

# Butterfly Monitoring Application Using IT

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## 1. Introduction

### Information Explosion

- ◆ Information created by people has increased rapidly since the year 2000, and are archived to the storage on Internet.
- ◆ Information retrieval from explosively growing information resources is not easy and costs long time.
- ◆ True human activity is obstructed for the long retrieval time.
- ◆ Also, the number of butterfly monitor data is huge, and various tools for supporting the monitoring activity are needed.

### e-Science

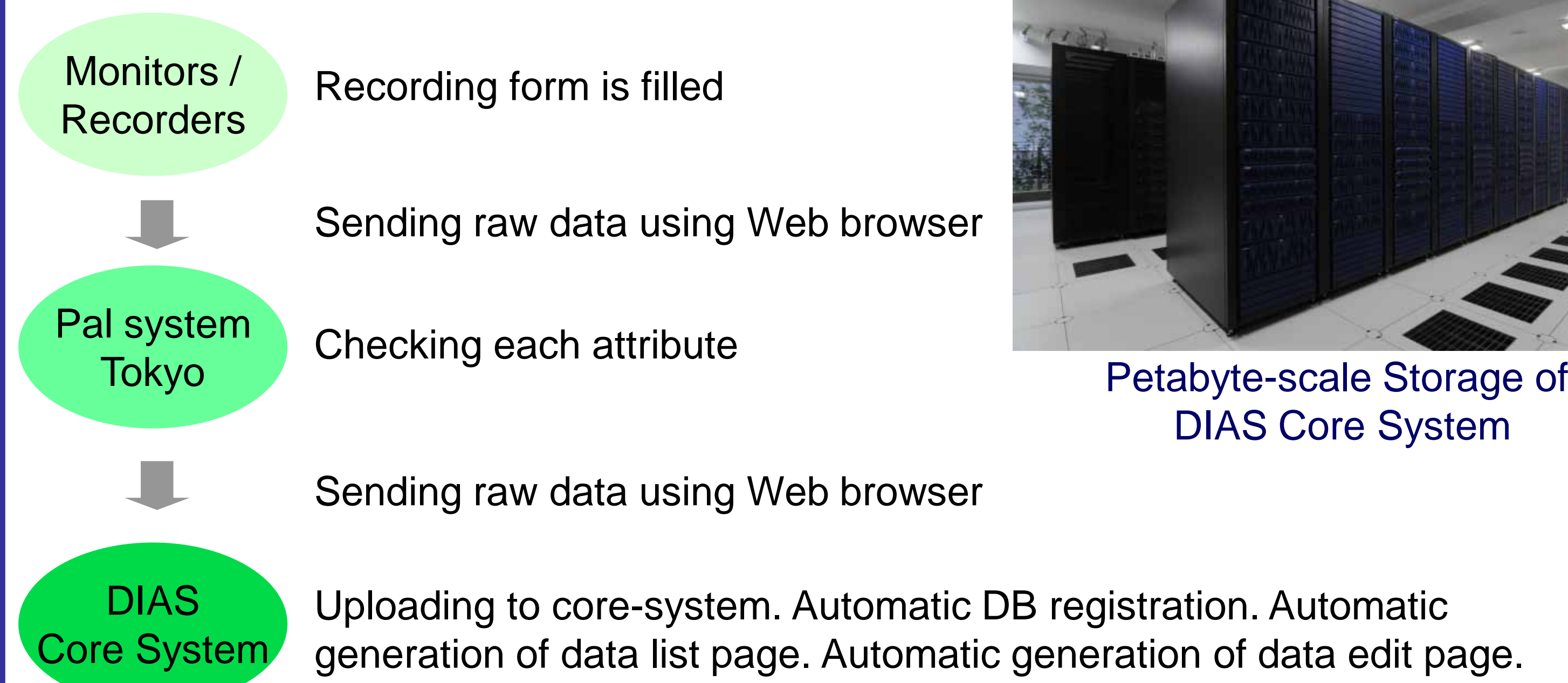
- ◆ The term "e-Science" denotes the systematic development of research methods that exploit advanced computational thinking.  
(Professor Malcolm Atkinson, e-Science Envoy, Research Councils UK.)
- ◆ Such methods enable new research by giving researchers access to resources held on widely-dispersed computers as though they were on their own desktops. The resources can include data ingest, managing a petabyte, common schema, data quality control, data query, data visualization and data analysis.

### Collaboration

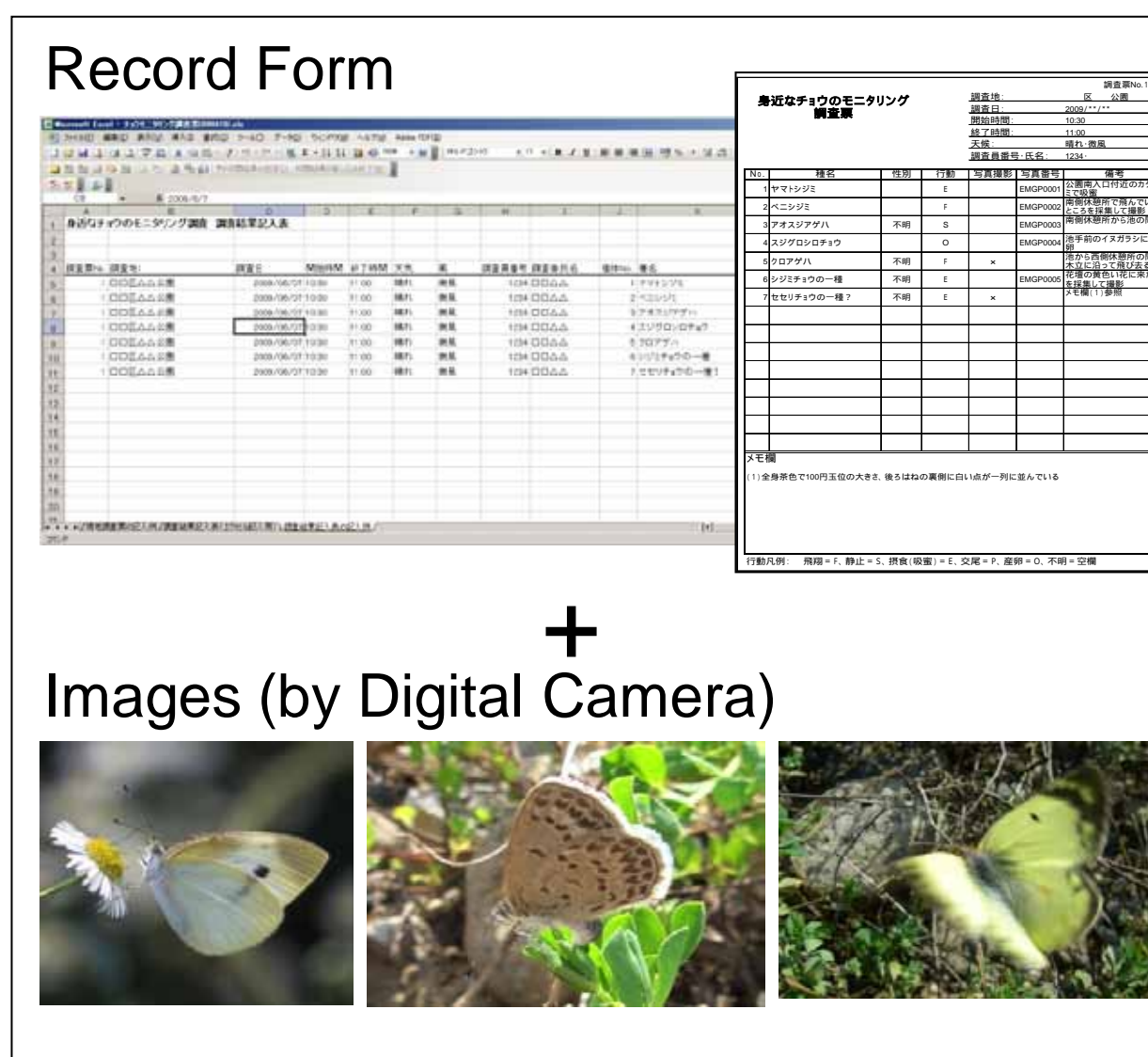
- ◆ Information technology is applied to biodiversity monitoring activity.
- ◆ Collaboration with citizens (Pal System Tokyo), conservation ecology researchers (Washitani Group, UT) and IT researchers (Kitsuregawa Group, UT)
- ◆ Target data is monitoring data of butterfly in Tokyo.
- ◆ Recorded data is digital.
- ◆ Recorded data with evidence digital pictures to keep the quality of the monitoring is collected, and the data is registered to database.
- ◆ Enlightenment of biodiversity to citizens
- ◆ Promotion of biodiversity analysis and new findings by researchers

## 2. Data Upload

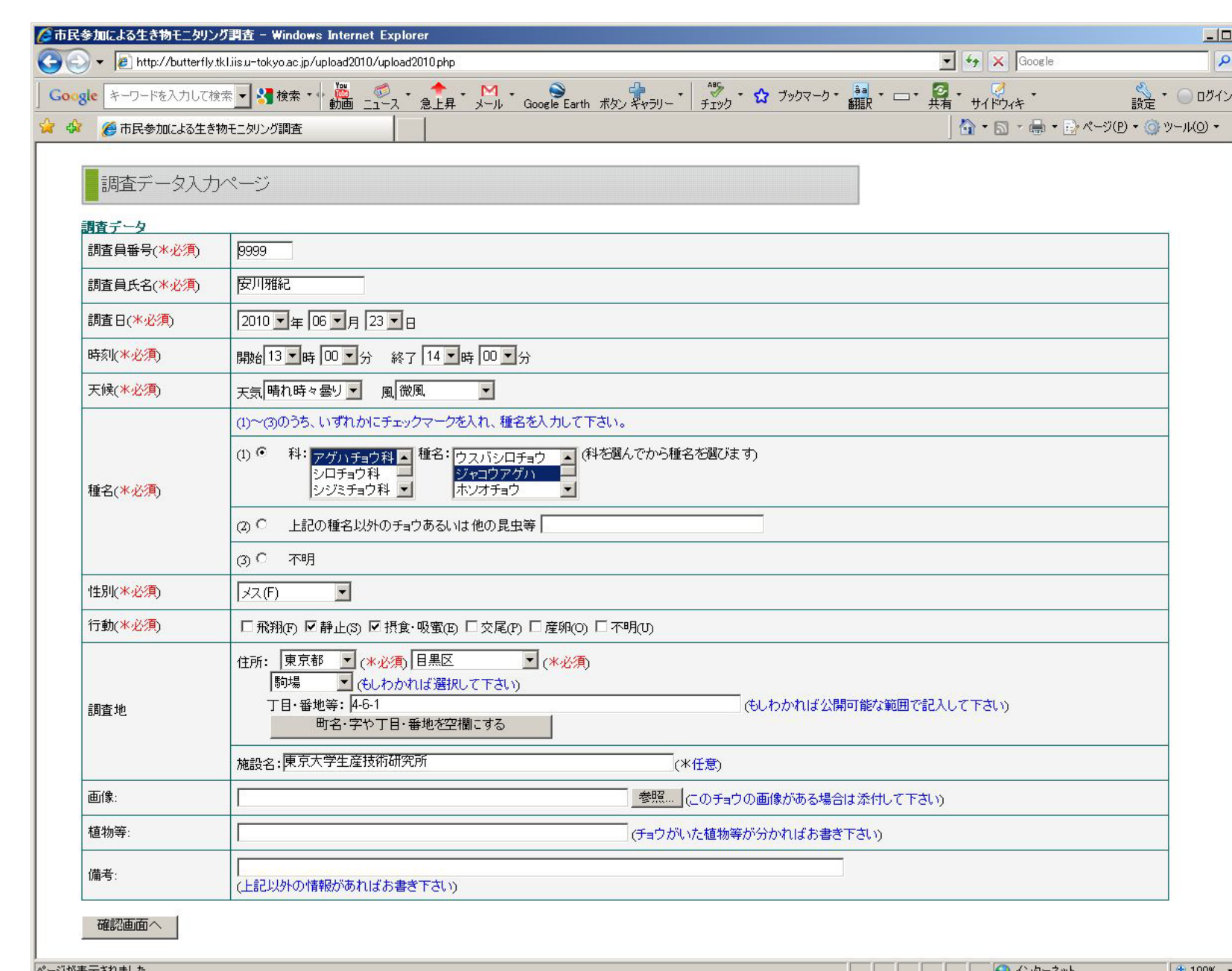
### Flow of Database Registration



Petabyte-scale Storage of DIAS Core System



Raw Data Set

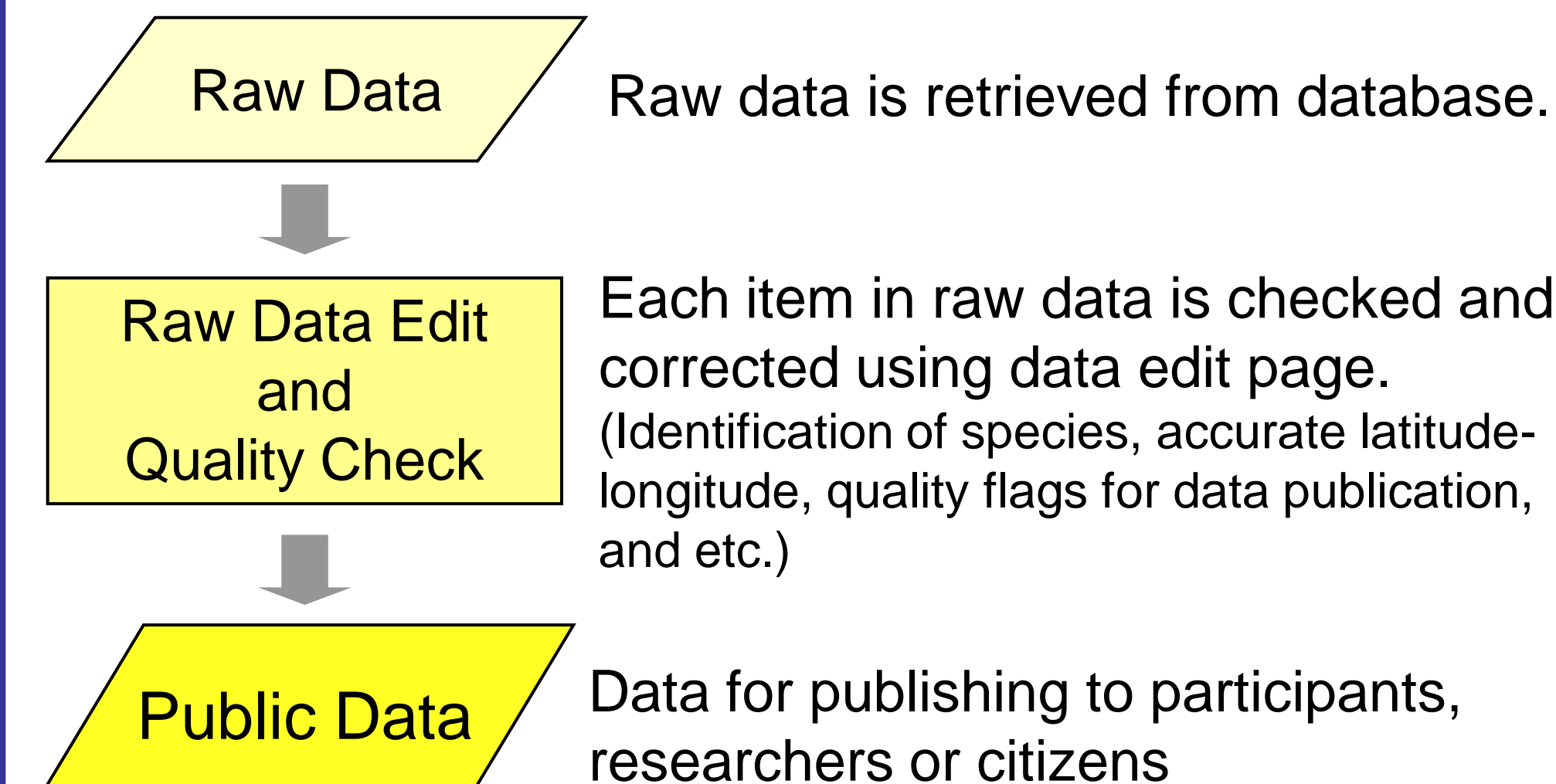


Data Upload Page

## 3. Quality Control of Uploaded Data

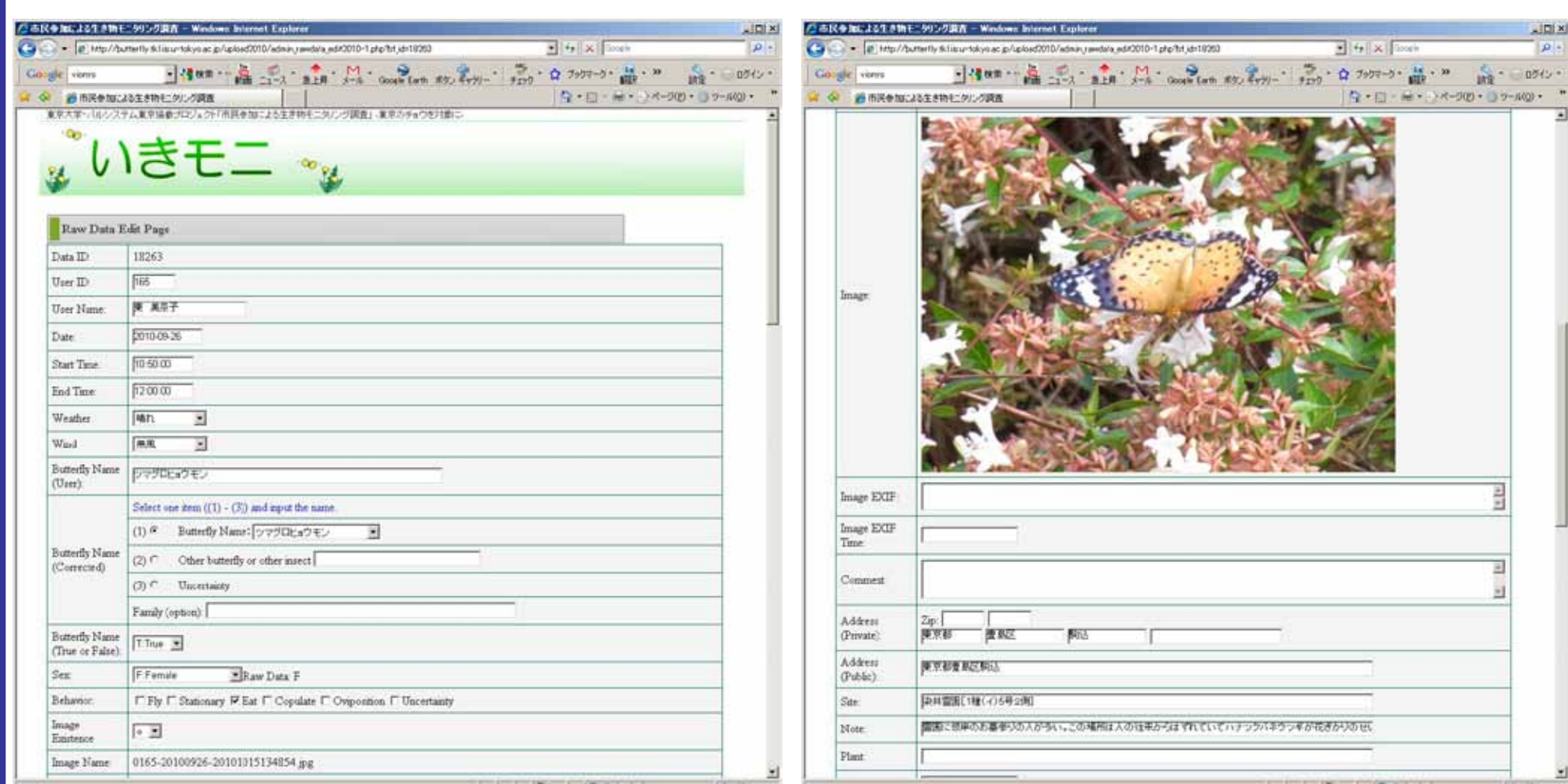
Because the reliability of data should be preserved from the viewpoint of data utilization, quality check of recorded data is needed.

### Flow from Raw Data to Public Data



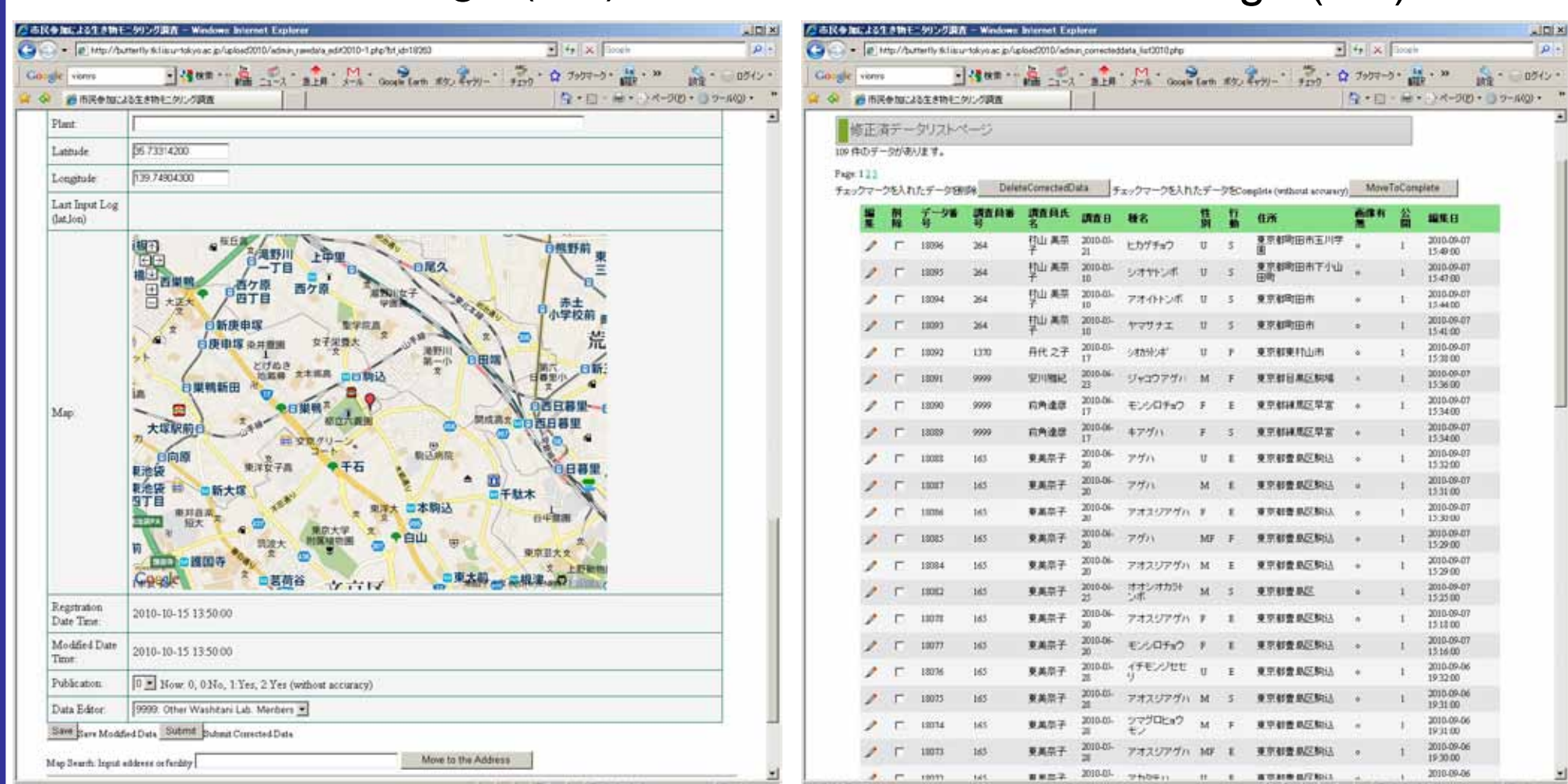
### Various Convenient Functions in Data Edit Tool

- ◆ Preparation of two input area for species identification  
Two identification results by participant and researcher are saved because of the identification study for the participant.
- ◆ Convert from address to latitude-longitude  
Using the address database, address is converted to latitude-longitude. Also, site name in recorded data can be converted to latitude-longitude.
- ◆ Map display  
Using the latitude-longitude, map around the recorded site is displayed.
- ◆ Utilization of cookie  
When editors input the same value on the same item, editors can omit the input by using cookie.



Data Edit Page (1/3)

Data Edit Page (2/3)



Data Edit Page (3/3)

List Page for Corrected Data

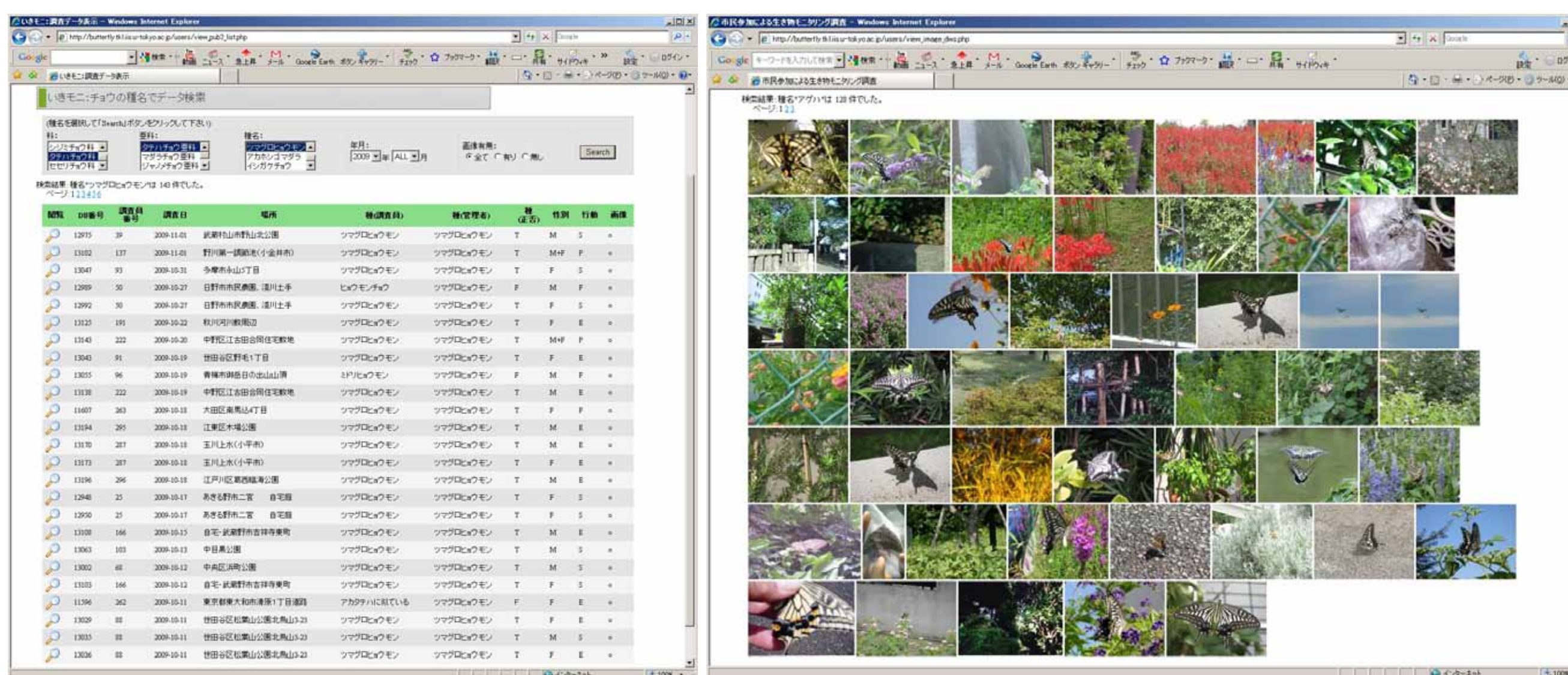
## 4. Opening to the Public

- ◆ Everyone can access our site using Web browser.
- ◆ More than 5000 records in FY2009
- ◆ Various retrieval functions (species, date, map, image, participant ID)
- ◆ Preparation of page only for the participant that can checks own data

URL: <http://butterfly.tkl.iis.u-tokyo.ac.jp/>

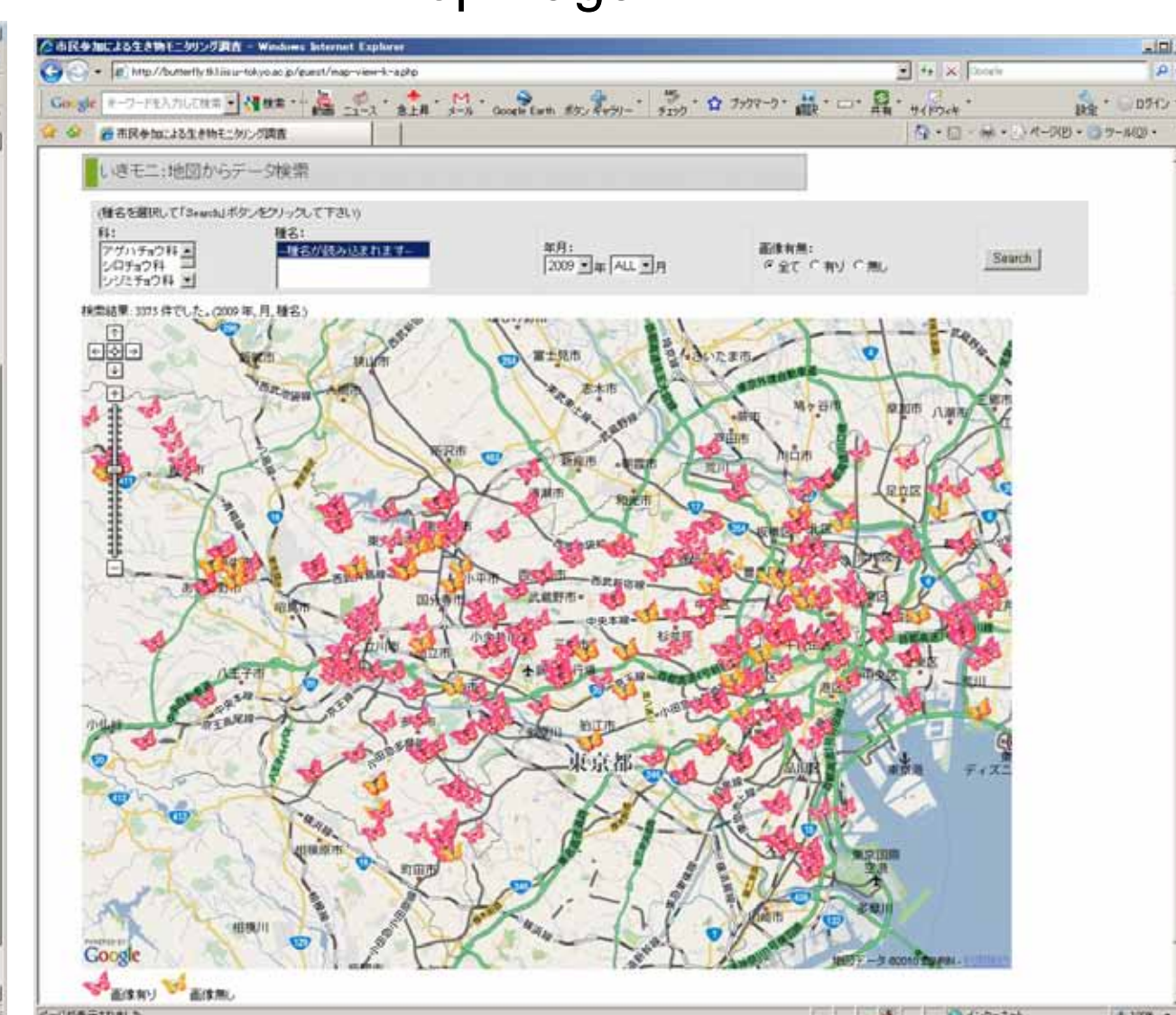


Top Page

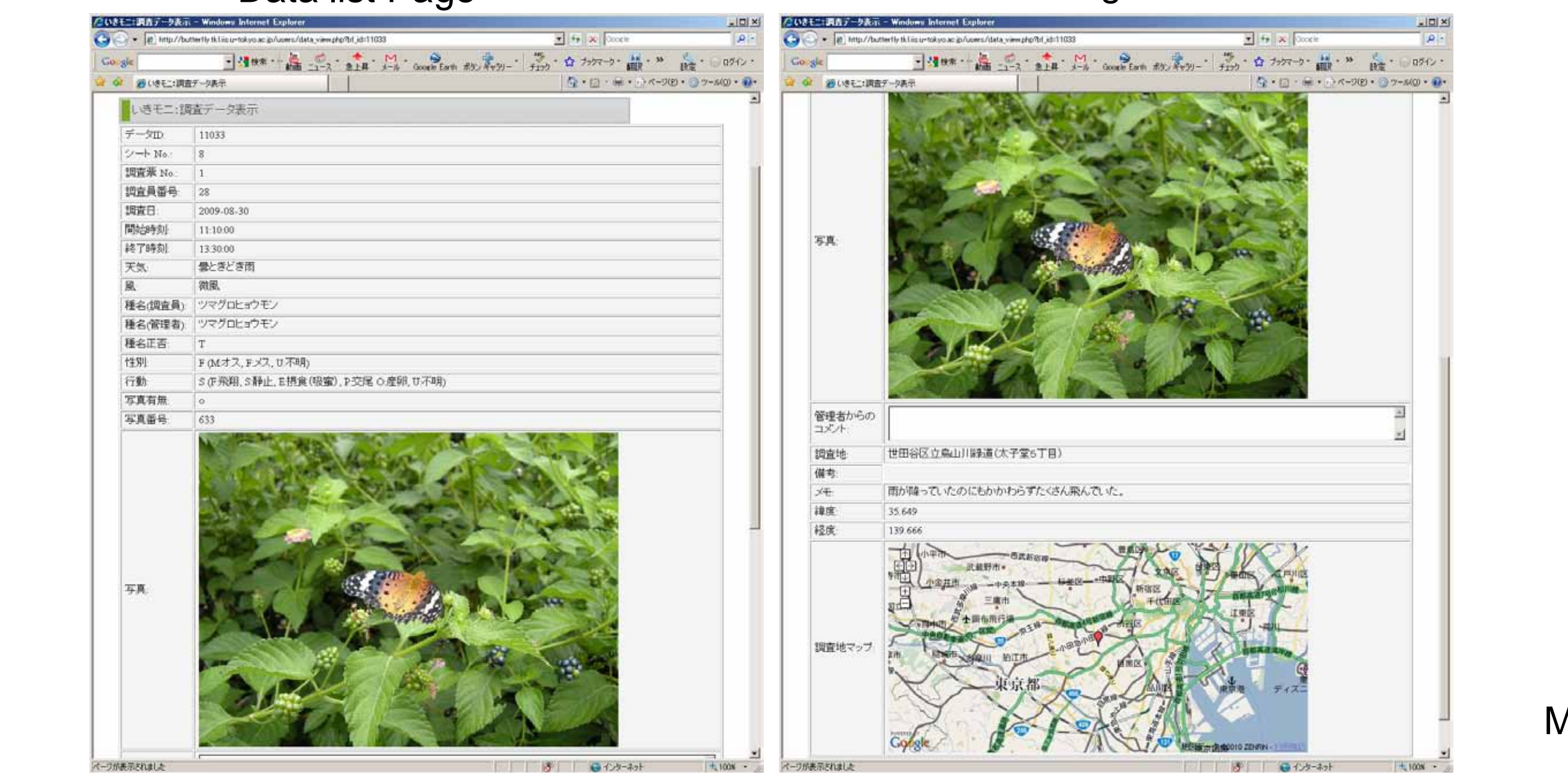


Data list Page

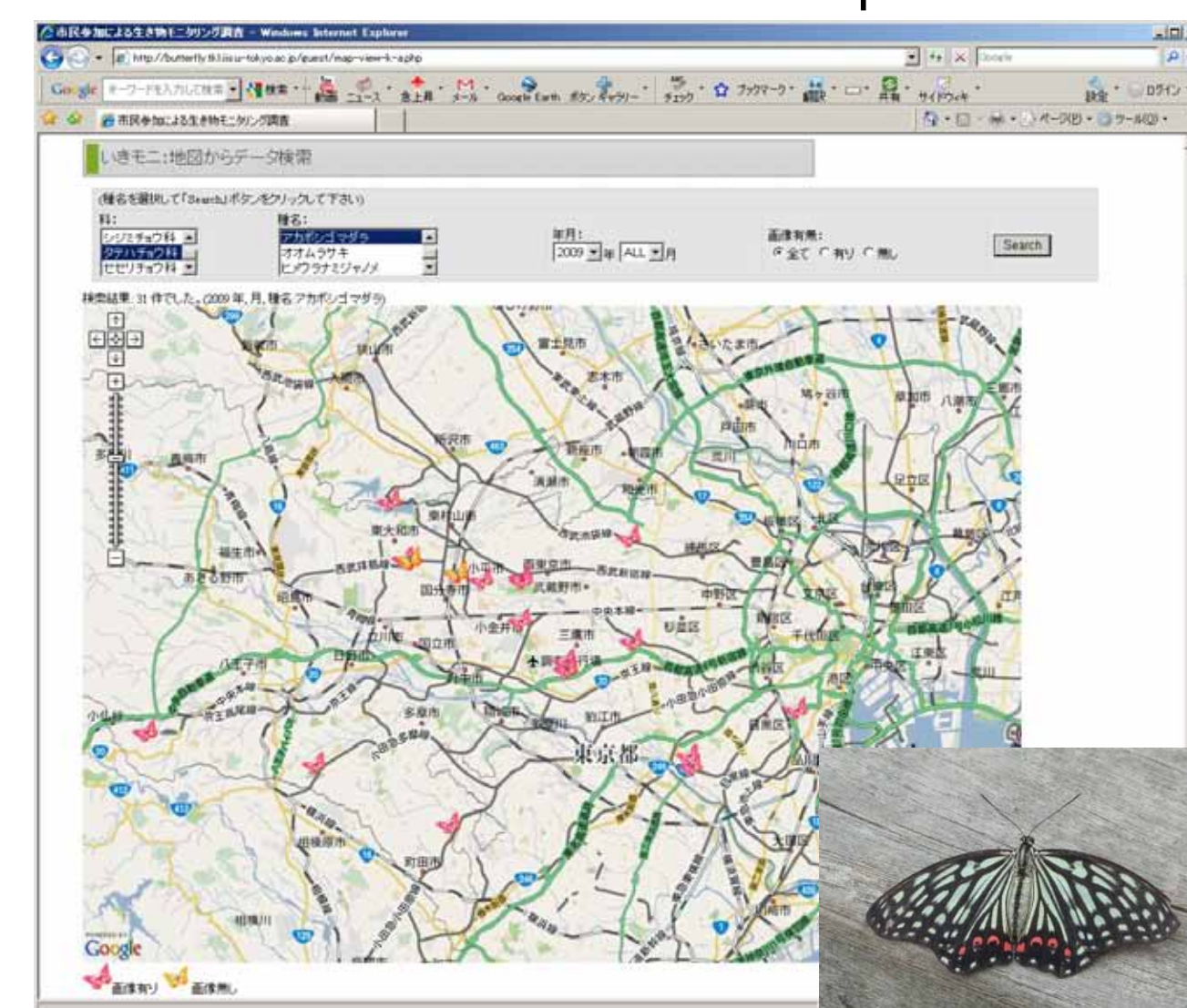
Image Browser



Record Point Map



Data detail Page



Map of *Hestina assimilis* (exotic species in Japan)

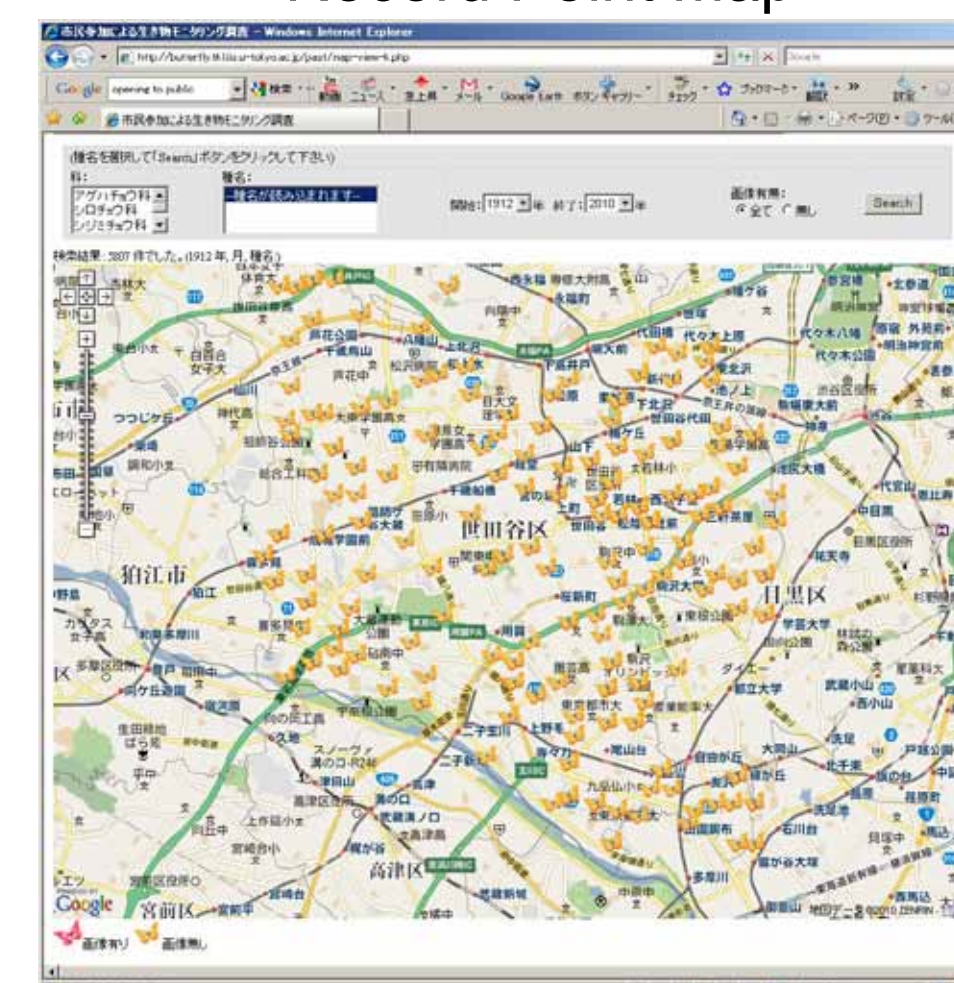
## 5. Tools for Past Data

- ◆ Past data has been registered in database.
- ◆ About 5800 records in from 1923 to 2008
- ◆ Visualization tools for time series change on various angles are being developed.
- ◆ Contribution to the new findings on biodiversity analysis

### Data list Page



### Record Point Map



### Chronological Table of Record of Each Species

