



ANIMAL WELFARE ASSESSMENT CONTEST 2022



Octopus Scenario

2022 Animal Welfare Assessment Contest

Prepared by J. Siegford [CC BY-NC-SA 4.0](#)

Photo credit: Cayli Carson CC BY NC ND 4.0

NOTES

1. THESE ARE FICTITIOUS ANIMALS AND SITUATIONS. They have been created using pictures and information collected from multiple sources to generate realistic, yet fabricated scenarios. Neither situation exists as presented here.
2. Please use the images and videos provided throughout the presentation as well as text when making your assessment.

Galene

- ~1-year-old, female giant Pacific octopus (*Enteroctopus dofleini*)
- Obtained 6 months ago from local fisherman (by-catch)
- 3.4kg (7.5lb)
 - 0.45kg (1lb) when obtained
- Aquarium plans to release her as she approaches egg laying



Mazu

- ~2-year-old, male giant Pacific octopus (*Enteroctopus dofleini*)
- Obtained 1.3 years ago from reputable supplier who provides most GPO to aquaria and zoos
- 10kg (22lb) currently
 - 6kg (13.2lb) when obtained
- Aquarium plans to keep Mazu until senescence
 - They will euthanize him when quality of life becomes poor



GPO = giant Pacific octopus



The Aquariums

Galene

- Located on Pacific coast (50°N)
- Have had GPO continuously at the aquarium since it opened 25 years ago
- 3 GPO at present
 - Galene
 - 2-year-old male in other display
 - Unsexed, small GPO off exhibit



Mazu

- Located inland (35°N)
- 1 previous GPO and other octopus species regularly since aquarium opened 44 years ago
- 2 GPO at present
 - Mazu
 - Unsexed, small GPO off exhibit



The Staff

Galene

- Primary aquarist has 15 years GPO experience, at aquarium 13 years
 - Trains and supervises other GPO staff (tank cleaning, water chemistry, GPO interaction, and assessment)
- 2 other aquarists and 2-3 interns regularly work with GPO
- Primary vet has 10 years GPO experience
 - Diplomat of zoological medicine (DACZM)
 - Certified aquatic veterinarian (CertAqV)

Mazu

- Primary aquarist has ~4 years GPO experience, at aquarium 3 years
- >10 other aquarists and interns rotate through GPO exhibit
- Primary vet has 3 years GPO experience
 - Diplomat of zoological medicine (DACZM)
 - Oversees 2 vets, 3 residents, and 2-3 interns who sometimes assist with GPO

Tank: Galene

- Housed in 4000L (1057gal) exhibit tank ~18 years old
 - Maximum water depth is 1.5m (5ft)
- Triangular shape, with two glass walls facing public
 - Back wall covered by backdrop (looks like rock)
 - Fluorescent full-spectrum lights above tank, dimmer in front
 - Fake rocks, kelp, mock dock piling placed around tank
 - Hanging ropes, plastic chains, small rocks rotated in/out
 - Monitor den fit, replace as Galene grows
- Solid fence around top of tank, lined with Astroturf
 - In front, tank wall extends >1m (3.3ft) above water
 - In rear, latching door opens for access (1.5m (4.9ft) wide)
- Platform with stairs extends along the backside of tank
 - Allows people to interact with octopus, reach into tank for cleaning
- Sea stars, urchins, limpets, and anemones live in tank
- 1-2 docents (or aquarist) always in exhibit room, answer questions, limit flash photography



Photo credit: Ucumari Photography CC BY NC ND 2



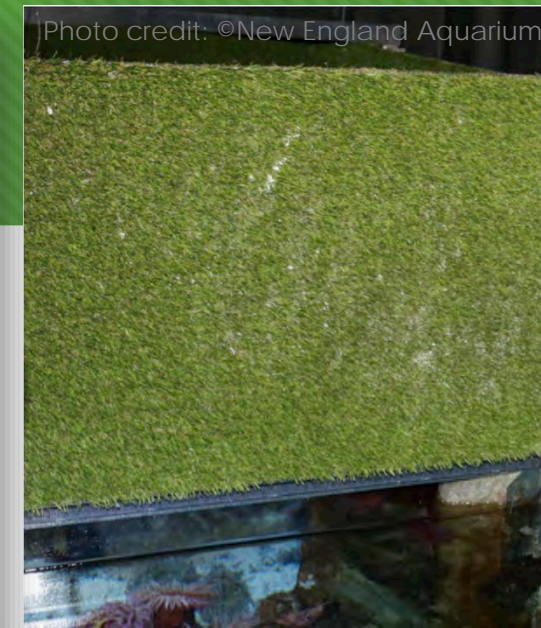
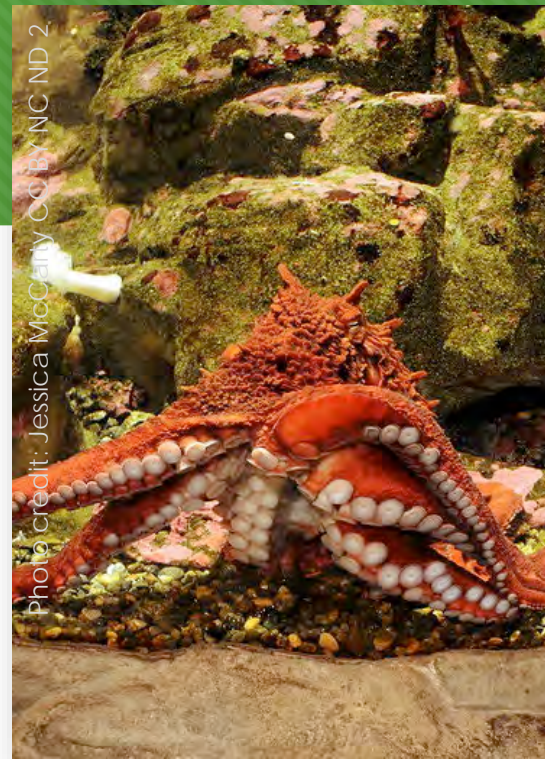
Photo credit: ©Daily Record



Photo credit: Tamie DeWitt CC BY NC ND 2

Tank: Mazu

- Housed in 8000L (2113gal) exhibit tank <5 years old
 - Maximum water depth is 3.0m (10ft)
- Public-facing side is a curved half cylinder
 - Straight back wall covered in textured rockwork
 - LED overhead lighting, uniform brightness front/ back
 - Rockwork extends from floor, includes den near front
 - Gravel substrate covers bottom of tank
 - Larger, mobile rocks are scattered about
 - Fake kelp present throughout tank
- Top edge of tank back is now lined with AstroTurf
 - Water ends 0.75m (2.5ft) below tank edge
- Metal catwalk with built in stairs along back wall
 - Provides access for staff to interact with Mazu and clean
- Aquarist/docent give talks daily when feeding or enriching
- Sponges, sea cucumbers, rock fish, sunflower stars, and anemones also live in tank



Water Systems

Galene

- Open system using natural seawater
 - Water is continuously pumped directly from ocean through the aquarium
- Water is filtered before entering GPO tanks
 - Water can be oxygenated or chilled as needed
- Water chemistry is assessed 2x/week
- System function is checked 3x/day
- Back up generators could run local filtration and temperature for ~1 wk

Mazu

- Closed system using artificial seawater
 - Biofilter, UV sterilizer and a chiller are key system components
- Water changes are done 2x/week
 - ~25% of tank volume exchanged
 - Tank temp increases ~2°C (~4°F)
- Water chemistry assessed every 2 wk
- System function is checked 2x/day
- Back up generators could run GPO system for 2-3 days

Water Chemistry

	Galene	Mazu
Temperature	Average = 8°C (46°F) Range = 6-11°C (43-52°F)	Average = 10°C (50°F) Range = 9-13°C (48-55°F)
Salinity	32‰	33‰
pH	8.3	8.0
Oxygen	92%	87%
Nitrate	4 mg/ml	17 mg/ml
Ammonia	0.00 mg/ml	0.02 mg/ml
Nitrite	0.000 mg/ml	0.003 mg/ml

Cleaning: Galene

- Inside of tank cleaned by reaching in with long-handled tools
- A siphon vacuum is used each morning to remove sucker sheds, food particles, and waste
 - Sometimes at the end of the day as needed
- Tank sides and interior surfaces scrubbed 2x/wk
 - Also when visible signs of algal growth
- Galene helps clean inside of her tank (when aquarist cleans glass using magnetic cloth)
- She is directed away from vacuum using food when she tries to approach



Cleaning: Mazu

- Most cleaning done by a diver entering tank
- A siphon vacuum, sponges, and scrub brushes are used to clean each morning
- Mazu likes to ride on vacuum and tries to steal the brushes and sponges
- The aquarist brings an extra brush or two when they come to clean
- Mazu has pulled off the aquarist's face mask several times and once pulled respirator out of their mouth



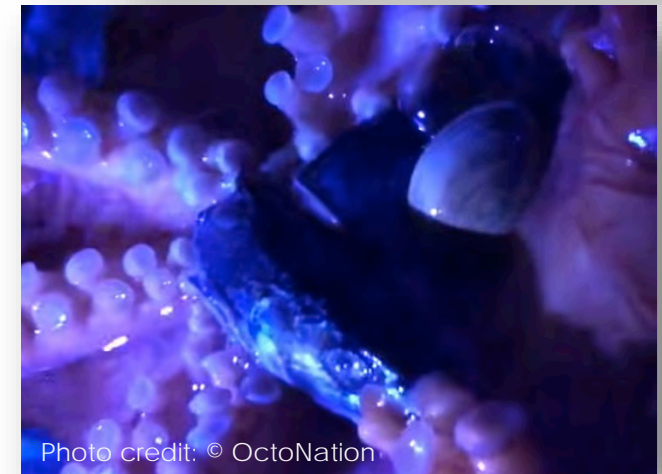
Feeding: Galene

- Fed daily
- Amount given increases weekly in proportion to her weight gain
- Fed crab (in shell), squid, herring, salmon, clams, and shrimp
- Occasionally given live prey for enrichment (usually clams, rarely a small spider crab)
- Galene quickly approaches and explores food
- She usually continues interacting with aquarist for 15-20 min before leaving to consume more labor-intensive food

Shrimp and Capelin



Spider Crab



Feeding: Mazu

- Fed every other day
- No live prey
- Fed thawed, previously frozen fish and squid
- Occasionally given partially opened clams
- Mazu is generally interested in food (especially mackerel and squid)
- He usually takes it and goes straight to den to eat
- Sometimes hard to tell if Mazu ate it all or if tank mates finished remaining food



Health and Welfare I: Galene

- Daily observation by aquarist include:
 - Color and behavior upon seeing aquarist
 - Initial response to food and amount taken
- Health and welfare checks done by vet, aquarist, curator, and sometimes director
 - Use formal scoring system
 - Each independently scores, then discuss to reach final score
- Weighed every 2 wk by aquarist
- Visited by veterinarian 1x/week
 - Visual exam, fecal sample for cortisol (when possible), and ultrasound



Health and Welfare I: Mazu

- Daily observations by aquarist
 - Notes response to self and food
 - Looks for spermatophore
- Aquarist conducts detailed health and welfare checks most weeks
- Weighed monthly by aquarist
- Visited by veterinarian 1x/month
- Monthly discussions of status by aquarist, curator, and vet
 - Focusing on detecting signs of senescence

Mazu in Weigh Container



Spermatophore



Health and Welfare II: Galene

- Galene has nearly regrown 2 arms that were missing when she was obtained
 - Tissue at tips appears healthy and healed
- Galene regularly changes color and texture
 - Turns red when feeding, interacting with humans or enrichment
 - Paler or mottled when resting
 - Skin texture varies in response to stimuli
- Presently gaining ~0.5kg/month (1.1lb)
- Ultrasound and fecal results in normal range



Health and Welfare II: Mazu

- White lesion present on mantle, has been there for several weeks
- Small lesions observed on most arms
 - One appears to be a bite from own beak
 - Healing seems slow
- Color changes in response to stimuli
 - Sometimes arms and mantle respond differently
- Limp ends of arms, do not always suction to tank
- Weight has remained stable in past month



Human-Octopus Interactions: Galene

- When staff approach tank, Galene swims over and reaches out
 - Typically typically allows staff to rub her mantle and handle her arms
 - Staff usually have to move on before she swims off
- Behind the scenes encounters 1x/day with 4-6 people
 - Wash hands, then dip in fish juice
 - Place hands out, allow Galene to make contact
 - She typically approaches visitors and investigates
- Galene explores with arm tips, gentle suction
 - Does not squirt
 - Has never bitten
- Participates in training for weight and ultrasound
 - Willingly crawls into laundry basket
 - Allows probe to touch arms and usually mantle

VIDEO: Galene-Human Interaction

Video credit: © OctoNation



Human-Octopus Interactions: Mazu

- When staff approach tank, Mazu usually surfaces on far side
 - Lately has been taking some time before he comes over
 - Has become reluctant to be touched
- Virtual classroom with Mazu every other week, 1-2 h
 - Used to try to grab iPad when educator stood close to tank edge. (Succeeded once—class ended early!)
- When Mazu makes contact, suction and pulls hard
 - Leaves suction marks on hands/arms
 - Sometimes unbalances people with force of pulling
 - Bit vet's sleeve once and tore cloth, did not puncture skin
 - Often squirts at humans

VIDEO: Mazu-Human Interaction

Video credit: © OctoNation



Enrichment: Galene

- Care team developed schedule for rotating >50 enrichment items
 - Many include food and require manipulation or patience
- Galene unscrews jar lids and engages with other enrichment items that involve twisting
 - She will spend up to an hour engaging with her favorites
- Interactions and trainings with aquarist, vet, other staff, and guests complement her physical enrichment
- Rocks, rope, kelp, and plastic chains are added, removed, or rearranged in tank >1x/month

Photo credit: Meghan Murphy CC BY NC ND 2



Photo credit: R. Anderson & D. Blustein

Enrichment: Mazu

- Aquarist gives enrichment daily
- Mazu has always been selective about what he interacts with
 - Never spends >5 min to solve puzzles or twist things open
 - Tossed Legos® out of the tank
- Engages with enrichments requiring him to push tentacles into spaces
 - Spending less time even with favorites in last month
- Mazu used to regularly paint pictures for sale in gift shop—sometimes does if smeared with squid juice



Behavior Notes: Galene

- Galene is active in morning, evening, and at night and in response to enrichment and human presence
 - Crawls around tank, moves small rocks, explores new items
 - Suctions to front of aquarium, seems to watch visitors
 - Divides resting time between front of tank and den
- Galene once squeezed behind the tank backdrop
 - Staff coaxed her out with a piece of crab on a feed stick
- She grooms thoroughly when shedding suckers (weekly)
- Inked once
 - Immediately after arriving when transferred to off exhibit tank

VIDEO: Galene Grooming



Video credit: Muzina Shanghai CC BY NC ND 2

Behavior Notes: Mazu

- Mazu's tank shows signs of overnight activity and aquarist sees activity in early morning before public viewing begins
 - Jets around tank, sometimes collides with sides
 - Arms often curled up
 - Sometimes wraps arms over head in den
 - Rests mostly in or behind den
- Squirts regularly at lights over tank
- Mazu escaped tank one evening ~1 year ago
 - Found on floor, returned to water in <10 min

