How do we scale hunter-gatherers' social networks?
Towards bridging interdisciplinary gaps

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For the greater part of the 20th century, hunter-gatherer societies were regarded as "small-scale societies" by modern sociology (see Barth ed. 1978 for overview). The broad distinction between "small-scale" and "large-scale" was increasingly losing its overall analytical grip in the late 20th century, also with regard to the classification of hunter-gatherers in these terms. Anthropologists who approached hunter-gatherers from ecological-evolutionary perspectives continue to address group-size as a key explanatory issue (see Kelly 1995 for overview), and some even associated it with the evolution of the human social mind (Dunbar 1993). By contrast, anthropologists who approached hunter-gatherers from socio-cultural perspectives have for the most ignored group – and population – sizes, regarding demographic figures as marginal to understanding hunter-gatherer societies, cultures and worlds (see Bird-David 2017 b, 2018, 2019 for overview). I, too, have been one of those latter ethnographers until I recently changed my approach to consider manifold and complex aspects of "scale" as at once concept, phenomenon, approach and much more (see Carr and Lempert 2016 for overview of the concept of scale).

What made me reconsider my approach was writing a book on the forest-forager Nayaka of South India, with whom I have been working since 1978 (and my students Daniel Naveh and Noa Lavi respectively since 2003 and 2010). My original plan was to write an ethnographic monograph, after having published many articles. I wanted to write a monograph from the standpoint of my long-term perspective of close to four decades of work with Nayaka. But the project became more complicated than I initially envisaged. The more I wrote, the more it dawned on me how any ethnographic description and analysis of Nayaka culture (and that of hunter-gatherers more generally) fails to

evoke their experiences lest we pay attention to scalar aspects of their lifeways. That is, we need to pay attention to how we, and how they, scale and imagine societies and lifeworlds, and the affordances and limits entailed in these scales. Consequently, I aligned my project with turn-of-the-21st century work in the social sciences concerned with "scale" as a modern analytical and discursive concept (what has since been tagged "the scalar turn", see in Carr and Lempert eds. 2016). And I integrated scalar issues into my book (Bird-David 2017a) and into follow-up articles (Bird-David 2017b, 2018, 2019). I started to ask myself who scales hunter-gatherer societies, by what criteria and for what purpose, and whether and how they scale themselves. I attended to issues of scales starting from the Nayaka order of magnitude, which comprises a few dozen people for residential groups, a few hundred for local communities, and rather unreliable outsiders' estimates of a few hundred to a few thousand for the entire population. These figures are comparable with those for many (not all) other hunter-gatherers. I went further from the numbers and explored how – as far as the order of magnitude goes, in comparison with other societies, and especially modern Western societies – hunter-gatherers' small order of magnitude influences their lifeways and lifeworlds. In my recent work, I revisited a range of topics in hunter-gatherer studies from this scale-sensitive perspective, e.g., kinship, marriage, gender and child rearing, relations with nonhumans, outsiders and the state, animistic and relational ontologies, and more. I showed how relevant is "smallness" of hunter-gatherers' social aggregates, and the "nearness" of the horizons of their worlds, are to understanding their lifeways and culturally-created worlds.

An apparently opposing perspective on hunter-gatherer scale has meanwhile been offered from an ecological-evolutionary standpoint by Douglas Bird and associates (Bird et al. 2019). These ethnographers drew on their work with Australian Aboriginal Martu people since 2000, as well as comparative work among Hadza and others. They took an evolutionary-ecological perspective, and argued that "foragers do not live in small-scale societies" (the article's subtitle). To the contrary, they argued, foragers live in "large-scale social networks" (p. 69). Based on this revision of hunter-gatherers' scale, the authors proposed – contra Dunbar's famous argument (1995) – that human cognition coevolved with large-scale social networks, with socio-ecological interactions and relational wealth.

On the face of things, we have conflicting assessments of the scale of hunter-gatherers social aggregates – in short referred to below as "socio-cultural" vs. "ecological-evolutionary" perspectives and "very-small-scale"

vs. "large-scale" positions. Up until today, these arguments have not been thoroughly debated, the main reason being a deepening disciplinary split within hunter-gatherer studies. Hunter-gatherer studies was constituted in the 1960s as a comparative and interdisciplinary project (Lee and DeVore eds. 1968), not least because ethnographically-observable hunter-gatherer cases are scarce, and their comparative study is crucial to understanding their recurring patterns and their variations, and in turn critical for speculating about our past and about human evolution. Ironically, the more sub-disciplinary traditions of socio-cultural versus ecological-evolutionary research on hunter-gatherer advanced since the 1960s, the more these traditions drifted apart beyond each other's range of comprehension – paradoxically precluding a comparison of cases which is so essential to the overall project. However, debating these two apparently contradictory assessments of hunter-gatherers being "small-scale" versus "large-scale" is important because this is not simply a matter of group size. Rather, what is at stake are wrong and misleading practices of scaling when theorizing on modern hunter-gatherer worlds (in the first case) and on human evolution (in the second case). We should therefore make an effort and debate these two arguments together, and in the process we may also hope to contribute a little to narrowing the disciplinary gap between the socio-cultural and ecological-evolutionary traditions in hunter-gatherer studies. This is precisely one of the main objectives of this collective volume, and in my contribution I want to take up this challenge.

In this chapter, I will ask if the socio-cultural and ecologically-evolutionary positions (foragers live in "very-small" vs. "large" scale social worlds) are really as contradictory as they initially seem to be. I will argue that these arguments accord with each other far more than their rhetoric and argumentative style may lead us to believe. The demographic figures upon which these arguments are based, I will show, do not necessarily contradict one another. Only their rhetorical package as "small" and "large" suggests contradictory arguments. Classifying the same demographic order of magnitude as "small-scale" (in the first instance) and as "large-scale" (in the second instance) may be the result of the different readerships that are being addressed: In the first case, I address socio-cultural ethnographers who compare hunter-gatherers with modern western societies while ignoring hunter-gatherers' comparatively tiny scale. In the second case Bird et al. (2019) address ecological-evolutionary students who still adhere to the worn-out "small-scale society"

stereotype. However, as I hope to show in this chapter, these arguments do not necessarily pull us in opposite directions.

I start this chapter by opening up the basic terms we use, including population size, scale and more generally the quantification of hunter-gatherers' social forms. My aim is to explain why socio-cultural ethnographers avoid quantification and yet I shall urge us not to do so for a better understanding of hunter-gatherer worlds and for the benefit of interdisciplinary hunter-gatherer studies. Next, I turn to the "large-scale" claim of ecological-evolutionary ethnographers, and show that it rests not so much on their actual quantitative figures but on how these figures are verbalized, interpreted and assessed through figures of speech. As I shall show this includes the construction of strawmen, of binaries and ethnocentric definitions. Showing that these two positions factually agree more than disagree with each other, and that the seeming conflict between them reflects on our insufficiently refined analytical terms, I propose an analytical refinement in the conclusion, consisting of three steps. First, at its simplest, a shift from binary reading of small and large scales to their relational reading as gradients on a scalar continuum. Second, analysis predicated on hunter-gatherers' social networks, rather than "societies". Third, a discussion of the intensity and density of hunter-gatherers' social networks', rather than just of their scale, with attention to their modes of sociality *and* subsistence, and the spatial correlates.

Mind the gap: Quantitative figures

Scale is a complex word. Dictionaries alone list multiple different meanings. In the social sciences, this term has been used for close to a century as a key analytical concept. The concept of scale includes the size of groups and populations but goes much further and associates the sizes with different social systems (polities, economics, cultures, etc.) within a grand binary modern distinction between "small-scale societies" and "large-scale societies" (see Barth 1978 for extensive discussion of this distinction). In this section, I want to press home that scale is a complex concept with multiple and changing meanings. Even in its apparent simplest sense as size of local groups and of societal total populations, questions arise as to who should be counted, by what criterion, when, by whom, and for what? Population surveys are entangled with identity politics and build on epistemological and ontological assumptions that are far from trivial and universal. All the same, socio-cultural ethnographers cannot simply ignore figures.

Even if we refer here to scale in its basic sense, group size, the scale of hunter-gatherers' social aggregates is a complex matter. A child can count several dozen members, the order of magnitude claimed to be typical for hunter-gatherer bands. But is it that simple? Sure, if I had the opportunity to time-travel with my grandson to the Nayaka I studied, he could easily count all those who lived in the hamlet I lived in: 28 men, women and children, 69 in the five hamlets who kept visiting each other and stayed in close contact. The problem would still be as to who should be counted? Everyone sleeping at the hamlet on a selected night, or present in the hamlet at a certain moment? Children of mixed marriages (e.g., of a Nayaka woman and a Muslim man) living in the hamlet along with those with parents who are both Nayaka? What about someone who left the hamlet a day before we do our count to visit and stay with relatives in another hamlet, often for an indeterminate duration of time? Or, the family who only arrived two weeks ago and are still staying in the hamlet? Other things complicate the matter: Should the hamlet's dogs be counted? Or young wild animals adopted and taken care of as a sort of children? And, allowing for polemically unsettling our assumptions and biases, should a couple who always stay together, or a mother and her just-born baby, be counted as two or, maybe, only as one social entity? The issue that these questions raise is not simply technical in nature. Technically, these questions can be resolved by the researcher's arbitrary decisions appropriate to his or her particular case. Rather, these questions begin to raise epistemological and ontological problems concerning the scaling of hunter-gatherer groups. As we move beyond the local group to their regional aggregates and the entire population, the basis of counting the hunter-gatherer population becomes more intricate as I want to explain in more detail below.

The composition of local groups is in constant flux, and groups keep moving from place to place. Even if this is solved by armies of surveyors with sufficient time at their disposal, the question of what criteria are to be employed remains. Who decides on the criteria, who reaches their scattered settlements in the wild in order to count them? Most estimates that appear in the hunter-gatherer literature have been produced by outsiders, commonly colonial and state administrative staff and sometimes missionaries and explorers. Even if we assume that they did their job well, itself a daring assumption, their estimates are entangled with identity politics and economics. The estimates are based on politically – and economically – motivated practices of naming and classifying peoples by their ethnicity, religion, language etc. In the case of many indigenous populations, even their ethnonyms are chosen by

outsiders and often change from time to time and between those who name them (Bird-David 2017b).

Population surveys aim to assist governing large-scale systems. The colonial India's population survey, for instance, which began in the early 19th century, is second to none for its massive scale and intricate classification. Continuing into independent India's national surveys, the 200 years old series of surveys show how inconsistent the naming and the enumeration of small so-called "tribal communities" like the forager Nayaka has been (Bird-David 2017a). Moreover, the very idea of the "population at large" assumes a notion of society as a category comprising of individuals who – irrespective of whether they know or engage with one another – are "alike" with regard to this or another criterion. As an "imagined community" (Anderson 1991[1983]), societies are aggregated in the mind, or be it on paper or with the help of a computer, as a clear-cut group and category. On the ground, people with diverse and complicated biographies and histories have to be "pushed" into this or that group category so that they can be counted. Against this background one begins to understand why social-culturally trained ethnographers of hunter-gatherers have, for some decades now, turned a blind eye to the scalar framework of hunter-gatherers' worlds. At best they mentioned demographic figures only in a line or two when introducing the people with whom they conduct research in their case studies. The sources were not very reliable. Unfortunately, they have not dealt with analytical implications of largely disregarding the problem.

At the same time hunter-gatherer demographic figures are of great importance for ecological and evolutionary perspectives. This is why much effort has been invested by scholars of these approaches to procure and collate hunter-gatherer demographic figures. Several scholars painstakingly collated figures from sources of all kinds, administrative and ethnographic, going back to 19th century sources and sifting through socio-cultural ethnographies. There is a three-page long table produced by Robert Kelly (1995: 206-8) and a seven pages long table produced by Lewis Binford (2001: 245-251) which are exemplary for this effort. Again and again these have since been cited in ecological-evolutionary work, and the more they are cited the more their authority is established. Unfortunately, their tenuous basis, including the fact that figures were taken over from colonial sources, socio-cultural ethnographies, etc., have been "forgotten" in the process. Talking across the disciplinary gap in hunter-gatherer studies, could greatly benefit by no longer ignoring hunter-

gatherers' demographic figures and by addressing the issues surrounding the epistemological and historical basis of these figures.

Mind the gap: Figures of speech

Having discussed the quantification of figures across the disciplinary spectrum, I now want to underline that caution needs to be taken when expressing these figures, with equal attention given to the figures of speech that are used. I turn to Bird et al. (2019) for illustrating what I mean. The wealth and quality of the quantitative figures that they provide, together with their radical claim that "foragers do not live in small-scale societies" which is based on these figures, lends itself to illustrate my point.

The authors draw on long-term, extensive ethnographic fieldwork with the Australian Desert Martu people. Their research teams have been attentive to quantification and they systematically produced quantitative data in a way that socio-culturally oriented ethnographers, who commonly work alone, do not, (nor can) usually do. Their claim discussed here is based on data collected between 2000-2010, compiling data on the composition of foraging groups, on the amount of time invested in foraging and the yields produced. It also includes data collected for a period of 8-weeks during 2010 on residential group fluctuation in a particular locality. Additionally, the authors turned to "basic census data" collected by Welfare patrol officers, who contacted isolated Martu groups in the 1960s, and they interviewed living Martu members of those 1960s groups. This is a commendable data basis by all accounts, but I want to show, that it supports (and not contradicts) the "smallness" of hunter-gatherers' worlds. The actual data, I argue, is occluded by the authors' choice of rhetorical and argumentative figures of speech.

The first rhetorical obstacle is that of setting up a strawman. Based on their data, the authors critically address the assumption that "groups of co-residents are nested within small communities that are, in turn, nested within small-scale societies" (p. 96). Some scholars outside hunter-gatherer studies may still be subscribing to this model but it is important to emphasize that students of hunter-gatherers have long emphasized the "flux" and "fluidity" of hunter-gatherers' groups, at least since the 1960s. The fluidity of local groups was, in fact, celebrated as one of the major conclusions reached in the 1966 conference "Man, the Hunter," the cross-disciplinary conference that started modern hunter-gatherer studies. Moreover, at least since then no ethnographer of hunter-gatherers has claimed what Bird et al. critique in their article,

by means of their good data, namely that "well-known hunter-gatherers do not live in hierarchically organized, small-scale societies" (p.97). To my mind this is a wasteful use of invaluable data, because it is used here to knock-down a strawman and it diverts attention away from the really critical issues.

The second rhetorical obstacle is their usage of "small" and "large" as binary terms in a way that in fact misrepresents the data. What are the actual figures that are provided in the article on Martu and other hunter-gatherer group size? Bird et al. carefully distinguish between four group-levels: a) "hearth groups", small family groups spatially spread around the settlement's center; b) "residential groups", the hearth-groups living around the same center; c) "foraging groups", people who day-forage together; and d) "large-residential groups" (called *tjapal* by Martu), gatherings taking place now and then during the year for ritual and social "business." For each group level they provide data on group size: 3-10 individuals for hearth groups, 41-127 for residential groups, 1-18 for foraging groups, and "upwards of hundreds of people" for the "large residential group" (pp. 101-103).

Being larger than the other smaller Martu groupings, it is the largest grouping with its "upwards of hundreds of people" which is tagged as "large residential group" and it is given particular comparative attention. The authors show similar group-sizes among other hunter-gatherers. For example, they cite studies of Hadza and Aché showing that adults typically interact with "hundreds of other adults during their life time" and are likely to observe "over 300 different men making tools over the course of their lives" (Hill et al. 2014, cited by Bird et al. 2019: 98). They cite Blurton-Jones who, based on a 15 years long survey of the Hadza, wrote that it is "completely wrong" to think of them as tiny bands averaging 21 people (ranging from 20 to 100) since each person recorded had co-lived with an "astonishing average of 69 different people" in the camps he moved between during 15 years (Blurton-Jones 2016, cited by Bird et al. 2019: 98). Figures of a similar order of magnitude can be added here, cited by David Wengrow and David Graeber (2015) for their own separate theoretical ends that need not concern us here beyond stating that these authors argue that hunter-gatherers alternated between small egalitarian organizations and large hierarchical political organizations. Wengrow and Graeber draw on 19th and early 20th century literature on North American hunter-gatherers. They cite, for example, Mauss and Beuchat seminal *Seasonal Variations of the Eskimo: A Study in Social Morphology* (1979 [1904-5]), which examines annual shifts between summer and winter settlements. In the summer, individual families lived in tents, dispersed and scattered over an immense area.

In the winter, the families congregated in "large" concentrated settlements of multi-family and communal houses to perform collective ceremonies. Mauss and Beuchat painstakingly researched contemporary and earlier surveys and concluded that the winter settlements, or what are elsewhere called the "large" groupings, consisted of eight to fifteen houses comprising 200 to 400 members.

Now, "upwards of hundreds" is surely larger than hunter-gatherers' local group size of several dozen people. A "few hundred" is surely larger than the "magic numbers" of local groups recognized in "Man, the Hunter" and of what is widely endorsed today, namely "25-50" men, women and children living in the same camp. But from here a slippery binary verbal slope leads to arguing that foragers do not live in "small" groups and, then, that they live in large assemblies. It is a slippage from "not-small" that is turned into "large". That hunter-gatherers often do not live in groups as small as those that ethnographers focused on for too long, does not automatically mean that they live in large-groups. Only under the tyranny of a binary split between "small-scale" and "large-scale" society does "not small" automatically turn into "large." And "hundreds" of hunter-gatherers suddenly figure as "large-scale," along with large-scale modern societies of hundreds and thousands of millions in the same category. The valuable data provided by Bird et al. meanwhile is misused as a basis for arguing, as the authors do, that foragers do not live in "small-scale" societies but, instead, in "large-scale" social networks of interaction (I return below to the insightful shift from "society" to "social network"). To the contrary, I want to argue that their data in fact strongly presses home the comparative "smallness" of hunter-gatherers' social formations, even at their largest reach "upwards of hundreds." Their data actually supports my sociocultural argument that ignoring hunter-gatherers' scale, even in its simple sense of demographic order of magnitude, along with what it limits and affords, obstructs our understanding of foragers' lived-experiences and worlds.

The last rhetorical obstacle on the way of bridging the gap between the different scholarly traditions in hunter-gatherer studies concerns the question of kinship relations. Are members of a hunter-gatherer group mostly kin or rather non-kin? Along with other ecological-evolutionary oriented students, Bird et al. (2019: 96) argue that "most mobile hunter-gatherers live in groups dominated by links between non-relatives." Their argument appears to radically turn the earlier consensus on its head according to which kinship is the basis of hunter-gatherer bands. The kinship basis of the hunter-gatherer band was assumed from the 1930 to the 1970s, kinship then consti-

tuted an important topic, and arguments revolved over which type of kinship relation characterizes the composition of the band. In the wake of "Man the Hunter", the interest then shifted to issues of the "hunter-gatherer mode of subsistence" (see Bird-David 1995 for more details). Thereafter, little by little, a few socio-cultural ethnographers of hunter-gatherers returned to kinship as a cultural phenomenon (see Bird-David 2017a). Against this background, we can revisit the polemic ecological-evolutionary argument that it is mostly non-relatives that comprise a hunter-gatherer group.

The "non-kin" argument resonates with that of the hunter-gatherer "large-scale" social formation, and likewise it is trapped within binary opposites. Bird et al. (2019), may serve as an example of other ecological-evolutionary statements on this issue. They, limit what they count as kinship connections to a "coefficient of relatedness greater than 0.06" (2019: 103). This scientific index limits those considered as kin just up to second cousins. By this definition, anybody else is non-kin, notably including relatives through marriage. This definition clearly departs from hunter-gatherers' own sense of kinship – but also from what is commonly regarded as kin in daily life by many Western people! While we may, arguably, put aside decades of contact with the state, including leaving and returning to desert settlements when examining foraging parameters, the same could hardly be done when examining genetic kinship connections among Martu people living in Government settlements in the 2000s. For Martu people, we learn from the authors, as for many other hunter-gatherers, affinal ties are important kinship ties. Marriage ties connected many members of Martu groups in the 2000s (Bird et al. 2019: 102). In the 1960's, we learn from their ethnographer Robert Tonkinson (2004), kinship was central, and it had even been the idiom through which Martu established relations with outsiders. All of these manifold kinship relations are not counted as kin by the authors. There is no sense of kinship being a gradient between close and more distant but there is instead a categorical cut between kin and non-kin.

All in all, the figures of speech outlined above occlude what the quantitative figures show in the article by Bird et al. (2019) and that I have referred to here as an example. If we remove the binary scaffoldings from the scalar augments there is hardly a basis for concluding that "foragers do not live in small-scale societies," that they "live in large-scale social networks," and their members are largely "non-relatives." Having said that, the article, at the same time, convincingly suggests that we should shift from "society" to "social network" as the overall theoretical construct. The polemic arguments on hunter-gath-

erers' scale may overshadow this proposal which is why I want to highlight its implications. For me, the move from "society" to "social networks" seems a promisingly productive way to approach hunter-gatherer sociality across the disciplinary gap in hunter-gatherer studies.

Concluding remarks: Towards refining our analysis of hunter-gatherers' social networks

So far I suggested that there is no real conflict between the argument derived from socio-cultural anthropology that smallness is analytically essential for understanding hunter-gatherer social worlds, and the argument derived from ecologically-evolutionary anthropology that hunter-gatherers "do not live in small-scale societies". The illusion of their conflict is created when socio-cultural anthropologists continue to doubt and underuse quantitative figures, and when polemic figures of speech in ecological-evolutionary anthropology cloud the data. Going beyond what are only seemingly discordant scalar claims, I suggest to move forwards by exploring hunter-gatherers' social networks.

This middle position involves shifting the focus from the smallest to the largest hunter-gatherer group levels, yet admitting that even the largest level is still "small" as far as scale goes in comparison when including the entire diversity of human societies. It involves simultaneously shifting from "society" to "social network," a sociological concept traced back to the work of Simmel (1950[1908]) and later operationalized as a sophisticated conceptual and methodological package, and which was originated and developed largely within the context of studying large-scale modern society. The challenge for scholars of hunter-gatherers is to adapt concepts and tools of "social networks" to the hunter-gatherer small-scale world, rather than apply the range of given tools to the hunter-gatherer and misrepresenting them as "large-scale social networks." The suggested turn towards the notion of social networks suggested by ecological-evolutionary hunter-gatherer scholarship can be brought together with a recent turn in socio-cultural hunter-gatherer scholarship towards relations and relationality as keys to understanding the hunter-gatherer culture and world. In the ecological-evolutionary approach relevant work on hunter-gatherer social networks include Apicella et al. (2012), Hamilton et al. (2007), Migliano et al. (2017), and Whallon (2006). In the socio-cultural approach on relations and a relational perspective this includes Myers (1986), Bird-David (1999, 2017a), and Ingold (2000).

"Intensity" as a property of social networks is a case in point and may be a good direction for developing this train of thought in further interdisciplinary work. Low-density population is a condition of successful subsistence based on hunting and gathering natural resources. At the same time, hunter-gatherers' social relations depend on performing them, rather than just knowing them, in other words what counts here is connecting with others by being-with them rather than by mapping relations against a genealogical template. Social relations have to be constantly reproduced and reaffirmed in order to be recognized and counted by hunter-gatherers. This is partly why hunter-gatherers constantly visit each other, why they share food, space and in a sense their selves. And this is why their groups are fluid, why they move between aggregates far more than ecological/economic factors can explain, and why now and then they gather in large residential groups, although their subsistence needs are met better when they live in small groups. Their social groups exist through their members' intense interactions with each other.

The ingenuity of hunter-gatherer social organization, I suggest, is articulating low-density population and high-intensity interaction so as to subsist and exist as individuals and as a collective. Intensity is the solution to the hunter-gatherers' paradox: low-density population for maximizing subsisting on natural resources, and high-intensity interaction for keeping their social networks going. This leads to suggesting several points to think about and pursue in future research. Instead of calling them "local groups" or "residential groups," they are rather approached as social networks, too. The "local" and the "regional" social networks can then be discussed by comparing their intensity, in relation to their social and subsistence practices as and when productive, the gradient social networks can be compared by such social network key terms as multiplexity to describe multiple ties between members, and propinquity to emphasize its correlation with members' geographical closeness. The dynamic articulation of hunter-gatherers' gradient social networks from residential to wider social networks could provide a basis for including space/territory in the analysis and discussing long-term processes of spatial and population expansion. Going beyond hunter-gatherers' social organizations, instead of calling their networks either small or large, they are rather characterized by a specific density. What we have called hunter-gatherers' "small scale society" then can figure as social network with low density subsistence and high density sociality, and what we have called "large societies" would rather be high density subsistence with low density sociality. But in

both instances understood as gradients that are subject to change by both external ecological conditions and internal socio-cultural reasons.

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Comment by Charlotte Damm

In numerous recent publications Nurit Bird-David advocates strongly for the necessity to take the "small-ness" of many hunter-gatherer communities seriously. Unless we acknowledge and explicitly refer to the intimacy of life in hunter-gatherer settings with their multirelational and pluripresent dynamics we will neglect highly significant aspects of their being, she argues. This perspective also allows us to perceive the inhabitants as more than faceless human "stick figures", but instead as individuals with a diversity of roles and experiences. Seen from archaeology, where Big Data analyses and cross-re-

gional approaches are prominent, it is refreshing to be reminded of the individual beings at the core of hunter-fisher-gatherer communities.

In response to the debate on scale amongst hunter-gatherers, Bird-David suggests the apparent conflict between arguments for small-scale and large-scale social worlds is linked to the different readerships addressed and the underlying research questions posed. The impact of dissimilar perspectives should not be underestimated. However, vague terminology adds to the confusion. What is implied by small-scale? How do we define and use the term? As Bird-David notes, the term has perhaps been used too readily in introductions to hunter-gatherers, with the risk of becoming descriptive rather than analytical. The term is clearly relative and could refer to quantitatively very different group sizes in different analytical contexts. Hence it should be explicated for all case studies, rather than employed as a self-explanatory concept. Bird-David does so predominantly through providing individual examples of relationships and interaction, focussing on the qualitative aspects of interaction rather than quantitative numbers, partly because she problematizes how we count members of a local group. Nevertheless, she accepts that providing demographic figures may be required for any wider comparison. This lack of agreement as to what constitutes a small-scale society is at the core of the present chapter, where Bird-David uses figures from Bird et al. (2019) to argue that despite numbers of "upwards of hundreds," the Martu community is still small-scale. If putting numbers on the table does not solve the issue, then we must perhaps return to the research questions: are we interested in quantifying the number of co-residents of an individual during their lifetime and the number of their personal contacts, or do we wish to explore qualitative aspects of interaction and their impact? The advantage of the first approach is of course that it will allow us to compare communities globally, while the latter may point to social behaviours and perceptions indicative of the scale of interaction as perceived by the community members themselves.

The existence of significant demographic and social diversity within extant and past hunter-gatherer communities is fully agreed upon in both archaeology and socio-cultural anthropology but may be under-communicated when seeking to describe similarities across the many different groups. The Nayaka and the Martu have very different historical trajectories and inhabit very different environments. While the Nayaka live in a region where agriculture and market-based economies have millennia-long histories, Western Australia was one of the last regions in the world to be impacted by colonialism. Similarly, the dense forest surrounding the Nayaka stands in great

contrast to the landscape where the Martu live. While an argument can be made for both being involved in small-scale social networks, a quest for a mutually agreed term may distract us from the fact that the historical and environmental settings of two communities may in fact have resulted in quite distinct socio-cultural scales. The workshop challenged us to consider how they scale, how we scale and how scale matters. In a debate concerning scales within hunter-gatherer communities themselves and in academic analyses, the possibility of different perceptions of scale among hunter-gatherers such as the Nayaka and the Martu should not be forgotten.

Comment by Bram Tucker

The *Scale Matters* workshop was partially inspired by the apparently discordant claims, published within a few years of each other, that hunter-gatherers live in "nano-scale" societies (Bird-David 2017), or have large social networks (Bird et al. 2019). Within the first hour of our workshop, most of us became convinced that the two claims were largely in agreement. The apparent discord stemmed from different sub-disciplinary traditions, terminologies, and audiences.

As someone engaged with both the sociocultural and ecological-evolutionary approaches to hunter-gatherer studies, I have found the division between these approaches to be a constant source of frustration. The "sides" do not seem to read each other's work in sufficient detail to see the parallels and contradictions. Elsewhere (Tucker 2014) I have speculated about the origins of this division. Social and cultural anthropologists assume *à priori* that humans are social creatures who collectively imagine into existence diverse cultural worlds. Neodarwinian behavioral theory co-evolved with neoclassical economic theories of rational individualism. As a result, the two approaches find themselves on opposite sides of significant theoretical clefts: structure versus agency, and cultural relativism versus psychic unity.

Over the past two decades, theoretical and methodological advances have pushed the ecological-evolutionary approach closer to the sociocultural tradition (Fuentes 2004; 2016). Whereas twentieth century evolutionary theory emphasized inter-individual competition and explained away apparent altruism as self-interest-in-disguise, a growing number of twenty-first century scholars accept theories of cultural group selection by which one's group affiliations have an equal or greater influence one's fitness than individual traits

and choices, so that people follow shared coordinative and cooperative norms even in the absence of individual advantage (Richerson and Boyd 2005). Thus, evolutionary anthropologists have arrived at the point where sociocultural anthropologists started, at the understanding that humans are social creatures in cultural worlds. Ethnographers with long-term fieldwork commitments such as Doug Bird, Rebecca Bliege Bird, and colleagues have learned that cosmological concepts like the Australian Dreamtime are inextricable from people's foraging behaviors and uses of resources.

That Bird-David, in her chapter in this volume, sees Bird et al.'s arguments about flexible group size and composition as a "strawman," illustrates just how far apart the sociocultural and ecological-evolutionary approaches to hunter-gatherer studies remain. Bird-David is correct, of course, that flexible group size and composition and the creation of kinship among non-biological relatives have been significant themes in social and cultural studies of foragers ever since the Man the Hunter Conference in 1968. But Bird et al. (2019) are correct that many paleoanthropologists and cognitive psychologists, particularly those working from non-human primate analogs and mathematical models, continue to assume that foragers, and humans generally, naturally assort by genetic kinship in hierarchically organized clusters. Bird et al.'s arguments might have been strawmen had they been published in *American Ethnologist*, but these arguments are not strawmen for the readers of the *Journal of Human Evolution*. Bird et al.'s article is a significant step toward closing the gap between approaches.

Bird-David argues in this volume that counting people is useful, but that it poses practical problems of who to count, and theoretical problems of whether a counted "group" compose a "society." Bird et al. agree. They use the concept of social networks to show that social structure transcends the small-scale of who one is spending time with at given moments in the day. Bird-David argues that "not-small" Martu social networks numbering "several hundred" are still "nano-scale" compared to nations. Ultimately, whether we call such grouping nano-, small-, large-, etc., depends on the comparisons we are interested in. Bird-David is defining hunter-gatherer scale in contrast to nations, whereas Bird et al. are defining scale among real-life hunter-gatherers in contrast to hypothetical "small-scale societies."

There remains a significant point of disagreement between Bird-David and Bird et al., and the fact that this point is not immediately obvious demonstrates how far we still have to go to bridge sub-disciplinary divides. It is nonsensical to ask whether "hunter-gatherers" live in "nano-" or "large-" scale so-

cieties, because hunter-gatherer is a scholar's category and not an objectively real thing. Group size probably predicts who we consider proper members of the hunter-gatherer category rather than the other way around. Notice that neither set of authors make comparisons to the 16th century Calusa of Florida, an example of a hunter-gatherer-fisher urbanized marine state (Thompson et al. 2018).

Indeed, neither Bird-David nor Bird et al. are actually arguing that being "hunter-gatherers" is the cause of social scale. Bird-David's discussion of scale among Nayaka is couched within a broader discussion of political encapsulation. Nayaka scale is small for social, historical, and political reasons. Bird et al.'s analysis of scale among Martu is framed around the significance of relational capital among semi-mobile people reliant on natural resources. Perhaps they are not talking about the same thing at all. Bird-David's arguments should be equally applicable to other minority indigenous communities regardless of their economic model, and Bird et al.'s arguments should apply to other mobile people in low-population density settings, including some farmers and herders.

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