FYI.

From: [s. 22(1)(a)(ii)]
Sent: Thursday, 5 June 2014 3:37 PM
To: [s. 22(1)(a)(ii)]
Subject: Yellow grub pics [SEC=UNCLASSIFIED]

Hi

Hope your trip to CER was pleasant, it was nice to meet the both of you.
I have attached some pics of the yellow grub hope you find them useful.

Kind Regards

Live Aquarium Fish Unit | Central East Region

Department of Agriculture
Central East Region
1 Grewe Place, Rosebery NSW 2018 Australia
PO Box 657, Mascot NSW 1460 Australia
Hi

This is was Identified by our entomologists on the (yellow tang fish) Clinostomum marginatum.

I could only find info on fresh water fish

Clinostomum marginatum is a species of parasitic fluke (class Trematoda). It is commonly called the "yellow grub". It is found in many freshwater fish in North America, and no fish, so far is immune to this parasite. This type of fluke can be found in the mouth of aquatic birds such as herons and egrets. They are also found commonly in the esophagus of fish-eating birds, and reptiles. Eggs of these trematodes are shed in the feces, hopefully into the water. Many aquatic birds become infected by ingesting freshwater fish that are infected. The metacercariae are found right beneath the skin or in the muscles.

Life cycle of this “yellow grub” consists of two intermediate hosts and one definitive host. The parasite’s eggs hatch in the water and the miracidium invades the foot of the snails. The cercaria leaves the snail and encysts in the muscle of the connective tissue of fresh-water species. The metacercarial stage is that is formed is then referred to as the “yellow grub”. The encysted metacercaria appears yellow, slightly oval spot, about 3 to 6 mm long. Metacercariae are common in the caudal, dorsal, and pectoral fins; on the inside surface of the operculum, and in the flesh. The adult trematode is found in the mouth and esophagus of herons and other fish-eating birds.
Morphology[edit]

*C. maginatum* is a yellow worm that can grow up to 6.4 millimetres (0.25 in) in the flesh of freshwater fish. Distinguishing characteristics of this parasite in the "miracidium" stage are three eyespots located on the mid-dorsal line, posterior of lateral papillae. These are cup-shaped and contains lens forming a triangle-shaped appearance on the parasite. They also contain two pairs of flame cells; one pair located on the anterior between the eyespots and lateral papillae and one pair on the posterior side. In addition, they have pairs of large refractive vacuoles, which are found near the flame cells. They differ in structure and physiological phenotypes depending on its habitat. However, ones found in herons were smooth, thick teguments and absorbed food such as glucose through facilitated diffusion.

Along with a thick tegument, these flukes were also found to have bacteria on them. The bacteria may play a role in the absorption and metabolism of glucose.

Life cycle[edit]

For its life cycle to be complete, *Clinostomum marginatum* requires two intermediate hosts (snail and fish) and one definitive host (bird). The life cycle begins when eggs hatch in the water. The miracidia swims and invades the foot of a snail of the genus *Helisoma*. They will die in several hours if they cannot find the snail host. While inside the snail, the miracidia undergo several asexual reproduction and the larvae eventually become cercariae. The cercariae form exits the snail and is free swimming in water, in search for a fitting fish host. They burrow inside the fish host, and the cercariae encyst and continue its next larval stage, known as "metacercariae", which are the yellow grubs. The grubs can live within the fish for several years until eaten by a bird host. When the parasitized fish is eaten, the grub matures in the throat of the bird. The eggs of the parasite known as a metacercariae are then released into the water through the bird's mouth when feeding and become adult flukes. This completes the life cycle.
Hi

Thanks for the images. Do you remember what the parasite was called?

Sorry if I've already asked you, I've been out of the office and just catching up on everything!

Hi

Kind Regards

s. 22(1)(a)(ii)

Cian Clancy
Patrick Brasley
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Hope your trip to CER was pleasant, it was nice to meet the both of you.
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Live Aquarium Fish Unit | Central East Region

Department of Agriculture
Central East Region
1 Crewe Place, Rosebery NSW 2018 Australia
PO Box 657, Mascot NSW 1460 Australia
## Animal Import Operations Branch – Fish Teleconference Minutes (FISH0714)

### 10:00-11:00 Wednesday 2<sup>nd</sup> July 2014

### Attendees:

<table>
<thead>
<tr>
<th>Branch and Region</th>
<th>Attendee Details</th>
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<td>Animal Import Operations Branch, (ACT)</td>
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<td>ACT (Minutes)</td>
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### 1. Regional Update

#### ACT:

s. 22(1)(a)(ii)

#### NER:

s. 22(1)(a)(ii)

#### CER:

s. 22(1)(a)(ii)

#### SWR-WA:

s. 22(1)(a)(ii)

### 2. Review of action items

s. 22(1)(a)(ii)
3. **Instructional Material updates**

4. **QAP criteria and audits**

5. **Regional compliance issues:**
6. **Regional visits:**

   s. 22(1)(a)(ii)

   CER has found imported yellow tangs with pustules on their dorsal fin. OSP have identified these as the parasite *Clinostomum marginatum*. CER mentioned that they are mostly found on shipments coming out of Hawaii.

   Other regions have not found the parasites but will remain vigilant with inspections of yellow tangs. CER has forwarded photos to ACT and these will be posted on OFIN. [ ] will also send the information to Animal Biosecurity.

7. **OFIN Fish ‘n’ Chats:**

   s. 22(1)(a)(ii)

8. **Service Delivery Modernisation:**

   s. 22(1)(a)(ii)

9. **Parasite on fish**

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   Other regions have not found the parasites but will remain vigilant with inspections of yellow tangs. CER has forwarded photos to ACT and these will be posted on OFIN. [ ] will also send the information to Animal Biosecurity.
10. s. 22(1)(a)(ii)
    s. 22(1)(a)(ii)

11. Update on Grey List and Live Import List:
    s. 22(1)(a)(ii)

12. Animal Biosecurity projects update:
    s. 22(1)(a)(ii)

13. File storage and Trim
    s. 22(1)(a)(ii)

14. Questions/other business
    s. 22(1)(a)(ii)
Action Items arising from meeting:

1. s. 22(1)(a)(ii)

2. s. 22(1)(a)(ii)

3. s. 22(1)(a)(ii)

4. s. 22(1)(a)(ii)

5. s. 22(1)(a)(ii)

6. ACT to post photos and information about parasites on yellow tangs on OFIN. Also send the information to Animal Biosecurity.

7. s. 22(1)(a)(ii)

8. s. 22(1)(a)(ii)

9. s. 22(1)(a)(ii)

10. s. 22(1)(a)(ii)
Hi

As discussed today we have carried out an inspection on a consignment of marine fish. Part of the consignment was 8 Achilles Tangs. One of these was observed to have what appears to be a single yellow grub on its dorsal fin.

The fish is quite an expensive one.

I referred the issue to one of our entomologists, and our chief vet. Both agreed with our assessment, although it is very difficult to verify visually.

After speaking to you we have added a hold line to the AIMS entry for this particular fish and advised that the fish must be kept in isolation, pending further advice and that the hold at this stage is indefinite.

I have attached for your information the literature we have on Yellow Grub. It appears that the final host has to be a water bird for the grub to reach maturity. In reality this would make it a relatively low biosecurity risk, given the fish will go to an aquarium until it dies.

Hope this is of assistance.

Regards,
Clinostomum marginatum is a species of parasitic fluke (class Trematoda). It is commonly called the "yellow grub". It is found in many freshwater fish in North America, and no fish, so far, is immune to this parasite. This type of fluke can be found in the mouth of aquatic birds such as herons and egrets. They are also found commonly in the esophagus of fish-eating birds, and reptiles. Eggs of these trematodes are shed in the feces, hopefully into the water. Many aquatic birds become infected by ingesting freshwater fish that are infected. The metacercariae are found right beneath the skin or in the muscles.

Life cycle of this “yellow grub” consists of two intermediate hosts and one definitive host. The parasite’s eggs hatch in the water and the miracidium invades the foot of the snails. The cercaria leaves the snail and encysts in the muscle of the connective tissue of fresh-water species. The metacercarial stage is that is formed and is then referred to as the “yellow grub”. The encysted metacercaria appears yellow, slightly oval spot, about 3 to 6 mm long. Metacercariae are common in the caudal, dorsal, and pectoral fins; on the inside surface of the operculum, and in the flesh. The adult trematode is found in the mouth and esophagus of herons and other fish-eating birds.

Contents

- 1 Morphology
- 2 Life cycle
- 3 Food source
- 4 References

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For its life cycle to be complete, *Clinostomum marginatum* requires two intermediate hosts (snail and fish) and one definitive host (bird). The life cycle begins when eggs hatch in the water. The miracidia swims and invades the foot of a snail of the genus *Helisoma*. They will die in several hours if they cannot find the snail host. While inside the snail, the miracidia undergo several asexual reproduction and the larvae eventually become cercariae. The cercariae form exits the snail and is free swimming in water, in search for a fitting fish host. They burrow inside the fish host, and the cercariae encyst and continue its next larval stage, known as "metacercariae", which are the yellow grubs. The grubs can live within the fish for several years until eaten by a bird host. When the parasitized fish is eaten, the grub matures in the throat of the bird. The eggs of the parasite known as a metacercariae are then released into the water through the bird's mouth when feeding and become adult flukes. This completes the life cycle.
Hello

Given that the finding was in a marine species, it is unlikely to be “yellow grub” (*Clinostomum marginatum*) as this is a digenean parasite of freshwater fish.

This notwithstanding, it is likely to be a metazoan parasite with a complex life cycle.

The 1999 ornamental fish IRA on which the current import policies are based notes the following with respect to metazoan parasite with complex life cycles:

...many metazoan parasites have life cycles that involve several host animals. As such, metazoans with such indirect life cycles are less likely to propagate or survive in closed systems such as aquaria. Should these parasites enter Australian natural waters, they could not establish unless suitable intermediate hosts were present. In addition, metazoan parasites of finfish do not normally cause significant disease. None of the above listed agents is considered likely to have more than a moderate level of impact in terms of consequences of establishment in Australia. Again, using the risk evaluation matrix in Chapter 1, it can be seen that an agent with a consequences score of moderate or less than moderate, would require a low, moderate or high probability of establishment to exceed the ALOP. Given the generally lower disease significance of metazoan parasites, and the lower likelihood of their becoming established in Australia via the importation of ornamental finfish, these disease agents are not considered likely to exceed the ALOP.

Most metazoan parasites are obligatory parasites and display varying degrees of host specificity. Many have life cycles that involve several host animals. Metazoans with indirect life cycles are not likely to propagate or survive in aquarium situations. Should these parasites enter Australian natural waters, they could not establish unless suitable intermediate hosts were present. In addition, metazoan parasites of fish do not normally cause significant disease.

As such, I would assess the biological risk associated with this particular consignment to be within our ALOP.

Regards,

Can you give us a bit of advice please. Note details below and attached.

From time to time our officers in the regions identify fish with ‘yellow grubs’. When identified, these fish are seized and destroyed. However, it can be very difficult to see the metacercariae on the fish and there is bound to be a proportion that are missed at inspection and pass through to the general population. The issue has come to a head because of an affected high value fish (details below) and the lack of clarity about how significant a risk is posed by ‘yellow grubs’ and whether we really need to destroy the fish.

In short, do you consider that these parasites are a significant biosecurity risk? If so, we’ll continue to seize and destroy affected fish when we identify them. Given the lifecycle (attached) and likely very small chance of imported...
fish entering this lifecycle, I think maybe there is not a significant risk. I’d be grateful for your thoughts on the matter – I can come and chat if that would be helpful.

Cheers

---

Hi

As discussed today we have carried out an inspection on a consignment of marine fish. Part of the consignment was 8 Achilles Tangs. One of these was observed to have what appears to be a single yellow grub on its dorsal fin. The fish is quite an expensive one.

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Hope this is of assistance.

Regards,

---

From: s. 22(1)(a)(ii)
Sent: Thursday, 28 August 2014 11:02 AM
To: s. 22(1)(a)(ii)
Subject: Yellow Grub [SEC=UNCLASSIFIED]
Thanks, this clarify things nicely. We’ll let the marine fish go.

What would be your assessment if we identify yellow grub like parasites on freshwater fish. At present we’ll seize and destroy, but let us know if you think we don’t need to do this.

Cheers

---

Hello

Given that the finding was in a marine species, it is unlikely to be “yellow grub” (*Clinostomum marginatum*) as this is a digenean parasite of freshwater fish.

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Cheers

Director, Live Animals Technical Team | Animal and Biological Import Assessments Branch
Phone +61 2 6272 4132 | Fax +61 2 6272 3110 | Mobile +61 434 735 459
Department of Agriculture
7 London Circuit, Canberra ACT 2601 Australia
GPO Box 858 Canberra ACT 2601 Australia
www.daff.gov.au

From: Yellow Grub [SEC=UNCLASSIFIED]

As discussed today we have carried out an inspection on a consignment of marine fish one of these was observed to have what appears to be a single yellow grub on its dorsal fin.

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Hope this is of assistance.

Regards,

s. 22(1)(a)(ii)

Supervisor - Live Fish Imports | Centralised Appointments | Central East Region

Department of Agriculture
1 Crewe Place Rosebery 2018

s. 22(1)(a)(ii) 02 8334 7445 @agriculture.gov.au

PO Box 657 Mascot NSW 1460
Hi folks

Re marine fish with metazoan parasite.

I have advice from our policy colleagues regarding the apparent ‘yellow grub’ in a tang. See below for details. The outcome is that the department considers that this is not a significant risk and so the fish can be released. I have advised that this would be the outcome and that one of the regional officers would be in touch to formalise this. I’d be grateful if you could contact about this.

Also note the comments below about ‘yellow grub’ being a parasite of freshwater fish. Unless there is more information you have on this issue that complicates the picture, I think this means any marine fish with ‘yellow grub’ can be released because we will in fact be dealing with a metazoan parasite with a complex lifecycle. This will be relevant to the yellow tangs that have this issue from time to time. If you have information that means we need to reconsider this, please let me know. I will follow up with the policy people and advise further regarding the significance of any detections in freshwater fish.

Regards

Director, Live Animals Technical Team | Animal and Biological Import Assessments Branch
Phone +61 2 6272 4132 | Fax +61 2 6272 3110 | Mobile +61 434 735 459

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Regards,

From: s. 22(1)(a)(ii)
Sent: Thursday, 28 August 2014 11:26 AM
To: s. 22(1)(a)(ii) - BA
Cc: s. 22(1)(a)(ii)
Subject: FW: Yellow Grub [SEC=UNCLASSIFIED]

Hi s. 22(1)(a)(ii)

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s. 22(1)(a)(ii)

Director, Live Animals Technical Team | Animal and Biological Import Assessments Branch

Phone +s. 22(1)(a)(ii) | Fax +61 2 6272 3110 | Mobile +s. 22(1)(a)(ii)
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Hope this is of assistance.

Regards,

[Signature]
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