

A microscopic image of a Clonorchis sinensis fluke, showing its characteristic branching internal organs and the suckers at the anterior end. The image is split vertically, with the left half on the left edge and the right half on the right edge of the slide.

Clonorchis sinensis Genome

Introduction to genomics (485 course)

**Presented by:
Sara Zaqzaq**

Thursday 20/1/2022

Outline

- **The selected paper**
- **The organism's : Taxonomy**
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- **Significance**
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The Selected Paper

Wang et al. *Genome Biology* 2011, **12**:R107
<http://genomebiology.com/2011/12/10/R107>



RESEARCH

Open Access

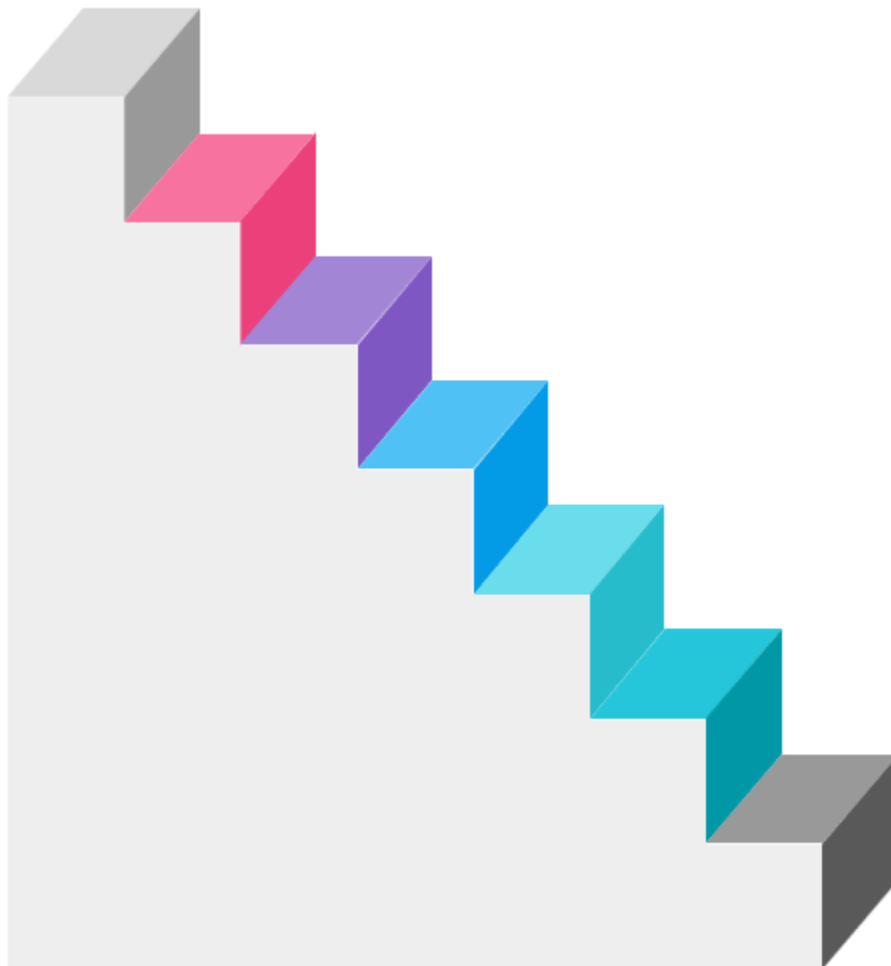
The draft genome of the carcinogenic human liver fluke *Clonorchis sinensis*

Xiaoyun Wang^{1,2}, Wenjun Chen^{1,2}, Yan Huang^{1,2}, Jiufeng Sun^{1,2}, Jingtao Men^{1,2}, Hailiang Liu³, Fang Luo³, Lei Guo³, Xiaoli Lv^{1,2}, Chuanhuan Deng^{1,2}, Chenhui Zhou^{1,2}, Yongxiu Fan^{1,2}, Xuerong Li^{1,2}, Lisi Huang^{1,2}, Yue Hu^{1,2}, Chi Liang^{1,2}, Xuchu Hu^{1,2}, Jin Xu^{1,2} and Xinbing Yu^{1,2*}

Abstract

Background: *Clonorchis sinensis* is a carcinogenic human liver fluke that is widespread in Asian countries. Increasing infection rates of this neglected tropical disease are leading to negative economic and public health consequences in affected regions. Experimental and epidemiological studies have shown a strong association between the incidence of cholangiocarcinoma and the infection rate of *C. sinensis*. To aid research into this organism, we have sequenced its genome.

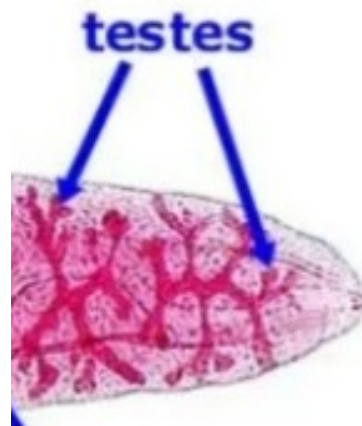
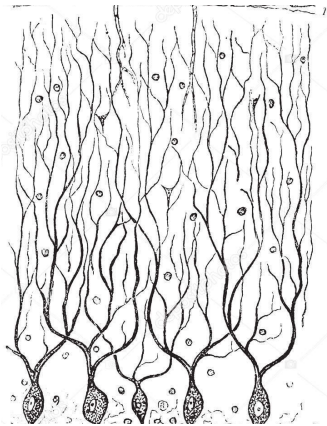
Clonorchis sinensis Taxonomy



- SK: Eukaryota
- K: Metazoa
- P: Platyhelminthes
- C: Trematoda
- O: Opisthorchiida
- F: Opisthorchiidae
- G: *Clonorchis*
- S: *sinensis*

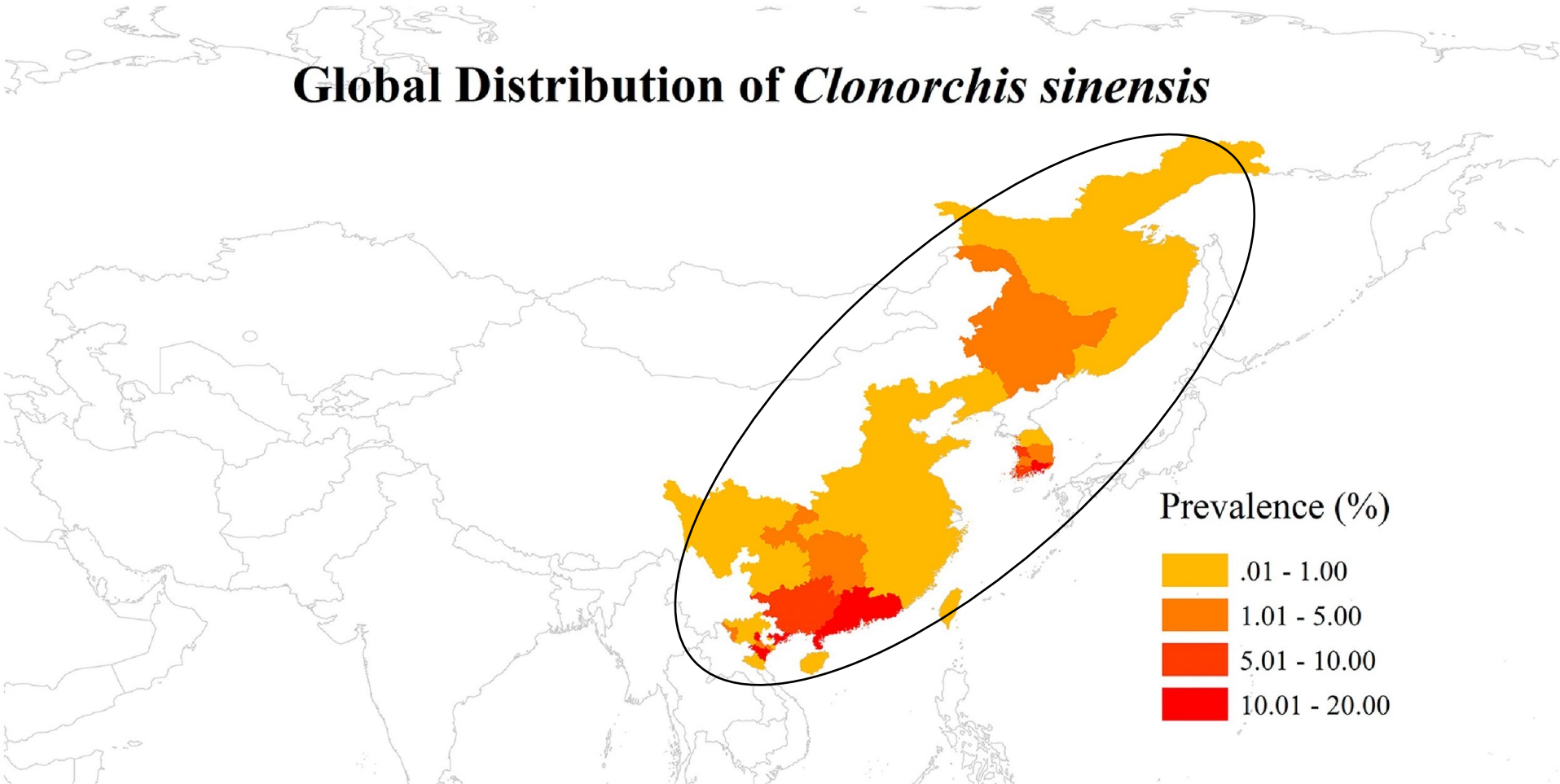
Origin of the name

Clonorchis sinensis



Geographical distribution

Global Distribution of *Clonorchis sinensis*

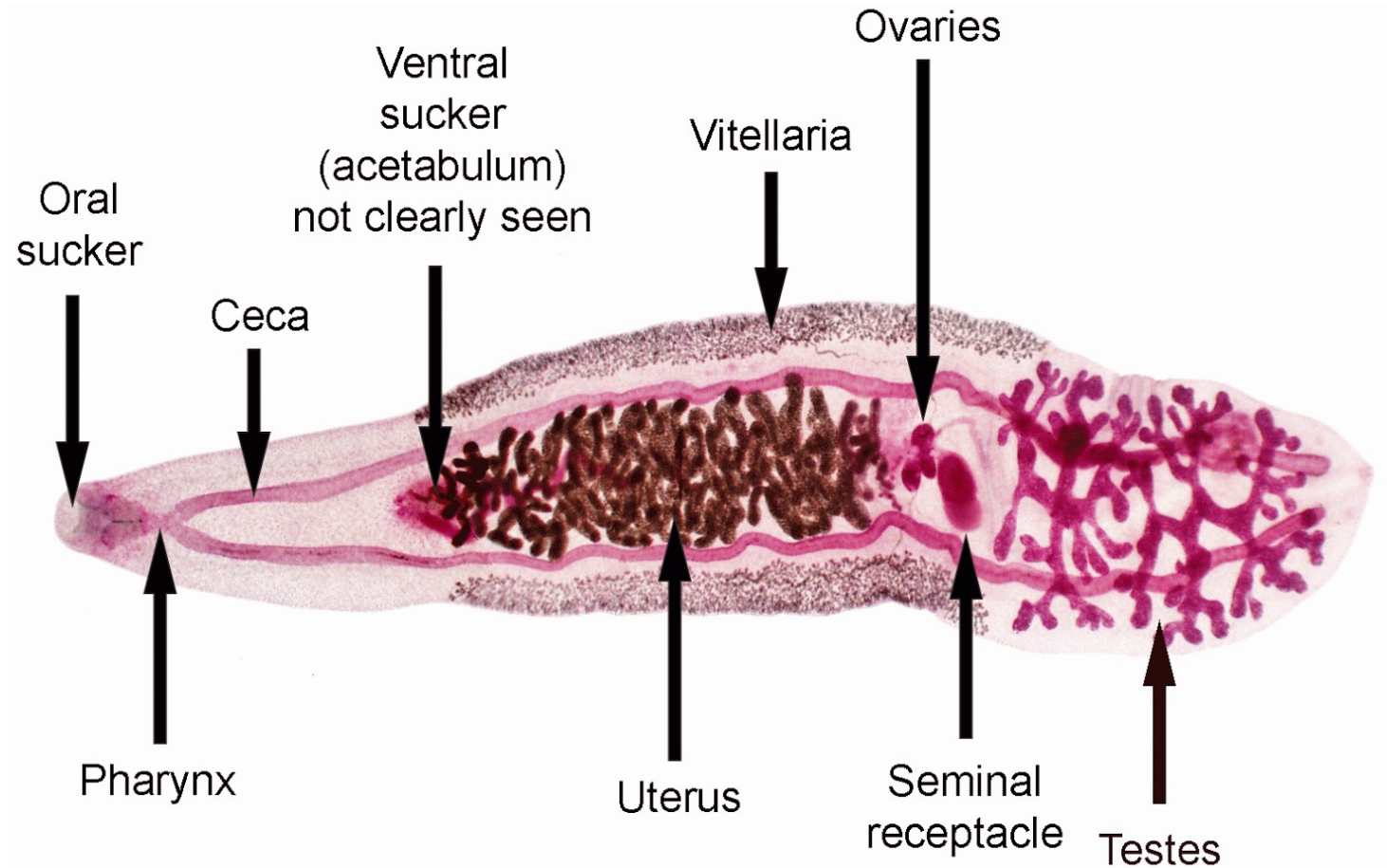


Trends in Parasitology

Named as the **Chinese OR the Oriental liver Fluke** because it orients to affect the Asian countries such as Korea , China, Taiwan and northern Vietnam

***Clonorchis sinensis* physical Characteristics**

- Flat , leaf shaped with slightly elongated and slender body
- length VS width = 15-20 mm VS 3-4 mm



***Clonorchis sinensis* physical Characteristics**

- Small, sharply curved with a clear lid-like structure named as **operculum** at the narrower end and a stem-like **knob** at the broader end.
- Miracium = larva =not free = trapped inside the fertilized egg



Operculum

Shoulder

Egg shell

Miracium

Abopercular knob

C.sinensis Life Cycle

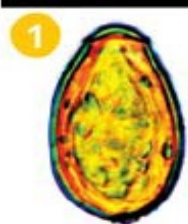
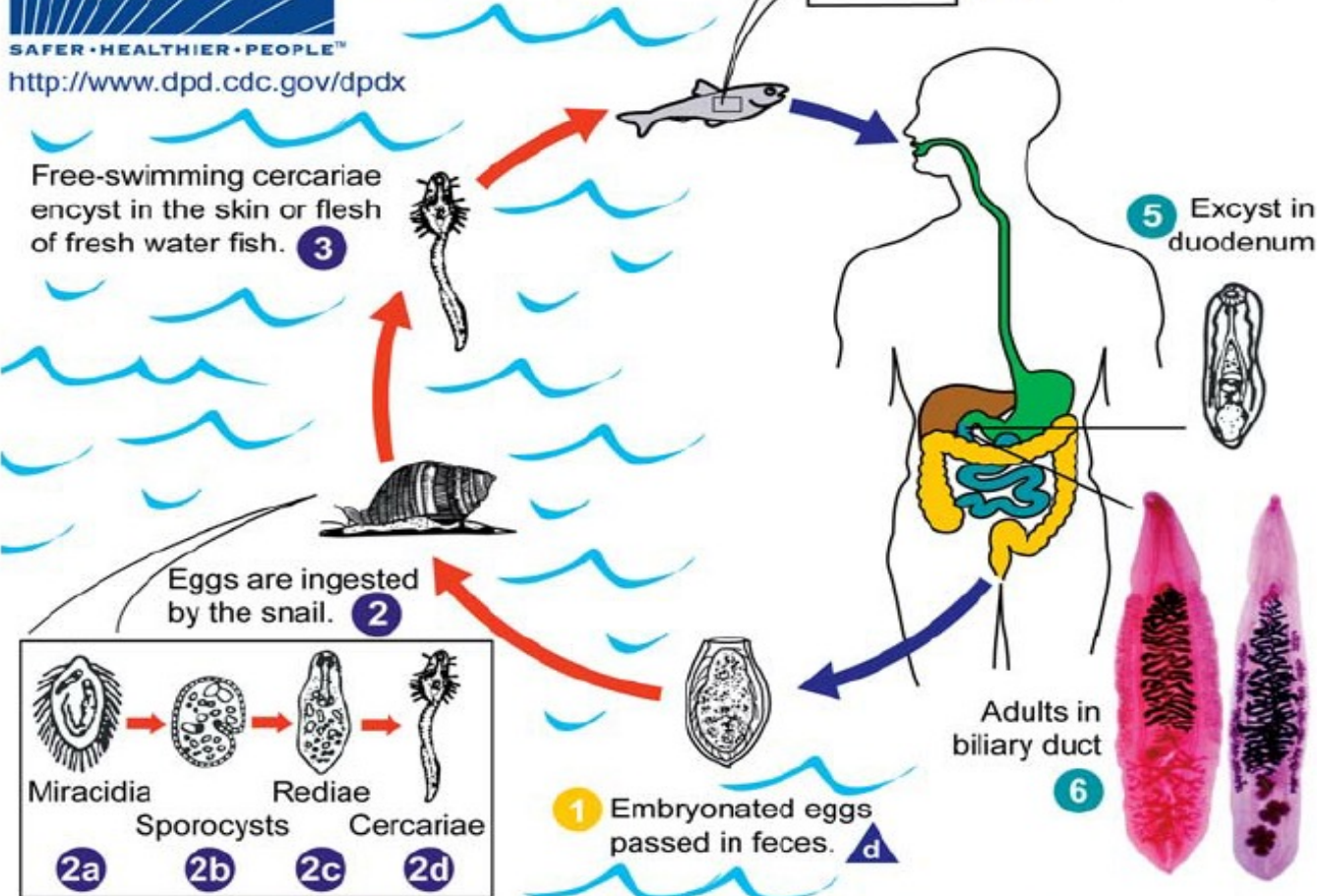


<http://www.dpd.cdc.gov/dpdx>

4 Metacercariae in flesh or skin of fresh water fish are ingested by human host.

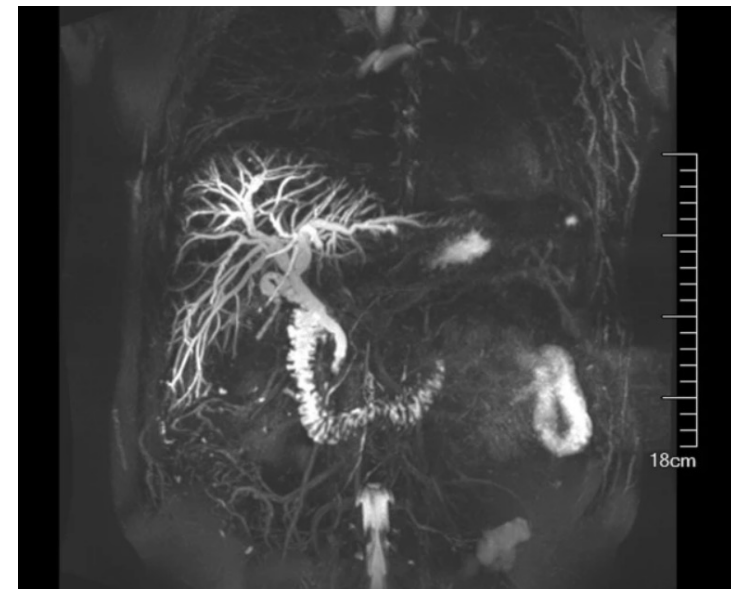


i = Infective Stage
d = Diagnostic Stage



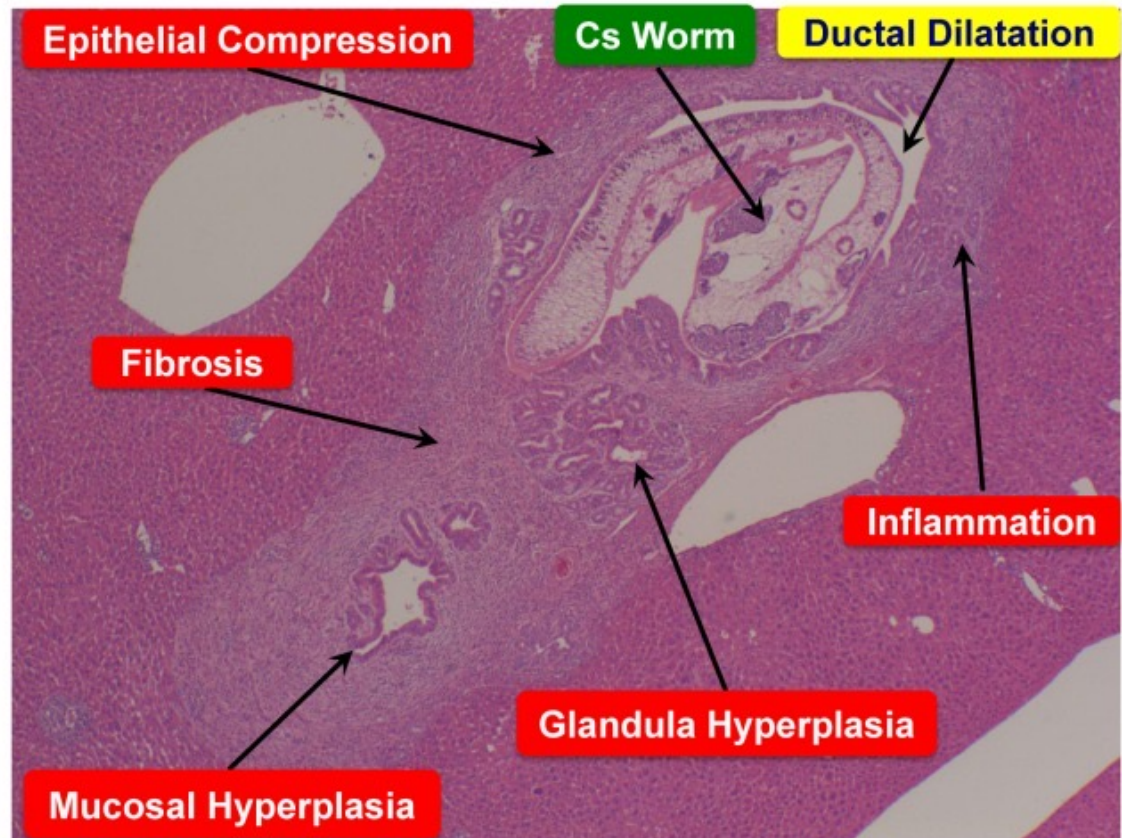
Significance of studying *C.sinensis* 's genome

- *Clonorchis sinensis* is widespread and affect more than 35 million people in Asian countries.
- The Increasing infection rates of this neglected tropical disease are leading to negative economic and public health consequences in affected regions.
- Also, experimental and epidemiological studies have shown a strong association between the incidence of cholangiocarcinoma and the infection rate of *C. sinensis*.

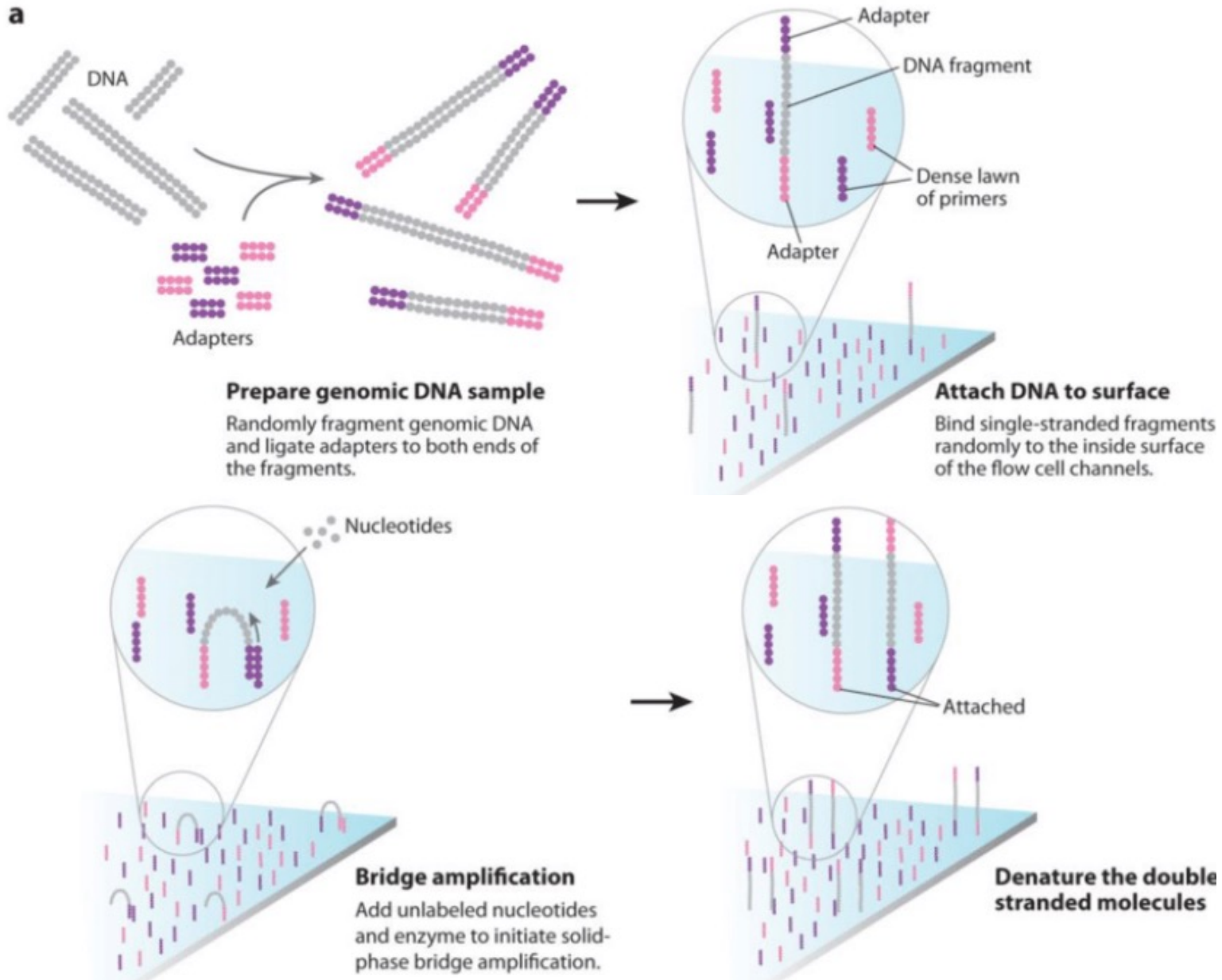


Sample taken to sequence *C.sinensis* 's genome

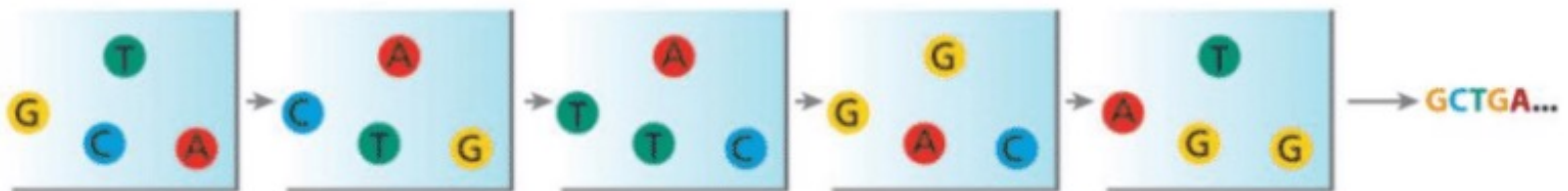
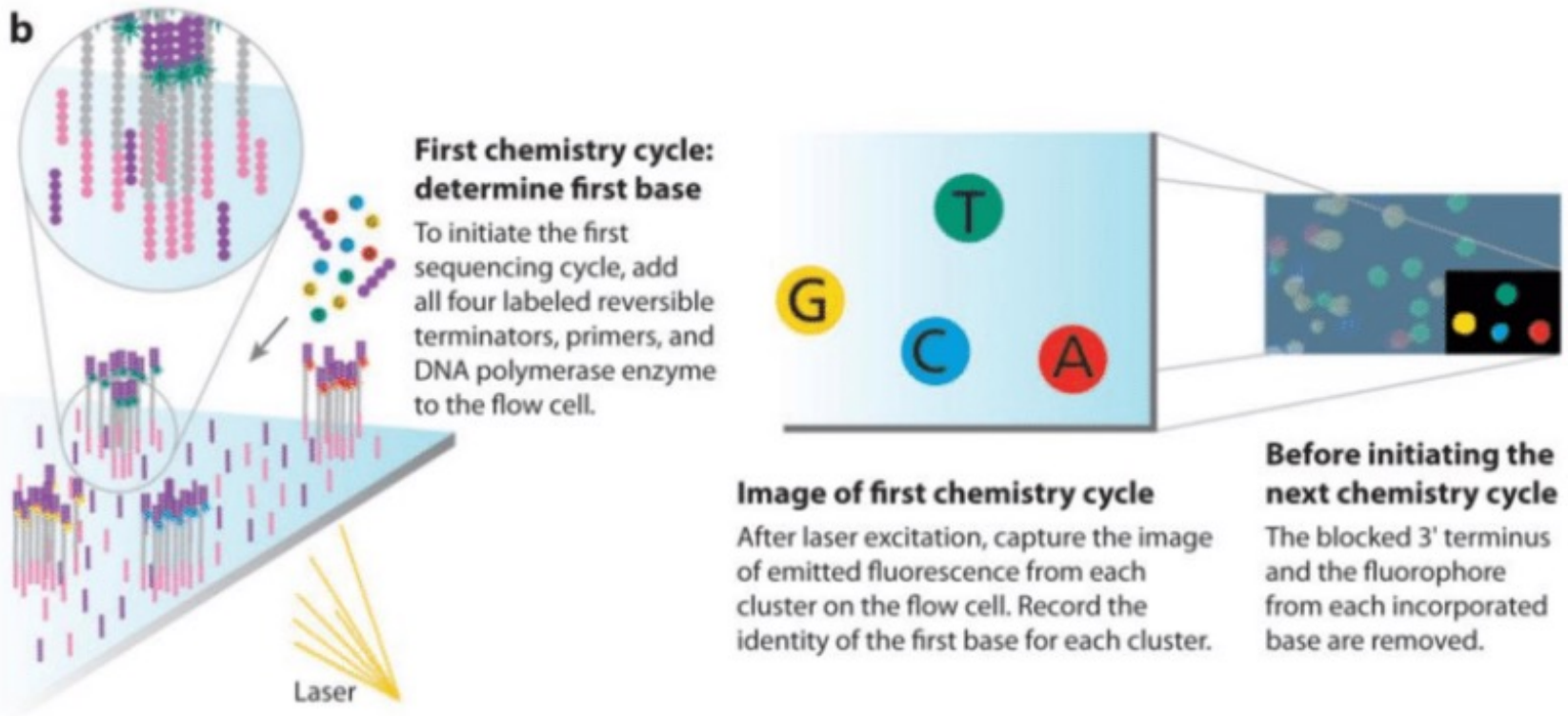
- Adult *C. sinensis* flukes were isolated from cat livers (Henan Province, China) and then a single adult fluke was chosen for genomic DNA extraction.



Sequencing method = Illumina sequencing



Sequencing method



Sequencing strategy = Whole genome Shotgun

- 1 Cut the DNA into overlapping fragments short enough for sequencing



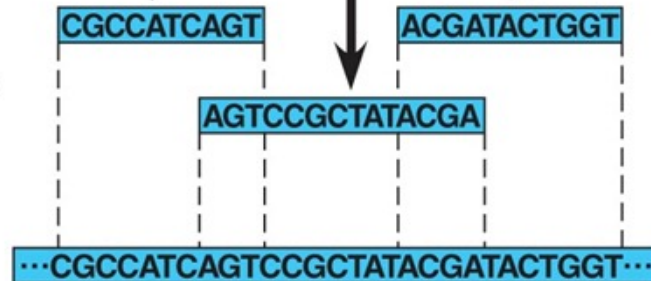
- 2 Clone the fragments in plasmid or phage vectors.



- 3 Sequence each fragment.

CGCCATCAGT AGTCCGCTATACGA ACGATACTGGT

- 4 Order the sequences into one overall sequence with computer software.



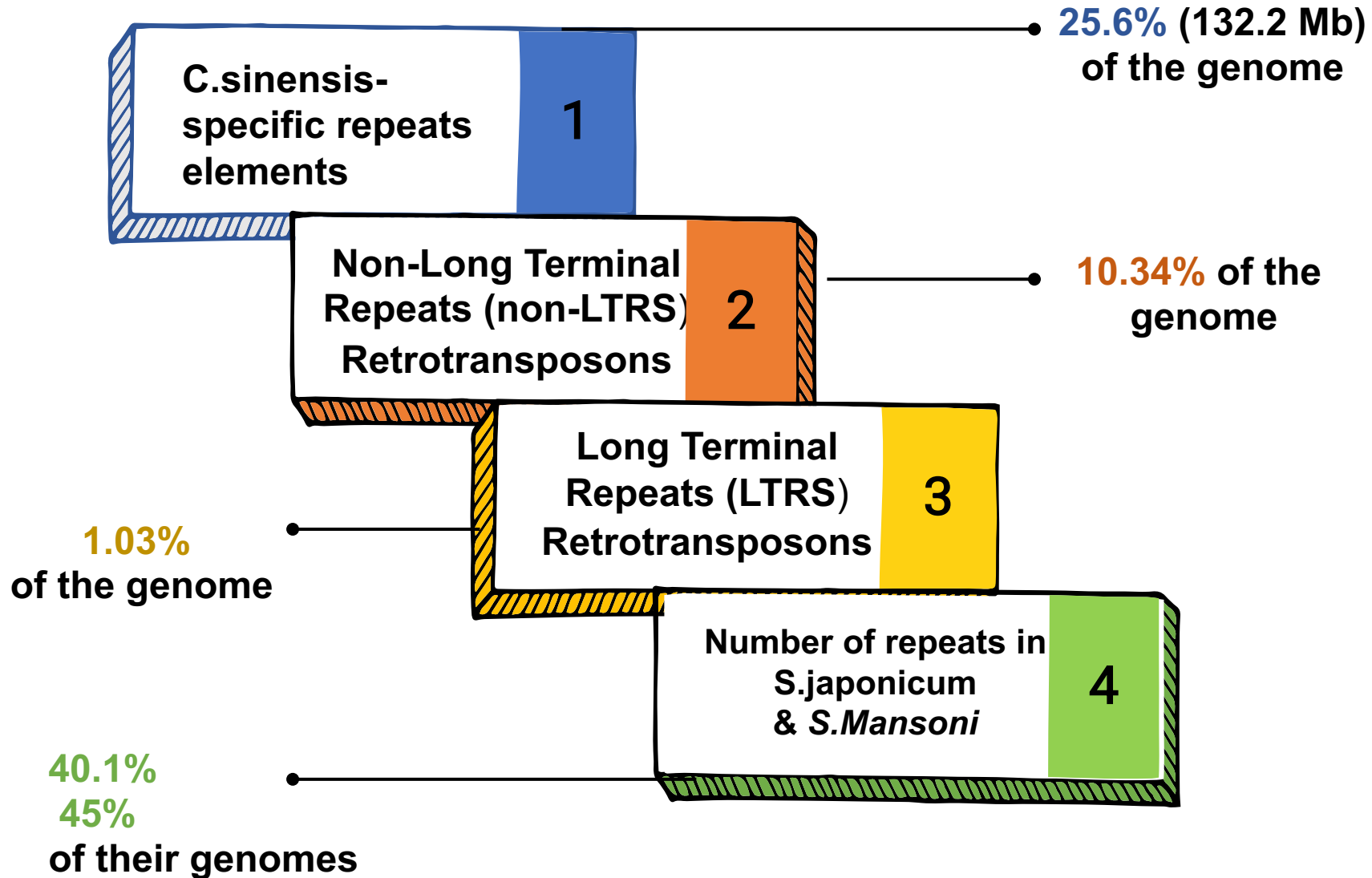
Genome Assembly

Table 1 Summary of the *C.sinensis* genome assembly

	Total length (Mb)	Number	N50 ^a (bp)	N90 ^a (bp)	Longest (bp)
Contig ^b	515.56	60,796	14,708	4,079	137,874
Scaffold ^b	516.46	31,822	30,195	7,299	238,094
Super-scaffold ^b	516.47	26,446	42,632	8,441	400,764

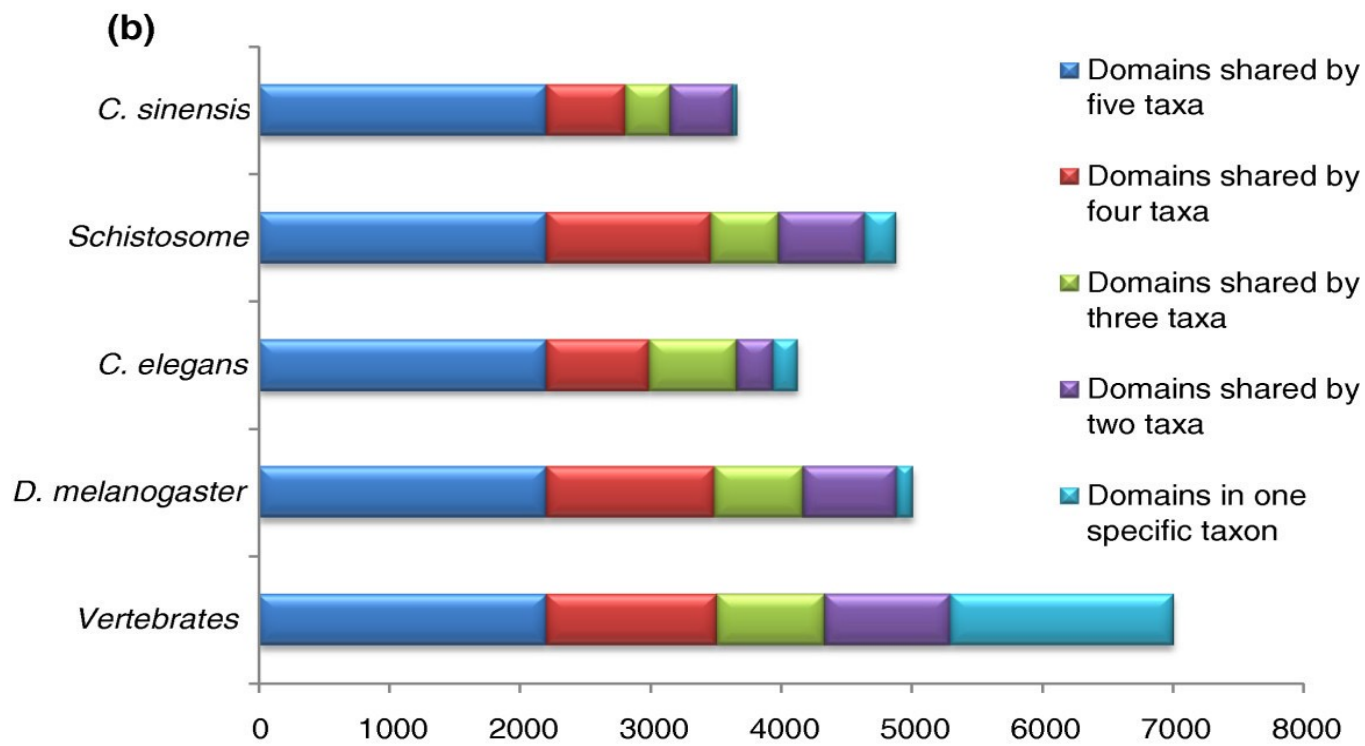
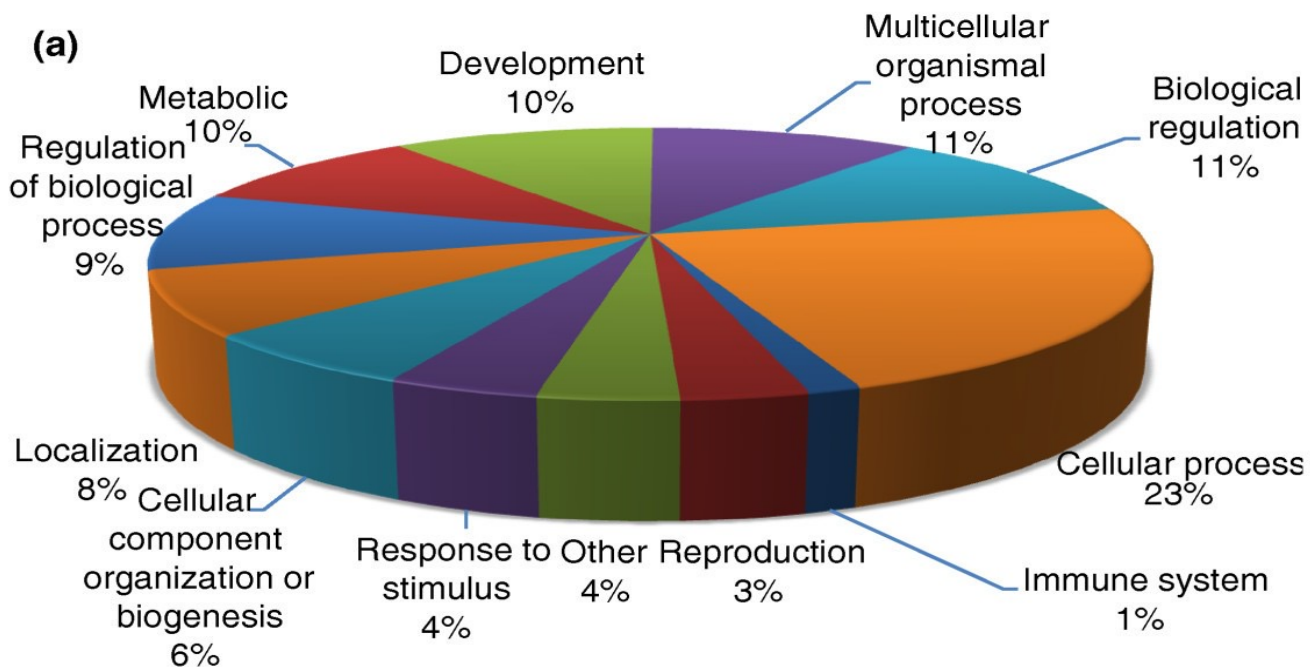
- **Genome coverage** : 5000x
- **Genome size** : 516 Mb
- **Number of chromosome** : (2n=56) 20 pairs of **small** chromosomes
8 pairs of **large** chromosomes
- **N50 contig** : 14,708 bp (15 kb)
- **Total no. of contigs** : 60,796 contigs
- **N50 scaffolds**: 30,195 bp (30kb)
- **Total no of scaffolds**: 31,822 scaffold
- **MORE contigs = smaller in size** / **LESS Scaffolds = large in size**

Structural Annotation



Functional Annotation

- The major protein domains of *C. sinensis* are shared with other taxa and *C. sinensis* has the fewest unique domains.



Interesting information

- Adult **liver flukes** can produce up to **4000 eggs** per day for at least six months.
- Worms can live up to **8 years** in humans.
- An infected person may pass viable eggs up to **30 years**.
- A human host with an average infection will have **two or three dozen** worms; heavily infected individuals have been found with as many as **20,000 worms**.

Interesting information

How can I prevent *Clonorchis* infection?

1. Avoiding raw or undercooked freshwater fish or even lightly salted, smoked, or pickled fish.

2. The FDA recommendations :

•Cooking

- Cook fish adequately (to an internal temperature of at least 145° F [\sim 63° C]).

•Freezing

- At -4°F (-20°C) or below for at least 7 days (total time)
- At -31°F (-35°C) or below until solid.

Questions



- What is the common name of *Clonorchis sinensis*?
- What is the name of the sequencing method used ?

**THANK YOU FOR LISTENING
TO MY PRESENTATION**

I HOPE YOU LIKED IT