A disease survey of Chinese mitten crabs (*Eriocheir sinensis*) from the River Thames, London, UK

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Introduction

The Chinese mitten crab (*Eriocheir sinensis*) is an alien species to UK waters originating from China. First introduced into Western Europe in the early 20th Century the species has spread throughout the region becoming established within the River Thames from the 1970's onwards. Mitten crabs are the second intermediate host to the oriental lung fluke (*Paragonimus westermanii*) which can be transmitted to humans via consumption of raw or undercooked crabmeat and infect over 20 million people in Asia. Due to its large population, anecdotal reports suggest establishment of an artesanal fishery for this species in the Thames. Samples were collected for a parasitological survey and to establish risk of human paragonimiasis in those consuming crabs from the river.

Chinese mitten crab (Eriocheir sinensis)

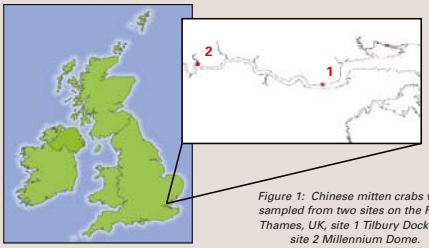

Figure 1: Chinese mitten crabs were sampled from two sites on the River Thames, UK, site 1 Tilbury Dock and site 2 Millennium Dome.

Method

Samples were collected via trapping and fyke nets over an 18 month period from sites at Tilbury Dock and the Millennium Dome. Mitten crabs were examined for the presence of pathogens and parasites (including *P. westermanii*) using fresh tissue preparations and standard techniques for histology and electron microscopy.

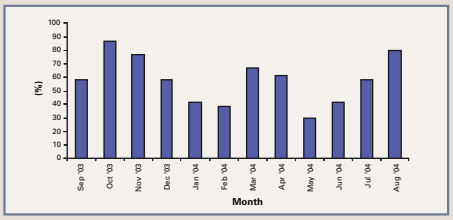

Figure 2A: Prevalence of hepatopancreatic microsporidian in mitten crabs from the Thames estuary, by month.

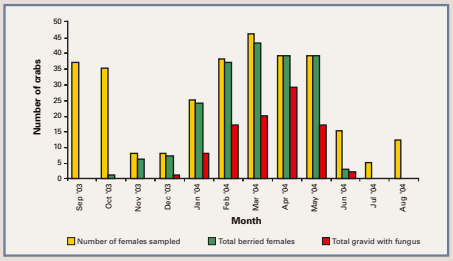

Figure 2B: Number of female (yellow bars), gravid female (green bars) and gravid females bearing fungal infection of egg mass (red bars) in mitten crabs from the Thames estuary, by month.

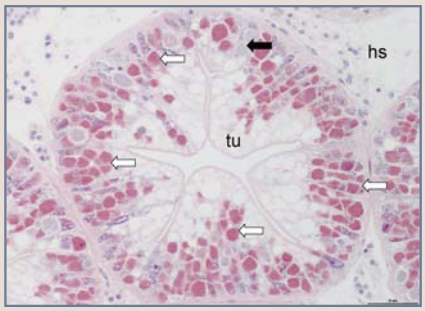

Figure 3: Hepatopancreas of mitten crab heavily infected with microsporidian parasite. Epithelial cells of hepatopancreatic tubule (tu) contain large granular inclusions, some of which are strongly eosinophilic (white arrows) and some of which are basophilic (black arrows). Haemo-sinusoids (hs) surrounding tubule appear normal. H&E stain. Scale bar = 25µm.

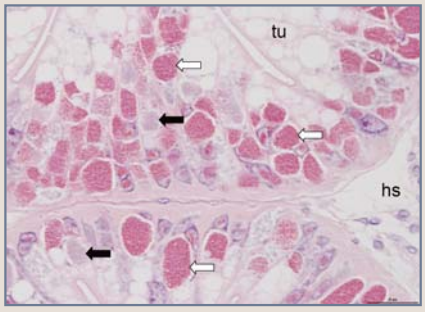

Figure 4: Higher power image of tubule showing eosinophilic (white arrow) and basophilic (black arrow) inclusions. H&E stain. Scale bar = 25µm.

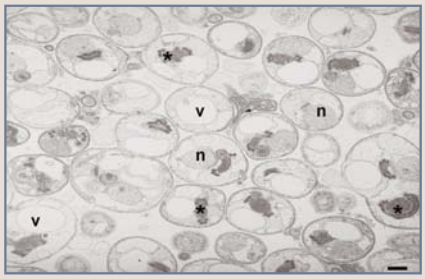

Figure 5: Sporonts developing within sporophorous vesicle. Nuclei (n) and vacuoles (v) are evident, polar filaments (asterisk) can be seen developing within the sporonts. TEM. Scale bar 500nm.

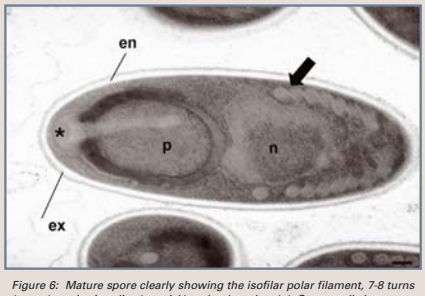

Figure 6: Mature spore clearly showing the isofilar polar filament, 7-8 turns (arrow), anchoring disc (asterisk) and polaroplast (p). Spore wall shows two layers the electron lucent endospore (en) and the electron dense exospore (ex). The nucleus (n) can be seen centrally located. TEM. Scale bar = 100nm.

Results

Analysis of multiple tissues and organs from over 1000 crabs over the sampling period failed to detect *P. westermanii* (or other encysted Digenea) in the Thames population. However during the course of the survey, a microsporidian (previously described as *Endoreticulatus eriocheir* infecting mitten crabs in China) was found inhabiting the hepatopancreatic tubules at high prevalence (Figure 2A). The egg clutch of gravid females was also found to be infected with an unidentified fungal pathogen that led to degeneration of the egg mass (Figure 2B).

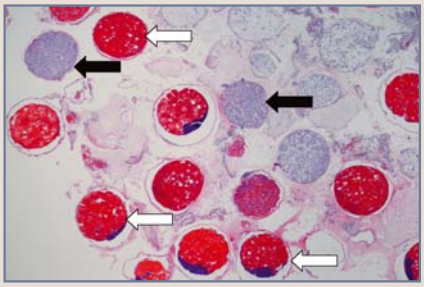

Figure 7: Histology of infected egg mass showing normal (white arrow) and fungus-infected (black arrow) eggs. H&E stain.

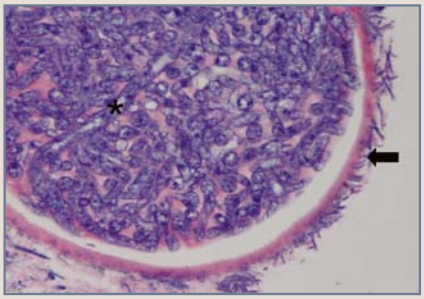

Figure 8: Single infected egg showing massive invasion of cytoplasm by fungal hyphae (asterisk) and filamentous bacterial growth on egg surface (arrow). H&E Stain.

Conclusions

Based upon the absence of *P. westermanii* cysts in the seasonal samples of *E. sinensis* collected from the Thames, we conclude that the risk of contracting human paragonimiasis in those consuming mitten crabs from the Thames is negligible. The absence of the parasite is likely due to the absence of the first intermediate snail host from the Thames ecosystem or absence of the encysted stages in original and subsequent invading populations. The presence of an alien microsporidian parasite in Thames crabs does demonstrate however the additional threat posed to native ecosystems by the introduction of alien host species. Further work to investigate the potential passage of this pathogen to native decapods is suggested.

Acknowledgement

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