

America's Most Wanted Invertebrates

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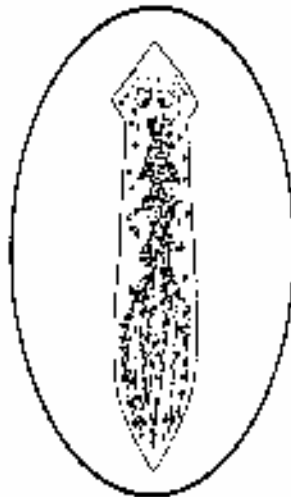
WANTED!

by the F.B.I. (Flatworm Bureau of Investigation)

Perry Planaria

(a.k.a. turbellarian flatworm, planarian)

Ciliary gliding without a license
Carrying a concealed pharynx



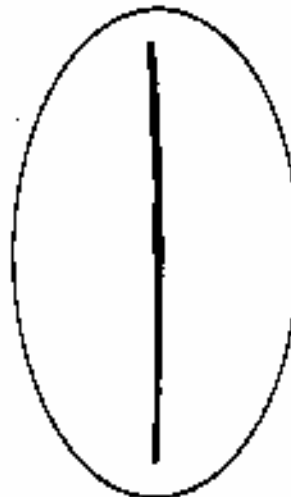
Dorsal View

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Lateral View

NABT Abstract: We present a new “minds-on” activity for the biology classroom that engages students in creative integration of detailed and diverse biological content about invertebrates. The activity results in student-generated written and pictorial profiles that accurately capture the biological features and essence of invertebrates. For each student, the outcome is a “fugitive wanted poster,” much like those seen at the post office or on television (“America’s Most Wanted”). Each poster addresses the following: (1) front and side profile (= *organism’s anatomical perspective*); (2) aliases and a.k.a. (= *taxonomy and common names*); (3) identifying features, marks, disguises (= *external and internal anatomy, camouflage*) (4) last whereabouts (= *habitat*); (5) known associates (= *biological community and niche*); (6) precautions for apprehending (= *field collecting, handling, maintaining, defense mechanisms of organism, etc.*); and (7) “rap sheet of mis-behavior.” Item #7 provides students with great opportunity and freedom to generate creative ‘metaphorical and metafaunal’ descriptions of an organism’s biological functions and behaviors, such as: *ciliary gliding without a permit, unlawful zooplankton assemblage, preying upon a daphnid, swimming backwards too fast, vagrancy in the mud, etc.* Full written description of the activity will be distributed. Samples of student work and assessment considerations will be presented.

NABT Program Description: Students “profile and capture the identity of living invertebrates” in this ‘minds-on’ activity that blends creative writing and illustration. Result: Scientifically-accurate invertebrate wanted posters.

Notes to the Instructor

(By L. Ihrig, Williamsburg Community Schools, IA)

Before beginning this activity, my students spend one 90-minute period in the field collecting invertebrates. The next two 90-minute periods are spent in the classroom sorting and identifying living specimens they collected. Then they are introduced to this assignment (pages 2-5), which I require them to read thoroughly before beginning.

Next, the students select an organism to be the focus of their project. Following careful observation of their organism, they begin answering the numbered questions in this assignment by combining knowledge they have gained by studying the living organisms with information they have obtained from various reference sources, mostly books (page 4). Sometimes they are challenged with new terminology or concepts in biology that they may not have previously studied. The motivation needed to successfully deal with these challenges arises as students sense their evolving "ownership" of their selected organism and their creative writing project. Combining this sense of ownership and a need to know, students are now ready to develop an understanding of new concepts through additional activities and reading materials.

The amount of class time dedicated to this project can vary depending upon how the project is utilized. If the project is used as an assessment, less time will need to be spent teaching concepts than if the project is used as a basis for the ecology unit. It may even be possible for students to do much or all of this activity without using living invertebrates. However, it is *strongly* recommended that living organisms be used as much as possible, because they dramatically increase student interest. Also, the activity need not be limited to invertebrates; any living organism that the instructor has available or familiarity with will work. However, questions may need to be modified to suit other groups of organisms.

Page 6 is a rubric that is used to assess each student's final project. Having the rubric in advance helps students to organize their activities, determine their progress, and understand what they need to do to earn the grade they desire. Page 7 provides a tool to assist the teacher in assessing how much of the required content is addressed in the final product. I use this page to determine what percentage of the content the student both accurately and thoroughly addressed.

With so many concepts to teach in such little time, the decision to make this project one of my students most time-consuming was not taken lightly. The activity is rewarding to me because it meets standards of the National Science Education Standards (NRC, 1996), as outlined in Appendix 1, page 8. Moreover, students demonstrate an interest in biology, display their creativity, take charge of their learning and have pride in their knowledge. This project culminates in an evening open house organized by the students to share their knowledge, final projects, and living invertebrates with their families, guardians and friends.

The Project

You are going to develop and apply your knowledge about ecology and an invertebrate to create a wanted poster. You can use your own creativity and inventiveness to give your organism some "personality" and "preferences," **but specific information about the organism's biology should remain as factual and accurate as possible.** Try to make your poster a coherent collection of information about your wanted invertebrate, rather than a disconnected list of answers to the questions.

Step One- Observations

If available in your classroom, study a living specimen of the organism you are researching. On notecards, carefully note, record, and sketch as many details as possible about its appearance (size, color, shape, appendages, number of segments, etc.) as well as its movements and other behavior. Note its reactions to light, touch, food, etc.

Step Two-Questions to consider on your poster

On your poster you must address all of the questions listed below. The "**street jargon**" used to embellish the wanted poster is written in **bold and underlined text**. The biological content that you need to research and present on your finished product is written in normal text.

If information is not available you need to apply your knowledge of ecology and the invertebrate to create a feasible speculative answer. In a section titled **Speculations About the Suspect**, you will detail what information is speculative by discussing what you (a) are unsure of, (b) could find no information about, or (c) would like to know more about.

Taxonomy

1. **Name and Relations**- Give the suspect's *scientific name*. List the suspect's taxonomy as specifically as your instructor desires. State the common names of related organisms.
2. **Aliases, AKA (also known as)**- What are common names for the organism?

Body Plan

3. **Identifying Features**- Provide a detailed description of the suspect's *appearance*, shape, size, color, texture, symmetry, segmentation (y/n), skeletal features, etc.
4. **Distinguishing Marks**- What distinguishes the suspect from its relatives? (For example, what features would allow you to pick your organism out of a line up of its relatives?) What features are unique, special, or peculiar about the suspect?

Development

5. **Juvenile Record**- Describe the suspect's earlier appearance(s) -- that is, *life stages* and *life cycle*. How big will the suspect grow?
6. **Police Sketches**- Create drawings to support information about the organism's life stages and life cycle.

General Ecology

7. **Last Whereabouts**- Describe the suspect's specific microhabitat. (Such as, under a rock, in shallow water near the shoreline, surrounded by plant material.)
8. **Preferred Hangouts**- Describe the suspect's biological *community*. That is, what populations of plants and animals live around the suspect? What is the suspect's niche?
9. **Rap sheet**- For example, ciliary gliding without a license, carrying a concealed pharynx, construction of a case without a permit.

Locomotion

10. **Suspect Last Seen Heading Towards**- Possible destinations within the suspect's habitat.
11. **Means of Getaway**- Provide a detailed description of the suspect's pattern or means of *locomotion*.
12. **Caution When Apprehending**- What makes the organism dangerous to its predators and/or prey? Describe the suspect's escape and defense mechanisms.

Step Three- Use of Resources and Taking Notes:

Use any and all available resources to gather specific information about the organism's ecology, anatomy, behavior, etc. The types of biological information you will need can be determined by reviewing the questions listed above. This information may be obtained from journals, magazine articles, library reference books, textbooks, World Wide Web, resource people, or other references. In addition to biological facts, the information you gather may include copies of photographs, diagrams, etc. You may trace, redraw, or modify these pictures to use on your poster, but **try to maintain accuracy and detail in your pictures. Below each picture, include a legend that describes the picture [for example: "Here the suspect is attached to a..."]**

There are many book resources available for you in the classroom. You may also use the public library, school library and the World Wide Web to gather resources and information. The authors of the following list of books have spent a considerable amount of time creating books that are thorough and filled with accurate information and drawings. Unfortunately, the same cannot always be said for information that is on the web.

Book Resources

- Pennak, R.W. (1989) *Freshwater Invertebrates of the United States*, 3rd ed. John Wiley. [I SBN: 0-47-63118-3]
- Thorp, J.H. & A.P. Covich (1991) *Ecology and Classification of North American Freshwater Invertebrates*. Academic Press. [I SBN: 0-12-6900645-9]
- McCafferty, W.P. (1983) *Aquatic Entomology: The Fisherman's and Ecologist's Guide to Insects and Their Relatives*. Jones and Bartlett. [I SBN: 0-86720-017-0]
- McGavin, G.C. (2000) *Insects, Spiders and Other Terrestrial Arthropods*. Dorling Kindersley. [I SBN: 0-7894-5337-1]
- Ruppert, E.E. & Barnes, R.D. (1994) *Invertebrate Zoology*. Saunders College Publishing. [I SBN 0-03-026668-8]
- Rainis, K.G. and B.J. Russell. (1996) *Guide to Microlife*. Franklin Watts. [I SBN: 0-531-11266-7]
- Kneidel, S. (1999) *A Kid's Guide to Catching and Keeping Insects and Other Small Creatures*. John Wiley. [I SBN: 0-471-25489-4]

Web Resources

- <http://www.britannica.com/>
- <http://www.earthlife.net/insects>
- <http://orion1.paisley.ac.uk/courses/Tatner/biomedica/home/museum.htm>
- <http://www.ecb.org/guides/biology/index.htm>
- <http://netvet.wustl.edu/invert.htm>
- <http://www.combat-fishing.com/indexanglerecology.html>
- <http://www.naturegrid.org.uk/pondexplorer/pond-cross.html>

Taking Notes

All of the information you collect will be recorded on notecards that will be submitted with your final project. The notecards should use the following format:

Example:

<u>Title</u>	Name
	Date
Information	
(Source) Use the MLA guide for citing resources	

<u>Movement</u>	Name
	Date
Daphnia swim by using the long and bristled antennae that are located on their heads. Their movements are jerky, but their antennae are powerful.	
Pennak, R.W. <u>Freshwater Invertebrates of the United States</u> . 3 rd ed. John Wiley, 1989.	

Step Four- Create a Visual

Your poster must include visuals that you create. Your visuals can be hand drawn, traced, created on the computer, etc. Your visuals may not be photocopies from print resources (books, magazines, journals, etc.) or printouts from the World Wide Web. Minimally, you must include a **descriptive** drawing of your invertebrate. This drawing should be large enough to label the distinguishing features without compromising the artistic integrity of the drawing. You may decide to create "profile" drawings of the suspect.

Step Five - Write Your Speculations About the Suspect

In a separate section, entitled "SPECULATIONS ABOUT THE SUSPECT", indicate which aspects of the organism's biology you were (a) interested in, (b) unsure of, (c) could find the most information about, (d) could find no information about, and (e) would like to know more about. Your speculations do not need to be written in wanted poster fashion, they can be written in first person from your point of view.

Step Six- Create Your Poster

Make certain that your poster is not simply lists of answered questions. This is a creative outlet for you to demonstrate your knowledge of the ecology of an invertebrate. Be cautious. Your goal is to produce a unique poster while highlighting accurate biological information. Make sure creativity is not used at the expense of accurate biological information.

Step Seven- Checklist

Make sure you have met all of the requirements of the project. The details of each requirement are listed above.

- Notecards are complete, properly formatted, and ready to be submitted.
- All questions are answered.
- Observations are included on the poster.
- Self-created visuals are accurate, neat, and labeled (not photocopies or printouts from the World Wide Web).
- Your Speculations About the Suspect section is complete.
- Your works cited page is accurate, complete and properly formatted.

Wanted Poster Rubric

	Excellent	Acceptable	Needs Improvement
Biological Information (Content)	All of the required biological information is presented on the poster. All of the information is accurate and accuracy is never sacrificed to embellish the story line.	Most of the required biological information is presented on the poster. Most of the information is accurate, but sometimes the accuracy of the information is sacrificed to embellish the poster.	Most of the required biological information is not presented on the poster. Most of the information is inaccurate, and oftentimes the accuracy of the information is sacrificed to embellish the poster.
	40 39 38 37 36	35 33 31 29 27 25	24 20 16 12 8 4 0
Quality of Ideas	The ideas on the poster are rich in thought and imagination, relevant to the story line and clearly presented.	The ideas on the poster are sound but unimaginative; most ideas are relevant to the story line.	The ideas on the poster unimaginative, not relevant to the story line, undeveloped and incomplete.
	20 19 18	17 16 15 14 13 12 11	10 9 8 7 6 5 4 0
Organization	The works cited page meets all of the formatting requirements. The poster is exceptionally well organized.	The works cited page meets most of the formatting requirements. The poster is well organized.	The works cited page meets few of the formatting requirements. The poster is clear.
	10 9	8 7	6 5 4 3 2 1 0
Drawing	The drawing is exceptional . It is accurate, neat and labeled.	The drawing is of good quality . It is accurate, neat and labeled.	The drawing is of poor quality . It is neat, accurate or labeled. (Not all three.)
	10 9	8 7	6 5 4 3 2 1 0
Notecards	All of the notecards are complete, thorough and properly formatted.	Most of the notecards are complete, thorough and properly formatted.	Few of the notecards are complete, thorough and properly formatted.
	10 9	8 7	6 5 4 3 2 1 0
Assessment	Student accurately assesses his or her own work.	Student is slightly inaccurate in assessing his or her own work.	Student is unable to accurately assess his or her own work.
	10 9	8 7	6 5 4 3 2 1 0

Instructor Checklist

The following checklist is provided for the instructor to use when assessing the content of the project. Checkmarks are **only** provided for those questions that are **both** accurately and thoroughly answered in the story.

Taxonomy

- Give the suspect's *scientific name*.
- List the suspect's taxonomy as specifically as your instructor desires.
- State the common names of related organisms.
- What are common names for the organism?

Body Plan

- Provide a detailed description of the suspect's *appearance*, shape, size, color, texture, symmetry, segmentation (y/n), skeletal features, etc.
- What features are unique, special, or peculiar about the suspect?

Development

- Describe the suspect's earlier appearance(s) -- that is, *life stages* and *life cycle*.
- How big will the suspect *grow*?
- Create drawings to support information about the organisms life stages and life cycle.

General Ecology

- Describe the suspect's specific microhabitat. (Such as, under a rock, in shallow water near the shoreline, surrounded by plant material.)
- Describe the suspect's biological *community*. That is, what populations of plants and animals live around the suspect?
- What is the suspect's niche?
- Rap sheet- For example, ciliary gliding without a license, carrying a concealed pharynx, construction of a case without a permit.

Locomotion

- Possible destinations within the suspect's habitat.
- Provide a detailed description of the suspect's pattern or means of *locomotion*.
- What makes the organism dangerous to its predators and/or prey? Describe the suspect's escape and defense mechanisms.

Appendix 1

When used as a basis for an Ecology unit, this project provides opportunities for students to begin developing and demonstrating understanding of three of the six Life Science content standards. (NRC, p. 181)

Life science content standards:

- Interdependence of organisms
- Matter, energy and organization in living systems
- Behavior of organisms

Each of the content standards are broken down into specific concepts that provide a guide to teach the content standard.

Guides to the content standards: The Interdependence of Organisms

- The atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.
- Energy flows through the ecosystem in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.
- Organisms both cooperate and compete in ecosystems.
- Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.

Guides to the content standards: Matter, Energy and Organization in Living Systems

- The energy for life primarily derives from the sun.
- The chemical bonds of food molecules contain energy.
- The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing and eliminating the matter and energy used to sustain the organism.

Guides to the content standards: The Behavior of Organisms

- Multicellular animals have nervous systems that generate behavior.