessary; are there any other possible approaches?

The project's focus is on insects; their collection will be entirely humane.

Please provide details of the animal species and number(s) to be used:

Species	Number
Insect species	1,000

Why is the species/model to be used the most appropriate?

The project's focus is on insects, pest and beneficial.

Experimental Design

As stated above, the series of collection events envisaged constitutes a qualitative experiment, though data will be available for temporally and spatially comparative purposes.

Experimental Design Report

No Response

Do your experiments involve the use of non-human primates?

No

Do your experiments involve the use of cats, dogs and/or equines?

No

Section 9 - Use of Human Participants, Patients and Tissue

Does your proposal involve the use of human participants, patients or tissue?

No

Section 10 - Financial Details

Budget Table

Please define the proposed budget for your project in the table below:

Budget heading		2022 - 2023	Total
Consumables (inc. fieldwork)			
Consumables	Cost	£3,000.00	£3,000.00
	Latest Cost	£3,000.00	£3,000.00
Consumables (inc. fieldwork) Total	Cost	£3,000.00	£3,000.00
	Latest Cost	£3,000.00	£3,000.00
Travel (inc. subsistence)			
Travel (inc. subsistence)	Cost	£7,000.00	£7,000.00
	Latest Cost	£7,000.00	£7,000.00
Travel (inc. subsistence) Total	Cost	£7,000.00	£7,000.00
	Latest Cost	£7,000.00	£7,000.00
Grand Total	Cost	£10,000.00	£10,000.00
	Latest Cost	£10,000.00	£10,000.00

Justification for Consumables (incl. fieldwork)

Please confirm the total value requested for consumables (incl. fieldwork) and provide a full justification for this amount.

We are claiming the maximum £3,000 for consumables in the expectation that very large numbers of specimens will be collected during the project's duration. These will require laboratory processing that includes various reagents, and in certain cases DNA extraction and purification. Costs of DNA sequencing are also included here. Travel and subsistence costs are based on previous Royal Society funded projects, in particular the Megaphragma International Exchange project with University of Naples (JP100330/2010).

Justification for Travel (inc. subsistence)

Please confirm the total requested for Travel (incl. subsistence) and provide a full justification for this amount.

Travel costs (£7,000) have been calculated based on a minimum of 2 field/lab visits by the UK Co-I to Iraq, and a minimum of 2 visits to UK by the Iraq Co-I or one of their team. Visits to London will be timed in order to make NHM guest accommodation available, which is both extremely convenient as well as subsidised, representing a major financial saving compared with equivalent accommodation in central London.

Section 11 - Applicant Declaration

Declaration

I hereby declare that the information provided in this application is true and correct to the best of my knowledge.

Checked

Applicant Name

Andrew Polaszek

Date

26 September 2022
