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Bird Species Identification

e-Science Application Case in Qinghai Lake Region

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青海湖

戈林初

Outline

- Introduction
- Data collection and database system
- Bird Species identification
- Future work

Qinghai Lake is located at the north-eastern end of the Qinghai-Tibetan Plateau



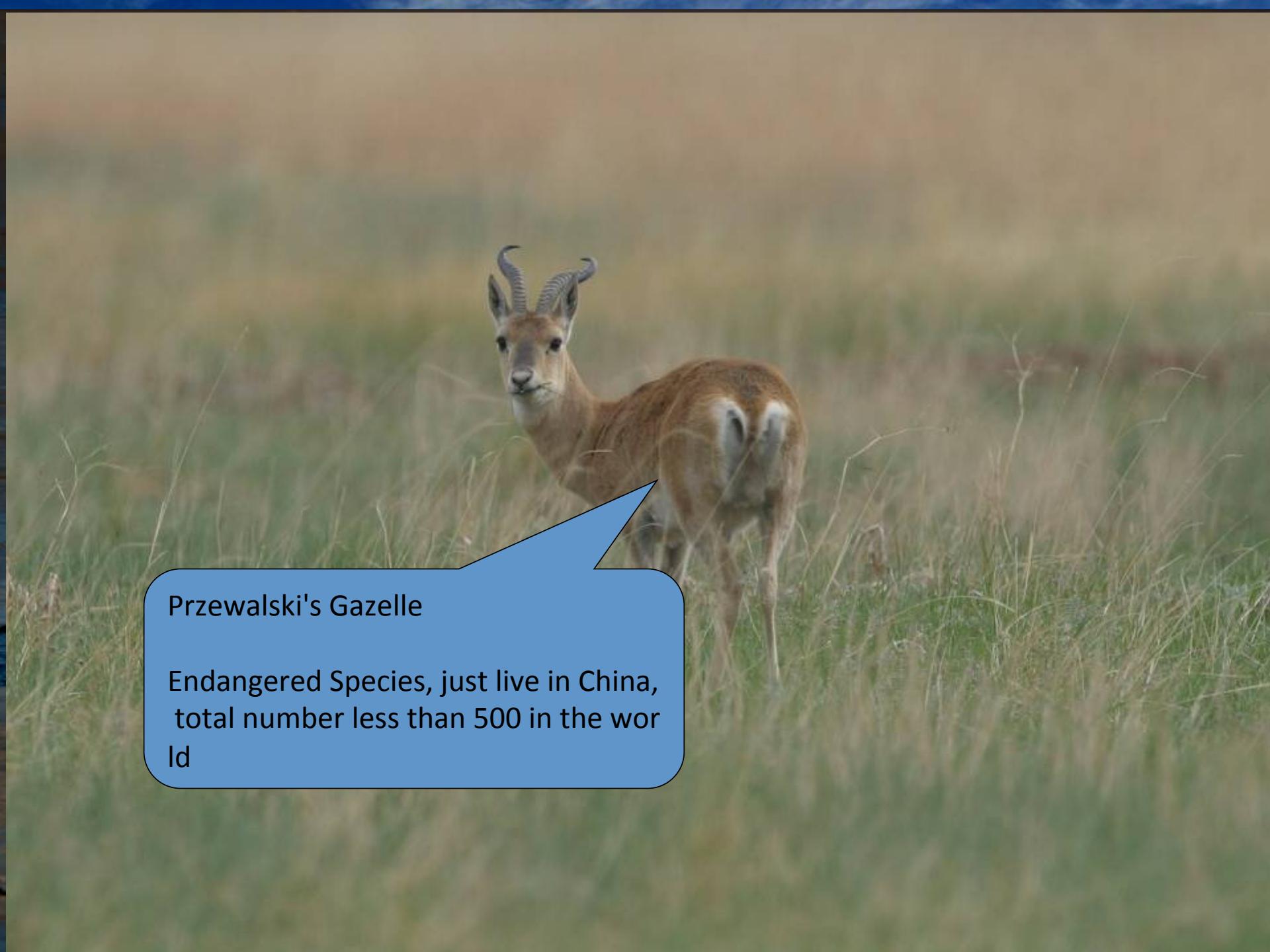
© 2008 NFGIS
© 2008 Europa Technologies
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe

elev 3200 m

2008 Google

36°52'28.73" N 100°15'59.89" E

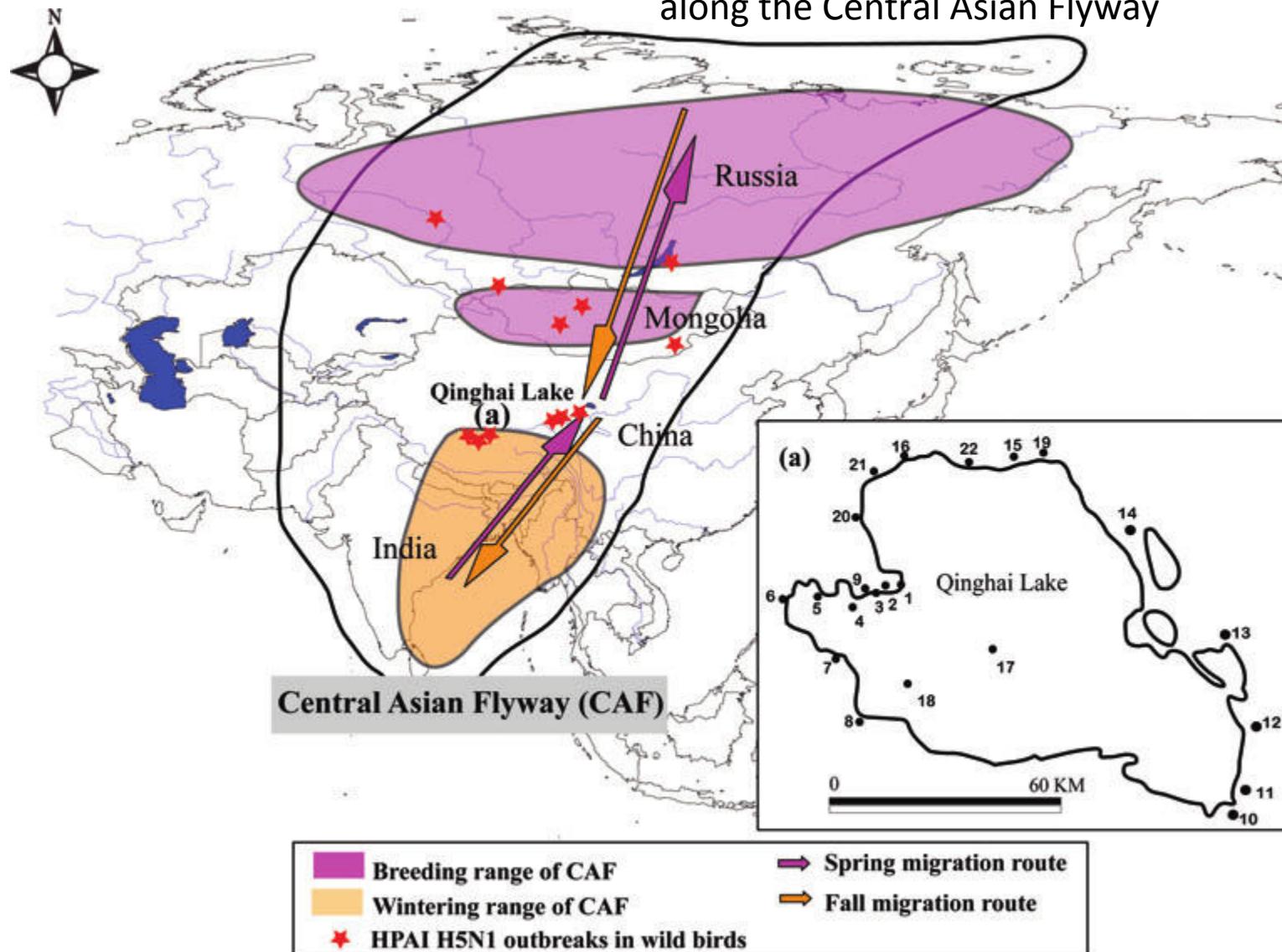
Eye alt 111.35 km

A photograph of a Przewalski's Gazelle standing in a field of tall, golden-brown grass. The gazelle is positioned in the center-right of the frame, facing towards the left. It has a light brown coat, a white patch on its rump, and distinctively curved, spiraling horns. A blue speech bubble is overlaid on the bottom-left side of the image.

Przewalski's Gazelle

Endangered Species, just live in China,
total number less than 500 in the world

Qinghai Lake is one of the most important breeding and stopover sites for migratory birds along the Central Asian Flyway



Location map of Qinghai Lake, including the range of the Central Asian Flyway.

e-Science Application in Qinghai Lake Region



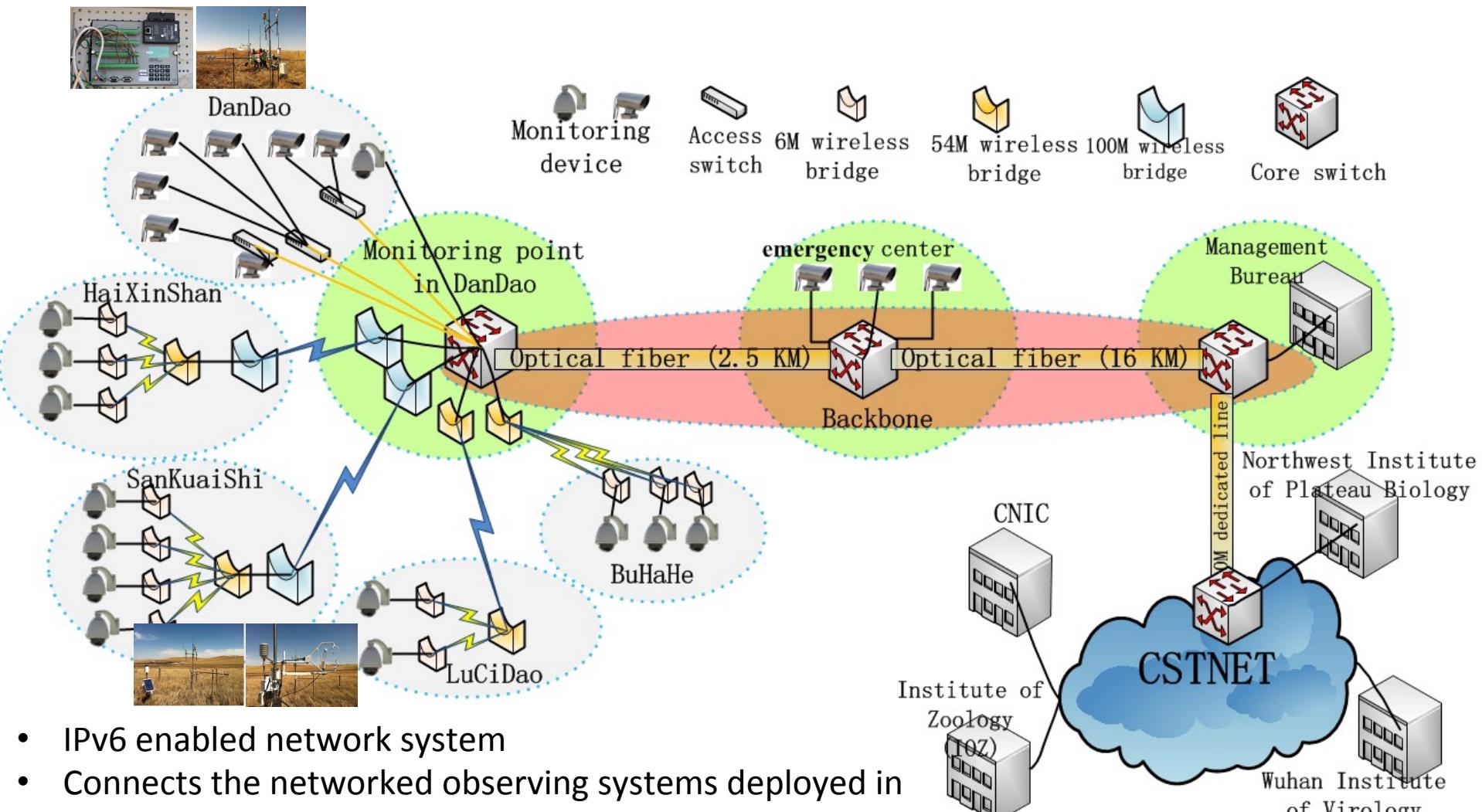
the first e-Science application for supporting ecological protection and research in plateau region, as well as the first application to national nature reserve in China

Joint Research Center of Chinese Academy of Sciences and
Qinghai Lake National Nature Reserve

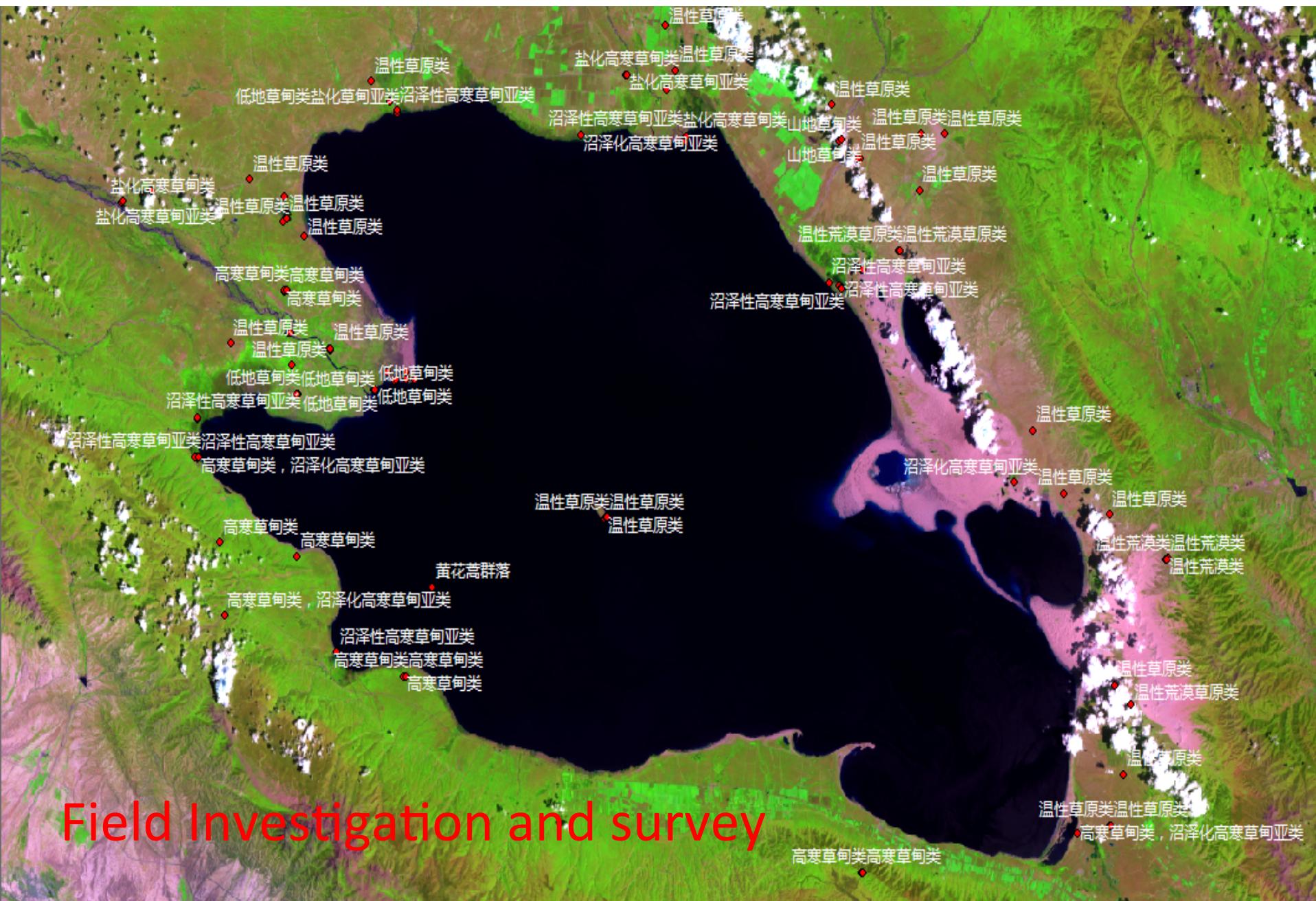
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Network Infrastructure



- IPv6 enabled network system
- Connects the networked observing systems deployed in the core protection area of the QLNNR into CSTNET
- A component of China Next Generation Network (CNGI)



Field Investigation and survey

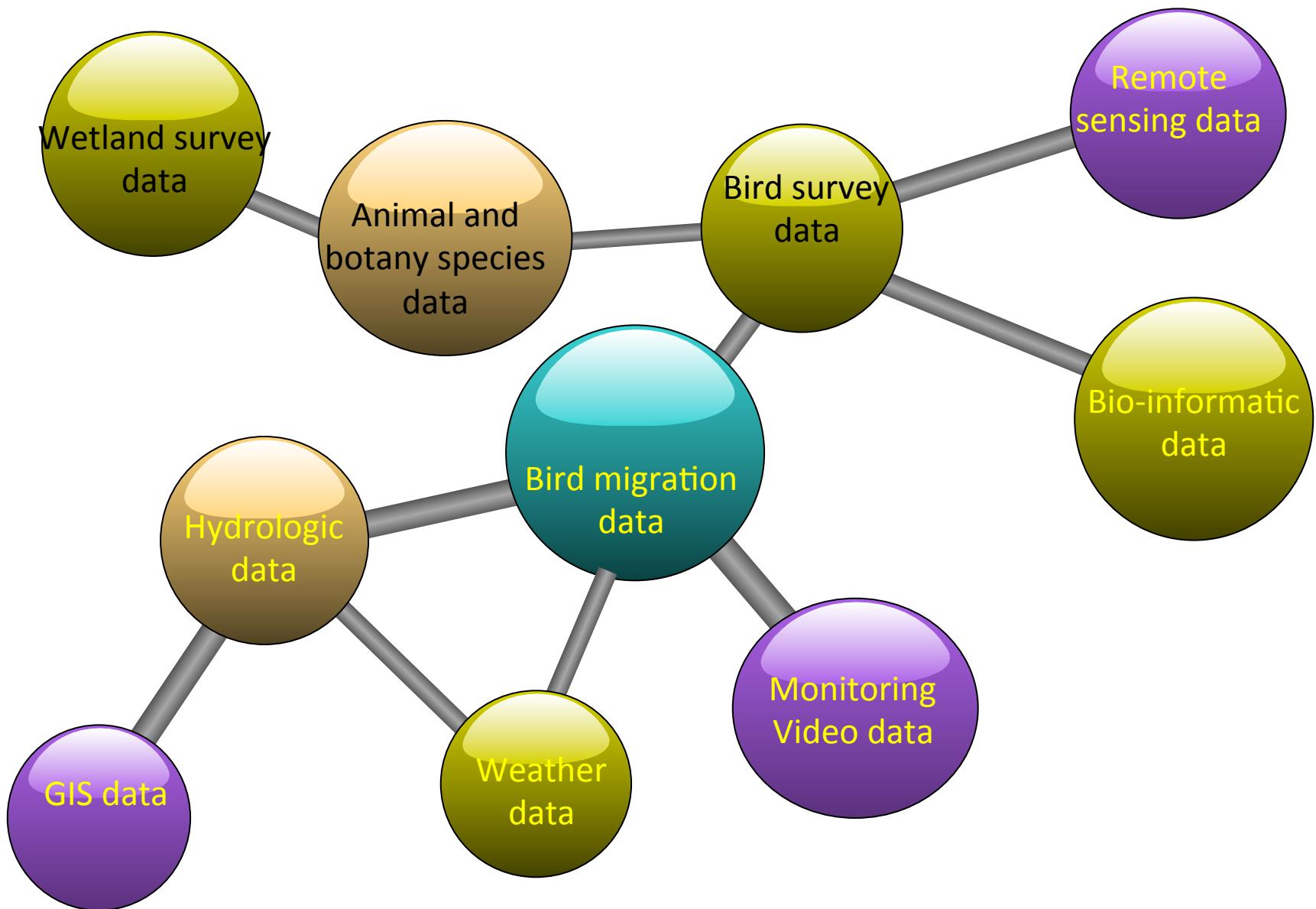


Equipment was programmed to record GPS locations every 2 hours, and the record data were uploaded to the Argos satellite tracking system every 2 days



GPS solar-powered Platform Terminal Transmitters (PTT)

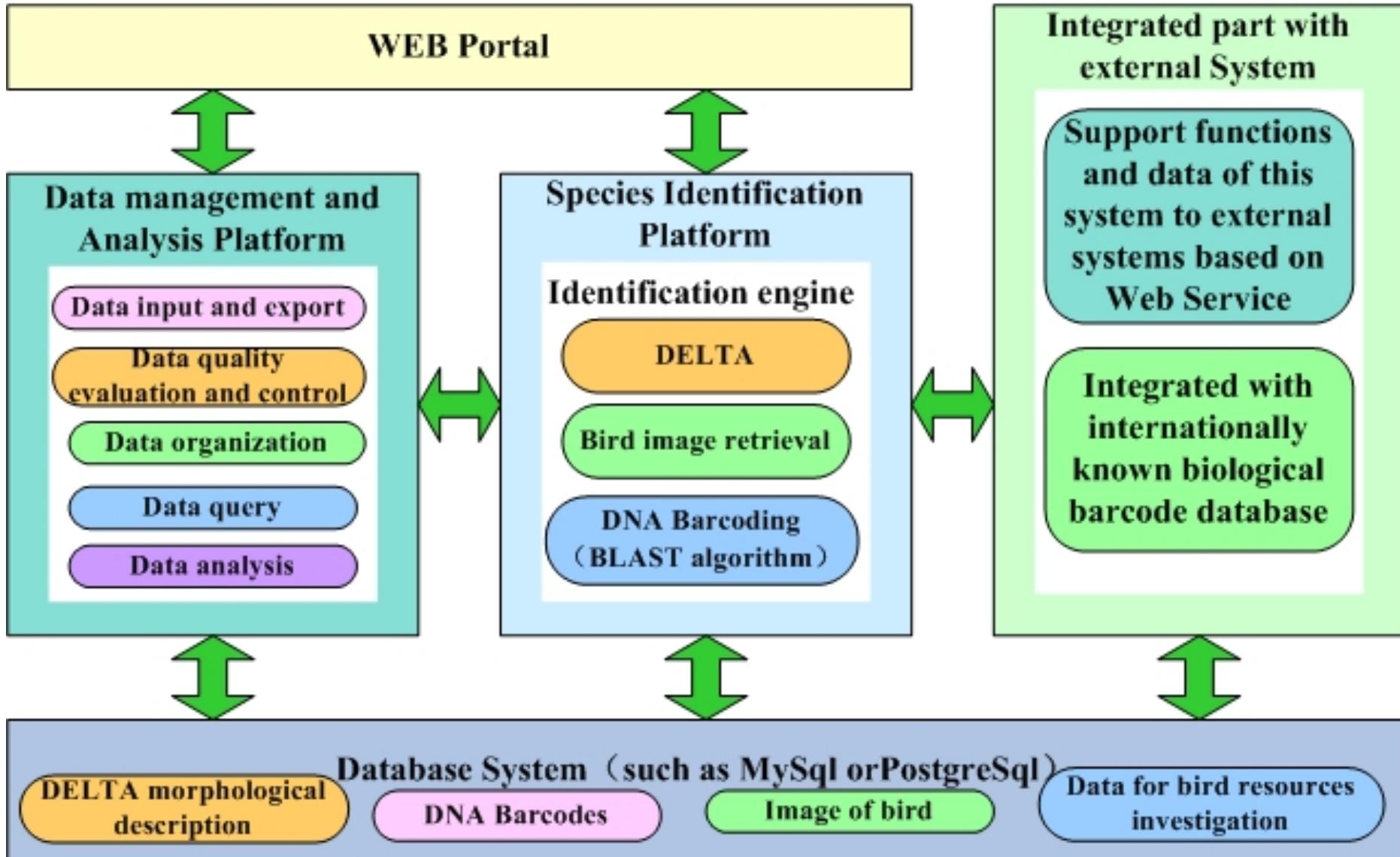




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System Architecture



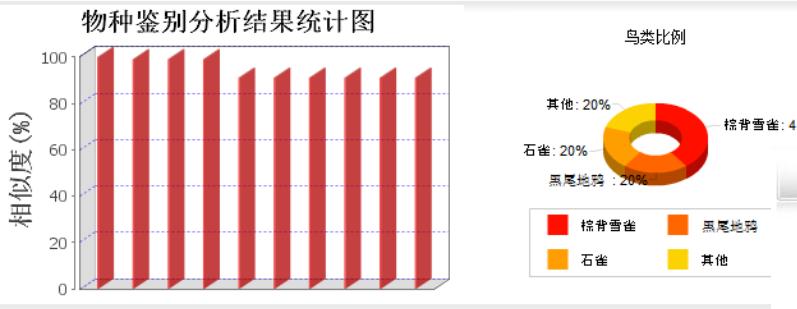
(1) DNA Barcoding

基因序列鉴别

请输入基因序列
（STA格式，>80）：

鉴别结果为：

基因序号	相似度	拉丁文名	中文名	英文名
1590	100%	<i>Montifringilla blanfordi</i>	棕背雪雀	Blanfordi' snow finch



前10条记录					
基因序号	拉丁文名	中文名	英文名	相似度	本词条记录
1590	Montifringilla blanfordi	棕背雪雀	Blanfordi' snow finch	100%	详情
1591	Montifringilla blanfordi	棕背雪雀	Blanfordi' snow finch	99%	详情
1592	Montifringilla blanfordi	棕背雪雀	Blanfordi' snow finch	99%	详情
1593	Montifringilla blanfordi	棕背雪雀	Blanfordi' snow finch	99%	详情
1452	Podoces hendersoni	黑尾地鸦	Mongolian Ground Jay	91%	详情
1451	Petronia petronia	石雀	Rock Petronia	91%	详情
1452	Podoces hendersoni	黑尾地鸦	Mongolian Ground Jay	91%	详情
1451	Petronia petronia	石雀	Rock Petronia	91%	详情
1565	Montifringilla taczankowskii	白腰雪雀	White-rumped Snowfinch	91%	详情
1561	Montifringilla taczankowskii	白腰雪雀	White-rumped Snowfinch	91%	详情

基因序列鉴别

拉丁文名:	中文名字:	英文名字:	
Montifringilla blanfordi	棕背雪雀	Blanford's snow finch	查询BOLD上该物种的详细信息
基因记录ID: 1590 1591 1592 1593 全部详情			
>>>>>> 基因ID为1590的详细数据记录 <<<<<<<			
基因数据记录详细信息			
基因记录ID: 1590	GenBank Accession : FJ624121		
PCR引物1: null	PCR引物1序列: null		
PCR引物2: null	PCR引物2序列: null		
测序引物1: null	测序引物1序列: null		
测序引物2: null	测序引物2序列: null		

总长度: 652 碱基A: 177 碱基C: 198 碱基G: 114 碱基T: 163 未明确: 0
ATAGTAGCTGGCCCTAACATCTTCATCTGGACAGACTGGGACAACTGGGACGCTTCAAGGACGATCAAGTATAACAGTGATCTGCAC
GGCGATCTTCCTGTAATATTCTCTCATGTTACATTAACTTAAATGGGGGGATTGGTAGCTACTGACTGTCTCTTAAATGGGGACCGGGG
ATGGGACATCCCGAAATAACAAACATAGCTTCTGACTTCTCCCTCCCTCCCTCTCTCTCTCTCTCTCTCTCTCTCTCTCTCTCTCT
ACAGGGCTGAACTGATACCCACCTAACACTGGCAACCTGGCCCCACGGGGACGGCTCAGTAGACCTGAATCTCTCTCTCTCTCTCTCT
TCTCTCAATCTTGGTCAATCAACTTATCACACAGCAATCAACATAAAACCTCTGGCCCTCAAGTACCTGAATCTCTCTCTCTCTCTCT
GTAATCT
TTGGACCTGGCAGGGAGGAACGCCATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACAT
TTGACCTGGCAGGGAGGAACGCCATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACATCTACAT

基因条形码样例

基因序列鉴别

(2) Bird image retrieval

组织 新建文件夹

控制面板

中国鸟类图像鉴别系统 (测试版)

中国鸟类图像鉴别系统 (测试版)

操作 图像处理 中国鸟类图像鉴别系统 (测试版)

操作历史

操作 图像处理 中国鸟类图像鉴别系统 (测试版)

操作历史

选择

2

中国鸟类图像鉴别系统 (测试版)

操作 图像处理 中国鸟类图像鉴别系统 (测试版)

操作历史

选择
处理
完成
切割
对比
详细对比

3

2

对比结果

The screenshot displays the Chinese Bird Image Identification System interface. At the top, there are three tabs labeled '操作' (Operation), '图像处理' (Image Processing), and '中国鸟类图像鉴别系统 (测试版)' (Chinese Bird Image Identification System (Test Version)). Below the tabs, there is a toolbar with various icons. The main area shows two bird images side-by-side under the 'Image Processing' tab. On the left, there is a vertical stack of buttons: '选择' (Select), '处理' (Process), '完成' (Finish), '切割' (Cut), '对比' (Compare), and '详细对比' (Detailed Compare). The '完成' button is highlighted with a red circle. To the right of the images, a '操作历史' (Operation History) section shows a sequence of three images: image 2 (a kingfisher), image 3 (a close-up of a kingfisher's head), and image 1 (a kingfisher). The bottom of the screen features a '对比结果' (Comparison Result) bar.

中国鸟类图像鉴别系统 (测试版)

操作	图像处理	操作历史
<input type="button" value="选择"/> <input type="button" value="处理"/> <input type="button" value="完成"/> <input type="button" value="切割"/> <input type="button" value="对比"/> <input type="button" value="详细对比"/>		

转到形态学鉴别

中国鸟类图像鉴别系统 (测试版)

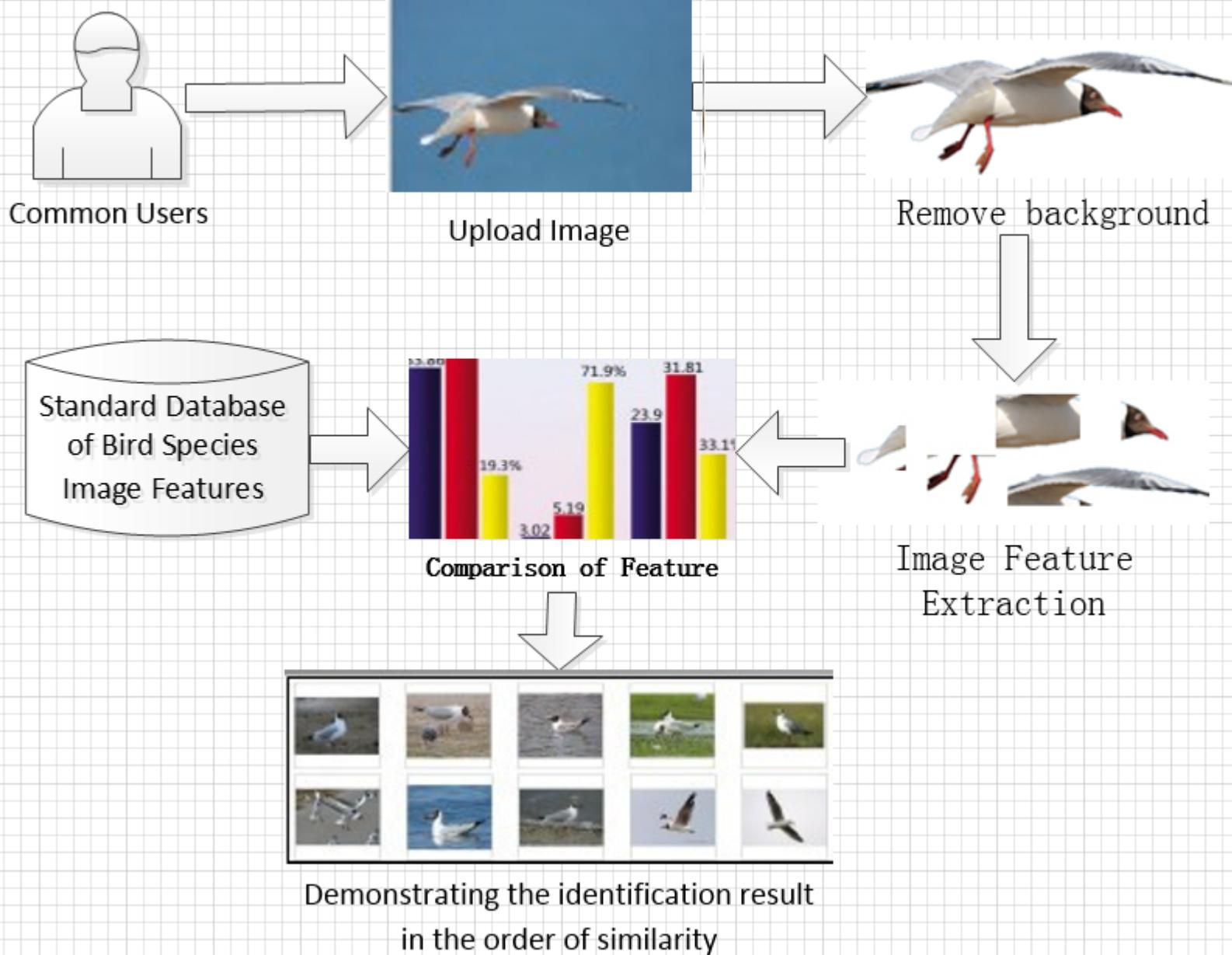
操作	图像处理	操作历史
<input type="button" value="选择"/> <input type="button" value="处理"/> <input type="button" value="完成"/> <input type="button" value="切割"/> <input type="button" value="对比"/> <input type="button" value="详细对比"/>	 请标记部位颜色: 嘴 <input checked="" type="checkbox"/> 头 <input type="checkbox"/> 颈 <input type="checkbox"/> 身 <input type="checkbox"/> 尾 <input type="checkbox"/>	

转到形态学鉴别

对比结果

每页显示数 7 | < | < | 当前第 2 | 页 共 36 页 | > | > |





(3) Morphological Identification

Chinese birds retrieval system

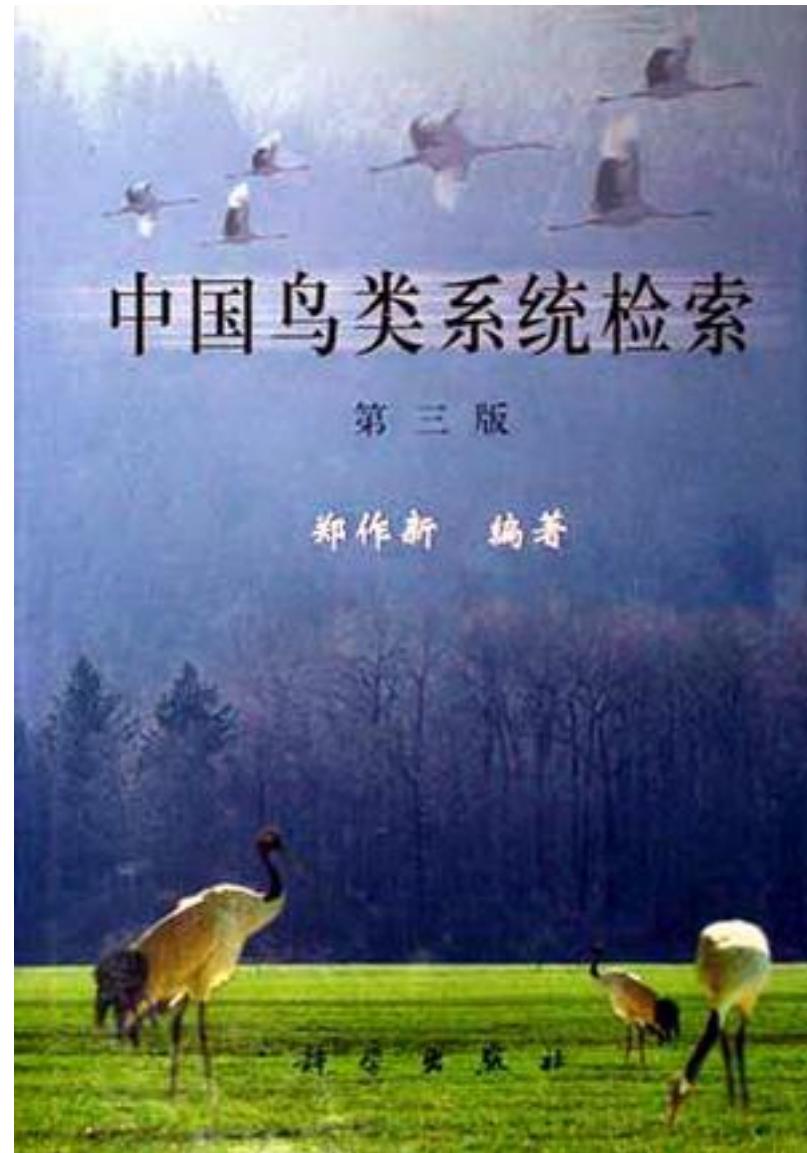
Academician Zheng Zuoxin

Third version



鸟纲分目检索

1. 脚适于游泳；蹼膜发达 2
脚适于步行；蹼不发达或付缺 7
2. 鼻呈角质管状 鹈形目 Procellariiformes (6)
鼻不呈角质管状 3
3. 趾间具全蹼 鹈形目 Pelecaniformes (8)
趾间不具全蹼 4
4. 嘴通常平扁，先端具嘴甲；雄性具交接器
..... 雁形目 Anseriformes (16)
嘴不平扁；雄性不具交接器 5
5. 翅尖长；尾羽正常发达 鸥形目 Lariformes (80)
翅短，或尖或圆；尾羽甚短 6
6. 向前三趾间具蹼 潜鸟目 Gaviiformes (3)
向前三趾各具瓣蹼 鸊鶒目 Podicipediformes (4)



重置

▷ 脚适于游泳；蹼膜发达

脚适于步行；蹼不发达或付缺

脚适于游泳；蹼膜发达



有101个物种符合

脚适于步行；蹼不发达
或付缺



有1019个物种符合

符合该条件的物种

[查看所有图片](#)



灰腹灰雀
Pyrrhula griseiventralis



丽色奇鹛
Heterophasia pulchella



灰头斑翅鹛
Actinodura souliei



灰喉针尾雨燕
Hirundapus cochinchinensis

▶ 重趾

脚适于游泳；蹠膜发达

▶ 脚适于步行；蹠不发达或付缺

颈和脚均较长；胫的下部裸出；蹠不

▶ 颈和脚均较短；胫全被羽；无蹠

颈和脚均较长；胫的下部裸出；蹠不

颈和脚均较短；胫全被羽；无蹠



有105个物种符合
符合该条件的物种

有917个物种符合



褐头鸫
Turdus obscurus

褐河乌
Cinclus pallasii

山麻雀
Passer montanus

绒额鳾
Sitta frontalis

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Future Work

- Data collection - more data accumulated
- Improve the identification methods to achieve better accuracy and better performance
- Voice recognition
- More analysis and e-Science application
-

Thanks!

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