TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING

POLAR TREC

Antarctica Day Celebration

Polar Gigantism in Antarctica

With PolarTREC Teacher Tim Dwyer & Researcher Dr. Art Woods

1 December 2016

APECS Association of Polar Early Career Scientists

OUR SPACES FOUNDATION FOR THE GOOD GOVERNANCE OF INTERNATIONAL SPACES

ARCUS ARCTIC RESEARCH CONSORTIUM OF THE UNITED STATES

Getting to Know Adobe Connect

Slides will be shown here

Exit presentation

Mute your speakers

Raise your hand

List of all participants

Follow the chat

Find out more about the presentation

Chat here

Participant Introductions

In the Chat box, please introduce yourself by typing in your:

- ✓ Name
- ✓ School or Institution
- ✓ The number of students and adults participating with you in the same location

Have you launched your Virtual Balloon yet?

As part of the 2016 Antarctica Day Celebration, you can launch your own virtual balloon.

Be part of the celebration!

Visit: http://www.ourspaces.org.uk/antarctica-day.html and launch a balloon from your location

Sponsored by: OUR SPACES FOUNDATION FOR THE GOOD GOVERNANCE OF INTERNATIONAL SPACES

What is PolarTREC?

- Since 2004, the Arctic Research Consortium of the United States (ARCUS), a non-profit organization, has been administrating the PolarTREC Program.

- PolarTREC is professional development for K-12 teachers. They are paired with researchers for 2-6 week research experiences in the polar regions.

- Over 150 teachers from around the United States have joined scientists in the Arctic and Antarctica to learn about science, the polar regions, and to share what they have learned with their students and communities.

ARCUS
ARCTIC RESEARCH CONSORTIUM OF THE UNITED STATES

25 Years of Connecting Arctic Research
www.arcus.org

Questions

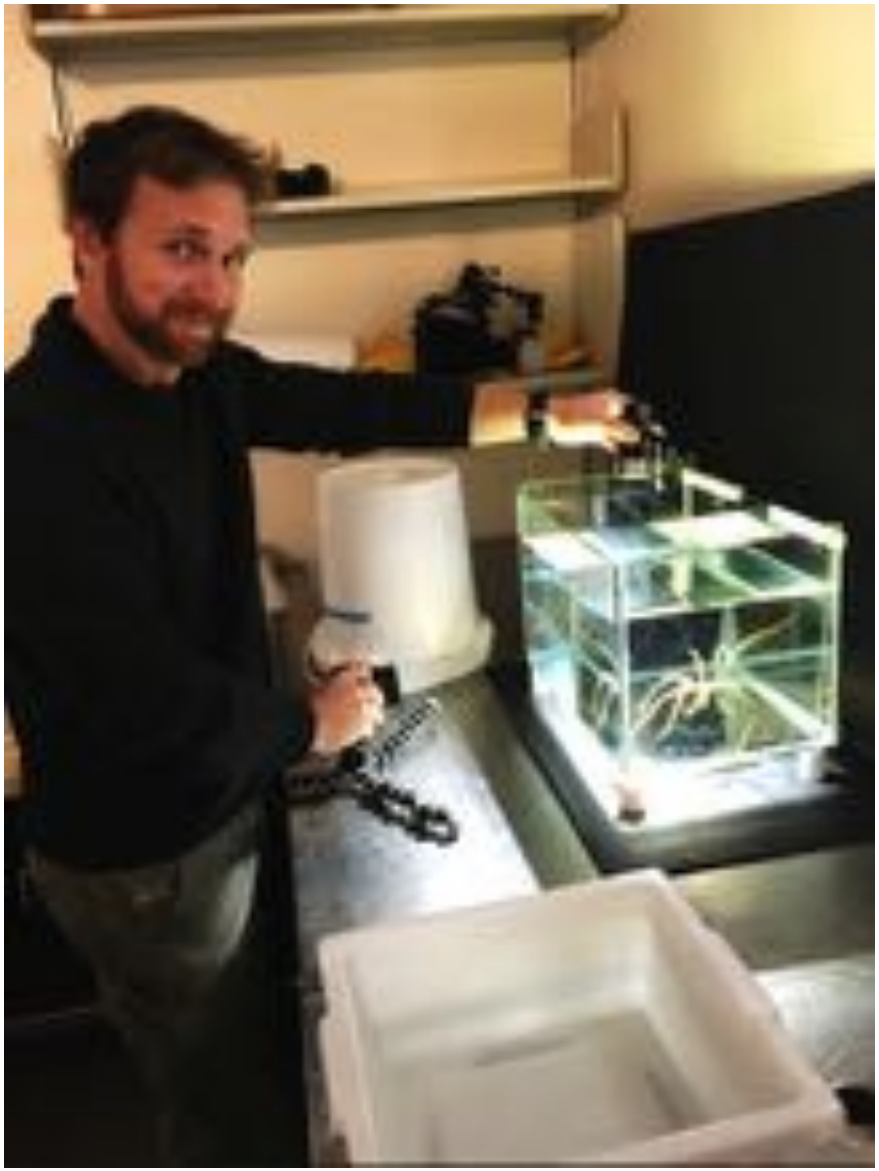
During the Presentation:

- Type your question in the text chat box

At the End of the Presentation:

- Raise your hand with the "hand button".
- PolarTREC staff will call on you and activate your microphone.
- Speak loud and clear, directly into the computer microphone or the phone to ask your question.

H. Arthur Woods
University of Montana



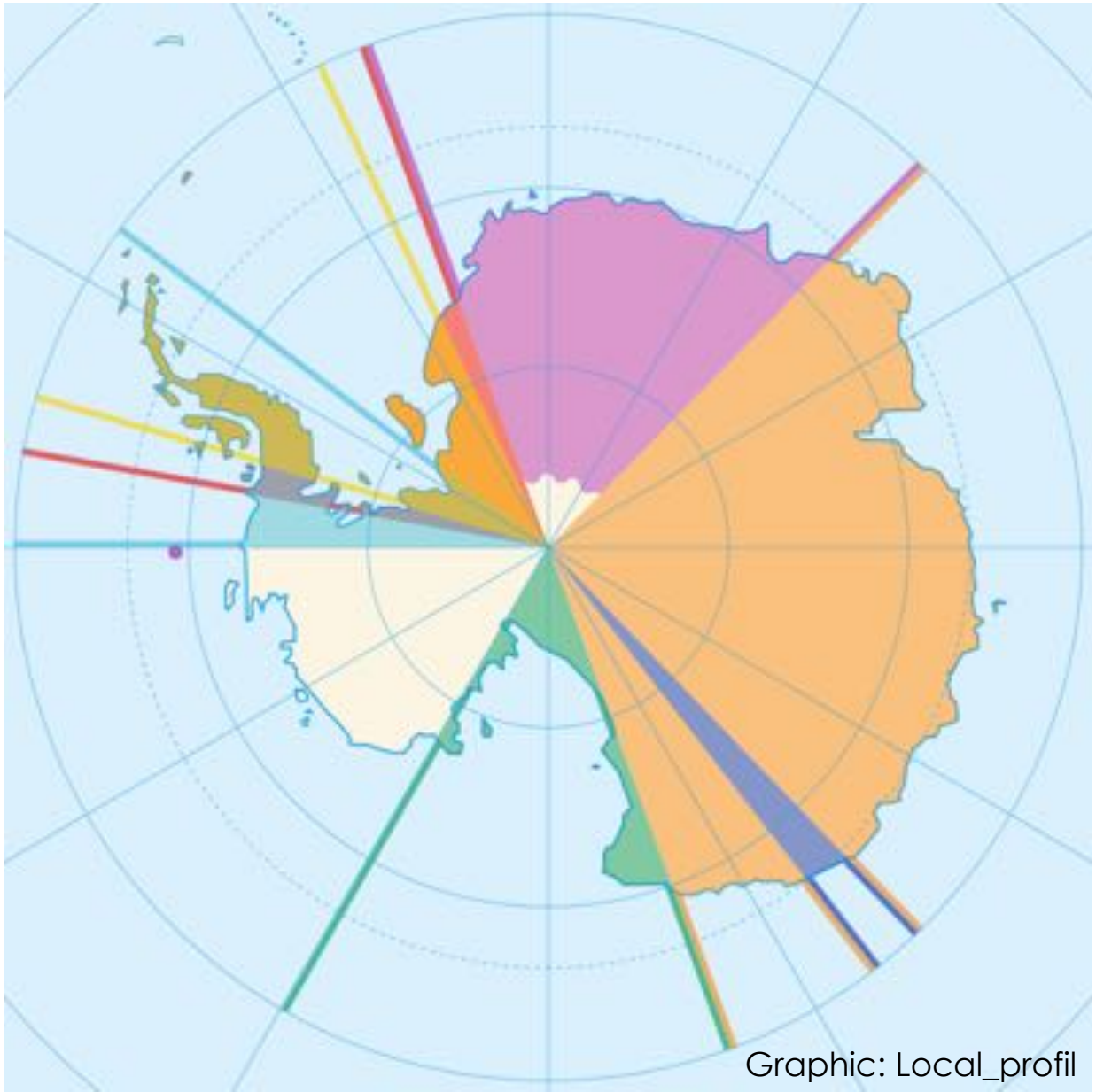
Timothy Dwyer
Spring Street International School

Size and Distance

Graphic courtesy
Elaine Hood, ASC/Leidos

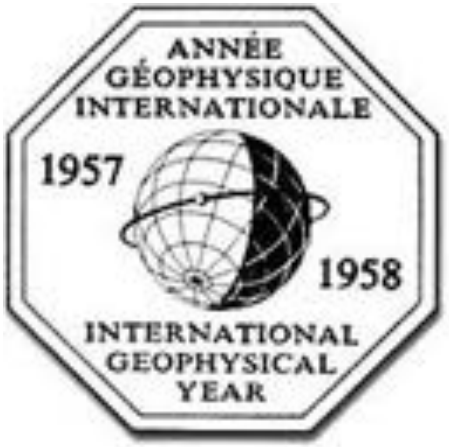
Early exploration

Territorial claims



Graphic: Local_profil

Early Science

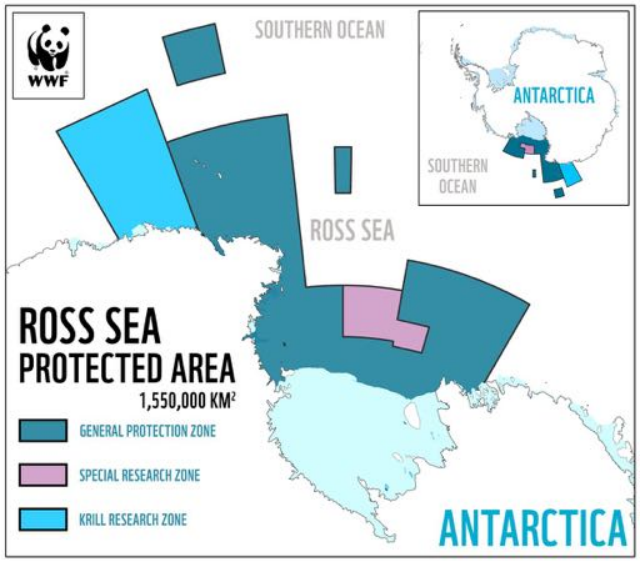


Graphic:
www.nas.edu/history/igy/

Antarctic Treaty - 1959

Environmental Protocols to the Antarctic Treaty (Madrid Protocols)

- Environmental Impact Assessments
- Non-native plants/animals prohibited
- Waste Management
- Marine Pollution prevention
- Protected Areas



Graphic: www.wwf.org

Specially Protected Areas

Science Management

www.scar.org

www.comnap.aq

www.nsf.gov


Signy (UK)
Orcadas (Argentina)
See inset
Brown (Argentina)
Gabriel González Videla (Chile)
Melchior (Argentina)
Yelcho (Chile)
Palmer (USA)
Vernadsky (Ukraine)
San Martin (Argentina)
Rothera (UK)
Luis Carvajal (Chile)
Neumayer (Germany)
SANAE IV (South Africa)
Aboa (Finland)
Wasa (Sweden)
Halley (UK)
Belgrano II (Argentina)
Sobral (Argentina)
RONNE ICE SHELF
Arturo Parodi (Chile)
Amundsen-Scott (USA)
Russkaya (Russia)
ROSS ICE SHELF
Scott Base (NZ)
McMurdo (USA)
Gondwana (Germany)
Mario Zucchelli (Italy)
Leningradskaya (Russia)
Troll (Norway)
Tor (Norway)
Dakshin Gangotri (India)
Maitri (India), Novolazarevskaya (Russia)
Asuka (Japan)
Princess Elisabeth (Belgium)
Kohnen (Germany)
Syowa (Japan)
Molodezhnaya (Russia)
Mizuho (Japan)
Dome Fuji (Japan)
Mawson (Australia)
Soyuz (Russia)
Druzhnaya 4 (Russia)
Law - Racovita (Australia/Romania)
Proposed station (India)
Progress 2 (Russia)
Zhongshan (China)
Davis (Australia)
Kunlun (China)
90° W
90° E
Mirny (Russia)
Vostok (Russia)
Concordia (France/Italy)
Casey (Australia)
Dumont d'Urville (France)
Legend
Year-round station
Seasonal station
Closed station
Proposed station

Elaine Hood, photo

Deciphering The Hows and Whys of Polar Gigantism with Sea Spiders

Brought to you by B-307-M

Bret Tobalske, photo

Bret Tobalske, University of Montana

Elaine Hood, photo

Steven Lane, University of Montana

Amy Moran, photo

Amy Moran,
University of Hawaii

Caitlin Shishido,
University of Hawaii

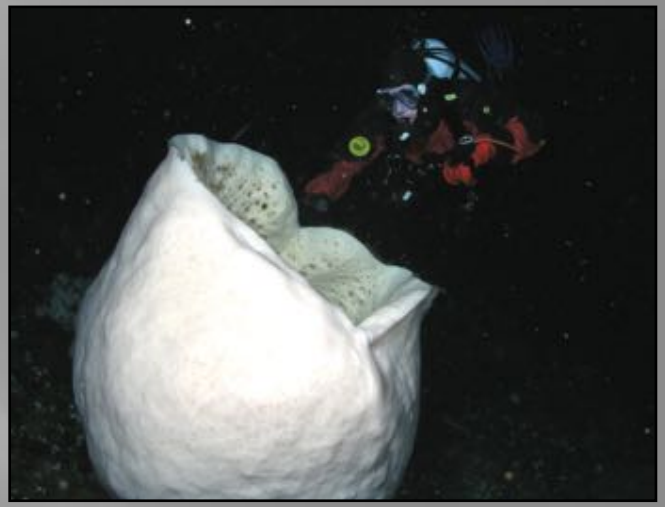
Elaine Hood, photo

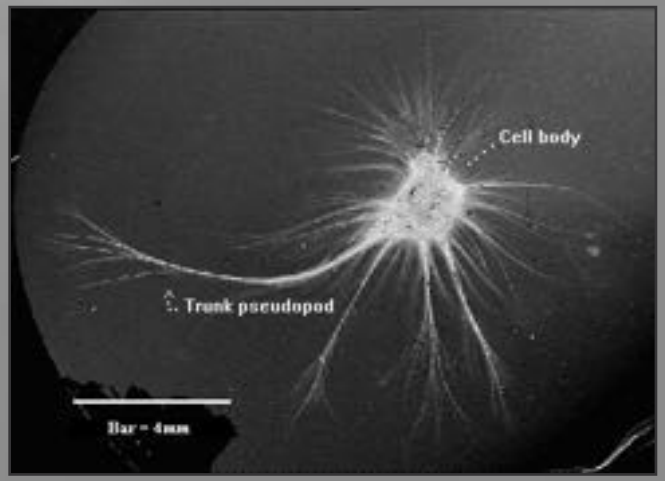
Polar gigantism

Amy Moran, photos

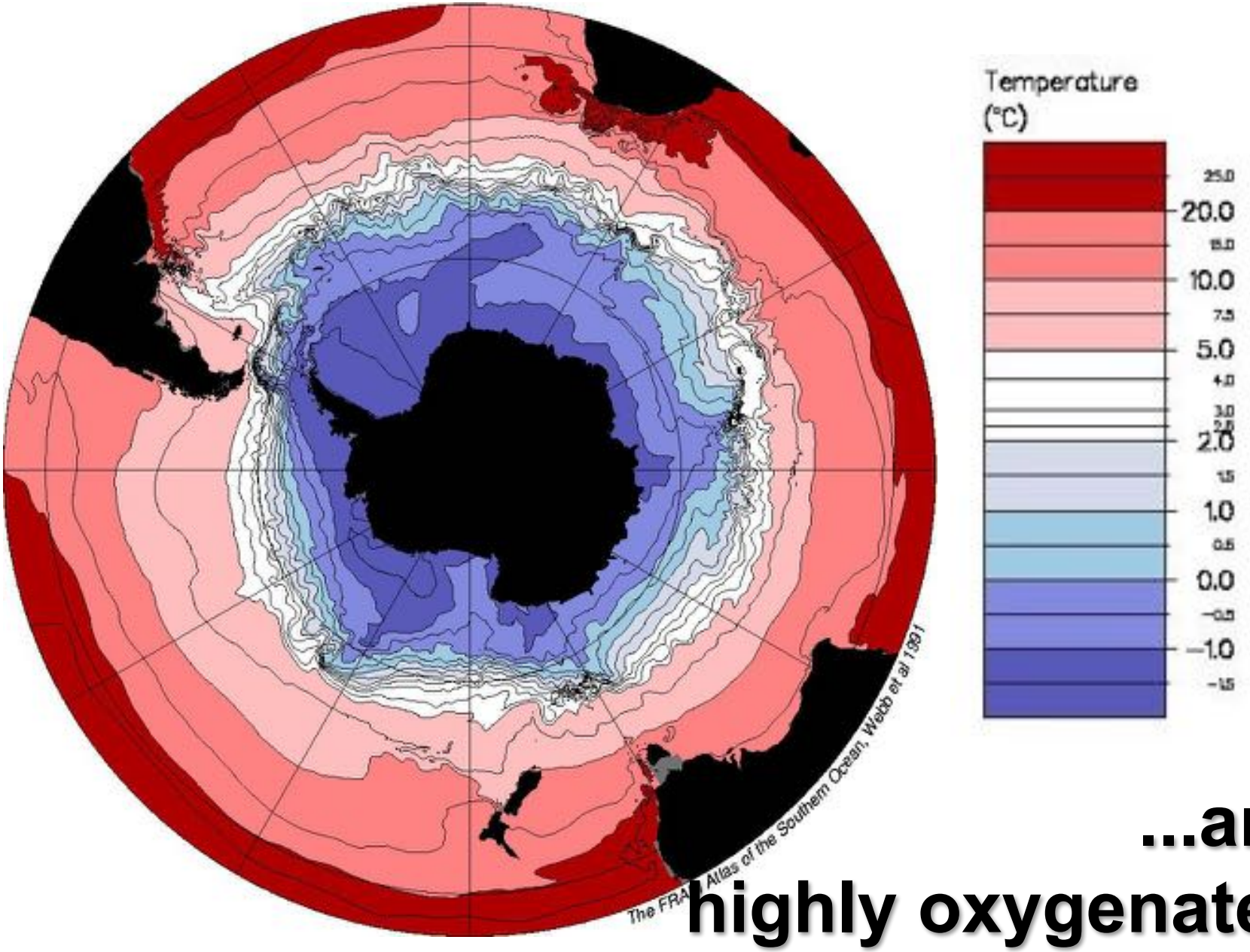
Polar Gigantism

Nemertea
Echinodermata
Mollusca
Ctenophora
Cnidaria
Porifera
Foraminifera
Nematoda
Ascideacea
Polychaeta
Cirripeda
Copepoda
Ostracoda
Isopoda
Amphipoda
Pycnogonida





The Southern Ocean is really cold…



…and highly oxygenated.

“Giant amphipods may be among the first species to disappear if global temperatures are increased or global oxygen levels decline. ”

Chapelle & Peck 1999 *Nature*

PNAS

Global warming benefits the small in aquatic ecosystems

Martin Daufresne[a,b,1], Kathrin Lengfellner[a], and Ulrich Sommer[a]

[a]FB3–Marine Ökologie, Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR), 24105 Kiel, Germany; and [b]HYAX–Lake Ecosystems Laboratory, Cemagref, 13182 Aix-en-Provence, France

nature climate change

PERSPECTIVE

PUBLISHED ONLINE: 16 OCTOBER 2011 | DOI: 10.1038/NCLIMATE1259

Shrinking body size as an ecological response to climate change

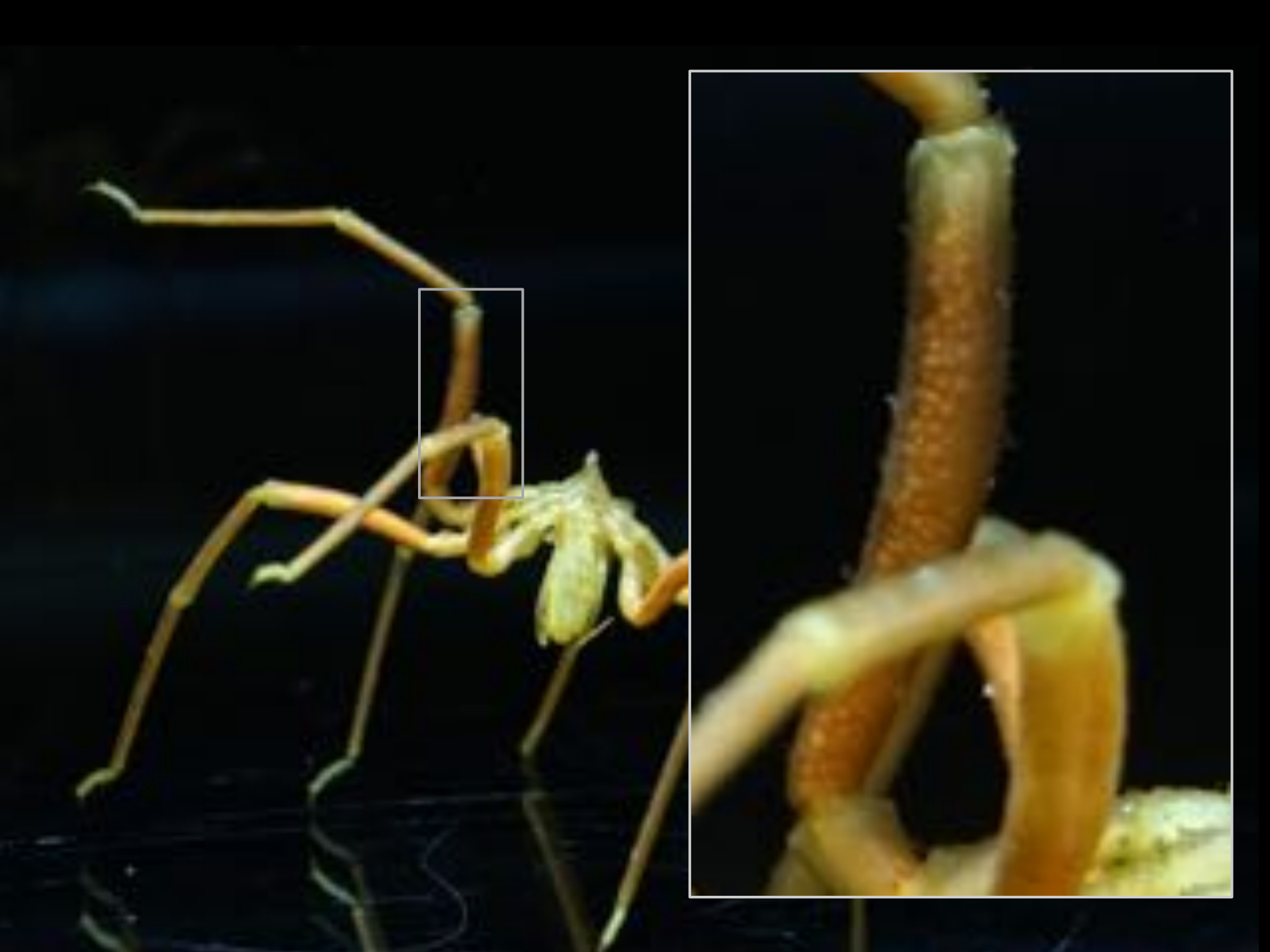
Jennifer A. Sheridan* and David Bickford*

Why are Antarctic giants so big?

How well can sea spiders tolerate changes in temperature and oxygen, and are larger ones more vulnerable?

Are polar giants going to be "losers" in a warming ocean?

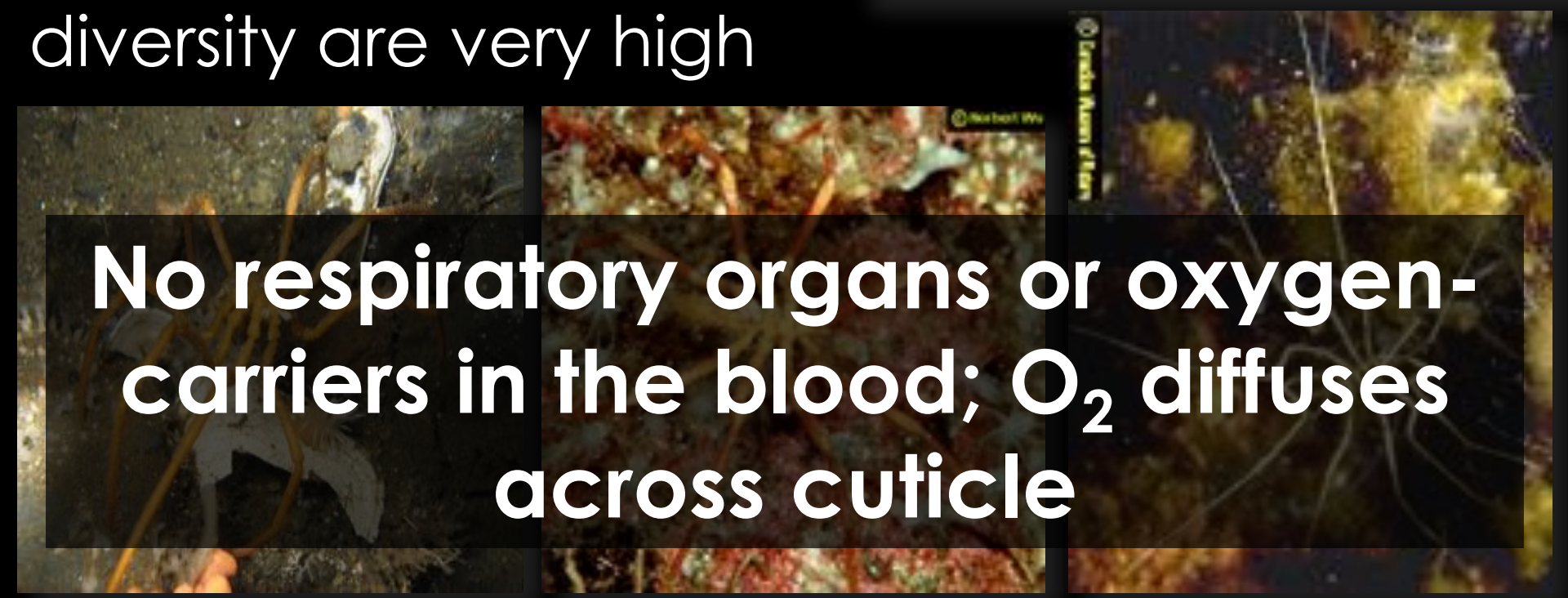

Bret Tobalske, photo



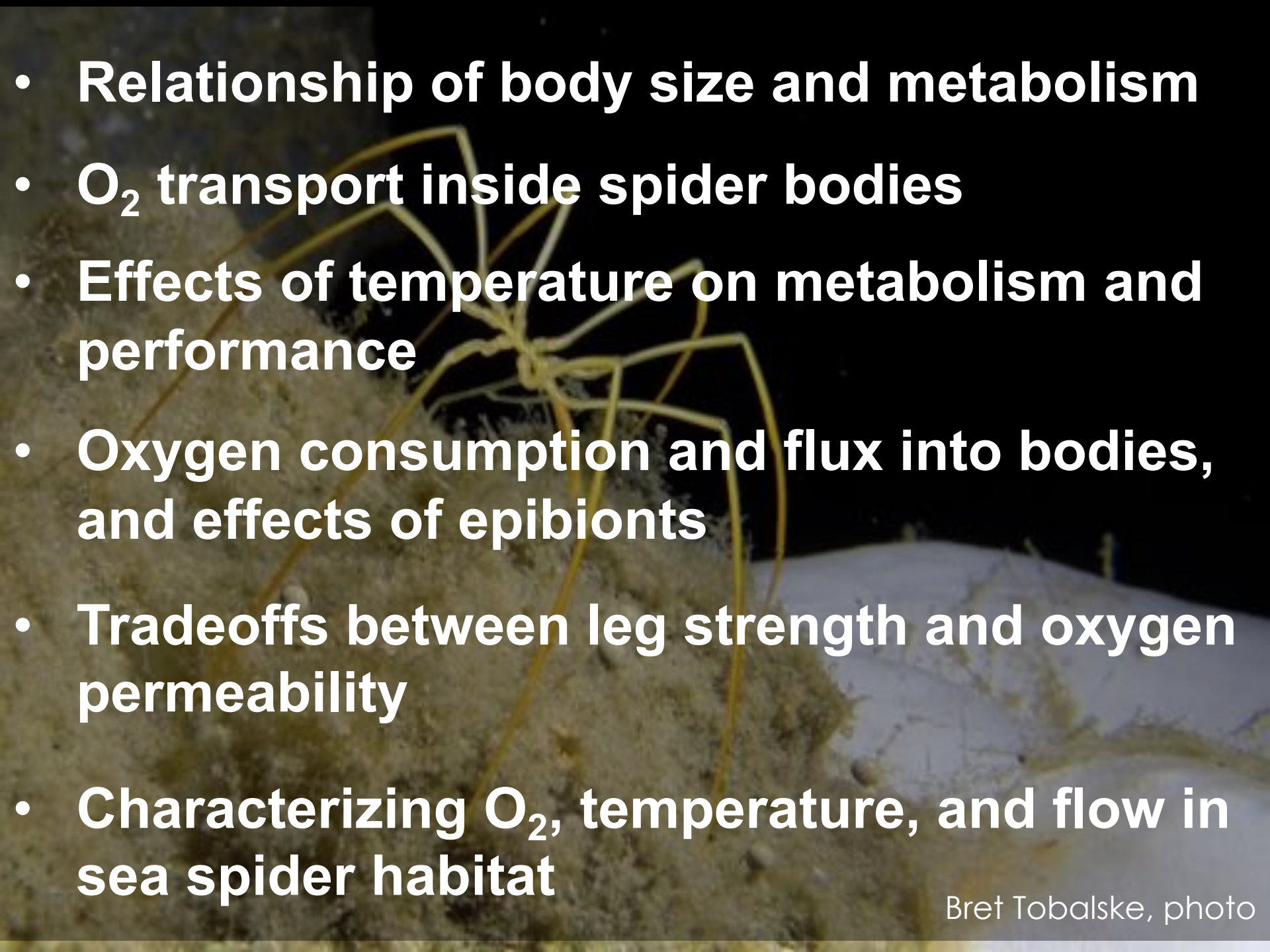
Class Pycnogonida

~1200-2000 species worldwide

~190 Antarctic species
Antarctic abundance and diversity are very high



No respiratory organs or oxygen-carriers in the blood; O_2 diffuses across cuticle



- Relationship of body size and metabolism
- O_2 transport inside spider bodies
- Effects of temperature on metabolism and performance
- Oxygen consumption and flux into bodies, and effects of epibionts
- Tradeoffs between leg strength and oxygen permeability
- Characterizing O_2, temperature, and flow in sea spider habitat

Bret Tobalske, photo

Number and size of pores increase with body size

Amy Moran, photos

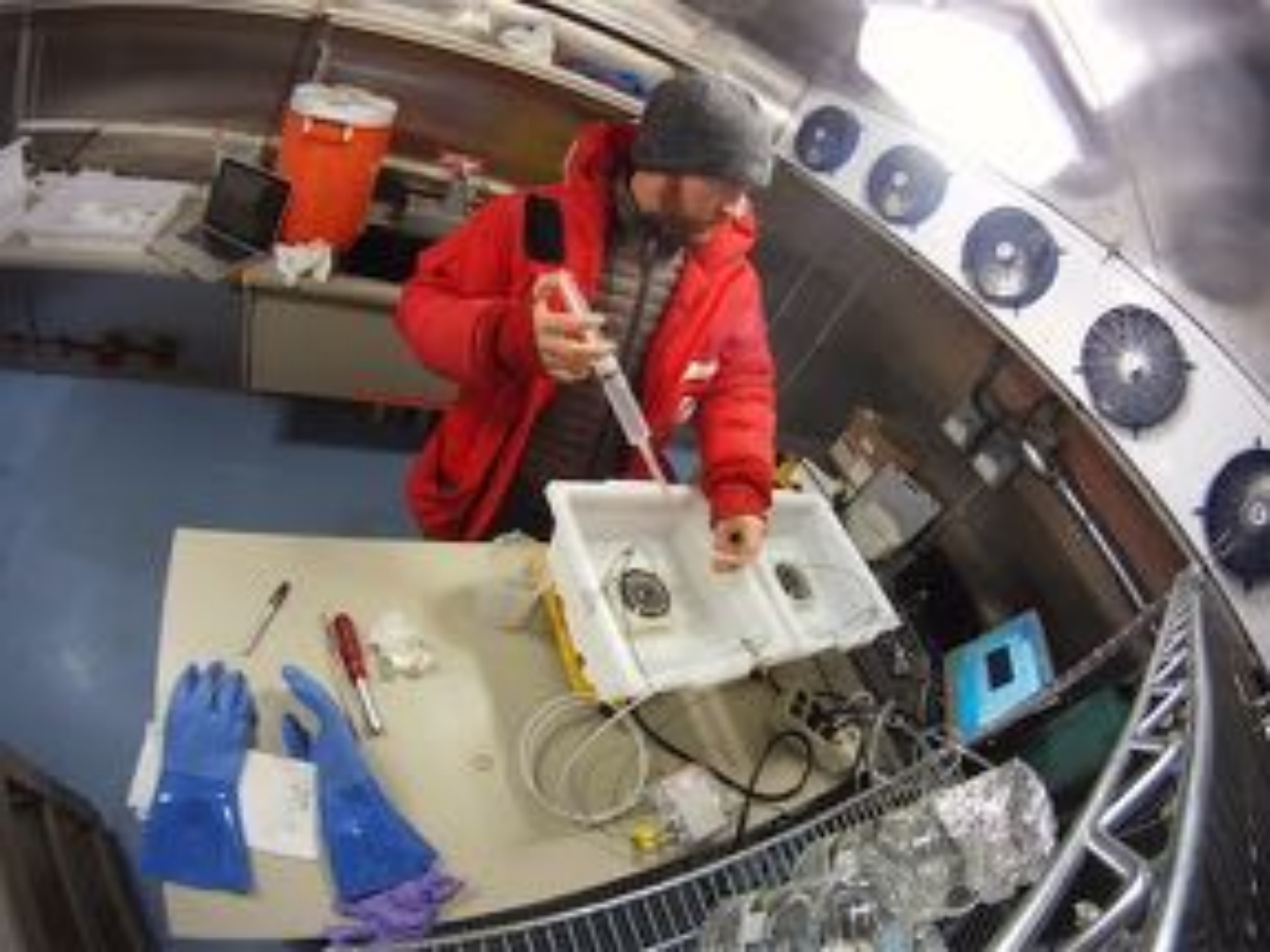
Rob Robbins, photo

Predators or parasites

Rob Robbins, photo

Rob Robbins, photo


Hypotheses for O_2 transport:
Diffusion only
Heart beats
Gut movements



Conducting Scatter Test

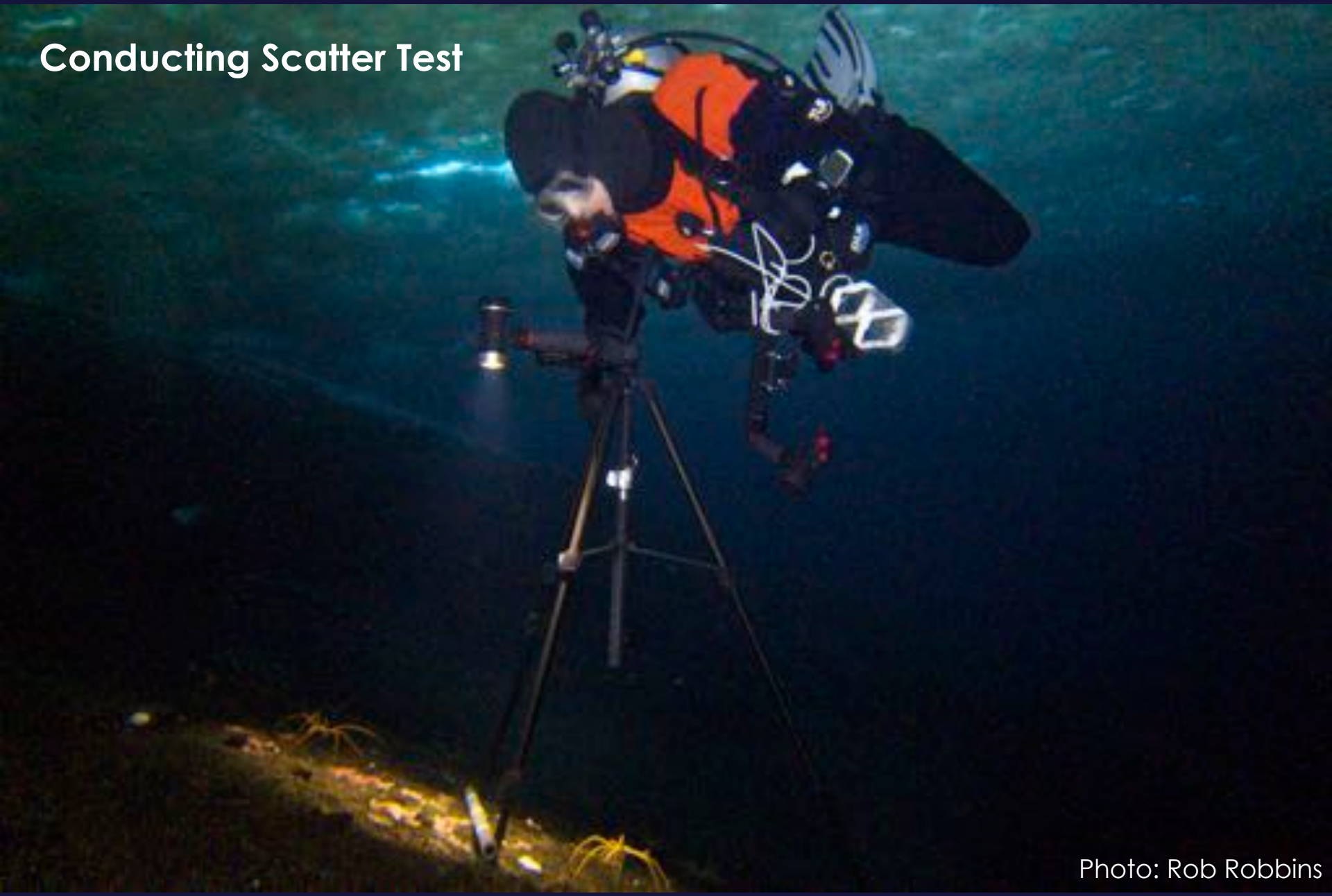


Photo: Rob Robbins


Rob Robbins, photo

Thanks

Rob Robbins & Steve Rupp

Crary Lab staff, Fleet Operations, Carpenters, Mechanical Equipment Center, dive tenders, dining staff

Rob Robbins, photo

Questions?

Join PolarTREC!

www.polartrec.com/about/join

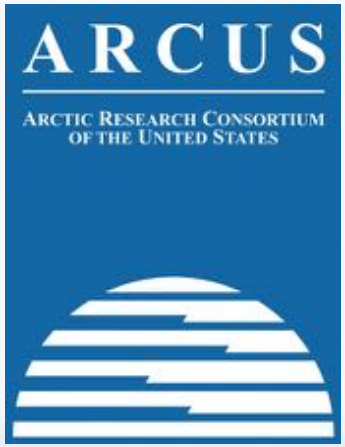
Everyone can participate in different ways:

- **Follow Expeditions**
- **Participate in PolarConnect Events**
- **Join the Polar Education Email List**
- **Check out the great resources**
- **Become a PolarTREC Teacher or Researcher**
- **Become a member of ARCUS**

Thank You!

An archive of the event will be available shortly.

http://www.polartrec.com/polar-connect/archive



25 Years of Connecting Arctic Research
www.arcus.org