

# Adrian's Blog

The Frozen Ramblings of a Marine Biologist

MONTHLY ARCHIVES: AUGUST 2016

## Enter the water, enter the food chain

Posted on [August 31, 2016](#)

Usually when people say “Enter the water, enter the food chain” they are talking about big aquatic predators like sharks. But I think it applies equally to itty bitty teeny tiny things. After we pick all the big things out of our sample, we sieve the water. This concentrates all the tiny animals. We then use a microscope to count all the little critters. Every year it amazes me how many super tiny animals live in the sea water. It also makes me wonder what things swim inside my ear every time I go swimming in the ocean. If they are swimming in my ear, are they also taking little nibbles in there?

The most abundant little critters in the water are copepods. Copepods have a huge range in size. Some we can't see at all without a microscope, others we can see as little flecks of color with the naked eye.



Two different kinds of copepods, a chaetagnanth, and a radiolarian

In the picture above you can see *Paraeuchaeta*, the biggest critter in the photo. *Paraeuchaeta* is a rather large copepod that we can often see as a orange dot flitting around the large sample. Under the microscope we can see that it has two huge arms that it keeps curled up under its mouth. Next to *Paraeuchaeta* you can see a bunch of smaller clear copepods. These are *Metridia* and they are the most common, and abundant copepod we get in our nets. Also in the pic above is a chaetagnanth (it looks a bit like a weird arrow coming in from the right side of the photo). You might remember me holding a huge one at the end of my last post. This small size is much more typical for chaetagnaths in the world oceans.

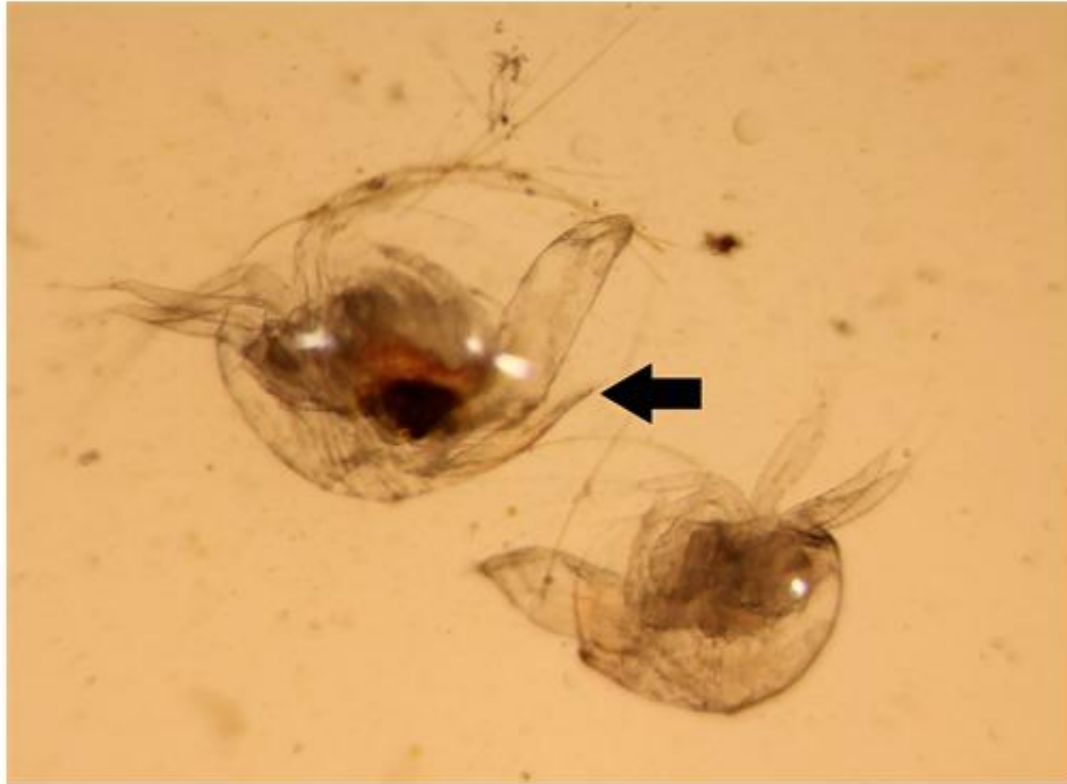
Copepods have a fun diversity of shapes. Two fun ones that are easy to recognize are “orange brushy feet” and *Heterohabdus sp.* Oddly enough we don’t know what species orange brushy feet is, but the orange brushy feet are unmistakably adorable. The Southern ocean copepod keys are also unmistakably difficult to work through, so the exact nature of good old orange brushy feet remains a mystery.



Orange brushy feet is on top Heterohabdus in on bottom

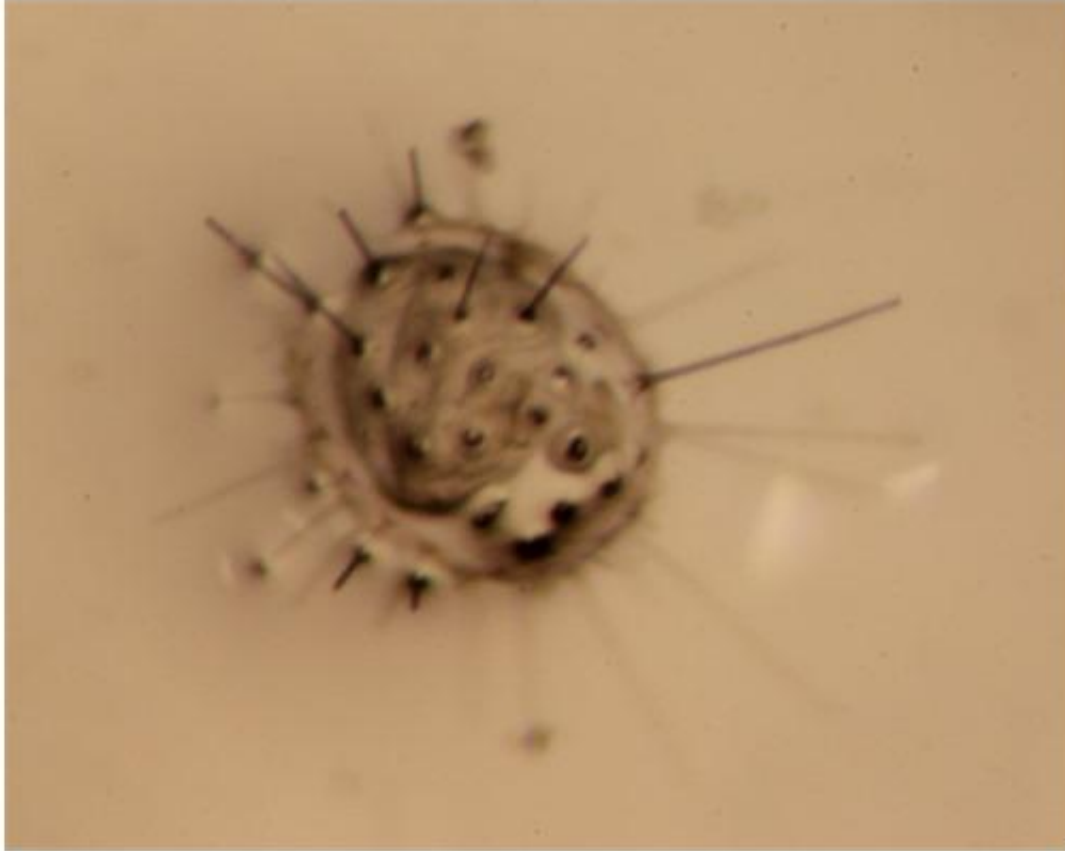
*Heterohabdus sp* is a nice big copepod. It usually has beautiful orange oil droplets inside of it. It also has tremendously long antennae and a long setae (hair) coming off its tail. Female *Heterohabdus* have “lady lumps”, or a bulge on either side at the base of the tail. You can see one of the lady lumps on the copepod pictured above.

In earlier blogs I have shown you what grown-up krill, *T. mac*, *Frigida*, and *Triacantha* look like. Well, we also get very small early larval stages of these guys. These early larval stages look nothing like the shrimp like creatures they will grow up to be, but we can still tell them apart. The most common larvae we get this time of year is the C1 stage of *Euphausia frigida*. We also get the C1 stage of *E. triacantha*. As is true for the adults, the triacantha larvae are bigger and more colorful than the frigida larvae. The triacantha larvae also have a rather conspicuous spine protecting their tails.



Tricantia C1 with spine (top) and Frigida C1 (bottom)

Another cool thing we get in our samples are radiolarians. These are crazy looking spikey balls. If these things were larger they would be terrifying weapons. But since they are small they are beautiful and really fun to find in the sample.



Behold! A radiolarian.

Another class of animals that we find using the microscope are polychaete worms. We can identify about 5 species of polychaetes, but there are so many more species here.



Unidentified polychaete with a teddy bear face.

I really do love looking at all these little critters under the microscope. We all do. You can frequently hear us greeting the animals, telling them they are gorgeous, and calling other team members over to look at particularly cool critters as we do our microscopic counts. Zooplankton are just amazing... but I still don't want them in my ears.

Posted in [2016 Winter](#), [Antarctica](#)

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## Some of my Favorite “weirdos”

Posted on [August 30, 2016](#)

When we pull in our net it is usually filled with euphausiids (mainly krill or *T. mac*) and then a few other things in much lower numbers. We call these other things “weirdos”. This is a very comprehensive scientific term that covers everything from gastropods, to amphipods, to arrow worms and jelly creatures. I love the weirdos! They are always so much fun to look at and try to identify. So without further ado, let me share some of my favorite weirdos with you...



Two *Clione limacina*

Its no secret. I just love *Clione limacina*, or Clione to her friends. These guys are pteropods and are sometimes called sea angels or sea butterflies. They are little snails that don't have shells, but rather flap through the ocean using wing like extensions of their mantle. Also, they are gorgeous in their lovely shades of orange, yellow and coral.

Most of the weirdos we get are amphipods. Amphipod morphology (their shapes, what they look like) can get pretty crazy. Some are adorable like this guy who comes with his own, home grown boxing gloves.



Eusirus properdentatus is ready to rumble.

Some grow their own swords. This is *Scina* sp. We call everything in this genus swordheads, for obvious reasons. This guys are just too hard for us to identify to species so we leave it at genus.



Scina swordhead is ready to do battle.

Other weirdos are all lovely and stary in purple.



*Primno macropa* dreams of becoming a star.

Sometimes you look at these rather tiny amphipods and wonder how they survived the net all in one piece. And then you look at their complex structures and think “surely I can identify this to species”, but you don’t get very far as the keys are not comprehensive. We had one tow that was within a few meters of the bottom. We usually keep the net much higher in the water column and catch pelagic species and we mostly can identify. However on this near benthic tow, we got a bunch of super neat looking benthic (bottom associated) critters that we had never seen before. Sometimes we could identify the critter down to family.



Totally weird and cool gammarid amphipod.

Other times we pull up something that is not in the key and defies all expectations. When we first saw this guy, we thought it was a pycnogonid (sea spider), but then we took a closer look under the microscope and the legs were all wrong for a pycnogonid. So we have zero clue as to what this thing is. We stuck it in its own jar and will consult with experts back at home.



Anyone know what this is? Anyone?

Speaking of legs... we tell a lot of amphipods a part by the size, and shape of their legs and leg segments. Let me show you an easy example. There are two closely related species that we frequently catch. One *Cylopus magellanicus* has a nubbin leg that is round (convex) or flat on both sides of the leg. The other *Cylopus lucasii* has a nubbin leg that is concave on one side.



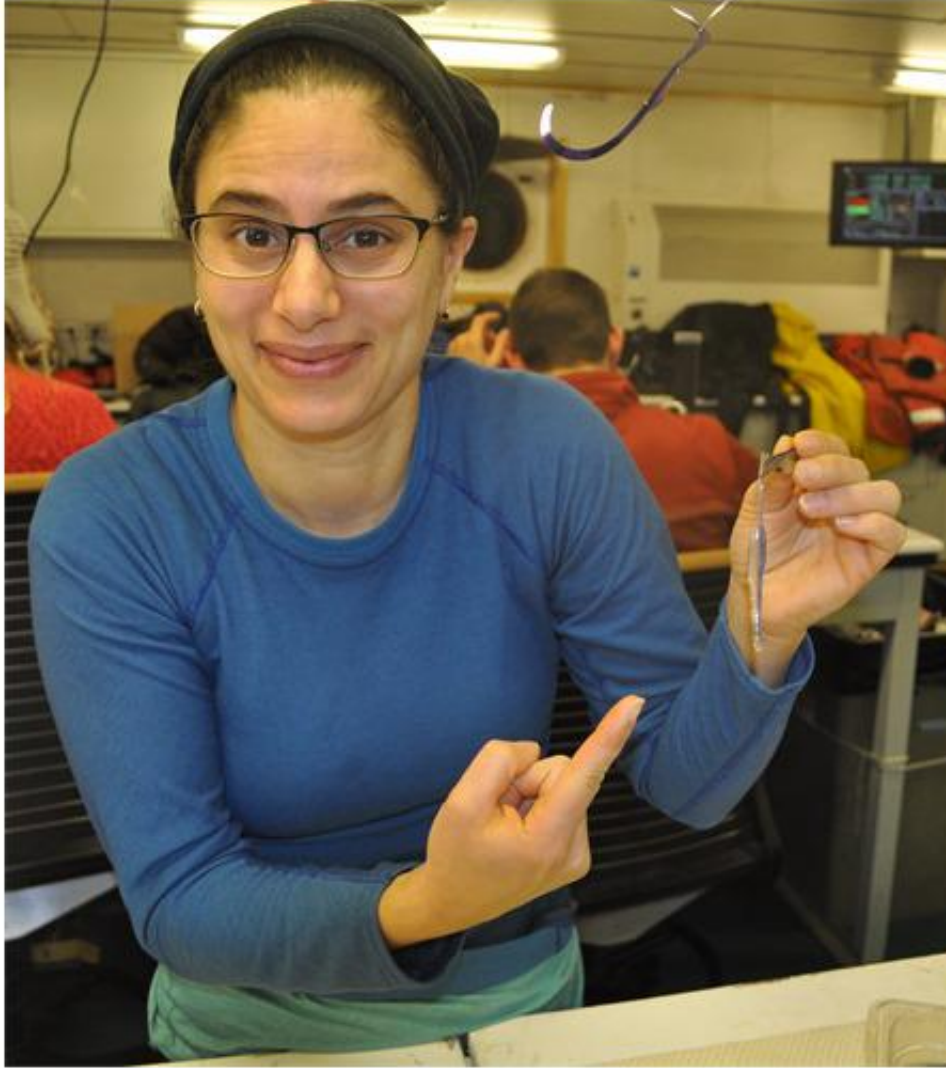
The arrow points to the nubbin. Look closely



Arrow points to *C. lucasii* concave nubbin leg

You may have also noticed that in the pictures above the *C. magellanicus* is blue while the *C. lucasii* is a reddish brown. Only *C. magellanicus* has a blue form, but not all *C. magellanicus* are blue. So, if we have a *Cylopus* that isn't blue, we need to look at the nubbin leg every single time.

One critter that we get every tow, that is super easy to identify is the chaetagnath (arrow worm). These guys are serious predators. They will try to eat anything they can bite, no matter how big. In more temperate oceans these guys are pretty small and you need a microscope to see them. In the Antarctic, chaetagnaths grow surprisingly large.



Look at the size of that chaetagnath!

Well I hope you enjoyed learning about zoo lab weirdos. They certainly are fun for us to look at!

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## Utterly Useless Ice

Posted on [August 24, 2016](#)

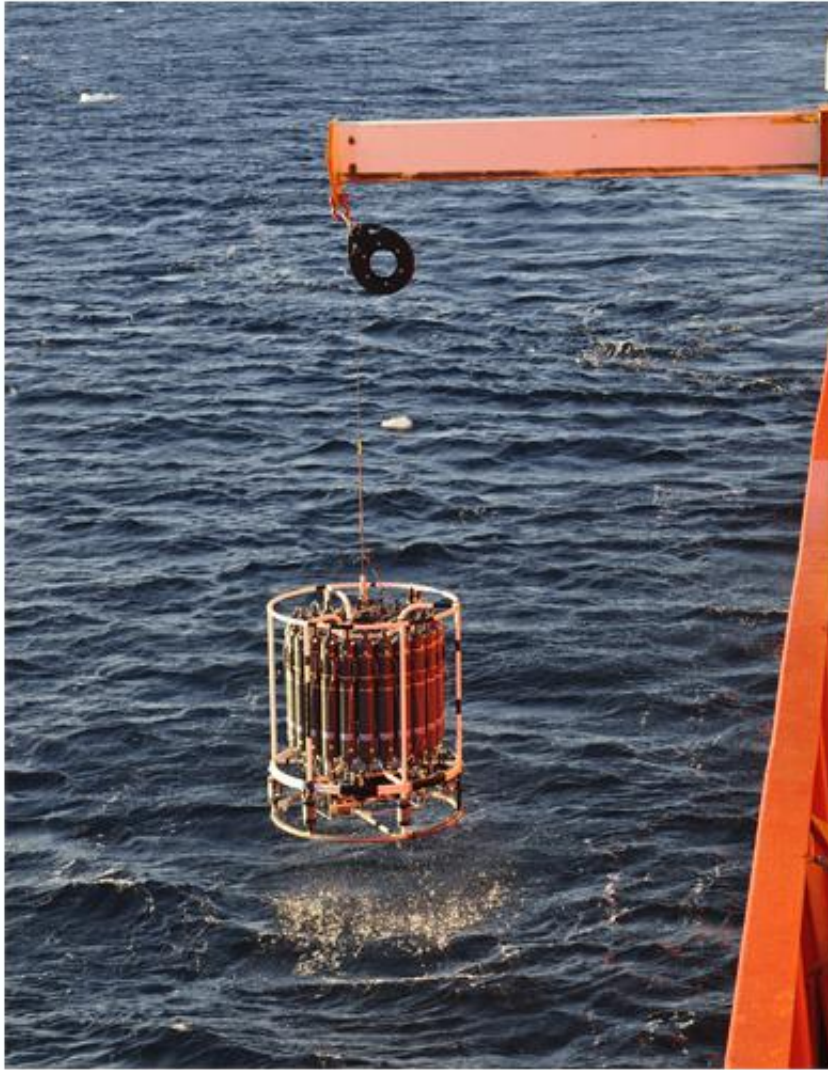
I love sea ice, in all of its manifestations. I really do. This trip we had so much open water, I longed for the day when the ship would be surrounded by ice- preferably thick first year ice with seals and penguins on top.

Well that day finally came- sort of. For the past few days we have been slogging through ice. Science has slowed to a snail's pace



Yeah the net will totally go in...

We are trying to get some sampling done. We have taken water samples with our CTD (Connectivity, Temperature, Depth sensors and it has an array of water bottles to collected samples). The CTD is fragile but we can usually blow a hole in the ice, drop it in,, and trust the rigid frame to protect it.



What a CTD cast should look like



CTD cast in worrisome ice

So have this chunky ice. We can't get the net in, because the ice will shred it (we already shredded one net in ice this trip). We try to get the CTD in, and the whole time the cast is going on we are fretting, worrying that we will lose or destroy, a very expensive piece of equipment in the ice. And every waking (and sleeping moment) Captain and his bridge crew are fretting about hitting hidden icebergs, so we are going glacially slow. We actually had to stop dead still for four hours while the engineers repaired a shaft that sprung an internal leak after we hit some ice. (Big tough icebreaker, eh?)



View from the bridge.

So this ice is frustrating and pretty useless. I mean big chunky ice could be could for krill. And big flat pieces of ice are preferred resting spots for seals, but there are very few upper level predators here. We haven't caught krill in days. It's just been T.mac and friends in our tows



Two stubborn fur seals who likely eat T. mac

So we are going slow- catching no krill, the bird and mammal team are seeing few animals, and the phytoplankton team is terrified that their equipment is going to get destroyed.



O'Brien Island emerges from the ice and clouds



We've had some pretty sunrises.



Calm still mornings.



Reflective snow petrel



Did I mention lovely sunrises?

But as this blog title says, this ice is useless. It slows us down, doesn't have penguins or seals on it, and there is no krill lurking underneath. The chief scientist made the decision to turn the boat around and head back to the Bransfield. If we are going to get stymied by ice, it may as well be good ice. We can see from the satellite imagery that there is more ice there now- but it is the useful kind of ice. There are krill in the Bransfield. And the ice may even be thick enough to support the weight of seals and penguins! Here's hoping that when I come on to shift tomorrow, there are seals on ice!

Posted in [2016 Winter](#), [Antarctica](#)

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## T. Mac and Friends

Posted on [August 22, 2016](#)

We have entered the part of the cruise that the Chief Scientist refers to as "mowing the lawn". We are in a region where the sampling stations are relatively close together and there is very little Antarctic krill (*Euphausia superba*). Instead we get small euphausiids (relatives of krill). The catches in this region are often dominated (in terms of number and biomass) by the charismatic small euphausiid known as T. mac (*Thysanoessa macrura*).



HI! We are T. mac!

I love T. mac. T mac is the absolute best! It is the only euphausiid we get that has bi-lobed (kidney bean shaped) eyes. That means that we can pick them out of the catch without needing a microscope. There is no way that we could confuse T. mac with another critter. T. mac is so courteous that even after it loses its eyeballs, we can still identify it at a glance.



T. mac off to the races.

T. mac has a “racing stripe”, a solid stripe of bright red from the tip of their head to the tip of their tails. No other euphausiid has such a cool stripe. T. Mac also has a ginormous leg that only critters in the genus *Thysanoessa* have



The leg on the biggest T. mac I have ever seen.

Considering how abundant *T. mac* are, and how easy they are to identify you would think that heaps of people study them. But you would be wrong. These little shrimp like guys are everywhere, but no one reports them in diet studies. Seriously, stuff must eat *T. mac*. They look like they would be a great snack- or you know if you snack on them all day you might not need dinner. But sadly when folks find pink mush in something's stomach down here they call it "krill" and poor *T. mac*'s ecological role remains undescribed



This guy studies *T. mac*. He thinks you should too!

Some people get distracted by *T. mac*'s flashy cousin *Euphausia triacantha*, which I must admit is gorgeous and looks a bit like a krill made from sugar.



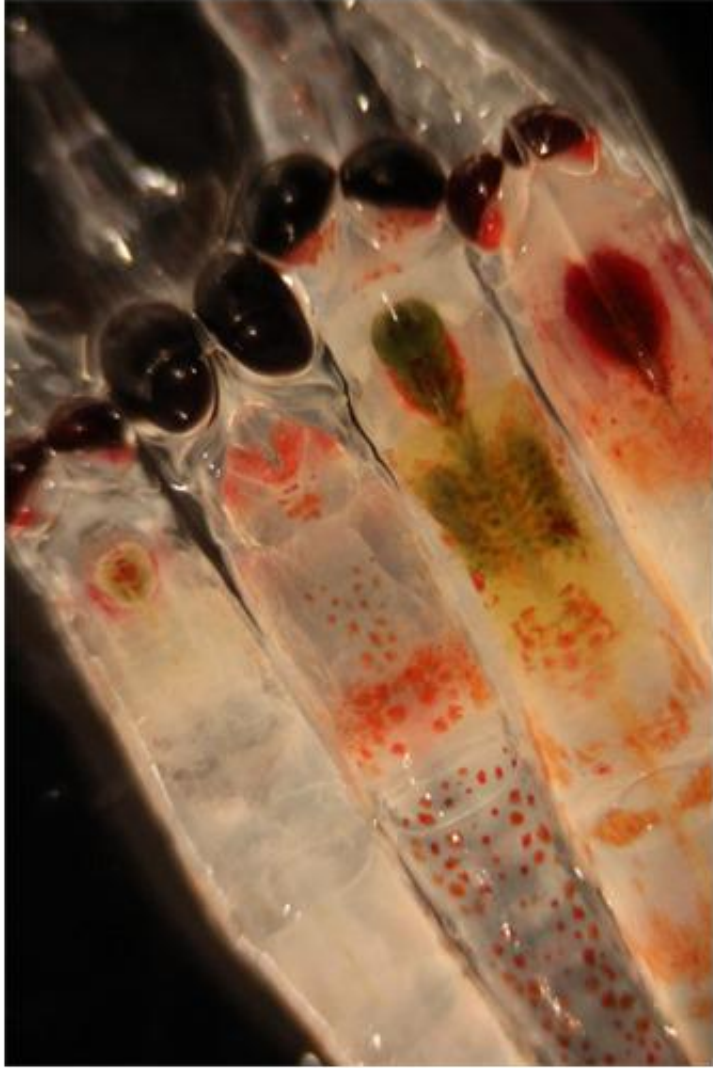
Tri us, you'll like us!

Triacantha has a lovely read spot that makes the adults easy to identify. We find them to be so pretty that we often make neat rows of triacantha in our sorting dishes. Triacantha's beauty demands that sort of thing. Every other species just gets counted and piled. But triacantha is ordered and appreciated.



Triacanthas all in a row (or several).

But triacantha has round eyes, and little triacantha may not have an obvious spot. Actually little triacantha can be easily confused with other round eyed euphausiids without the aid of the microscope. Under the scope we are looking mostly at differences in the rostrum, the pointy bit above the eyes. Here let me show you.



4 different species. Can you spot T. mac?

Ok on the left we have *Euphausia frigida* another small euphausiid that we don't get in large numbers. It has a rather blunt rostrum. There is no pointy bit that goes between its eyes. Next to frigida is T. mac. You can see the bilobed eyes and racing stripe. You'll notice that its rostrum has a crease down the middle, and extends to the midline of those enormous eyes. Next to T. mac is *Euphausia superba* (krill). Krill's rostrum is intermediate between frigida and T. mac, and doesn't have an obvious crease. Finally on the right is triacantha. You can see the red spot. The pointy bit of the rostrum extends further than krill's, there is an obvious crease, it has a different overall shape. Yes these are subtle differences. I need a reference picture in front of me every time I 'scope out small euphausiids. It takes me forever...which is why I love T. mac so much (hardly any scoping required).

Well this has been fun, but now I must get back to counting a boatload (actually an accurate term in this instance) of small euphausiids

Posted in [2016 Winter](#), [Antarctica](#)

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## Ice! Ho!

Posted on [August 16, 2016](#)

Well we finally found some ice. We came back up into the Bransfield Strait. For the last 2 years the Bransfield has been packed with ice and wildlife lounging on ice. This year, not so much, but we did find some lovely ice. We were looking for a nice sheltered spot to calibrate our acoustics (we use something like a fancy fish finder, to help us “see” the krill patches” and they need to be calibrated every year). Along the way to finding the sweet spot for calibration, we found some icebergs, and some slushy chunky ice with aspirations of grandeur.



Sunrise at the start of the search for "the spot"

As we were searching for a good spot, we came across some beautiful icebergs.



That is one beautiful berg!

Winds picked up to 50 knots which cut my photography short. It was rather had to take an in focus photo with my lens blowing around so much!

For the passed few nights we have gotten pancake ice at night, but it was always gone by morning. Not today! Today we had pancakes through breakfast and lunch and I am really hopeful that we will have them all day



Best way to wake up.

Pancakes are lovely, gorgeous things. If this were early in the winter, it would be awesome to see pancakes. This late in the season you would expect to see a few pancakes and more thicker, larger first year ice. The largest we have seen- with the exception of the icebergs, are newly formed (just a few weeks old at most) pancakes. This certainly is a warm low ice winter.

The lack of sea ice means that we are cranking through our science. We have been super busy. We have already sampled at 50 stations. I am exhausted just thinking about it all! Hurray for science! Booo for so much wide open water.

Posted in [2016 Winter](#), [Antarctica](#)

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## Because you know it's all about the krill

Posted on [August 13, 2016](#)

I am currently at sea with NOAA-AMLR on their winter oceanographic survey cruise, also known as the krill cruise. We are interested in the entire zooplankton (animals that can swim up and down but not horizontally against a current)

current, but mostly we are interested in krill. The data we get from this cruise is used as part of an ecosystem based management strategy for the Antarctic krill fishery. We are trying to learn all we can about krill and krill associated zooplankton, but mostly krill.

We are trying to describe population dynamics for krill. Essentially we want to know how the krill population changes in terms of abundance (how much krill there is), distribution (where we find krill), and size stratification (what size are the krill and how many of each size class are there), and what is the sex ratio (how many boys and girls are in the population), and finally what is the sexual maturity or stage of the population (how ready are they to spawn and make more krill).

Let me walk you through our process for getting all this information. Krill form large swarms. When we catch krill, we tend to catch A LOT of krill. We can't possibly count, measure, and sex and stage them all. So the first thing we do is prepare to sub-sample. We mix the krill with sea water until all of it reaches a known volume. In the example below that volume is 32 liters. Then we give the krill a good stir, get it all mixed up so that the krill are less likely to be segregated by sex or size. Then we dip in a known volume container and take a random sample. We'll take multiple samples to get our numbers high enough.



Taking a random sample from the krill catch.

Next we count every single krill in the random sample. Since we know what percentage of the total sample it was, we can multiply our count to estimate the total number of krill caught.



Counting the sub sample

In this tow we counted just over 1,900 krill and estimated that there were 13,680 krill in the total catch. From the counted krill. We take another random sample that gets measured, sexed and staged.



Using calipers to measure krill.

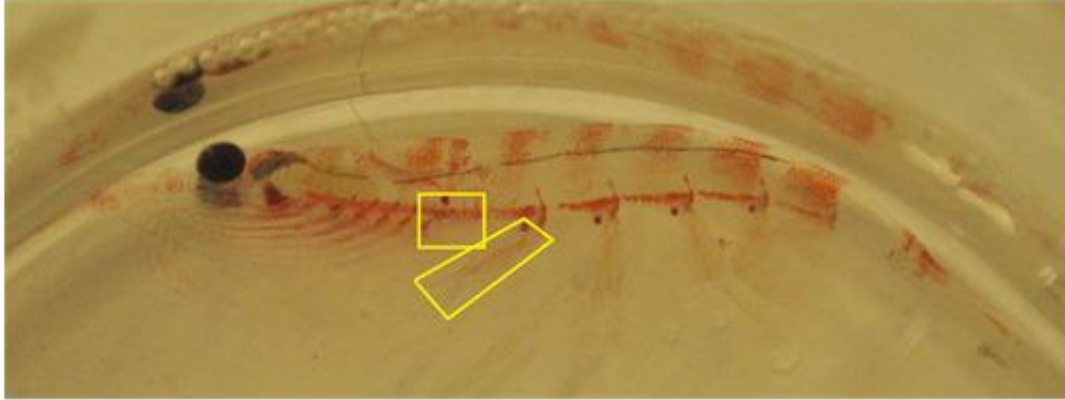
A subset of the measured krill get used for a number of science projects. Measuring krill is fairly straight forward. You measure, in millimeters from the tip of it's rostrum to the tip of its tail.



Krill in tube is science about to happen!

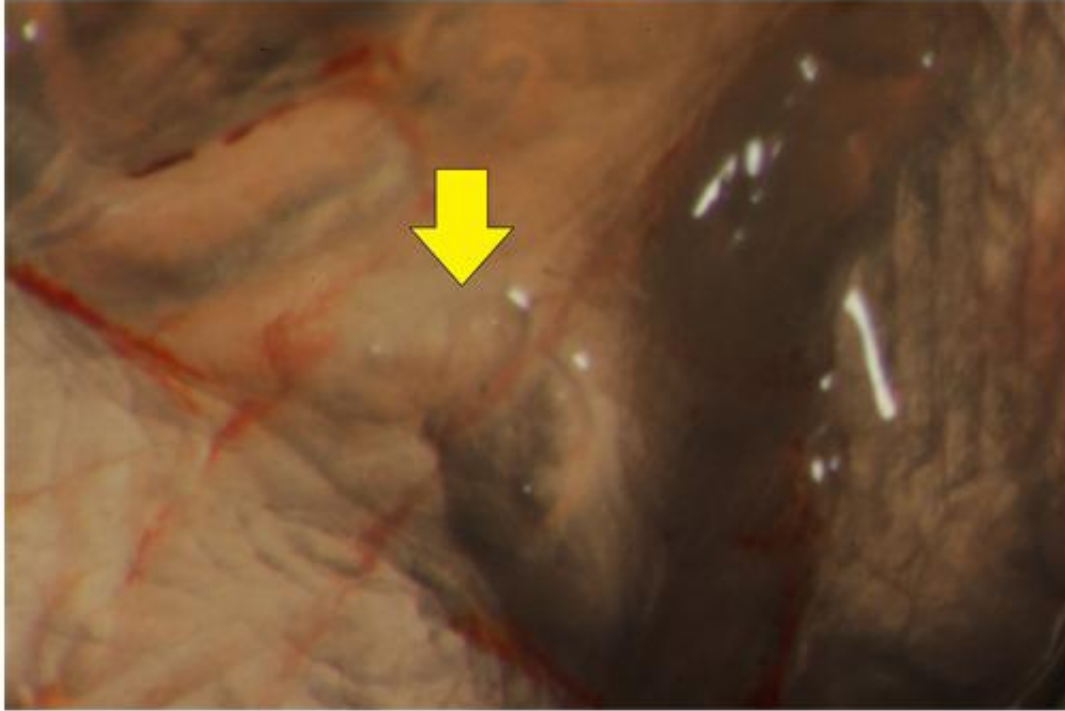
The krill above are going to get frozen and stored at  $-80^{\circ}\text{C}$  until scientists in Oregon can study their guts. This is just one of 6 projects we are collecting, measuring, sexing and staging krill for this year.

Determining the sex and stage of the krill is a little less intuitive. Krill don't develop observable sexual characteristics until they get larger than about 25 or 26 mm. To figure out what sex a krill is you need to look in two places, on its abdomen near the gills and on its first swimming leg.



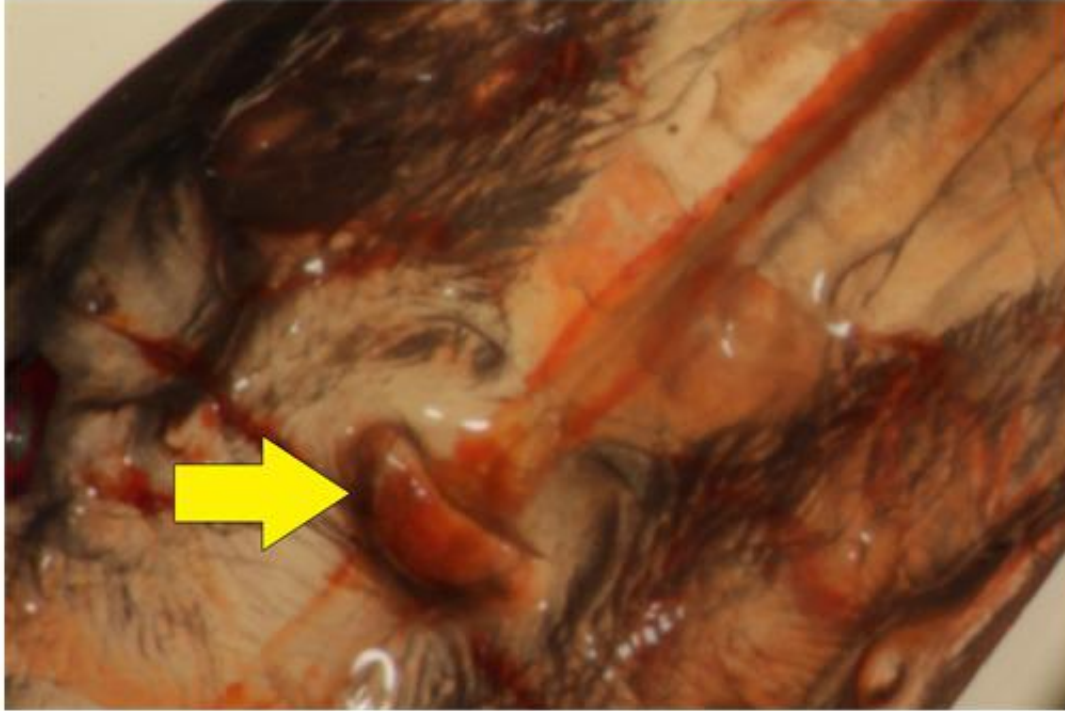
### Where to look for sexual characteristics on a krill

If you put a krill on its back, female krill will have a thylecum roughly where the square is. early stage males and juveniles will have nothing in that region. If you look carefully in the longer rectangle on the picture above you will see the first swimming leg. In males, this is modified into a petasma- or the male sexual appendage. Very mature males will also have obvious ejaculatory ducts and sperm packets visible on their abdomen.



Thylecum on a small female

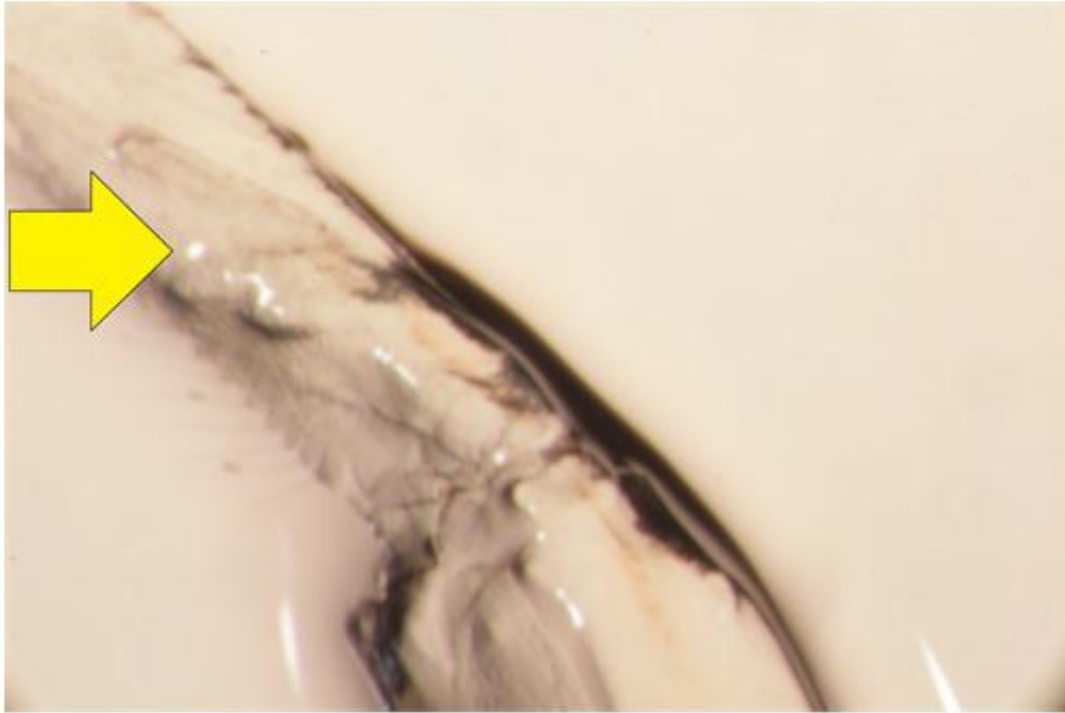
In small females, the thylecum is transparent and very hard to see!! During spawning females store sperm packets near their thylecum.



Thylecum on a large female.

In larger females, the thylecum becomes a bit more opaque and picks up an organish reddish color. When the female is ready for spawning, the thylecum will turn a bright, fire engine, red. This won't happen until spring, so I don't have any photos of that.

The petasma, in males, evolves from a little nubbin to a rather complicated gnarly claw in individuals that are ready to spawn.



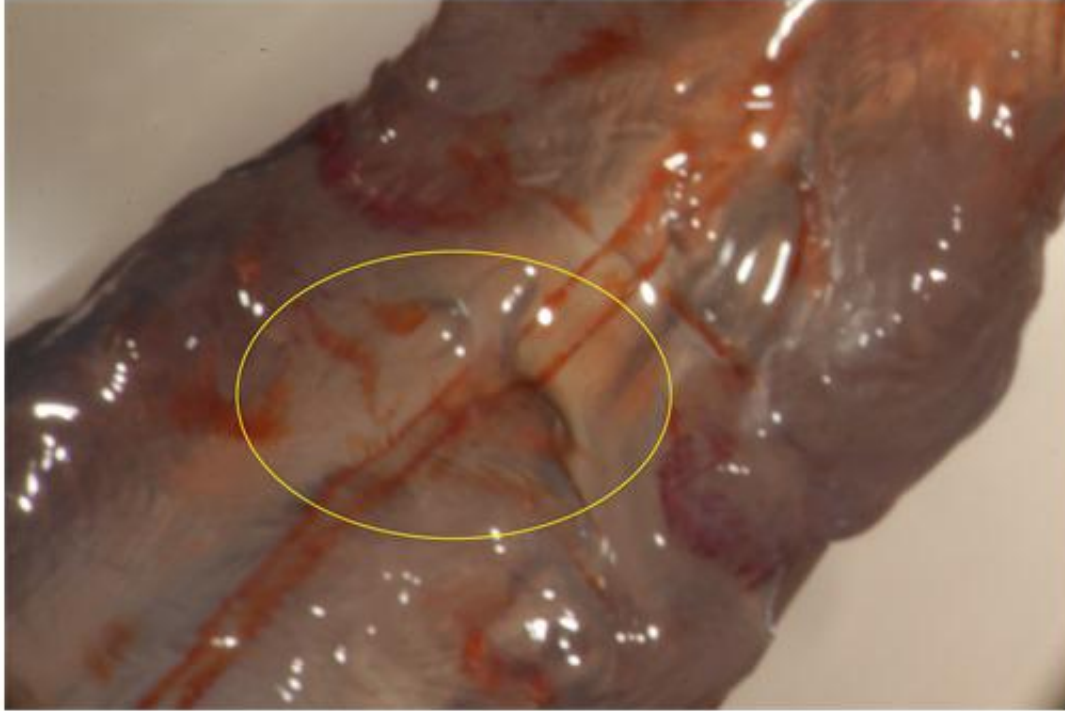
See something that looks like peace sign?

At this time of year we get 2 stages of males, Male 2 and Male 3. Male 2s are starting to develop their petasma and nothing is visible on their abdomen. Pictured above is a Male 2b. His petasma has started to split into two distinctive regions, but has not yet developed that claw like look of males ready to spawn.



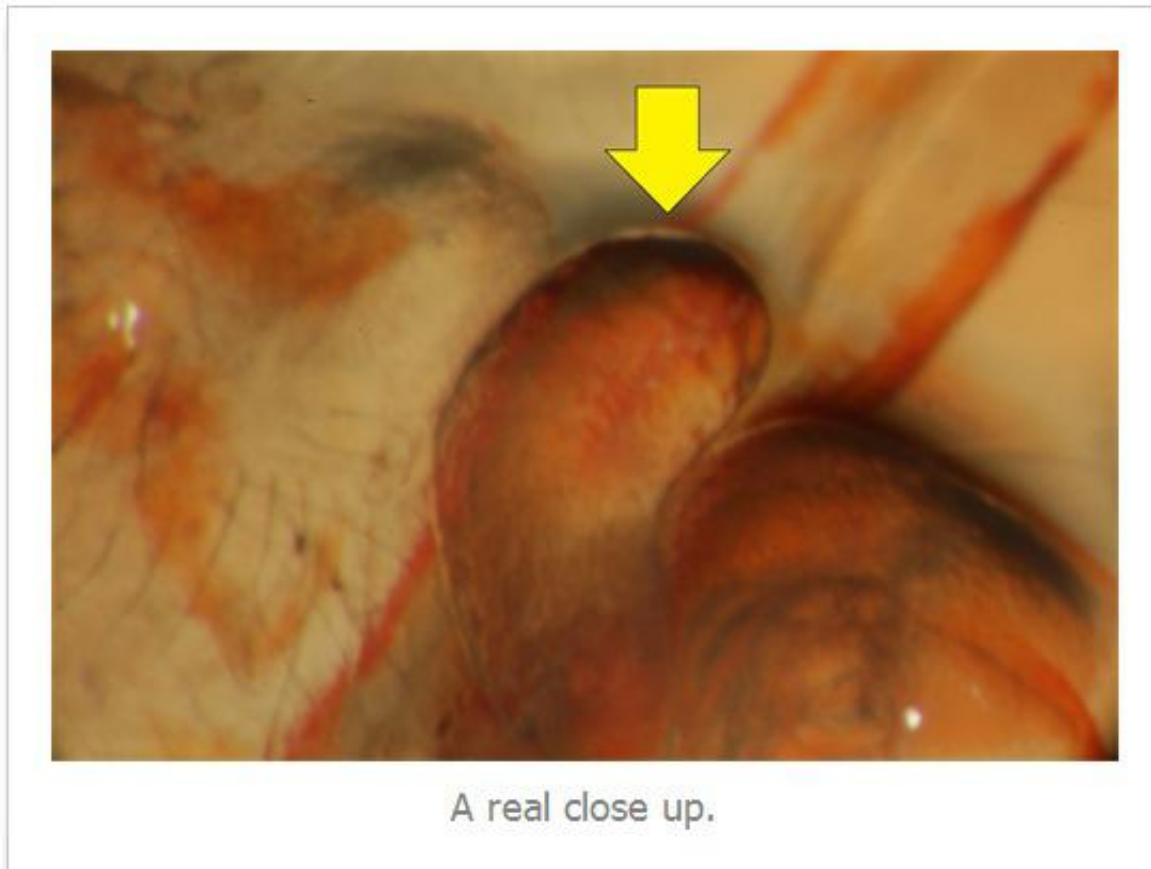
Above is a fully developed petasma from a male 3. See how it looks like a series of hooks? Pretty gnarly huh?

When a male is ready to spawn it is a stage 3B. That means that ejaculatory ducts are visible on its abdomen, they are filled with sperm packets, and the sperm packets can be easily released by gently pushing on the ducts. Spawning starts in spring, and we have caught a number of males who are raring to go.



This is a Male 3B. The ducts are outlined in orange.

In the photo above, the you can see the ejaculatory ducts inside the yellow circle. The duct on the left has had its sperm packet expressed. The empty duct looks a little like a "t" outline in orange. The loose sperm packet is in the center of the abdomen between the two ducts.



In the center of the zoomed in photo, the arrow points to the sperm packet. The empty duct can be seen on the left and a full duct can be seen on the right.

And there you have it. You are now ready to sex and stage krill. Maybe you could come help me out so that it doesn't take me more two hours to go through 70 krill! We have two very experienced female scientists on board who can each work up 150 krill in the time it takes me to do 70! Krill goals right there, krill goals.

It looks like we're going to be socked in with krill for a while. One day I hope to leave zoo lab during daylight so that I can get more scenic photos!

Posted in [2016 Winter](#), [Antarctica](#)

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## Glorious Gerlache

Posted on [August 11, 2016](#)

You may have noticed that I haven't posted any sea ice pictures yet. Long time readers of this blog might find that a bit odd given how much I love sea ice. There is a reason for that. There hasn't been much sea ice at all. On the upside we can get into whatever area we want because the waterway is clear. On the down side, we haven't seen many penguins or seals, or at least not many photogenic ones hauled out on ice

For the past three years, we have been trying to get to the Gerlache Strait, an area south of our usual sampling grid. Each year we were blocked by sea ice. This year we finally made it! Sadly we didn't find a lot of sea ice there either, but the views were spectacular!



Sunrise in the Gerlache.



Finally some ice!



Everyone was taking photos.



The mountains in the Gerlache have their own weather.

Another reason I haven't posted in a little while is because I have been soooooo busy. I work the night shift, midnight to noon. In the Gerlache Strait, that was the krill catching shift. We had so many krill! I was going cross-eyed measuring, sexing (determining if they were male or female) and staging (determining how ready they are to make baby krill) them. When we get a krill haul it is all hands on deck to work through the krill. We are collecting for five different projects, and maintaining AMLR's database. We need to fully sex and stage at least two hundred krill per tow, label and store them! Basically my entire shift is spent dealing with krill. I would just finish one tow, when the net came up with more krill.



A sub sample of the krill.



Pickin' and clickin' krill



Zoo Team sexing and staging krill.



Sexed, staged, and measured krill ready for science.

We try to count every single krill that comes on board, but some times the net is just too full. so we sub sample and extrapolate to how many krill were in the whole catch.

Now that we have finished in the Gerlache we are moving on to the Bransfield. There should also be a ton of krill there too. I am think I am going to be putting krill under the microscope until I go cross eyed!

Posted in [2016 Winter, Antarctica](#)