

ANSO Highlight is to share the new ideas, methodologies, datasets and technologies of sustainability research by summarizing the latest progress and achievements of scientific projects funded by ANSO and ANSO partners. Through this publication, we would like to stimulate active collaboration and communication among ANSO members and partners.

## Research on Ecological Security Assessment and Countermeasures along the China-Mongolia-Russia Corridor in the Belt and Road Region

### Summary

Research on Ecological Security Assessment and Countermeasures along the China-Mongolia-Russia Corridor (CMRC) in the Belt and Road Region is a joint cooperative research project launched by the ANSO in January 2020. The project is led and funded by the International Society of Zoological Sciences (ISZS), cooperating with the Institute of Zoology of the Chinese Academy of Sciences (IOZ/CAS), International Alliance of Protected Areas (IAPA) and its related protected area member organizations (including China, Russia, Mongolia, and Kazakhstan) and relevant institutions of the Russian, Mongolian, and Kazakhstan Academy of Sciences.

**Period:** January 1, 2020-December 31, 2022

**PI:** ZHANG Zhibin

**Contact:** xieyan@ioz.ac.cn

➡ P2-P6

## Investigation and monitoring of agricultural and forestry pests in the interior of Central Asia

### Summary

"Investigation and monitoring of agricultural and forestry pests in the interior of Central Asia" is a joint cooperative research project launched by the ANSO in January 2020. The project is led by the Institute of Zoology, Chinese Academy of Sciences, cooperating with Xinjiang Normal University and relevant institutions of the Uzbekistan, Kazakhstan, Tajikistan Academy of Sciences and Ministry of agriculture and environmental protection of Turkmenistan.

**Period:** January 1, 2020 - December 31, 2022

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➡ P7-P12

# Research on Ecological Security Assessment and Countermeasures along the China-Mongolia-Russia Corridor in the Belt and Road Region

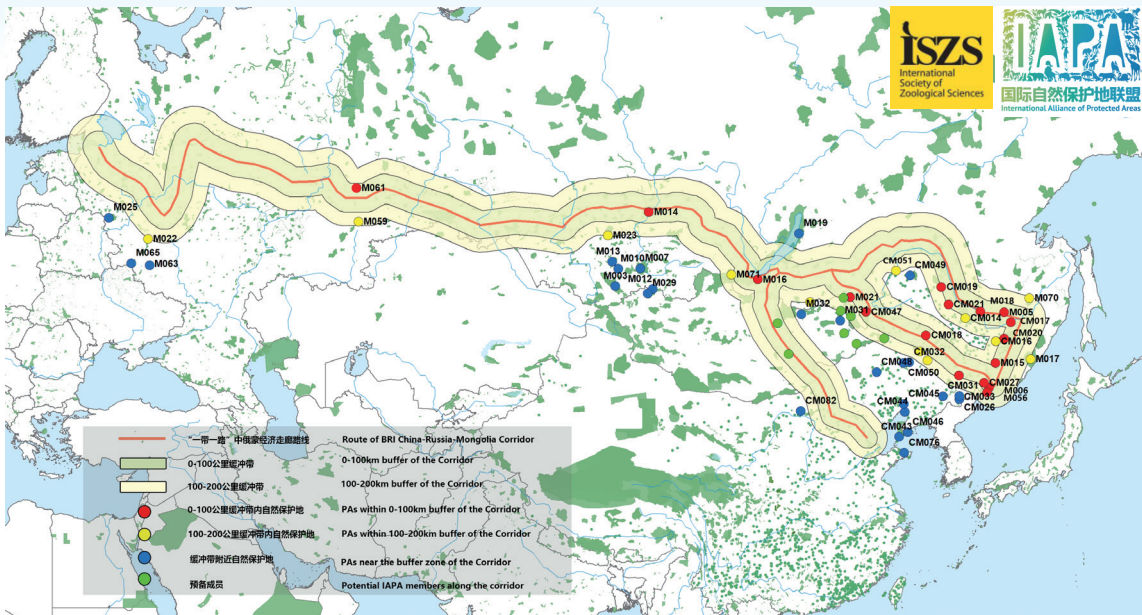
## Objectives

The CMRC Project is to carry out ecological monitoring and biosafety assessment research along the China-Mongolia-Russia Corridor in the Belt and Road (B&R) region. It aims to provide the scientific basis for ecological environment protection and cooperation of countries and regions in the B&R. It will improve local ecological monitoring capabilities, promote the development philosophy and spirit of the Belt and Road Initiative (BRI) and encouraging B&R green development.

## Research Contents

The project will complete the collection of historical information and survey the status of large mammals, birds, small mammals and their relevant diseases in key areas of the CMRC, establish the ecological baseline information database, develop the ecological monitoring standards and assessment system of the CMRC, analyze the potential impact of major B&R projects on its ecological environment and ecological risks, and propose ecological conservation and risk prevention countermeasures and recommendations.





国家 Country	Code	成员单位	Organization
俄罗斯 Russia	M005	巴斯托克国家自然保护区	Bastak State Nature Reserve
	M006	豹地国家公园	Land of the Leopard National Park
	M014	斯图比自然保护区	Stobiy National Reserve
	M015	汗凯斯基国家自然生物圈保护区	Khankaiskiy State Nature Biosphere Reserve
	M016	贝加尔湖国家自然生物圈保护区	Baikal'skiy State Nature Biosphere Reserve
	M018	兴安斯基国家自然保护区	Khinganskiy State Nature Reserve
	M021	达尔斯基国家自然生物圈保护区	Daur'skiy State Nature Biosphere Reserve
	M056	远东海洋国家自然生物圈保护区	Far Eastern Marine State Biosphere Nature Reserve
	M061	斯维尔德洛夫斯克生物圈保护区	Vitim'skiy Biosphere Reserve
	M011	索霍林斯基国家自然生物圈保护区	Sokhondinskiy State Nature Biosphere Reserve
	M017	穆霍特利国家自然生物圈保护区	Sikhote-Alin State Nature Biosphere Reserve
	M022	乌布拉克国家公园	Uyru National Park
	M023	库兹涅茨阿拉套国家自然保护区	Kuznetskiy Altai State Nature Reserve
	M059	塔甘纳国家公园	Taganay National Park
	M070	扎波德诺耶普里莫列国家自然保护区	State Natural Protected Areas in Zapovednoye Primurie
	M061	斯维尔德洛夫斯克生物圈保护区	Vitim'skiy Biosphere Reserve
	M071	通金斯基国家公园	Tunkinskiy National Park
	M013	萨卢格斯基国家公园	Sailugenskiy National Park
蒙古国 Mongolia	M019	巴古尔斯基国家自然保护区	Barguzinskiy State Nature Biosphere Reserve
	M025	斯摩棱斯克国家公园	Smolensk Lakeland National Park
	M063	中央切尔诺泽姆生物圈保护区	Central Chernozem Nature Biosphere Reserve
	M010	哈卡斯国家自然生物圈保护区	Khakasskiy State Nature Biosphere Reserve
	M007	伊亚斯-舒申斯基国家自然生物圈保护区	Sayano-Shushenskiy State Nature Biosphere Reserve
	M003	阿尔泰斯基国家自然生物圈保护区	Altayskiy State Nature Biosphere Reserve
	M012	乌布拉克国家公园	Uyru National Park
	M065	厄鲁斯-德斯尼亚斯科-波列西耶生物圈保护区	Nerusso-Desnianskoe-Polesie Biosphere Reserve
	M031	东方省国家特别保护区	Dornod State Special Protected Areas
	M032	鄂嫩-巴鲁吉国家公园	Onon-Baj National Park
	M029	乌布拉克特别保护区	Uvs Basin Specially Protected Areas
	*	伊赫特自然保护区	Ikh Nart Nature Reserve
	*	特吉国家公园	Gorkhi-Terelj National Park
	*	博格德汗特别保护区	Choinir Bogd Nature Reserve
	*	伊赫加兹林山自然保护区	Ikh Gazrin Chuluu Nature Reserve
	*	博格德汗特别保护区	Bogd Khan Special Protected Areas
	*	胡斯泰国家公园	Khustai National Park
	*	"图吉因纳尔斯"自然纪念碑	"Tuijin nars" Natural Monument
	*	努姆鲁格特别保护区	Numrug Special Protected Areas

国家 Country	Code	成员单位	Organization
中国 China	CM017	黑龙江八岔岛国家级自然保护区	Heilongjiang Bacha Island National Nature Reserve
	CM018	黑龙江扎龙国家级自然保护区	Heilongjiang Zhalong National Nature Reserve
	CM019	黑龙江中央站黑鹳和鸿雁国家级自然保护区	Heilongjiang Central Station Spotted Capercaillie National Nature Reserve
	CM020	黑龙江纳尔河国家级自然保护区	Heilongjiang Naoli River National Nature Reserve
	CM021	黑龙江胜力河国家级自然保护区	Heilongjiang Shengli National Nature Reserve
	CM027	吉林汪清国家级自然保护区	Jilin Wangqing National Nature Reserve
	CM030	吉林黄泥河国家级自然保护区	Jilin Huangni River National Nature Reserve
	CM047	内蒙古呼伦湖国家级自然保护区	Inner Mongolia Hulun Lake National Nature Reserve
	CM051	内蒙古额尔古纳国家级自然保护区	Inner Mongolia Erguna National Nature Reserve
	CM014	黑龙江草街湿地国家级自然保护区	Heilongjiang Cuibei Wetland Provincial Nature Reserve
	CM015	黑龙江丰林国家级自然保护区	Heilongjiang Fenglin National Nature Reserve
	CM016	黑龙江宝清七星河国家级自然保护区	Heilongjiang Baqing Qixinghe National Nature Reserve
	CM028	吉林查干湖国家级自然保护区	Jilin Chagan Lake National Nature Reserve
	CM029	吉林莫莫格国家级自然保护区	Jilin Momoge National Nature Reserve
	CM026	吉林长白山国家级自然保护区	Jilin Changbai Mountain National Nature Reserve
	CM032	吉林向海国家级自然保护区	Jilin Xianghai National Nature Reserve
	CM033	吉林图们国家级自然保护区	Jilin Tumen National Nature Reserve
	CM049	内蒙古大兴安岭汗马国家级自然保护区	Inner Mongolia Da Hinggan Ling Hanma National Nature Reserve
中国 China	CM050	内蒙古科尔沁国家级自然保护区	Inner Mongolia Horqin National Nature Reserve
	CM031	吉林哈达岭国家级自然保护区	Jilin Hada National Nature Reserve
	CM082	内蒙古大青山国家级自然保护区	Inner Mongolia Daqingshan National Nature Reserve
	CM043	辽宁蛇岛老铁山国家级自然保护区	Liaoning Snake Island-Laotieshan National Nature Reserve
	CM044	辽宁河口门国家级自然保护区	Liaoning Liaohekou National Nature Reserve
	CM045	辽宁乐东国家级自然保护区	Liaoning Yulwushan National Nature Reserve
	CM046	大连旅顺口区国家级自然保护区	Dalian Chengshantou Coastal Landform National Nature Reserve
	CM048	内蒙古善马山国家级自然保护区	Inner Mongolia Saihan Wula National Nature Reserve
中国 China	CM076	山东昆嵛山国家级自然保护区	Shandong Kunyushan National Reserve

Project Site: China-Mongolia-Russia Corridor of BRI

## Main Progress

Established a preliminary ecological security cooperation network along the China-Mongolia-Russia Corridor. There are 64 protected areas (PAs), and 12 scientific research institutions are included in the network, which strengthened the communication among trans-boundary PAs.

Held five international workshops and training meetings to promote communication, cooperation and related monitoring technology sharing among the countries.

Established preliminary ecological baseline databases of the CMRC region, collected relevant information on the project area, especially the temporal and spatial data of 25 key species, and provided the basis for compiling the Ecological, Social and Development Report of the China-Mongolia-Russia Corridor.

Carried out a field survey in Inner Mongolia and surrounding grasslands for animal species distributed along the China-Mongolia-Russia Corridor. These works have provided a large amount of first-hand information.

Compiled three reports with recommendations on three aspects along the China-Mongolia-Russia Corridor: ecological security, trans-boundary cooperation among PAs, and biological disaster prevention and control.

## Highlights

Established a regional ecological information database of the China-Mongolia-Russia Corridor, compiled recommendation reports on ecological security to promote trans-boundary conservation and biological disaster prevention and control.

A symposium on the theme of Research on Ecological Security Assessment and Countermeasures along the China-Mongolia-Russia Corridor in the Belt and Road Region was held on 20 September 2020 in Changbai Mountain with over 190 onsite and over 100 online participants. The symposium promoted the implementation of the CMRC project.

## Future plans

Establish and improve an ecological monitoring system, formulate a specification of cooperation in ecological monitoring, and establish monitoring capacity.

Continue to promote exchanges and cooperation among transnational nature reserves and hold international symposiums and training meetings.

Carry out data collection, develop transnational field work, establish basic database of ecological information of the CMRC region.

Submit suggestions of ecological security and risk prevention to government departments of the four countries (China, Russia, Mongolia and Kazakhstan).

regional ecological

information database

ecological security

trans-boundary conservation and  
biological disaster prevention and control



## Publication

Article: From ecological barrier to biosafety -- Taking the cross-border cooperation between China, Mongolia and Russia as an example. ZHANG Zhibin, XIE Yan. *Man and biosphere*, 2021 (127) 67-71.

ANSO Innovation Development Report. XIE Yan, JIANG Guangshun, ZHANG Lixun, BI Junhuai, LI Weidong, LIU Songtao. *Countermeasures and Recommendations for Transboundary Cooperation on Protected Areas along Northern Border of China. The B&R Innovative Development Report*. Beijing: Science Press of China, 2021, 201-208.

Research report: Report on Ecology, Society and Development of China Mongolia Russia Economic Corridor. LI Xinhai, XIE Yan, WAN Xinru, Yansanjav Adiya, Gansukh Sukhchuluun, Viatcheslav Rozhnov, Valery Neronov, ZHOU Tingting, SHI Jinsong.

Consultation report: Implementation plan for the construction project of Balhu Gazelle Autonomous Region Nature Reserve in Inner Mongolia. BI Junhuai.

Consultation report: Inner Mongolia Plague Gerbils Epidemic Analysis Report. JU Cheng, WAN Xinru, ZHANG Zhibin.



ANSO project meetings



Photos of field work in Inner Mongolia





## Principal Investigator

### ZHANG Zhibin, Professor

ZHANG Zhibin is a Professor from the Institute of Zoology, Chinese Academy of Sciences (CAS). He obtained the B.S. degree of Zoology in the Lanzhou University in 1984, and the Ph.D degree of Animal Ecology, CAS in 1989. He was elected as the foreign member of Norwegian Academy of Science and Letters in 2014, and member of Academy of Europe (Academia Europaea) in 2017. He is now the President of International Society of Zoological Sciences (ISZS) and Editor-in-Chief of Integrative Zoology.

His research interests focus on studying impacts of global change on population and community dynamics of animals and their interactions with plants and microbes by integrating the ecological studies from local to global scale, and from monotonic to non-monotonic regimes.

# Investigation and monitoring of agricultural and forestry pests in the interior of Central Asia

## Objectives

As an important region of the Belt and Road Initiative, Central Asia has a very close relationship with China. The biota is both similar to and different from that of China, which has a significant impact on our country's neighboring biosafety and foreign economic and trade cooperation. Relying on the Belt and Road Animal Resources and Sustainable Utilization Alliance, this project aims to organize a targeted survey of agricultural and forestry pest resources, to determine the composition and fauna of agricultural and forestry pests in the hinterland of Central Asia, and to develop a database of agricultural and forestry pests in this area. The project will also build a rapid species identification platform based on DNA barcode technology, as well as a monitoring network for important pests. The project aims further to export targeted "green" prevention and control equipment and products, to organize relevant professional knowledge and special technical training meetings to encourage young scientists and technology teams dedicated to the monitoring and prevention of pests in agriculture and forestry, and to attract leading scholars to China for exchange visits and cooperative research, in order to build a cooperative research network for monitoring agricultural and forestry pest in Central Asian.

## Methodology

We conduct pest resources surveys in partner countries, collect specimens and integrate sample information, establish a Central Asian agricultural and forestry pest database and

a DNA barcode standard sequence library to achieve rapid identification of species; build up a pest monitoring network to provide a basis for formulating control strategies. The Chinese side will provide green prevention and control technologies and comprehensive management optimization measures for partner countries, and conduct professional technical training, academic exchanges and personnel training in various fields, such as specimen collection, species identification, and pest monitoring methods.



## Main progress

Through a field survey of agricultural pest resources, more than 12,000 specimens of various agricultural pests have been collected; 17,000 specimens have been systematically sorted, and 1,680 DNA barcode sequences of more than 160 pest species have been obtained. The Central Asia Agriculture Pest specimen library, the basic database of pest species of the Belt and Road Region and the rapid identification platform of DNA barcode have been initially established. The Chinese and English versions of the e-book "Agricultural Pests in the B&R Region in Central and East Asia" has been compiled. A monitoring network composed of equipment and products based on the suction tower, entomological radar, sex attractants, etc. has been built, and part of the monitoring data has become an important basis for forecasting, field prevention and control of cross-border migratory locusts on the border between China and Kazakhstan. Operating procedures for monitoring, prevention and control equipment have been provided for three major pests for organic vegetables, greenhouse crops, and fruit trees, as well as lists and instructions for the three major categories of green prevention and control products. A Chinese-English bilingual agricultural pest information platform (Insect Pest Information Platform, <http://www.insectpestip.net>) was built. Information on the management of 406 species of pest in 83 families and 8 orders can be accessed at any time. Training services have been provided on the use of green prevention and control products and equipment, as well as corresponding English standards and operating instructions for cooperating countries.

12000

specimens of  
various agricultural pests

17000

160

pest species

1680  
DNA

barcode sequences



## Highlights

More than 12,000 new specimens of various agricultural pests were collected; 17,000 specimens were systematically sorted, and 1,680 DNA barcode sequences of more than 160 pests were obtained; a specimen library of agricultural pests in Central Asia, a basic species database, and a rapid identification platform of DNA barcodes were established; and "Agricultural Insect Information Platform" in both Chinese and English has been built, providing information on 406 species of agricultural pests distributed in the Belt and Road of Central and Eastern Asia; 3 sets of integrated technologies for the prevention and monitoring of organic vegetables, greenhouse crops, and fruit tree pests and 4 green technology operating procedures have been formed; product lists and instructions for use have been developed; training has been provided for young scientists in partner countries, of whom currently 7 students are studying in China.

## Future Plan

We plan to guide collaborators to carry out online resource survey specimen sorting and identification remotely in their own country; to continue to obtain important pest DNA barcode sequences, and further to improve the rapid identification system; to improve the monitoring system for migratory insects based on suction trap and insect radar; and to carry out timely biological control of important lepidopteran pests in the experimental bases selected by the partner countries based on the monitoring results of sex attractants. We also will continue to instruct foreign students from the partner countries to carry out scientific research and training, particularly for young technical scientists for foreign countries mainly through online methods.

## Agricultural Insect Information Platform



## Publication and IP

Book:

CY Jiang, RZ Zhang. 2020. Insects and spiders in Uzbekistan. Wuhan: Hubei Science and Technology Press. 2020139834 978-7-5352-9555-2

E-Book: (Chinese and English bilingual)

Institute of Zoology, Chinese Academy of Sciences, Fujian Agriculture and Forestry University. 2021. Agricultural insect pests in the Belt and Road areas in East-Central Asia.

J Chen, ZX Li, LY Jiang, GX Qiao\*. 2021. *Glyphochaitophorus*, a new genus of Chaitophorinae (Hemiptera: Aphididae) from China. Zootaxa, 4975(3): 581-591.

TY Liu, J Chen, \* LY Jiang, GX Qiao\*. 2020. Phylogeny and species reassessment of *Hyalopterus* (Aphididae, Aphidinae). Zool. Scripta, 49: 755-767.

P He, J Chen, HZ Kong, L Cai, GX Qiao\*. 2021. Important supporting role of biological specimen in biodiversity conservation and research. Bulletin of the Chinese Academy of Sciences, 36(4): 425-435. Invention patent:

A method for counting insect granuloviruses, 2020, ZL201810390398.2, applicants: H Zhang, QL Qin, L Miao, Q Meng, X Li, JH Zhang, GL Zhou, HT Wang, FF Fang, ZQ Feng, XZ Chen.

Invention patent: (applied)

Detection method and Kit for Microsporidium locust by real-time quantitative PCR, 2020, Xinjiang: CN106967834A, special applicants: HX Hu, R Ji, H Wang, TS Fan, F Yu, XH Duan.

Utility model patent:

A wind-suction trap for trapping small pests, 2020, ZL201922158911.8, applicants: JH Zhang, L Miao, HY Li, QL Qin, HT Wang, H Zhang, X Li, GL Zhou, Q Meng.

Software copyright:

DNA barcoding local visualization comparison system V1.0, 2020, 2020SR1920278, applicant: XC Zhu.



The Insect Pest Information Platform (IPIP) [www.insectipio.net/](http://www.insectipio.net/) is a product of a key international collaboration project on insect pest monitoring and control supported by the Ministry of Science & Technology of China (2017-2020). The project includes partners from China, Mongolia, Kazakhstan and Kyrgyzstan. The IPIP aims to provide services in retrieving regional pest species information, releasing pest monitoring data from suction traps, and disseminating pest control approaches in the Belt and Road areas in East-Central Asia.

### IPIP Architecture



Alliance of International Science Organizations (ANSO-CR-KF-2020-04)

### Agricultural insect pests in the Belt and Road areas in East-Central Asia

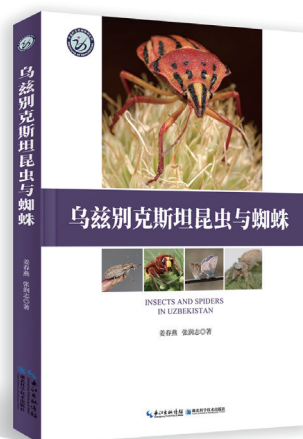
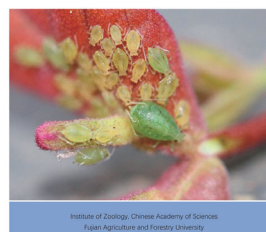


Figure 1 Monograph, Electric Book and Information Platform



Insect specimens from Kazakhstan



Insect specimens from Tajikistan



Insect specimens from Uzbekistan

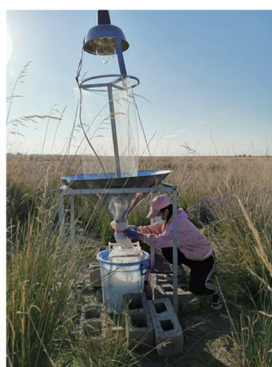
Figure 2 Insect specimens after sorting and preparing (partial)



Figure 3 Surveys in the field and preparing the specimens



Suction Trap in Kazakhstan



Insect trap lamps in the China-Kazakhstan border area

Figure 4 Monitoring equipments in the field







## Principal Investigator

### QIAO Ge-Xia, Professor

Prof. QIAO engages in evolution and ecology of biological diversity and complexity of biological interactions of aphids and other organisms, as well as ecology and control of aphid pests, and focuses on the collection and management of animal specimen resources. She leads teams in Central Asia and Northeast Asia to survey pests in agriculture and forestry, build pest monitoring networks, provide biological control technologies, and conduct technical training for young talents. She is a Committee Member of the Association of Asia-Pacific Entomological Society, Member of Major Systematic Entomology Facilities, President of the 9th International Symposium on Aphids, and Standing Member of The Entomological Society of China, etc. Her awards include National Science Fund for Distinguished Young Scholars, National Outstanding Scientific and Technological Workers, Top Ten Outstanding Women Award of Chinese Academy of Sciences, and Zhou Yao Entomological Taxonomy Fund Award (first prize) etc.

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