*Horseshoe Crab Jeopardy! International Version*

**Adapted from**: Garth Stubbolo, Everett Meredith Middle School (Middletown, DE) and Stacy Epperson, MD Dept. of Natural Resources, Aquatic Education Program. 2010. Green Eggs & Sand curriculum. **by:** Gary Kreamer. 2015. Delaware Division of Fish & Wildlife, Aquatic Resources Education Program.

**Grade Level:** Middle School/High School/College

**Class time:** one 40-50 minute class period

**Materials:** computer, LCD Projector, Horseshoe Crab Jeopardy Power Point, teacher question & answer sheet, chalkboard and chalk (or white board and dry-erase marker) for tallying team scores

**Overview**: This activity, provided in PowerPoint format, engages students in “Jeopardy” style game play, to assess their knowledge of various aspects of horseshoe crab (HSC) biology, ecology and uses. Two versions of the game are provided: one with a general knowledge focus (targeting the student level) and the other (Double Jeopardy) with more challenging content (aimed at more HSC-savvy audiences). Clear instructions are also provided for teachers for creating their own versions of the game, including how to change categories, clues, answers and images for adaptation to other audiences and topics.

**Procedure:**

1. Open the HSC Jeopardy.ppt file and select Slideshow mode.
2. Lay out the rules of the game with attention to: a) raising of hands to provide answers (in question form) to clues (whether anyone from any team can do this, or whether a person is designated hand raiser for each team, and whether hands can be raised before the entire clue is read or only after); b) order of participation: team that provides correct answer (in question form) gets to choose the next question from the board, but if answered incorrectly, remaining teams are given chance to try providing the answer/question to that same clue or opt for choosing a different one from the board; c) scoring of dollars earned (not real of course) for answers: whether to deduct dollars (as in the game show) for incorrect answers/questions or to just add to team totals for the correct ones; and d) agreeing to set time limit for answers (15 seconds? 30 seconds?) or risk forfeiting to other team.
3. Divide students into no more than 3 teams. Decide which team goes first. That team selects a category and dollar value. The teacher (or assigned student facilitator) clicks on the choice with the mouse.
4. Once the clue statement is read aloud by the teacher (or assigned student game facilitator), hands are raised. The team to raise their hand first has the first shot at the question.
5. If the answering team is correct (using teacher answer key provided), the teacher (or student facilitator) selects “answer” from the clue slide (calling up the correct answer slide to verify it), then the $ earned score is added to the score on the board. The game continues by clicking on “return to gameboard” and asking the team to select the next category and clue.
6. If the teacher decides (using answer key provided) that the answer given is incorrect, before the Answer link is clicked, the remaining team(s) are given a chance to answer the question, or they may choose to decline. If so, play moves on to the next team to select a question from the board.
7. Play continues until all clues/squares have been answered, or time runs out for the class/program. The team with the most $ earned at that point is declared the winner.

**Creating different versions of the game:** The instructions to follow are applicable to working with the Windows 10 version of PowerPoint. Alternative pathways may need to be followed for making adjust-ments for items #2-4 below when working with other Windows and/or MAC PowerPoint versions.

1. **Changing categories, clues and answers**: This is the easy part. To change categories, open up the first slide (showing the gameboard) in Normal View. Highlight the category heading text, and change it to whatever new category name you wish to create. Do this for all categories. Similarly, to change clues and answers, go to the respective slide for each, highlight the text box, delete the old text and type in the new.
2. **Changing background images on slides**: Select the Slide Sorter option from the View menu and drag/click to select the sequence of slides in which you wish to insert a new background image. Open the Design menu and select Background. Under Insert from: click the File button and browse to the folder/file containing the image you’d like to insert. Once selected, you should see that image inserted into all the slides you selected. Click the Close button to exit the background pop-up.
3. **To lighten or adjust background images**: Should the image you selected be too bold or busy that it interferes with the reading of screen text (but still constitutes a scene or graphic you wish to use), you can experiment with lightening it by going back to the Format Background pop-up (by selecting Background from the Design menu again) and moving the Transparency tab near the bottom of the screen to the right to whatever percentage gives you the desired level of visibility. Once done, hit Close to exit that pop-up and return to your Slide Sorter view screen for any further adjustments.
4. **Changing the location of Daily Double slides**: This is the most challenging of changes to make, so if you don’t need to do it, then let it be - unless you have a class of students with which you use varying versions of the game throughout the year who’ve caught on to where the Daily Doubles fall. To make such changes, you will need to do the following: in Slide Sorter mode, drag and drop the Daily Double slide to just in front of the clue slide that you want it to cover (that’s the easy part). Now to the tricky part … the flow of HSC Jeopardy from gameboard slide to the slide that shows a selected category and dollar/number choice is controlled by a hyperlink embedded in the underlined number of the gameboard slide. So for example (in HSC Jeopardy), when one clicks (in slide show screen format) on the “Where in the World” category at “400”, the hyperlink in place will automatically move the game to slide 8, which brings up the clue slide associated with that choice. But if the sequence of slides is changed by moving any of the Daily Double slides to new spots, then the sequence of hyperlinks can be thrown out of whack. To correct that, one needs to go back into Normal View to the gameboard slide, right-click on whichever category/number cell you need to change, select Edit Hyperlink from the pop-up, scroll down through the menu of slide listing options, and make sure that the slide number you wish the hyperlink to navigate to is highlighted. Once so, hit OK to go back to the gameboard, and continue similar edits of hyperlinks to any other impacted slides. Important note: there can be a domino effect to making such a change to one slide, resulting in the need to edit links to the sequence of a whole bunch of other slides to follow. Should you need to do this, it may be helpful to set up a chart - such as those provided on the pages following - to indicate the sequence of slides and hyperlinks for the game, so if any changes need to be made, adjustments to the sequence can be tracked accordingly. Please note: there is no need to change hyperlinks associated with underlined text (e.g. Question, Answer or Return to Gameboard prompts on slides, as these are set to advance where they need to go regardless of the slide order).

International Horseshoe Crab Jeopardy ppt slides set-up information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Value | Hyperlink takes you to  | Question | "What is" Answer |
| 1st column (Where in the World?) | 100  |  Slide 2 | are horseshoe crabs called ‘kabutogani’ | Japan |
| 200  |  Slide 4 | are the southernmost populations of the American horseshoe crabfound | Yucatan, Mexico  |
| 300  |  Slide 6 | are the eggs of HSCs considered a dining delicacy | Malaysia, Thailand and/or Vietnam |
| 400  |  Slide 8 | do you need to go to see the largest masses of spawning HSCs on the planet | Delaware Bay, USA |
| 500  |  Slide 10 – Daily Double | are HSCs raised by high school students for release into the wild to help rebuild populations  | Hong Kong and/or Taiwan  |
| 2nd column (By the Numbers) | 100  |  Slide 13 | number of species of HSCs that exist today | 4 |
| 200  |  Slide 15 | number of long spines on female *Tachypleus tridentatus*  | 3 |
| 300  |  Slide 17 | number of pairs of legs on a horseshoe crab | 5 |
| 400  |  Slide 19 | millions of years HSCs have been living on Earth  | 450 (445 to be precise) |
| 500  | Slide 21  | years it takes an American HSC to reach adulthood | 8-10 |
| 3rd column (HSC Parts Smarts) | 100  |  Slide 23 | Nobel Prizes were awarded for research carried out on this part of the HSC anatomy | lateral eyes or compound eyes |
| 200  | Slide 25 -Daily Double  | structures horseshoe crabs use for respiration | book gills |
| 300  |  Slide 28 | scientific term for front section of the HSC body  | prosoma |
| 400  |  Slide 30 | name used for specially modified hind legs of the HSC | pusher legs |
| 500  |  Slide 32 | during spawning, eggs (in females) and sperm (in males) are released from the underside of this HSC structure  | operculum (or gill cover)  |
| 4th column (Horseshoe Uses) | 100  |  Slide 34 | much-valued biomedical product from HSC blood | LAL or TAL |
| 200  |  Slide 36 | HSC eggs on Delaware Bay provide a key resource in supporting the migration of \_\_\_\_\_ | shorebirds (or red knots) |
| 300  | Slide 38 -Daily Double  | LAL makes human medicines safe to use by ensuring that they are not contaminated with \_\_\_\_\_  | bacterial endotoxins |
| 400  | Slide 41  | from the mid 1800’s to 1900’s, millions of HSCs were harvested on Delaware Bay for use as \_\_\_\_\_ | fertilizer |
| 500  | Slide 43 | In the United States today, large numbers of HSCs are used by commercial fisherman as \_\_\_\_\_  | bait (for eel or conch fisheries) |
| 5th column (HSC Hodge Podge) | 100  | Slide 45 -Daily Double | the blood of the HSC appears blue because it contains | copper |
| 200  | Slide 48  | process by which HSCs grow in stages | molting |
| 300  | Slide 50 | people have died from using HSCs in this way | eating them |
| 400  | Slide 52 | phylum of animals to which HSCs belong | arthropod |
| 500  | Slide 54 | highly diverse, long extinct, group of animals that came before HSCs and resembled them in many ways  | trilobites |

 International Horseshoe Crab Double Jeopardy ppt slides set-up information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Value | Hyperlink takes you to  | Question | "What is" Answer |
| 1st column (the Four Species) | 200  |  Slide 2 | the most abundant and well-protected of the 4 horseshoe crab (HSC) species  | *Limulus polyphemus* |
| 400  |  Slide 4 | females of this species feature 3 long spines on each side of the opisthosoma | *Tachypleus tridentatus* |
| 600  |  Slide 6 – Daily Double | produces the largest eggs of the four species | *Tachypleus gigas* |
| 800  |  Slide 9 | practices polyandrous (multiple males fertilizing the eggs of one female) mating strategies  | *Limulus polyphemus*  |
| 1000  | Slide 11  | species associated with tetradotoxin poisoning from consumption by humans | *Carcinoscorpius rotundicauda* |
| 2nd column (Where in the World?) | 200  |  Slide 13 | a museum shaped like and dedicated to the horseshoe crab can be found here  | Japan |
| 400  |  Slide 15 | bounties were once offered in this coastal U.S. area for turning in the tails of dead HSCs | Cape Cod |
| 600  |  Slide 17 | HSCs are used for bait in the octopus fishery here | Mexico |
| 800  |  Slide 19 – Daily Double | HSCs are celebrated in these countries during Chinese Valentine’s day events | Hong Kong, Taiwan and/or China |
| 1000  |  Slide 22 | Buddhist blessings of horseshoe crab events have been held here each of the last 6 years  | United States (or Delaware Bay) |
| 3rd column (Structure & Function) | 200  |  Slide 24 | these structures enable the HSC to detect UV light for adjusting its sensitivity to light at night | median eyes |
| 400  | Slide 26 | female HSCs use these versatile appendages to mold their eggs into clusters  | pusher legs |
| 600  |  Slide 28 | photosensors in this structure assist the HSC in maintaining its day/night 24-hour clock | telson |
| 800  |  Slide 30 | chitinous spines inside this organ help the HSC break down its food  | crop-gizzard (or proventriculus) |
| 1000  |  Slide 32 | name for special sensory organ located at the base of the HSC pusher leg above its gills  | flabellum |
| 4th column (HSCs & Humans) | 200  |  Slide 34 | a few years ago, Asian HSCs were being imported to the United States for use as | bait for eel or conch (whelk) fisheries  |
| 400  |  Slide 36 – Daily Double | over 100 years ago on Delaware Bay, HSC eggs were shoveled up by the wagonload for use as  | feed for chickens & hogs |
| 600  | Slide 39  | Japanese mythology holds that the spirit of these people are embodied in the shells of HSCs  | Samurai warriors |
| 800  | Slide 41  | in the 1970's, University of Delaware researchers spun chitin filaments from HSCs for use in | burn wraps and/or surgical sutures  |
| 1000  | Slide 43 | an Indian researcher recently discovered potential use of the fluid inside the HSC egg for  | tissue regeneration therapies |
| 5th column (Name that Scientist) | 200  | Slide 45  | noted for his ground-breaking, Nobel Prize winning research on horseshoe crab vision | Dr. Keffer Hartline |
| 400  | Slide 47  | renowned world authority (after 60+ years of dedicated study) on *Limulus polyphemus* | Dr. Carl Shuster |
| 600  | Slide 49 | researchers recognized for their extraordinary collaboration on the discovery of LAL | Dr. Fred Bang & Dr. Jack Levin |
| 800  |  Slide 51 | most honored Japanese HSC scientist for lifelong pioneering research on *Tachypleus tridentatus* | Dr. Koichi Sekiguchi |
| 1000  |  Slide 53 – Daily Double | noted for developing a synthetic, genetically-engineered version of LAL called 'Factor C'  | Dr. Jeak Ling Ding |

Teacher answer key for International HSC Jeopardy (student version) game

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Where in the World?** | **By the Numbers** | **HSC Parts Smarts** | **Horseshoe Uses** | **HSC Hodge Podge** |
| **100**are horseshoe crabs called ‘kabutogani’*What is Japan?* | **100**number of species of HSCs that exist today *What is 4?* | **100**Nobel Prizes were awarded for research carried out on this part of the HSC anatomy *What are the lateral eyes or compound eyes?* | **100**much-valued biomedical product from HSC blood *What is LAL or TAL?* | **100 Daily Double!**the blood of the HSC appears blue because it contains *What is copper?* |
| **200**are the southernmost populations of the American horseshoe crabfound*What is Yucatan/Mexico?* | **200**number of long spines on female *Tachypleus tridentatus* *What is 3?* | **200 Daily Double!**structures horseshoe crabs use for respiration*What are the book gills?* | **200**HSC eggs on Delaware Bay provide a key resource in supporting the migration of *What are shorebirds (or red knots)?* | **200**process by which HSCs grow in stages*What is molting?* |
| **300**are the eggs of HSCs considered a dining delicacy *What is Malaysia, Thailand and/or Vietnam?* | **300**number of pairs of legs on a horseshoe crab*What is 5?* | **300**scientific term for front section of HSC body *What is the prosoma?* | **300 Daily Double!**LAL makes human medicines safe to use by ensuring that they are not contaminated with *What are bacterial endotoxins?* | **300**people have died from using HSCs in this way *What is eating them?* |
| **400**do you need to go to see the largest masses of spawning HSCs on the planet *What is Delaware Bay, USA?* | **400**millions of years HSCs have been living on Earth *What is 445? (or 450)* | **400**name used for the specially modified hind legs of the HSC *What are the pusher legs?* | **400**from the mid 1800’s to 1900’s, millions of HSCs were harvested on Delaware Bay for use as *What is fertilizer?* | **400**phylum of animals to which HSCs belong *What is arthropod?* |
| **500 Daily Double!**are HSCs raised by high school students for release into the wild to help rebuild populations*What is Hong Kong or Taiwan?* | **500**years it takes an American HSC to reach adulthood*What is 8-10?* | **500**during spawning, eggs (in females) and sperm (in males) are released from the underside of this HSC structure*What is the operculum?* | **500**In the U.S. today, large numbers of HSCs are used by commercial fisherman as *What is bait for eel or conch (whelk) fisheries?* | **500**highly diverse, long extinct, group of animals that came before HSCs and resembled them in many ways *What are trilobites?* |

Teacher answer key for International HSC Double Jeopardy (challenging level) game

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **The Four Species** | **Where in the World?** | **Structure & Function** | **Human connections** | **Name that Scientist** |
| **200**the most abundant and well-protected of the 4 HSC species*What is Limulus polyphemus?* | **200**a museum shaped like and dedicated to the horseshoe crab can be found here *What is Japan?* | **200**these structures enable the HSC to detect UV light for adjusting its sensitivity to light at night*What are the median eyes?* | **200**a few years ago, Asian HSCs were being imported to the United States for use as*What is bait for eel or conch/whelk fisheries?* | **200**noted for his ground-breaking, Nobel Prize winning research on horseshoe crab vision*Who is Keffer Hartline?* |
| **400**females of this species feature 3 long spines on each side of the opisthosoma*What is Tachypleus tridentatus?* | **400**bounties were once offered in this U.S. coastal area for turning in the tails of dead HSCs*What is Cape Cod (USA)?* | **400**female HSCs use these versatile appendages to mold their eggs into clusters*What are the pusher legs?* | **400 Daily Double!**over 100 years ago on Delaware Bay, HSC eggs were shoveled up by the wagonload for use as*What is feed for chickens or hogs?* | **400**renowned world authority (after 60+ years of dedicated study) on Limulus polyphemus*Who is Dr. Carl Shuster?* |
| **600 Daily Double!**produces the largest eggs of the four species*What is Tachypleus gigas?* | **600**HSCs are used for bait in the octopus fishery here*What is Mexico?* | **600**photosensors in this structure assist the HSC in maintaining its day/night 24-hour clock*What is the telson?* | **600**Japanese mythology holds that the spirit of these people are embodied in the shells of HSCs*What are Samurai warriors?* | **600**two researchers recognized for their extraordinary collaboration on the discovery of LAL*Who are Dr. Fred Bang and Dr. Jack Levin?* |
| **800**practices polyandrous (multiple males fertilizing the eggs of one female) mating strategies*What is Limulus polyphemus?* | **800 Daily Double!**HSCs are celebrated in these countries during Chinese Valentine’s day events*What is Hong Kong, Taiwan and/or China?* | **800**chitinous spines inside this organ help the HSC break down its food*What is the crop-gizzard (or proventriculus)?* | **800**in the 1970's, University of Delaware researchers spun chitin filaments from HSCs for use in*What is burn wraps and/or surgical sutures?* | **800**most honored Japanese HSC scientist for lifelong pioneering research on T. tridentatus*Who is* *Dr. Koichi Sekiguchi?* |
| **1000**species associated with tetradotoxin poisoning from consumption by humans*What is Carcinoscorpius rotundicauda?* | **1000**Buddhist blessings of horseshoe crab events have been held here each of the last 6 years *What is Delaware Bay, USA?* | **1000**name for special sensory organ located at the base of the HSC pusher leg above its gills*What is the flabellum?* | **1000**an Indian researcher recently discovered potential use of the fluid inside the HSC egg for*What is tissue regeneration or organ transplant therapies?* | **1000 Daily Double!**noted for developing a synthetic, genetically-engineered version of LAL called 'Factor C'*Who is Dr. Jeak Ling Ding?* |