General biology in 21 century: from museums of "mortified" samples to electron images of living biological objects

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Biology studies images of (living) objects of various degrees of complexity and different levels of organization, as well as models of biochemical reactions.

Biology is full of visual information…

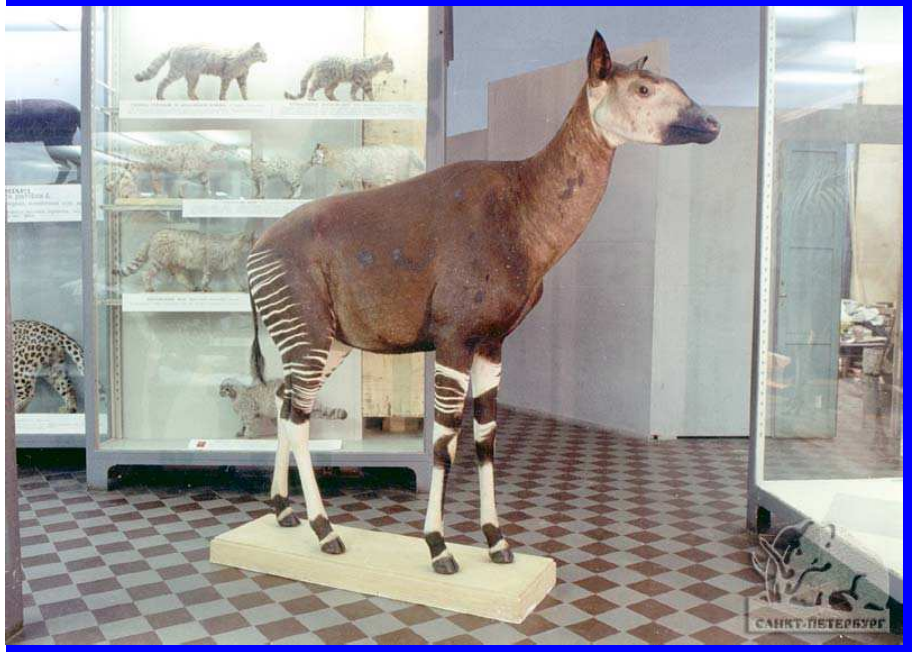
Most importantly, the quality of this information predetermines the accuracy of the worldview we biologists project to the outer world, as well as the accuracy of our own perception.

Fundamental difference of Virtual Biological collections from the traditional resources of bioinformatics:

In contrast to textual databases on genomics or proteomics, which contain continuities of nucleotide and aminoacid counts of biological macromolecules, a digital biological museum is a collection of biological images

In the past 200 years or so, biologists have been studying mostly the “still life” picture, because traditional biology since Carolus Linnaeus to date has been dealing with fixed, mummified or otherwise immobilized museum exhibits.

Zoological Museum, St-Petersburg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Until very recently, it was impossible to work with live objects or create adequate images of live objects.

Then, at the turn of the 21st century, digital technologies of image generation came to our science. The scanners and digital photo and video cameras so common today were destined to radically change the informational content of biology.

Its principal objective, from now on, is to accumulate collections of virtual (electronic, digital) images of biological objects varying in their organization from whole organisms to cellular and subcellular levels.

When we first contemplated the problem three things became clear:

First. Future collections ought to be three-dimensional, as most biological objects are 3D.

Second. Until we biologists lack affordable high resolution 3D scanners, we have to work with the so-called flat biological objects.

"Flat" are the objects for which the third dimension (thickness or depth) is of no particular importance.

In the animal world, a good example would be the flat worm Planarians.

In the vegetable world – the leaves of plants.

All visual information about this type of objects is contained in a 2D image.

Computer biology – flat biological objects

Flat worm Planarian *Girardia tigrina*

Because for a digital biological museum it is not enough to store full-fledged exhibits, like all other museums do.

Third. It's far more important to develop uniform rules and standards for the generation of images that biologists all over the world could follow.

The temporary standard for plant leaves images

RESOLUTION - 600 dpi,
COLOR Standard

Girardia tigrina

Videotape of planarian movement

«bad» AVI

«good» AVI

Computer (digital) biology

Image generation,

storage,

analysis

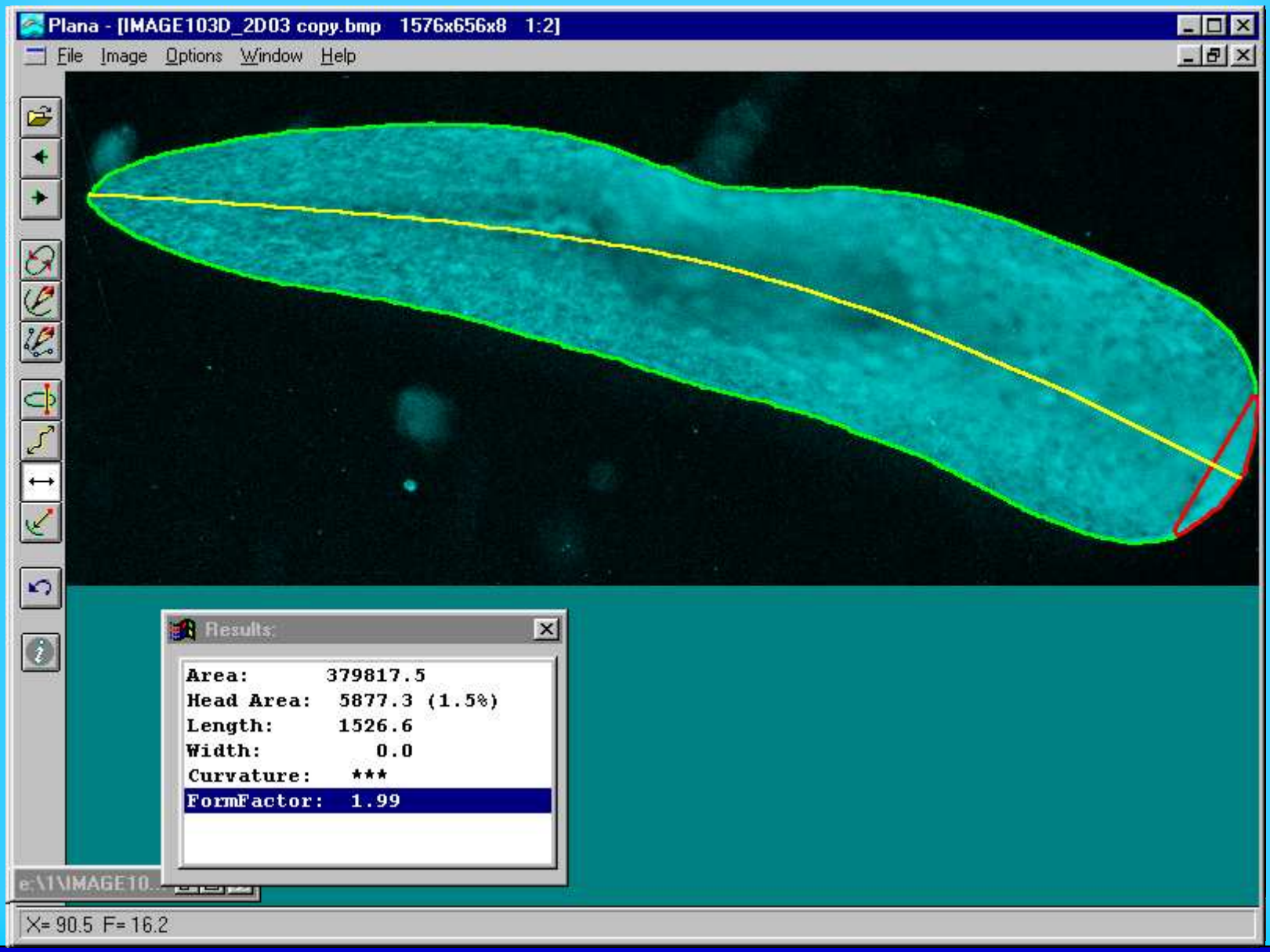
The main goal of computer biology

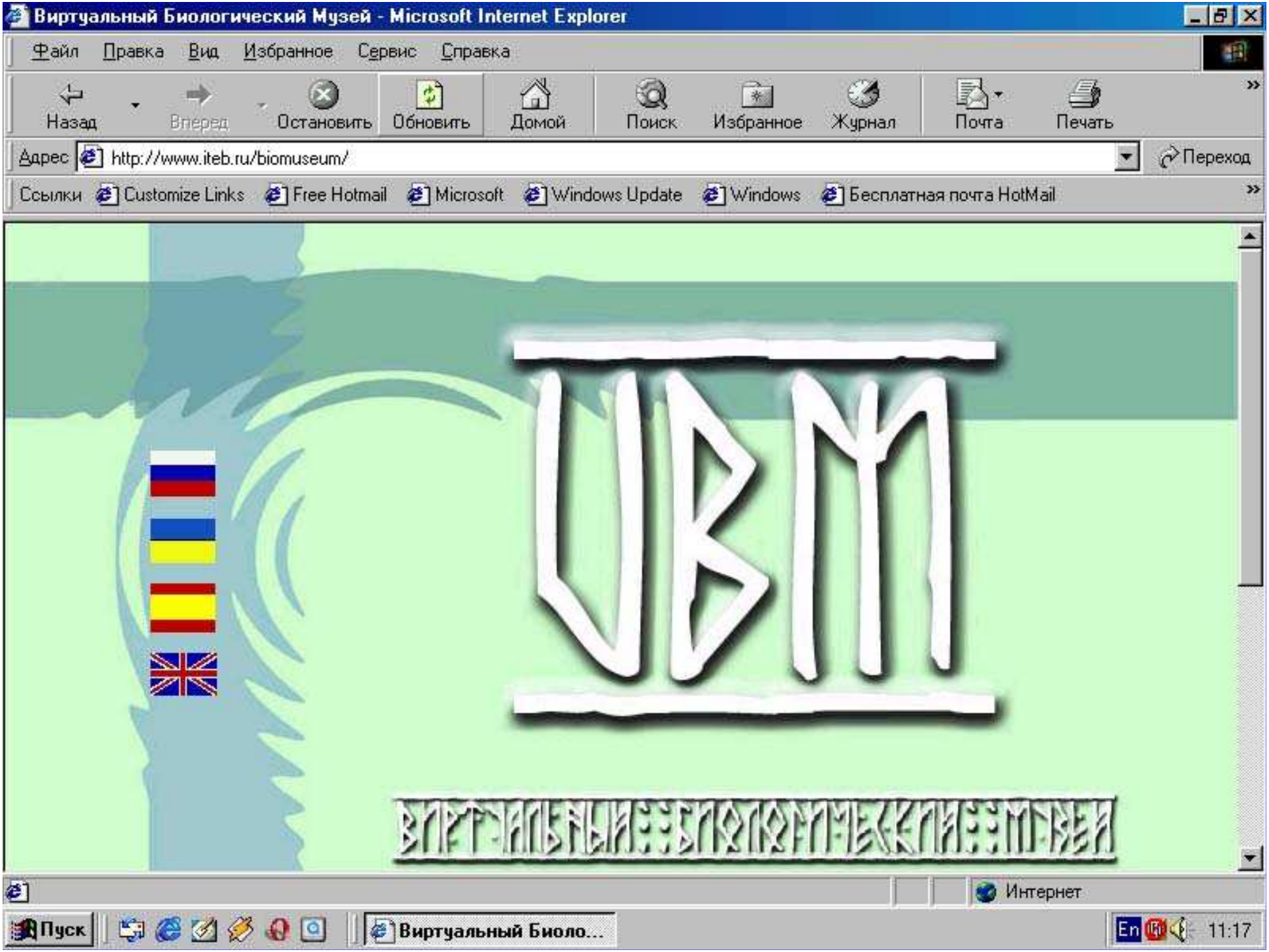
To obtain the precise

quantitative information

about the biological object

Analysis of planarian images (*Plana 4.1)*




Виртуальный Биологический Музей - Microsoft Internet Explorer
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Адрес http://www.iteb.ru/biomuseum/
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Пуск
Виртуальный Биоло...
11:17

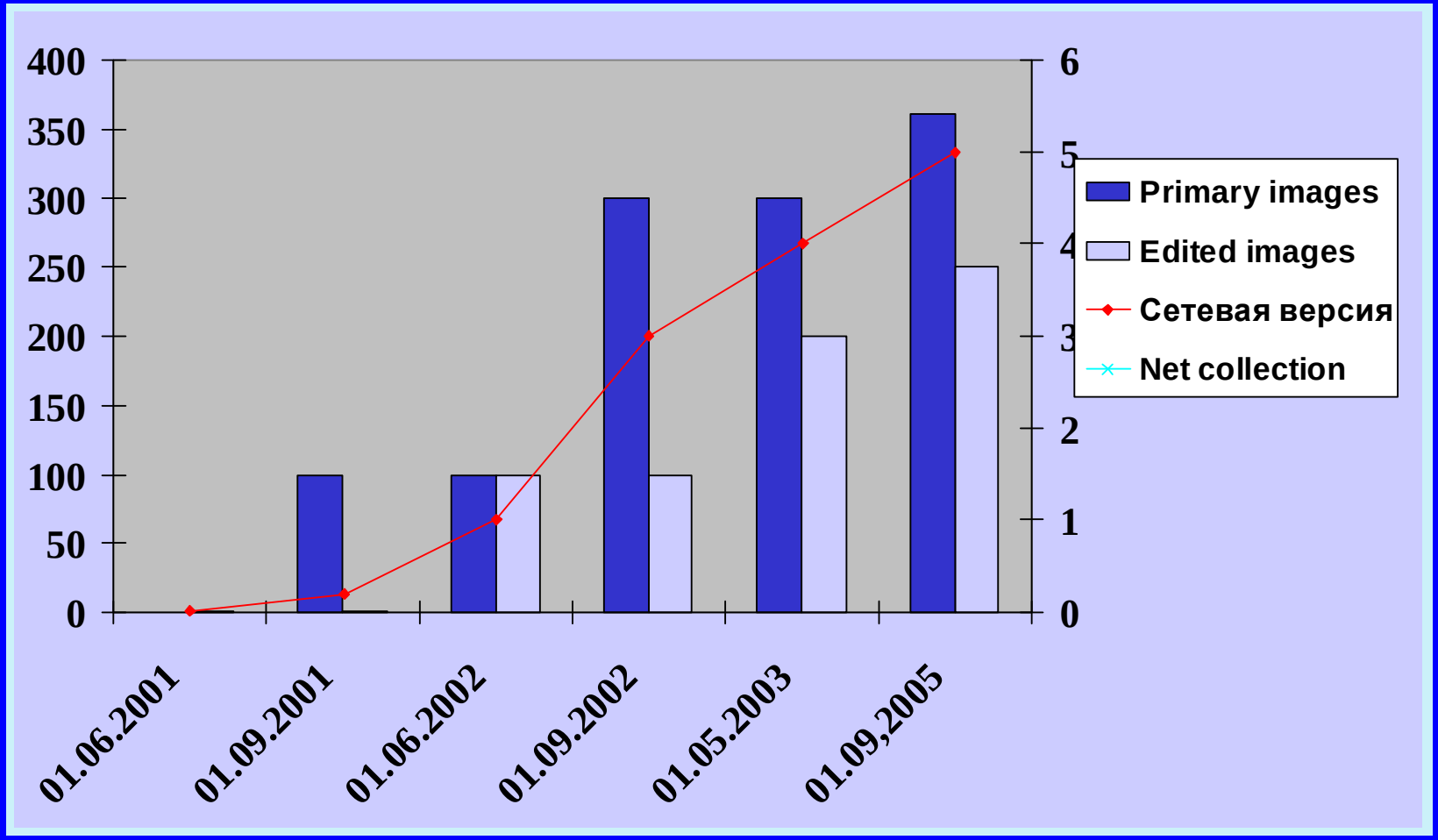
Linden sp. (*Tilia cordata*),

back side of the leaves

The total amount VBM collection

up to 1.09.2005 (in Gb)

more then 10 000 in *.tiff

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Coastal	(169,733)		Europe	(221,475)		Plants	(265,000)	

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Amanita phalloides

DEATH CAP MUSHROOM

SAVE | EMAIL | PRINT | ALERTS | BLOG | DEL.ICIO.US

IUCN CONSERVATION STATUS: SECURE

LAST POSTING 04/20/2007

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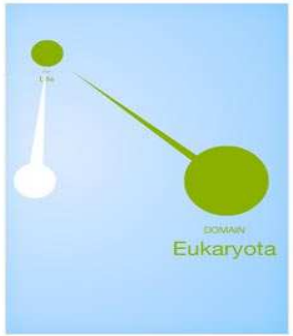

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This species is deadly **POISONOUS**.

Amanita phalloides was originally described from Europe. In Europe it occurs with beech (*Fagus*), oak (*Quercus*), pine (*Pinus*), chestnut (*Castanea*), horse chestnut (*Aesculus*), birch (*Betula*), filbert and hazelnuts (*Corylus maxima*), iron wood or hornbeam (*Carpinus*), and spruce (*Picea*). In the northern hemisphere the present species when transplanted can spread to local trees of the same genera in addition to Canadian hemlock (*Tsuga*). It is reported under *Leptospermum* in New Zealand and under *Eucalyptus* and leguminous trees in Tanzania. Importation in the western hemisphere has occurred from Canada to Argentina.

This species is easily exported with its symbionts (oaks, pines, nut trees, etc.). As a consequence, it has been introduced in many countries in which European trees of its symbionts have been planted. It can then be exported from those countries it has colonized.

Everywhere it has been imported, it is a major cause of life-threatening mushroom poisonings.

SOURCES

UPDATED 03/16/2007

R. E. Tulloss	03/16/2007
Royal Botanic Gardens, Kew	02/02/2007
Dr. Ossinger	10/01/2006
Plant Talk	09/23/2006
Wikipedia	09/03/2006

EXPERT REFERENCES

UPDATED 02/23/2007

The Genus Amanita by Rod Tulloss and Zhu-liang Yang

CONTRIBUTE TO EOL

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1 *Ursus maritimus* (Images)
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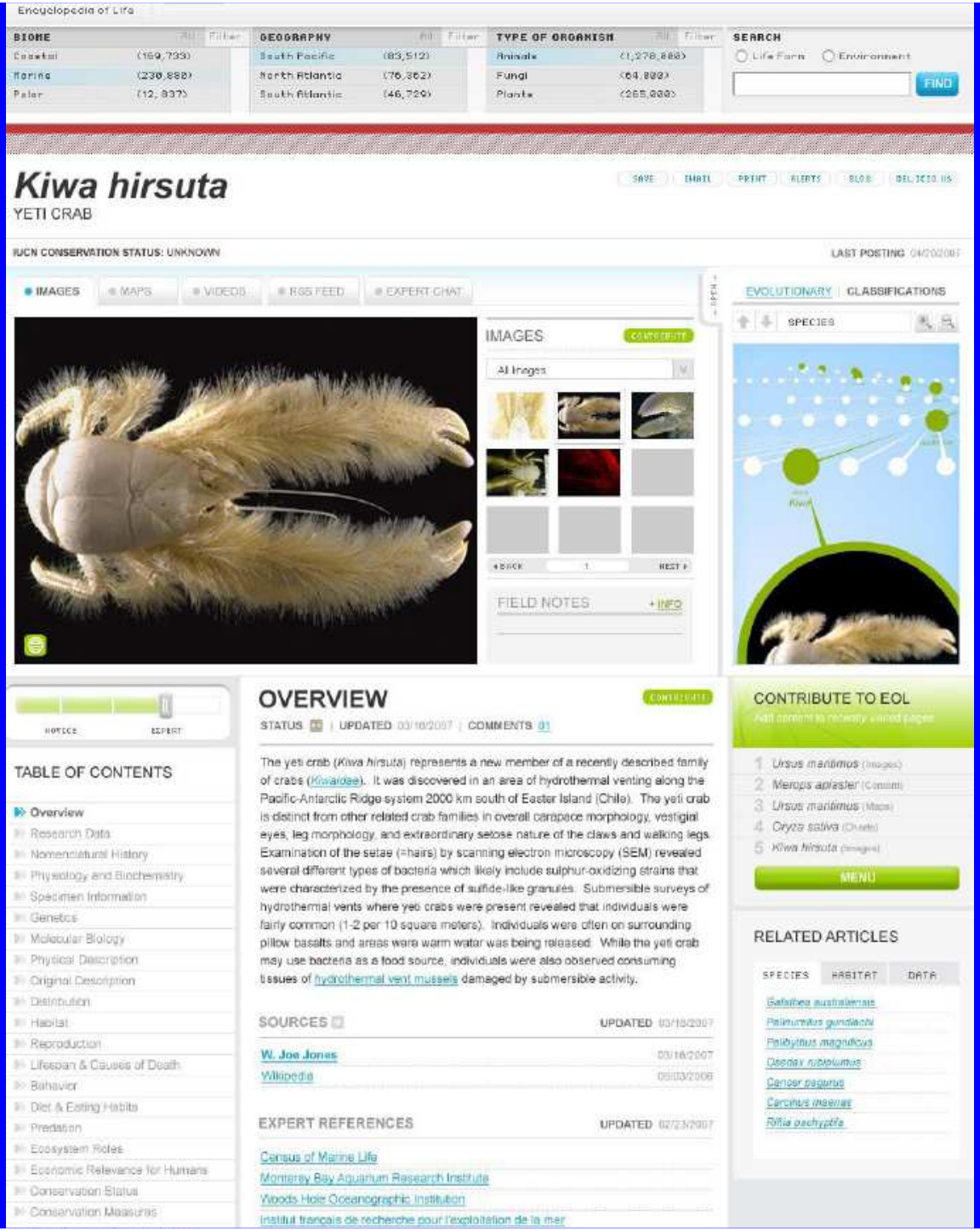
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Marine (230,882)
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OVERVIEW
STATUS | UPDATED | COMMENTS 01
The yeti crab (Kiwa hirsuta) represents a new member of a recently described family of crabs (Kiwaidae). It was discovered in an area of hydrothermal venting along the Pacific-Antarctic Ridge system 2000 km south of Easter Island (Chile). The yeti crab is distinct from other related crab families in overall carapace morphology, vestigial eyes, leg morphology, and extraordinary setose nature of the claws and walking legs. Examination of the setae (=hairs) by scanning electron microscopy (SEM) revealed several different types of bacteria which likely include sulphur-oxidizing strains that were characterized by the presence of sulfide-like granules. Submersible surveys of hydrothermal vents where yeti crabs were present revealed that individuals were fairly common (1-2 per 10 square meters). Individuals were often on surrounding pillow basalts and areas were warm water was being released. While the yeti crab may use bacteria as a food source, individuals were also observed consuming tissues of hydrothermal vent mussels damaged by submersible activity.
SOURCES
UPDATED
W. Joe Jones
Wikipedia
EXPERT REFERENCES
UPDATED
Census of Marine Life
Monterey Bay Aquarium Research Institute
Woods Hole Oceanographic Institution
Institut français de recherche pour l'exploitation de la mer
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Virtual biological collections

Physiomics

La Nature est un temple où de vivants piliers
laissent parfois sortir de confuses paroles;
l'homme y passe à travers des forêts de symboles
qui l'observent avec des regards familiers.
Charles Pierre Baudelaire

Textual databases which contain continuities of nucleotide and aminoacid counts of biological macromolecules

Proteomics

Genomics