

# Vermiculture



## Worm Selection

# Objectives

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- ❖ Identify the types of worms commonly cultivated
- ❖ Understand the major differences between worm species
- ❖ Be able to select appropriate species to suit individual goals, circumstances, and preferences

# Commonly Cultivated Worm Species

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- ❧ Red Wigglers - *Eisenia Fetida*
- ❧ European Night Crawlers - *Eisenia Hortensis*
- ❧ African Night Crawlers - *Eudrilus Eugeniae*
- ❧ Alabama Jumpers - *Amyntas Gracilis*

# Major Traits Used in Worm Selection

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- ❖ Depth at which worms are active
  - ❖ Epigeic
  - ❖ Endogeic
  - ❖ Anecic
- ❖ Temperature Tolerances
- ❖ Function(s) Desired
- ❖ Reproductive Rate
- ❖ Growth Rate

# Depth of Activities



- ❖ **Epigeic: surface dwellers** live in areas containing high amounts of organic matter. They live at or near the soil surface, typically between 4" and 12" and feed on leaf litter, decaying plant roots or dung
  - ❖ do not form permanent burrows.
  - ❖ tend to have dark skin color which acts as camouflage as they move through the leaf litter, and helps to protect them from UV rays.
  - ❖ muscles are strong and thick in proportion to their length, allowing for quick movement
  - ❖ tend to be small (1-18 cm in length)
  - ❖ cannot survive in soil
  - ❖ Native species usually live in forest litter.
- ❖ **Endogeic: topsoil dwellers**
  - ❖ Dwell in the top 12" of soil
  - ❖ eat large amounts of soil and the organic matter in it
  - ❖ sometimes come to the surface to search for food
  - ❖ form shallow semi-permanent burrows.
  - ❖ muscle layers are not as thick nor do they move as quickly as epigeic earthworms.
  - ❖ range in size from 2.5-30 cm
  - ❖ native endogeic earthworms are often found in grasslands.
- ❖ **Anecic earthworms: Burrowing** earthworms make permanent vertical burrows in soil. They feed on leaves on the soil surface that they drag into their burrows.
  - ❖ cast on the surface, and these casts can quite often be seen in grasslands
  - ❖ Powerful digging capabilities, resulting in aeration and locomotion benefits to the soil
  - ❖ darkly colored at the head end (red or brown) and have paler tails

# Red Wigglers

*Eisenia fetida*



# Red Wigglers

*Eisenia fetida*



- ❖ Epigeic:
  - ❖ The most commonly used worms for Vermiculture and Vermicomposting in the world.
- ❖ Their natural habitat is your local manure pile and/or compost pile. Because their skin is relatively thin, and their strength marginal, these worms perform poorly at aerating soil.
- ❖ Commonly used for panfish bait. At approximately 1/10<sup>th</sup> the weight of most Nightcrawlers, these are the perfect size for small fish.
- ❖ Compost material the fastest.
- ❖ Quick breeders.
- ❖ Tolerant of many conditions
- ❖ Good for: **Composting, Fishing**

# Red Wigglers

*Eisenia fetida*



Temperature Tolerance: 38F - 95F

Ideal Temperature Range: 70F - 80F

Size: Up to 2 inches long

Reproductive Rate:

Days to hatch: 32 - 73

Days to Maturity: 53 - 76

Days from egg to Maturity: 85 - 149

Colony Growth Rate: 10.4 young/week

# European Nightcrawlers

*Eisenia hortensis*



# European Nightcrawlers

*Eisenia hortensis*



- ❖ European Nightcrawlers are good composters, but a little less voracious than Red Wigglers.
  - ❖ Do not perform well in the dirt
  - ❖ Closely related to the red worm
  - ❖ Mid-sized worms - about 3x the size of the Red Wiggler
  - ❖ Fairly tolerant of conditions like the red worm
  - ❖ A close second as far as speed in composting material
- ❖ Good for: Fishing, Composting

# European Nightcrawlers

*Eisenia hortensis*



Temperature Tolerance: 45F - 88F

Ideal Temperature Range: 60F - 70F

Size: Approximately 3 inches long

Reproductive Rate:

Days to hatch: 40 - 128

Days to Maturity: 57 - 86

Days from egg to Maturity: 97 - 214

Colony Growth Rate: 1.4 young/week

# African Night Crawlers

*Eudrilus eugeniae*



# African Night Crawlers

*Eudrilus eugeniae*



- ❖ **African Nightcrawlers** are every bit as voracious as Red Wigglers, but they are sensitive to cold temperature
  - ❖ Better suited for compost bins than dirt
  - ❖ Prefer warmer temperatures – 70F or higher
  - ❖ Relatively thin skin makes these worms best suited for a sheltered composting environment
  - ❖ Longer than European Nightcrawlers, but thinner.
  - ❖ Perfect fishing worm for warm waters
  - ❖ Native to tropical west Africa
  - ❖ A little more picky about their bin conditions than European nightcrawlers
  - ❖ Big and can process material very fast
  - ❖ Good for: **Fishing, Composting**

# African Night Crawlers

*Eudrilus eugeniae*



Temperature Tolerance: 45F - 95F

Ideal Temperature Range: 75F - 82F

Size: 6 to 10 inches long

Reproductive Rate:

Days to hatch: 13 - 27

Days to Maturity: 32 - 95

Days from egg to Maturity: 43 - 122

Colony Growth Rate: 6.7 young/week

# Alabama Jumpers

*Amnthus gracilis*



# Alabama Jumpers

*Amunthus gracilus*

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- ❖ Alabama Jumpers are considered very poor composters. Preferring leaf litter to kitchen scraps, these worms tend to prefer living in SOIL.
  - ❖ The best worms for aerating the garden.
  - ❖ Thick skin allows them to live in soil ranging from sandy to heavy clay
  - ❖ Prefer leaf litter or compost
  - ❖ Easily propagated in the garden.
  - ❖ Strongest of all of the commercial worms
  - ❖ EXTREMELY active worms
  - ❖ Thickest skin of all the commercial worms, allowing them to stay on the hook for long periods of time.
  - ❖ Good For: **Gardening, Fishing**

# Alabama Jumpers

*Amunthus gracilus*

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Temperature Tolerance: 38F - 95F

Ideal Temperature Range: 70F - 80F

Size: 6 to 10 inches long

\*Reproductive Rate:

Highly reproductive in soil.

Low rates of reproduction in bins.

Colony Growth Rate:

Highly reproductive in soil.

Low rates of reproduction in bins.

# Why Cultivate Worms?

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- ❧ Composting Organic Material
- ❧ Produce Castings
- ❧ Fishing Bait
- ❧ Livestock Food
- ❧ Aerate the Soil

# Most Common Uses for Worms

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- ❖ Composting
- ❖ Fishing
- ❖ Gardening

# Composting Criteria

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- ❖ Qualities of effective composting worms:
  - ❖ Surface dwellers (Epigeic): Top 12 inches
  - ❖ Hungry: Flock to Food
  - ❖ Fast Reproduction: Double in population every 3-4 months in optimum conditions
  - ❖ Ability to survive in captivity
    - ❖ Temperature
    - ❖ Moisture
    - ❖ pH

# Fishing Criteria

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- ❖ Size
- ❖ Activity
- ❖ Toughness of Skin
- ❖ Temperature tolerance for local environment

# Gardening Criteria



- ❖ Thick skin
- ❖ Powerful diggers
- ❖ Range of travel
- ❖ Depth (Anecic)

# Test Your Knowledge

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- ❖ 1. Johnny-Boy wants to establish a worm bin in his apartment in downtown Albuquerque. He would like to produce nutrient rich material for amending the soil in his container garden, and recycle his kitchen scraps. Which type of worm would you recommend that he select for his bin? Why?
- ❖ 2. Carl is interested in producing bait for his trout fishing outings in Chama. He lives in Las Cruces, and has no space inside his house for worm bins. He would also like to aerate the many raised beds in which he grows his vegetables. Which type of worm would you recommend that he select for his needs? Why?
- ❖ 3. Stub E. Potgutski, who is Carl's neighbor, is ONLY interested in fishing in the warm waters of the South. He has the resources to start any sort of bin/bed necessary to produce his bait worms. Which type of worm would you recommend that he select for his needs? Why?

# Recap

	Red Wigglers	European Nightcrawlers	African Nightcrawlers	Alabama Jumpers
Depth of Activities	Epigeic 4"-6"	Epigeic 4" - 12"	Epigeic 4" - 12"	Anecic 4" - 6'
Size	Up to 2"	≈ 3"	6" - 10"	6" - 10"
Temperature Range Tolerated	38F - 95F Ideal: 70F - 80F	45F - 88F Ideal: 70F - 80F	45F - 95F Ideal: 70F - 80F	Unable to find specifics
Growth Rate	To Hatch: 32 – 73 days To Maturity: 53 – 76 days Egg to Maturity: 85-149 days	To Hatch: 40-128 days To Maturity: 57-86 days Egg to Maturity: 97-214 days	To Hatch: 13-27 days To Maturity: 32-95 days Egg to Maturity: 43-122 days	High rates in soil. Low rates in Bins
Reproductive Rate	3.8 cocoons/wk 3.3 hatchlings/cocoon 10.4 young/wk	1.1 cocoons/wk 1.6 hatchlings/cocoon 1.4 young/wk	3.6 cocoons/wk 2.3 hatchlings/cocoon 6.7 young/wk	High rates in soil. Low rates in Bins
Most Suitable Function(s)	Composting Pan-Fishing	Fishing Composting	Fishing Composting	Aeration Fishing

# Questions?

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# References

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- ❧ Appelhof, M. (1997). *Worms Eat My Garbage. 2<sup>nd</sup> edition.* Kalamazoo, MI. Flowerfield Enterprises, LLC.
- ❧ Lowenfels, J. (2013). *Teaming with Nutrients.* Portland, OR. Timber Press.
- ❧ Lowenfels, J. & Lewis, W. (2010). *Teaming with Microbes.* Portland, OR. Timber Press.