

Molecular Systematics & Ethnobotany Case Study: Breadfruit



Thanks to Tim Motley & Nyree Zerega for pictures and information.

- Hawaii, California, Bering Strait
- Bounty-hunting
- Pandora's Box
- Breadfruit
- Molecular systematics

William Bligh



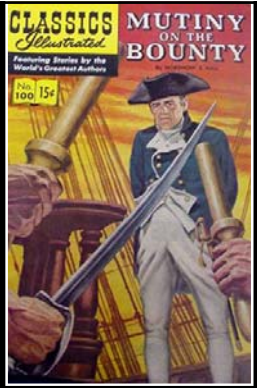
-James Cook's sailing master
(3rd Voyage; 1776)

-Captain, HMS *Bounty*
(1787-1789)

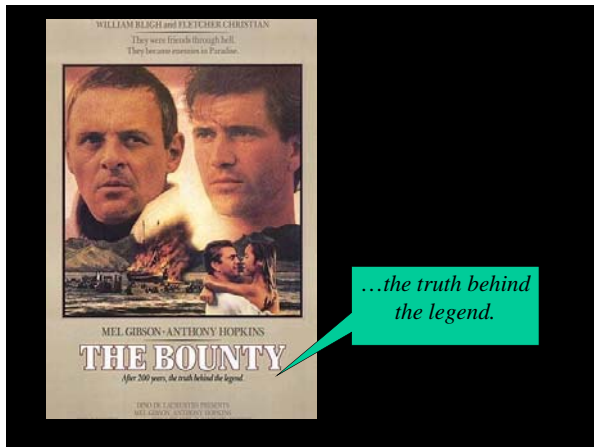
HMS Bounty



George III (reign: 1760-1820)
portrait by Allan Ramsay, 1762



Mutiny on the Bounty, 1979

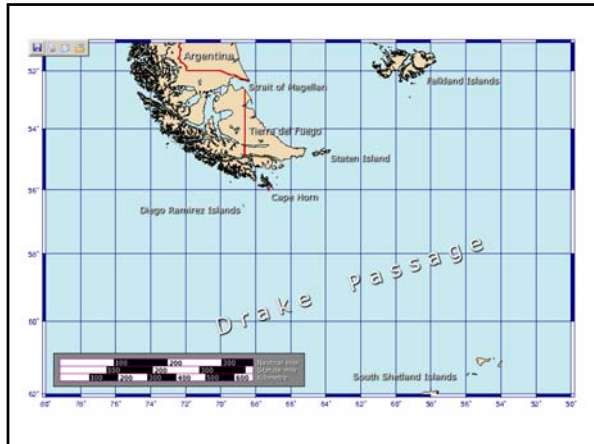


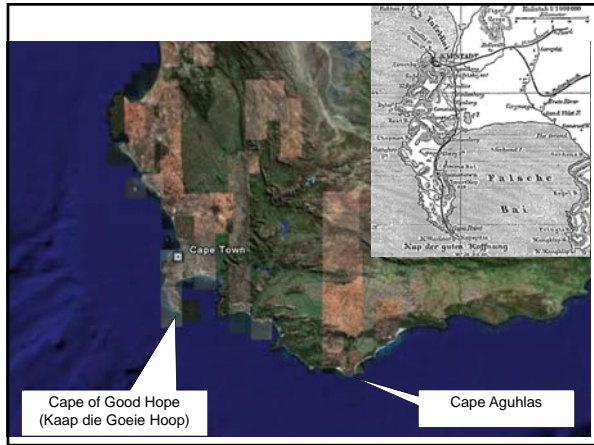
The voyage of the HMS Bounty, 1787-1789

-23 Dec 1787, departed for Tahiti

Mission: To collect **breadfruit** for West Indies.

Tahiti







The voyage of the HMS Bounty, 1787-1789



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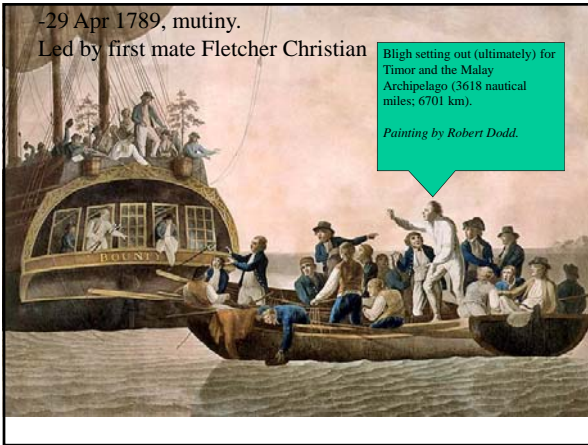
Mission: To collect **breadfruit** for West Indies.

-28 Oct 1788, reached Tahiti

5 mos. Collecting & preparing 1015 breadfruit trees.

-4 Apr 1789; set sail for West Indies

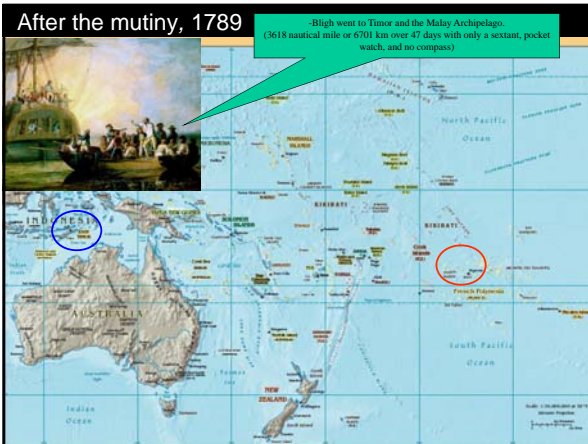
-29 Apr 1789, mutiny.
Led by first mate Fletcher Christian



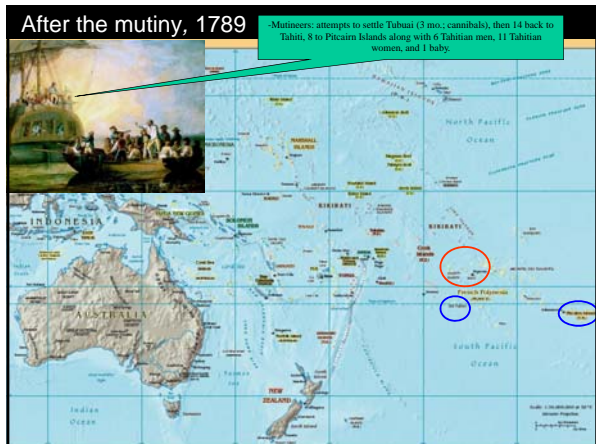
Bligh setting out (ultimately) for Timor and the Malay Archipelago (3618 nautical miles; 6701 km).

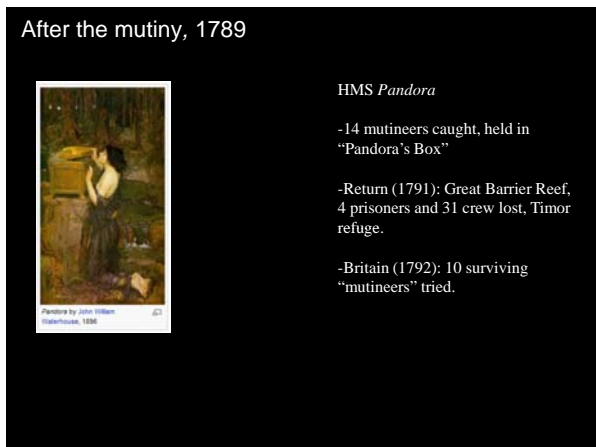
Painting by Robert Dodd.

After the mutiny, 1789



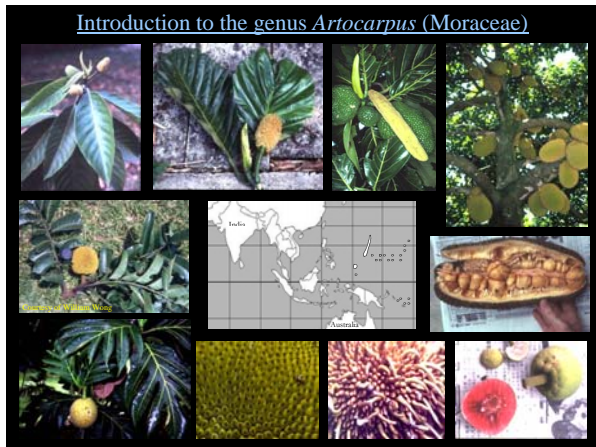
Bligh went to Timor and the Malay Archipelago (3618 nautical mile or 6701 km over 47 days with only a sextant, pocket watch, and no compass)

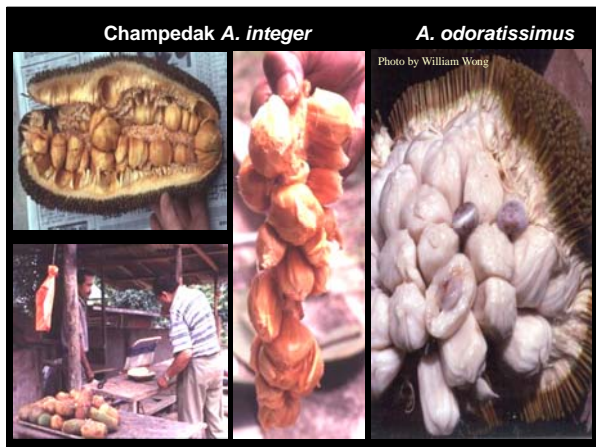


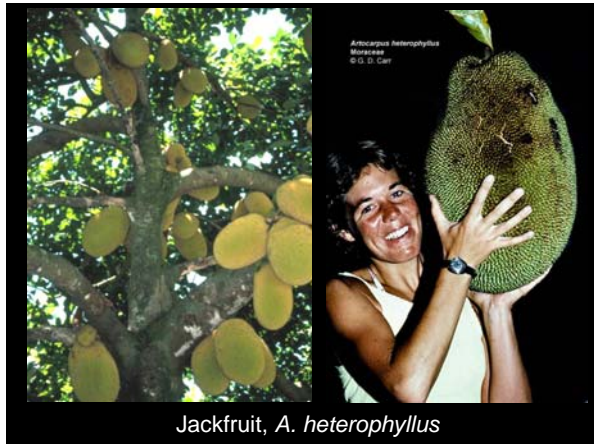


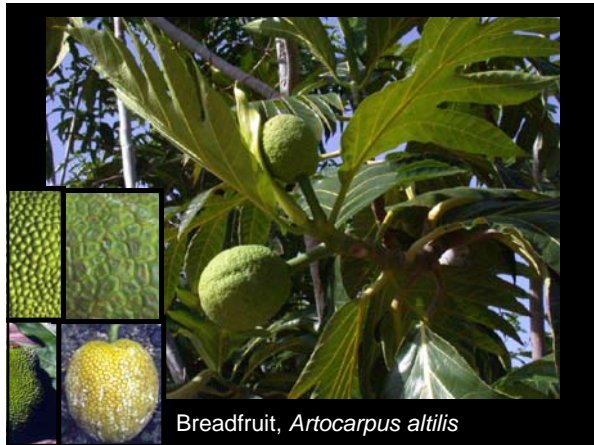


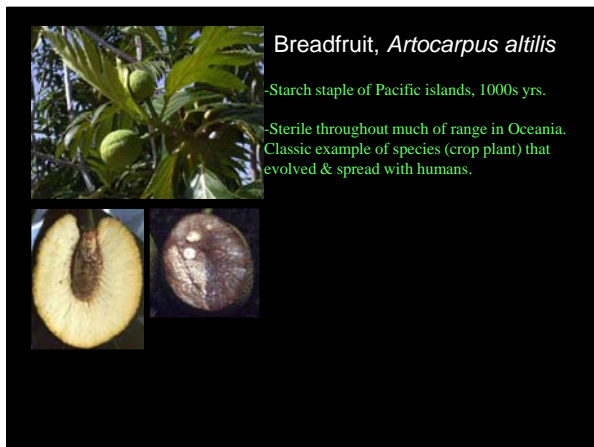


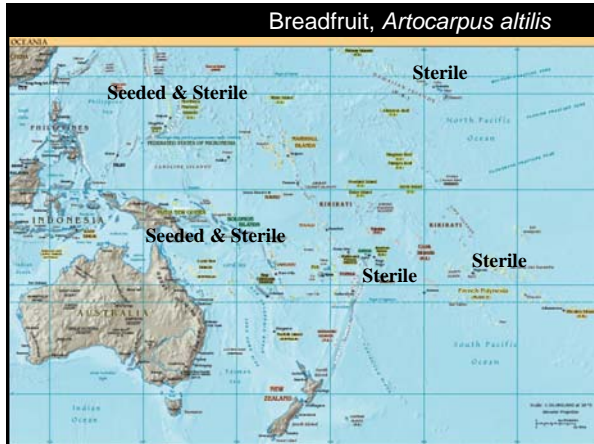


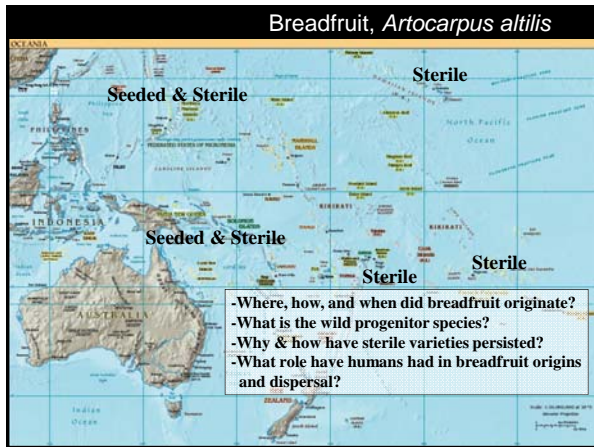













-Where, how, and when did breadfruit originate?
 -What is the wild progenitor species?
 -Why & how have sterile varieties persisted?
 -What role have humans had in breadfruit origins and dispersal?




Artocarpus altilis (breadfruit)

Nyree Conard Zerega
 Director, Plant Biology and Conservation Masters Program
 Northwestern University & The Chicago Botanic Garden

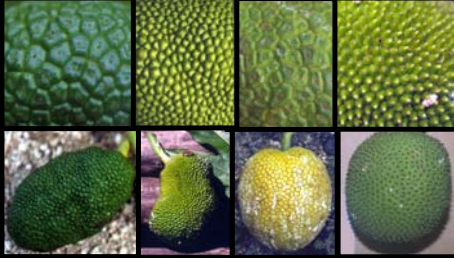
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 M.S. 1995, [New York University](#)
 B.A. 1996, [Tulane State University](#)



Infructescence shape and texture variation

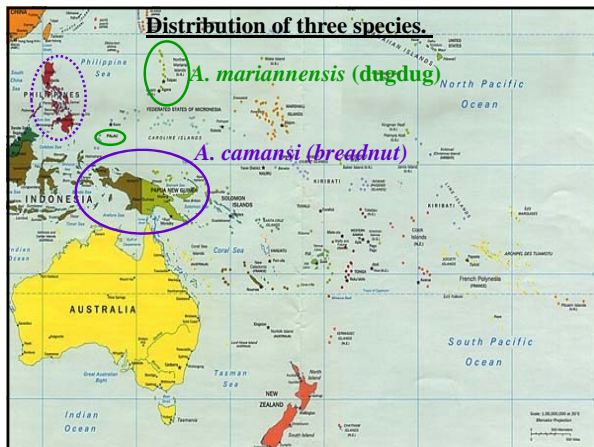


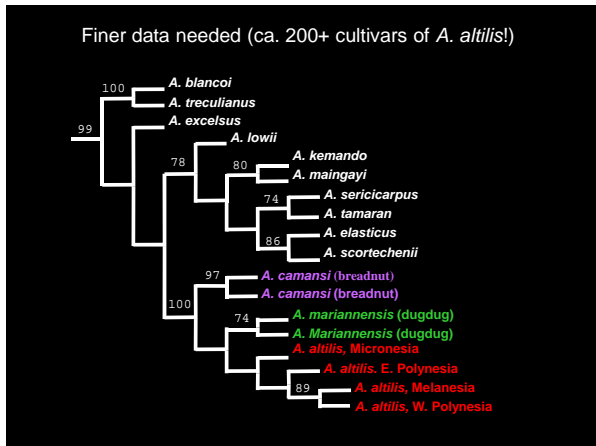
A. mariannensis *A. altalis*, breadfruit *A. camansi*

Leaf variation



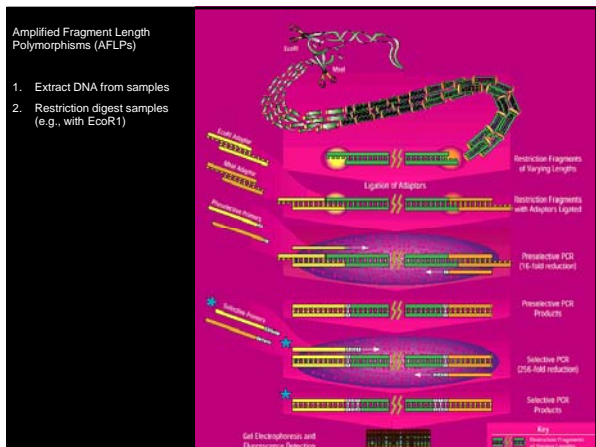
A. mariannensis *A. altalis*, breadfruit *A. camansi*



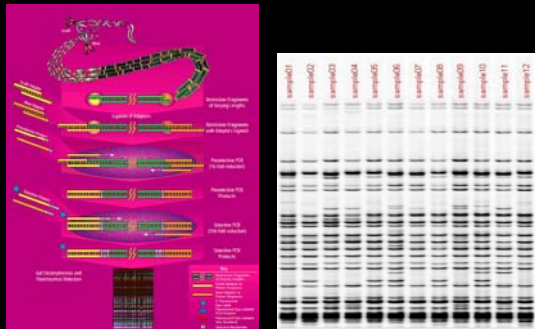


Amplified Fragment Length Polymorphisms (AFLPs)
(DNA fingerprinting)

Isozymes / Allozymes Analysis
(protein profiling)



Amplified Fragment Length Polymorphisms (AFLPs)
(DNA fingerprinting)



If breadfruit is a hybrid



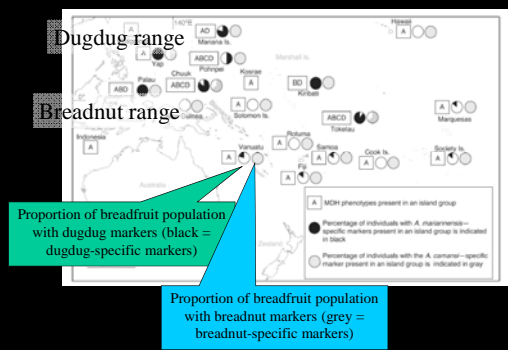
Then we expect AFLP additivity

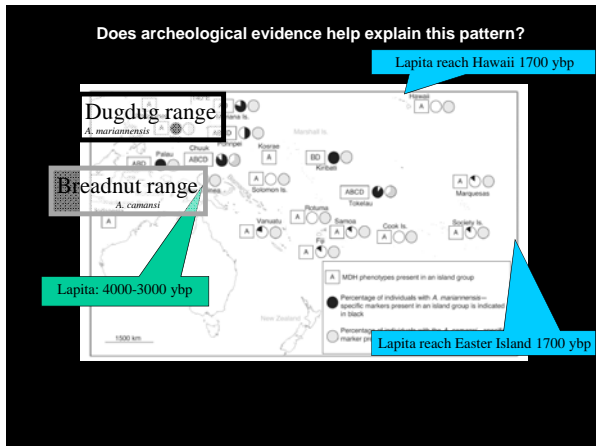
A. camansi (breadnut) *A. altilis* (breadfruit) *A. mariannensis* (dugdug)

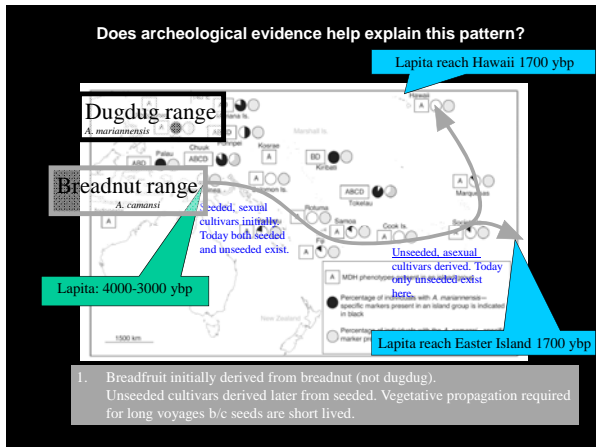


Much of breadfruit is breadnut, some islands (esp. Micronesia) with dugdug genes too.

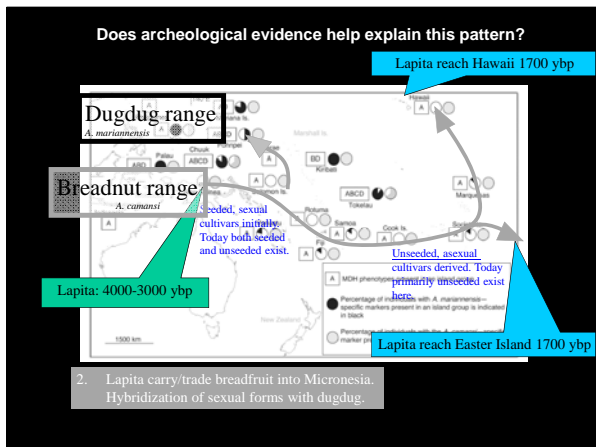
Diane Ragone (NTBG), N. Zerega







1. Breadfruit initially derived from breadnut (not dugdug). Unseeded cultivars derived later from seeded. Vegetative propagation required for long voyages b/c seeds are short lived.



2. Lapita carry trade breadfruit into Micronesia. Hybridization of sexual forms with dugdug.

Does archeological evidence help explain this pattern?

Lapita reach Hawaii 1700 ybp

Dugdug range
A. maritima

Breadnut range
A. camansi

Unseeded, asexual cultivars derived. Today primarily unseeded exist here.

Lapita: 4000-3000 ybp

Lapita reach Easter Island 1700 ybp

3. Hybrid breadfruits dispersed/traded out of Micronesia.

Does archeological evidence help explain this pattern?

Lapita reach Hawaii 1700 ybp

Dugdug range
A. maritima

Breadnut range
A. camansi

Unseeded, asexual cultivars derived. Today primarily unseeded exist here.

Lapita: 4000-3000 ybp

Lapita reach Easter Island 1700 ybp

4. Limited trade/dispersal of hybrid breadfruits south into original breadfruit range, followed by backcrossing with pure breadnut-contributed breadfruits.
