Introduction to Archaeology: Notes 12

Animal and plant remains

- Animal remains
  - **Faunal analysis**: analysis of remains of animals
    - usually bone and teeth
    - also occasionally hair, hide, hooves, toenails, etc.
    - also fish bones and scales, often by a separate expert
    - shellfish are usually analyzed by yet another expert
  - Done by a **faunal analyst** or **zooarchaeologist**
  - faunal analysis
    - requires a lot of experience and very good spatial visualization skills
    - is usually done by comparing bones to a **comparative collection**
  - Faunal analysts often spend a lot of time amassing their comparative collections
    - they disgust their friends and neighbors by collecting road kills
    - having strange animals cooked for them
    - boiling meat off bones and carcasses
    - burying carcasses to allow the meat to rot away, to be dug up later
    - establishing dermestid beetle colonies
      - these are bugs that eat dead meat
      - they clean the bones effectively without the damage caused by boiling, bleach, mechanical cleaning, etc.
      - often allowed to live in small, heated, sealed "bug rooms" where samples are left to be cleaned
  - zooarchaeologists typically record
    - which specific bones and sections of the animals are present, and quantities of each
      - identify each **element** (whole bone; may be represented by multiple fragments)
    - the kinds of animals present, and how many of each, as specifically as possible
      - **taxon**: kind of animal (**taxa**, plural)
      - ideally to the species or even variety within species
        - but often only possible to the genus or family
        - or even sometimes just "large mammal" vs. "small mammal"
      - depends on preservation, research goals, etc.
    - age and sex of animals when possible
    - pathologies (injuries, diseases, etc.)
      - may suggest uses the animals had in life, like pack animals
    - tooth marks from dogs, other carnivores, rats, etc.
      - can suggest if the site was a dangerous place, frequented by carnivores
      - if the bone was left exposed (stinking and attracting insects) or buried, which might suggest a kill site vs. a longer-term camp
    - any marks from killing or butchering the animal
      - may show what parts were eaten, preparation for drying or smoking, etc.
    - smashing of long bones to get marrow out

    - "pot polish" from boiling the bones
    - modifications of bones or other parts, as in making tools or ornaments
    - etc.
- the data is used for
- reconstructing the meat part of diet
    - what species were eaten
    - roughly how important meat was to the diet (or not)
    - whether the animals were herded or hunted
    - changes over time, etc.
- reconstructing seasonality of site occupation
    - that is, was the site occupied year-round?
        - if not, during what parts of the year?
    - based on ages at death of juveniles, from tooth eruption
    - and knowledge of the season when modern animals of the same species give birth
    - if juveniles died there at all ages, people were there with their herds, or killing the animals if wild, during the whole year
    - if juveniles died there only at certain ages, representing distinct seasons, then the site was probably occupied seasonally
        - say, 6 months after the birthing season, one year and six months after, two years and 6 months, etc.
        - corroborating evidence from other animals and plants would make this more convincing
- hunting methods
    - includes both material technology (spears, bows, etc.) and social "technology" (group coordination)
    - herd-management techniques
        - based on age and sex composition of the hunted animals
        - if they don't match the natural herd composition, then certain ages and sexes were preferentially selected to kill
        - if younger individuals and females were spared, this suggests conscious effort to maintain the herd, taking the less necessary individuals for food and leaving the reproducers to replenish the herd
        - this may be an initial step towards animal domestication
- determining when people domesticated animals in specific cultures
    - based on looking at changes in the animals' characteristics compared to their wild ancestors
- variations in diet may indicate ethnicity or status differences
    - Great Zimbabwe example (1250-1450 AD)
    - bone from the slopes below the "Acropolis" at Great Zimbabwe was overwhelmingly cattle, with a little sheep or goat
        - over 75% killed while still immature: i.e. veal
        - so food consumed on the Acropolis was the most valuable kind, presumably eaten by high-status people
    - at a smaller settlement with an enclosure wall (Manekweni)

        - the bones in garbage from inside the enclosure were dominated by cattle bones
            - remember, in a cattle pastoralist society, cattle and beef are wealth
        - while the bones in garbage from outside were dominated by sheep, goat, and game
            - presumably lower-status people
    - variations in body parts present may indicate processing or trade
        - at the Peruvian site of Chavín de Huántar,
            - a town of 2,000 to 3,000 people, large for the region and time period,
            - with an important temple apparently visited by pilgrims from much of the northern Andes
        - during the period of around 500 BC to 200 BC, wild animal bone virtually disappeared, replaced by domesticated camelid bone
            - with a surprising lack of foot bones and heads
            - the bones that are present may correspond to the bones that would be included in portions of dried (actually, freeze-dried) meat
                - this freeze-drying process can only be done at higher elevations than Chavín
                - so it must have been imported and traded for something at Chavín
            - so the faunal analysis suggests a shift from locally hunted meat to domestic, processed meat that was brought to the site from elsewhere, probably in trade
                - that is, a much more complex and regional economy
- What to record and analyze?
    - NISP: Number of Identifiable Specimens
        - problem: many identifiable specimens might come from a single animal's carcass, or each one might represent a different animal
        - what if some animals have lots of distinctive, identifiable bones, while others have fewer bones per individual that can be definitely identified?
            - the harder-to-identify animals will be undercounted
        - what if some animals are brought to the site whole, while others are butchered where they were killed?
            - the butchered animals will be undercounted
    - MNI: Minimum Number of Individuals
        - somewhat better at estimating how many animals were involved in creating the record, but still a rough indicator
    - grams of bone of a given species or type
        - easy, but has problems similar to NISP
    - meat weight
        - estimated amount of meat that was on each bone
        - gives a better idea of the contribution of meat to the diet
        - avoids some problems of NISP, MNI, and bone weight
        - if we have all the bone from a pit, for example, who cares if two legs of lamb came from one lamb or two?
        - sometimes done by estimating amount of meat per animal
            - based on MNI
            - this has all the problems of MNI

- but at least makes the meat contribution of different species comparable

- Botanical analysis
  - **archaeobotany**: study of ancient plant remains
    - focusing on reconstructing environment, climate, resource availability, etc.
  - **paleoethnobotany**: study of ancient plant remains
    - with a focus on plant-human relationships and their changes over time
    - diet and food preparation (cuisine)
    - implications about farming and gathering practices
    - determining if a site was occupied year-round, or only during certain seasons ("seasonality")
    - craft uses of plants (fibers for textiles, gourds for net floats, reeds for mats or house construction, basketry, etc.)
    - uses of plants for fuels
    - can have implications about ethnic, occupational, status, etc. relationships
  - **macrobotanical remains**: pieces of plant material that are big enough to pick out while excavating, or that turn up in the screen
    - in most sites, the only way that macrobotanical remains are preserved is by being **carbonized** (burned)
      - and usually, only things that are being cooked or used for fuel are likely to get in a fire and be preserved
    - but in very dry, frozen, or anaerobic wet sites, a lot of plant material can be preserved
    - a related kind of macrobotanical find: casts or impressions in ceramics, bricks, etc.
      - example of wheat and barley impressions from Mehrgarh, Baluchistan, early Neolithic (7000 - 4500 BC)
    - macrobotanical remains are often used to help to reconstruct diet
      - Peruvian examples:
        - kinds of corn and cobs
        - guavas, peppers, beans, etc.
    - macrobotanical remains are sometimes found in coprolites, also very useful for reconstructing diet
      - **coprolites**: dried feces (human, dog, etc.)
      - only preserved in special circumstances
        - usually very dry environments
      - often contain macrobotanical remains
        - also small bone fragments, microscopic botanical material, parasites that reflect general health status
        - a very direct, specific source of data on diet, even specific meals and cuisine
        - analysis requires specialists!
      - Peruvian example of coprolites
    - macrobotanical remains also often help to indicate non-dietary activities, crafts, architecture, etc.
      - farming for fibers:
        - cotton bolls, fiber, etc. indicate farming of cotton for textiles and/or seed oil

- finding the non-fiber parts of cotton indicates that people at the site were involved in farming it, rather than trading for fibers or textiles made elsewhere
- collecting for mats, cordage, etc
  - reeds, grasses, etc.
  - along with basketry, these artifacts are often studied by specialists who are not botanists
  - but they often will have a paleoethnobotanist identify the plants that provided the raw materials
- collecting architectural building materials
  - in the area where I work, two different cultures used different kinds of reeds to build their houses
  - why?
- ritual behavior involving plants
  - example: "offerings" of whole food or craft items in pits
  - example: layers of reeds in burial mounds
    - where did they come from?
    - what did they "mean"?
- example of changing fuel from the Mantaro Valley, Peru
  - this is a project that I worked on
  - Chris Hastorf and Sissel Johannessen
  - looked at charcoal from flotation samples
  - compared proportions of wood chunks, stem (twig) pieces, and grass fragments
  - found gradual decline in proportion of wood chunks, rise in proportion of twigs during Pancan periods
  - then shift to more wood in Wanka II and Wanka III (Inka) periods
  - they saw this as a decline in availability of wood through the Pancan periods, then the rise of tree farming with the appearance of local chiefdoms
    - they argued tree farming may have had symbolic as well as economic value for emerging elites
  - there are many reasons to be skeptical, but this does show how far some people may push paleoethnobotanical data
- how to count botanical remains?
  - similar problems as counting broken bone, but worse
    - you can’t possibly examine all the soil from a site under a microscope!
    - so paleoethnobotanists are always dealing with tiny, expensive samples of even a small feature like a hearth
  - we won’t go into the quantitative methods here
- there are various kinds of smaller plant remains
  - flotation samples, light fraction
    - these are usually just smaller seeds and broken plant parts
    - identified using magnification, but otherwise similar to macrobotanical remains
  - **phytoliths**: silica (opal) deposits that form mostly in the stems of arid-adapted grassy plants, but in some other cases as well
    - some can be identified as to what species of plant they come from

- others are ambiguous
- they are microscopic, but durable
- must be laboriously extracted from
  - soil samples
  - the surfaces of grinding stones
  - sometimes identifiable ones remain embedded in "**sickle gloss**" on stone blades used to cut thatch, harvest grain, etc.
- example: reconstructing what crops were grown on prehistoric agricultural terraces in the Osmore valley, Peru
  - work by Tony Ribiero
  - soil samples contained maize phytoliths (and some others; not yet published)
  - a different project recently did the same at a coastal site north of the Osmore valley

- **pollen**: the male gametes of flowering plants
  - often commonly included here: spores, which are "packaged" cells that disperse and later grow into plants
  - the study of pollen is **palynology**
  - microscopic, but durable
  - can be identified as to what species they come from
  - extracted from soil samples
  - also from "pollen washes" from the surface of some artifacts
  - have evolved specifically to blow around easily, so contamination is a constant worry
  - soil samples collect the "pollen rain" at the time the soil was at or near the surface
    - this reflects the plant mix in a fairly large surrounding area, depending on prevailing winds, etc.
    - good for general climatic and ecological reconstruction
    - example of mesolithic Star Carr, ~7500 BC
      - pollen indicated a birch forested environment while the site was occupied
      - and a dramatic change to elm, oak, and hazel just as the site was abandoned
      - climate or other environmental change related to abandonment?
  - pollen found in specific contexts like burials or storage rooms is sometimes taken to reflect the activities that happened there, rather than just the general environment
  - Shanidar cave example
    - flower pollen concentrated in areas around a Neanderthal burial suggested intentional, ritual burial with flowers
    - but maybe the pollen was from flowers dragged into burrows by a species of rodent (called a jird) known to have burrowed in the cave
    - not as bad as Kelly and Thomas say
    - there *were* samples from other areas of the cave deposits that had much less flower pollen in them
      - did the jirds only hide flower heads in this one spot, out of all the ones checked by the project?
      - so the original claim still seems fairly likely
  - Pampa de la Llamas, Huaca A example

        - were the rooms were for storage?
        - very little evidence of what would have been stored there
            - not surprising; if it had any value, it would have been removed
        - pollen from niches suggests cotton, beans, potatoes, peanuts
            - but it could have blown in on the wind
            - pollen comes from flowers; it is not typically plentiful on the parts of plants that would be stored, like peanuts or potatoes
        - lots of rodent bones also suggest storage
- Combining these kinds of evidence can be very powerful
    - macrobotanical remains and flotation samples show what seeds and other edible parts were present
        - sometimes also what non-edible parts, stems, leaves, fuel, etc.
        - but in many sites, only carbonized (burned) plant remains survive
        - and mostly what gets carbonized is food being cooked, and fuel, not peels, stems, etc.
    - phytoliths show what grassy stems were present
        - good only for some kinds of plants
        - these are parts that might or might not be collected and brought to a site
        - depending on what the people wanted to do with the plant
            - eat the seeds? make mats from the stems?
            - and how and where they processed it
    - pollen shows
        - the general plant environment (usually)
        - presence of flowers (in special cases)
    - so combining these might show that
        - seeds were harvested and brought back to the site (if expected phytoliths are absent)
        - a common plant was not used for some reason (if it is found in the pollen)
        - a plant was brought in from a long way away (if it is not found in the pollen)
        - etc.

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