# Crustacean Ecology

Kaylyn Flanigan


Hans Hillewaert, 2013

**Identification:**

This week, I had trouble deciphering the subphylum of the invertebrate presented to our Invertebrate Biology class. I knew it was an arthropod, but made it too complicated and was looking for a bizarre, blink-and-you-miss-it, classification. To my frustrated dismay, it was a crustacean (which sounds simple, hindsight is 20/20).

This particular picture is of an amphipod which is an order within the class malacostraca. The invertebrate shown in class belongs to the same class, but in the order isopoda.

# Ecology

- *The study of relations and interactions between organisms and their environment*

# Crustacean Distribution



Crustaceans are found nearly everywhere on the earth. They are found at the top of mountains, in marine trenches, and almost everyone in between.

Found in marine and freshwater and terrestrial ecosystems

Distribution (Creative Commons).

# Isopod Distribution

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Missouri Department of Conservation

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Isopods are an order of class malacostraca

1. Amphipods and isopods have been from the Andes Mountains (elevation 13,300 feet); within the Andes, Lake Titicaca - a freshwater body - also has species of crustacean[1].
2. Isopods have also been found in the desert[9].
   a. *Hemilepistus reaumuri*
3. Freshwater isopods are commonly found near the bottom of freshwater surrounded by debris and decaying matter[5]. They prefer water that is high in organic nutrients and feed on detritus and plants; they are considered scavengers, omnivores, and carnivores[5]. Some species also occupy caves; these species are nearly translucent or white and are commonly blind[1,5].
4. Intertidal species are found clinging to boat pylons and seaweed or other sea plants[6]. *Ligia exotica*, is commonly referred to as a wharf roach and can be found scuttling about debris in the intertidal zone and piers[6].
5. Deep sea isopod, *Bathynomus giganticus* is much larger than its shallow water relatives[6].

# Distribution Similarities

1. **Malacostraca, ostracoda, and copepoda contain species that inhabit marine, fresh, and terrestrial ecosystems[8].**

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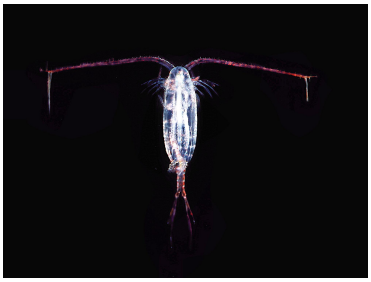
2. **Almost every class has species in either marine or freshwater ecosystems**
    a. **Pentastomida are internal vertebrate parasites[8].**



# Distribution Similarities

1. Malacostraca, ostracoda, and copepoda contain species that inhabit marine, fresh, and terrestrial ecosystems[8].
2. Almost every class has species in either marine or freshwater ecosystems
   a. Pentastomida are internal vertebrate parasites[8].
3. **The vast majority of crustaceans are mobile and free-living**
   a. **Barnacles and parasitic species defy this**

NOAA

# Distribution Differences

1. **Pentastomida, a completely parasitic class, is dissimilar to the distribution of malacostracans as pentastomida distribution is based solely on their hosts[8].**
2. Species determined distribution differences

Our invertebrate of the week is a isopod belonging to the class malacostraca. Differences that are mentioned above are in relation to the class malacostraca.

# Distribution Differences

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2. **Species determined distribution differences**
    a. **Discussed in subsequent slides**

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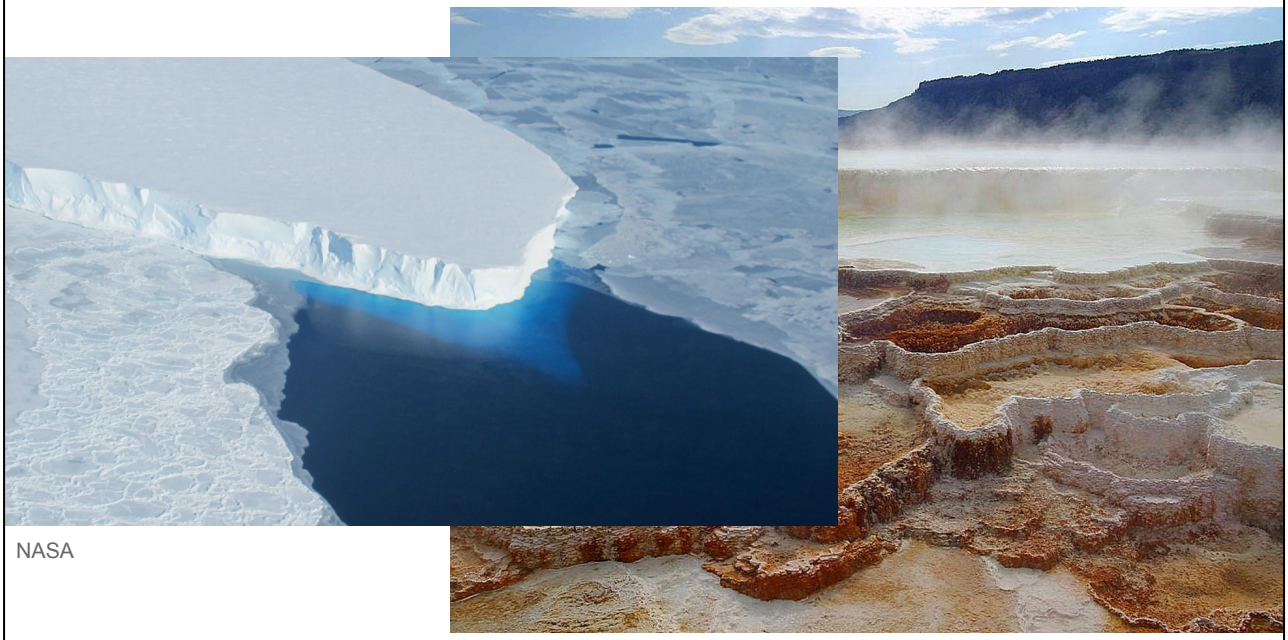
John Sullivan, 2013

What do a hot springs and sheets of ice have in common? Water, yes.
And...amphipods!

Amphipods were discovered in the hot springs of yellowstone national park - where the temperature reaches 113 - 123 degrees farenheit; astoundingly, the same species were found to be active under six-seven feet of ice in the Arctic Coast of North America[1].

Similarly, *Thermosbaena* was discovered in the Algerian thermal waters[1].



NASA

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This isn't the only crustacean that can survive in extremely cold temperatures. As the light penetration decreases, temperature also decreases.

*Gammarus limnaeus*

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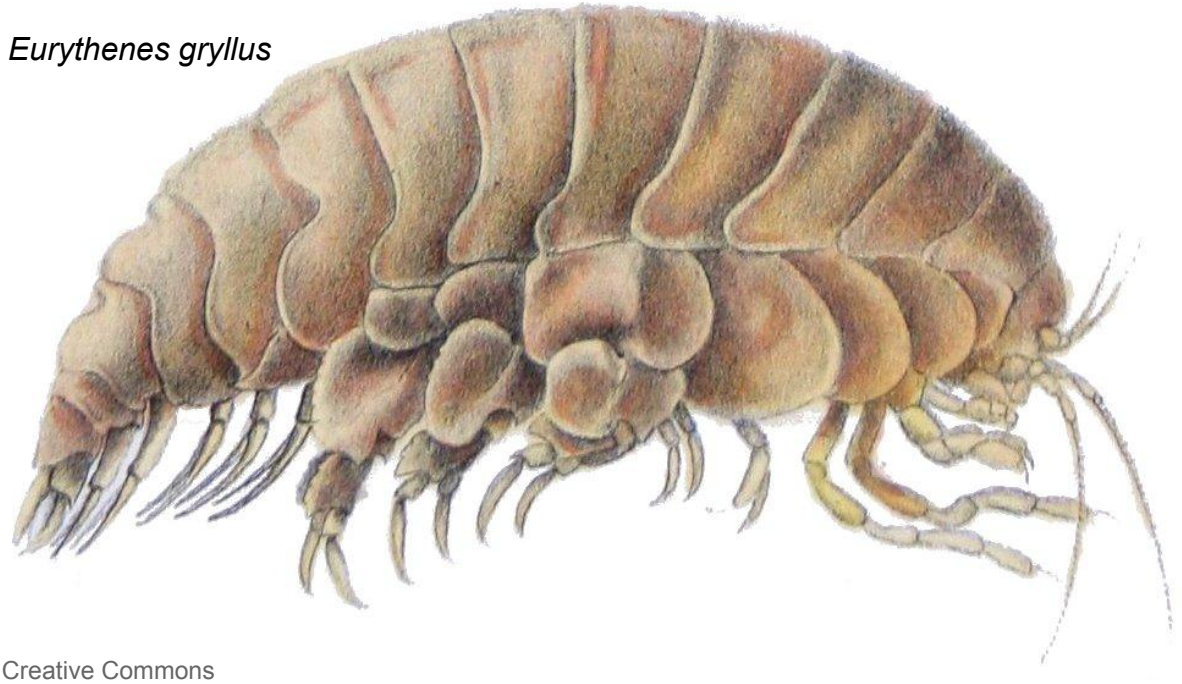
*Gammarus limnaeus* was found occupying both niches! This is fascinating because it represents the adaptability of these organisms.

This above picture is not of the exact species discusses, but is in the same genus.

*Eurythenes gryllus*



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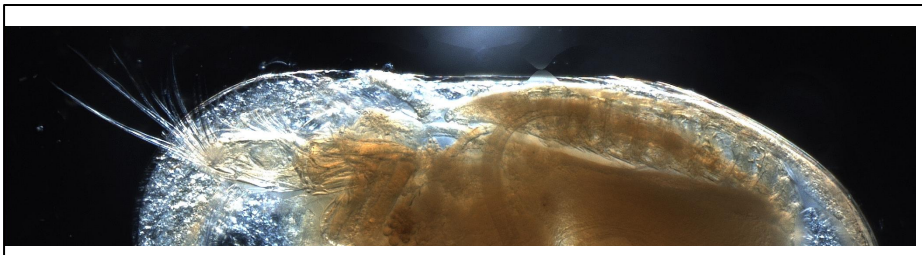
The aforementioned species isn't the only one who can survive chilly temperatures. *Eurythenes gryllus* - another amphipod - lives nearly four miles below the sea surface where temperatures are fridgid[1].

As light penetration dissipates as one moves further away from the surface, temperatures drop quickly. Four miles under the surface, *Eurythenes gryllus*, is active and thriving.

Anna Syme, 2007

Ostracod, *Darwinula sp.*, are present in the the hot springs of Arkansas national park[2,3].

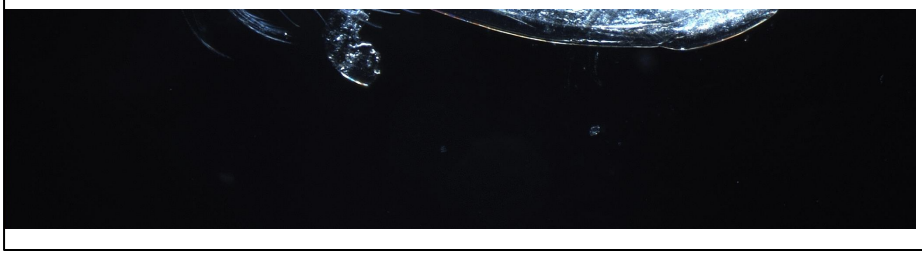
We already saw that amphipods are present in extreme temperatures, and ostracods can, too.



## Interns Find Tiny Crustaceans in Arkansas National Park

Interns at a national park in Arkansas have discovered species of a crustacean that hadn't before been documented in the park's waters.

Aug. 14, 2017, at 2:33 p.m.



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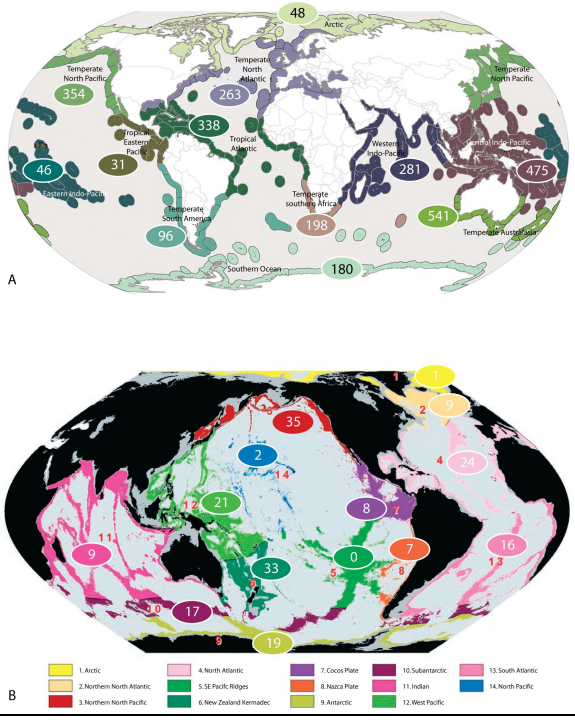
# In short...




...everywhere

Poore, G., 2014.

**This figure only represents the marine crustaceans and does not account for the terrestrial or freshwater varieties.

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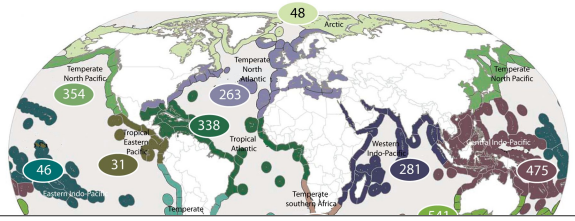
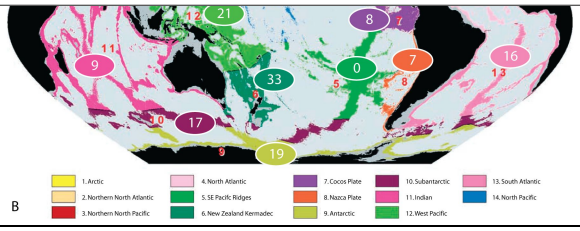



"Crustaceans are as ubiquitous as mosquitoes"

*Waldo L. Schmitt*




Poore, G., 2014.

...everywhere

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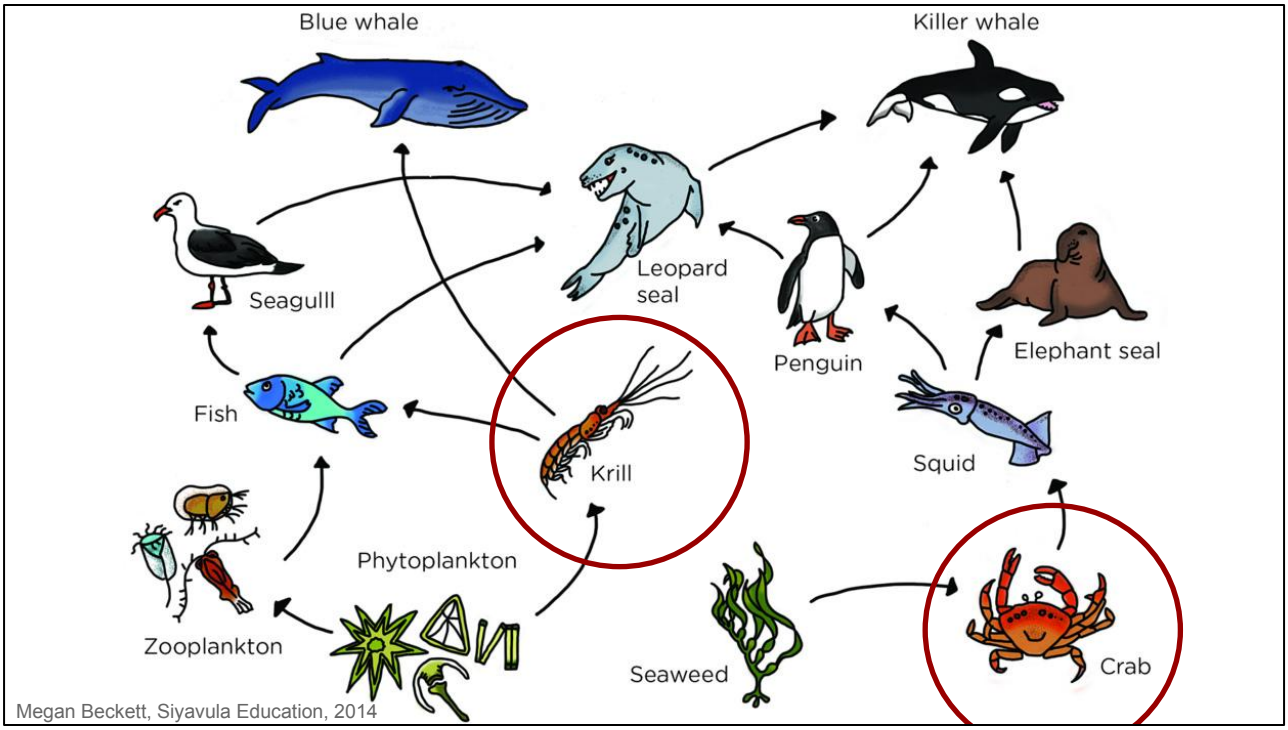
Others have said similar tidbits about crustaceans being so dispersed; however, many say that crustaceans are the insects of the sea, and while they may not be incorrect, and if we're being inclusive towards the land crustaceans, I'd rather stick with Schmitt's version.




Marine food web interactions (Megan Beckett, Siyavula Education, 2014).

Isopods play an important role within the food chain by feeding on algae and phytoplankton and being preyed upon by larger trophic levels.

# Crustaceans

- **Crabs (decapoda) influence prey behavior**

PIXNIO

While crabs are eating their prey, their prey find new ways to avoid/protect against the crabs. The crabs then evolve stronger pincers, but the crabs directly affected their prey's body structures and made them change behaviors.

# Crustaceans

- Crabs (decapoda) influence prey behavior
- **Consume dead organic matter**

Kevin Litman-Narvarro

# Crustaceans

- Crabs (decapoda) influence prey body structure
- Consume dead organic matter
- **Provide important link in web - primary producers to consumers**



As isopods are omnivores, carnivores, and detritivores, they perform decomposition, process particulate organic matter into labile carbon, and feed on photosynthetic organic matter to supply energy up the food chain.

Terrestrial isopods have been shown to increase decomposition of leaf litter[7].

- Contribute to decomposition
- Make photosynthetic energy available to higher trophic levels
- Consume particulate organic carbon

# Food Web Similarities

- **Crustaceans are important food sources for many marine animals**
  - Either directly (krill being consumed by whales; squid consuming a crab) or indirectly (seal that consumes a squid that consumed a crab)

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- Crustaceans are important food sources for many marine animals
  - Either directly (krill being consumed by whales; squid consuming a crab) or indirectly (seal that consumes a squid that consumed a crab)
- **Detritivores (which include some isopods) consume dead organic matter whose nutrients will eventually be passed up the food web**

# Food Web Differences

- **Terrestrial isopods contribute to decomposition**
  - Nutrients gained through consuming leaf litter will eventually make its way through the food web

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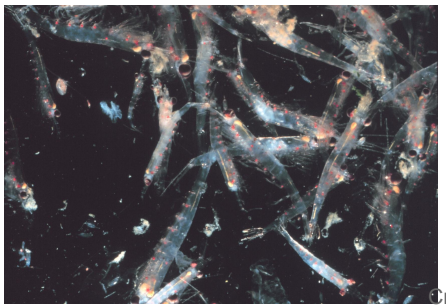
- Terrestrial isopods contribute to decomposition
  - Nutrients gained through consuming leaf litter will eventually make its way through the food web
- **Mysidacea, krill, barnacles, and some isopods are filter feeders**
  - These species can filter out particulate organic matter. Energy obtained from this consumption is dispersed throughout the food web when they are consumed by predators



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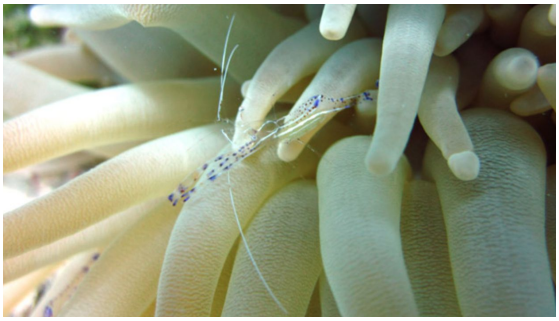
Species interactions (Creative Commons, 2017).

# Species Interactions - Crustaceans

- Parasitism
  - *Typton carneus* (decapod) lives in fire sponges and leaves bored tunnels[8]
  - Pea crabs (decapoda) lives in oysters, sea cucumbers, and clams

# Species Interactions - Crustaceans

- Commensalism
  - Pederson cleaning shrimp
  - Barnacles on whales



Bermuda Institute of Ocean Sciences

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Decorator Crab and sponge commensalism

# Species Interactions - Crustaceans

- Mutualism
  - Carrier crab and spiny urchin

Bernard Dupont

Crab gets protection and urchin gains access to new feeding grounds

# Species Interactions - Isopod

- Parasitism
  - *Cymothoa exigua*
    - Tongue-eating isopod

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https://www.youtube.com/watch?v=327-bwMQI-Y&t=2s

# Species Interactions - Isopod

- Parasitism
  - *Cymothoa exigua*
    - Tongue-eating isopod
- Commensalism
  - Whale louse

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# Species Interactions Similarities

- **Crustaceans exhibit mutualistic, commensalistic, and parasitic relationships with other organisms.**
  - Aside from the class pentastomida, classes are not all parasitic/mutualistic/commensalistic

# Species Interactions Similarities

- Crustaceans exhibit mutualistic, commensalistic, and parasitic relationships with other organisms.
  - Aside from the class pentastomida, classes are not all parasitic/mutualistic/commensalistic
- **Due to the variety of crustaceans, there is great diversity in species interactions**

# Species Interactions Differences

- **Host choice**

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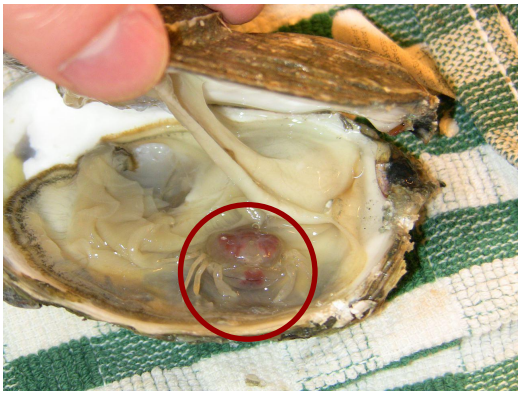

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## Species Interactions Differences

- Host choice
- Reason for exhibiting a mutualistic, commensalistic, or parasitic relationship

Mutualism: carrier crab and spiny urchin[10]
- Carrier crab gets protection
- Spiny urchin gets access to new feeding grounds

Commensalism: whale louse
- Does not hurt the whale, just eats the dead skin and bacteria off them[11]
- For nutrients

Commensalism: barnacles
- Uses the migration of the whale to gain access to nutrient rich water[11]

Parasitism: tongue eating isopod
- Nutrient acquisition
- Ingests whatever the host does, could eventually starve the host[14].

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