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Population History for Caracol, Belize

Numbers, Complexity, and Urbanism

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Settlement archaeology has been essential in driving archaeological investigations at Caracol, Belize, since the formal implementation of the research program in 1985. When the Caracol Archaeological Project started work at the site, the map had only seventy-eight structures—all located in the downtown area. A University of Pennsylvania team conducted initial survey work in the early 1950s but did not formally publish results until 1981 (Beetz and Satterthwaite 1981). Based on this map, the overall spatial extent of the city center could not be defined, let alone the broader settlement area. To begin solving this issue, we started mapping the ancient settlement outside Caracol's central architecture, initially using a transect starting in the epicenter and running due east, and shortly thereafter using the site's ancient causeway system to establish settlement transects. Eventually, these causeways were tied into a north–south and east–west grid of narrow brechas, all some 50 m apart, that we then used to undertake block mapping of the city on foot with transit and tape (A. F. Chase 1988).

As a result of this early mapping effort, the image of Caracol grew larger in spatial scale year by year. Yet, these efforts also highlighted the immense amount of time, funding, and energy that would be needed to complete settlement mapping. With traditional technologies and methods, a final site map would not have been possible in our lifetimes, especially since the edge of the city remained elusive. After completing the mapping of some 23 km^2 of the settlement (figure 3.1), we started looking at other potential technologies for determining how the larger city of Caracol was constituted. In 2004 we began working with a biologist colleague at the University of Central Florida (UCF), John F. Weishampel, who had been trained by NASA in remote sensing and

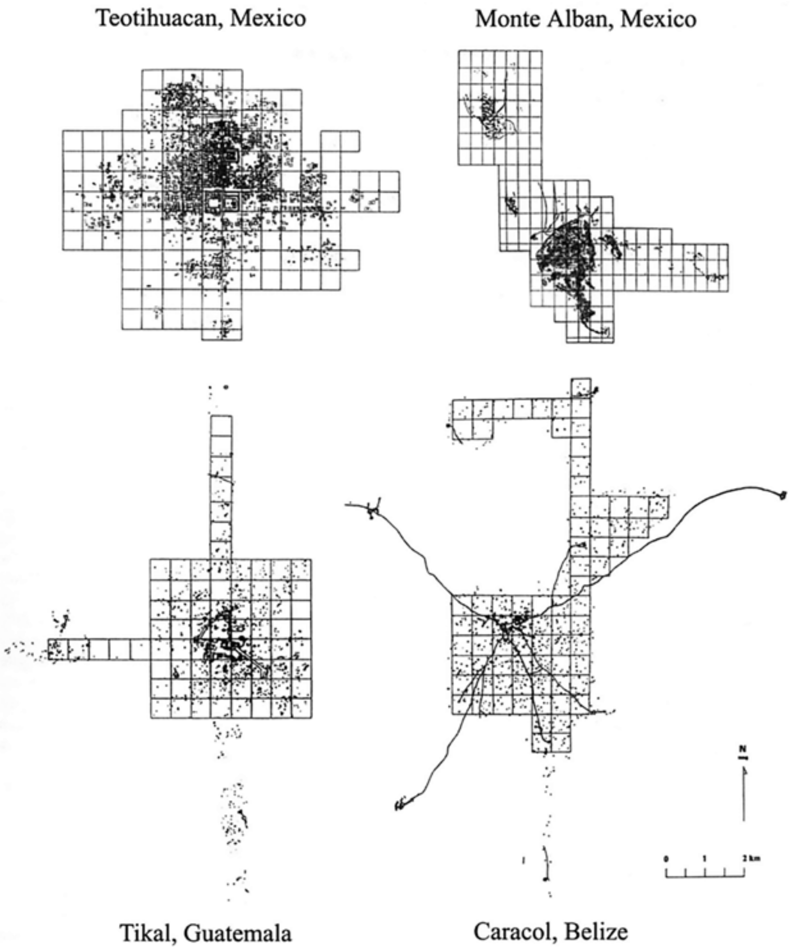

Figure 3.1 Comparative maps showing pre-lidar on-the-ground surveys for four important ancient Mesoamerican cities (reproduced from A. F. Chase, Chase, and Smith 2009, fig. 3).

who had experience in using early forms of lidar in Central America to examine forest canopies. We submitted our first joint grant proposal to explore using this technology at Caracol in 2005 and were eventually funded by NASA in December 2007 to carry out this exercise. The subcontracted company, the National Center for Airborne Laser Mapping (NCALM; see Fernandez-Diaz et al. 2014), could not make the required aerial flights until April 2009.

By midsummer 2009, we had the processed lidar results for 200 km^2 of the Caracol landscape, and the outcome was beyond our wildest dreams. The data revealed a palimpsest landscape showing ancient Maya settlement beneath the canopy (A. F. Chase et al. 2011; Weishampel et al. 2011; D. Z. Chase et al. 2011; A. F. Chase, Chase, and Weishampel 2010). While covering a larger area than our on-ground surveys, however, this dataset did not fully encompass the spatial extent of Caracol's settlement. Thus, in 2013, with a consortium of other archaeologists working in western Belize, we acquired an additional 1,059 km^2 of lidar for much of the west-central Belize landscape (A. F. Chase et al. 2014a, 2014b). The 2009 and 2013 lidar acquisitions (figure 3.2) enabled us to establish the areas of greatest settlement density as well as northern and eastern settlement drop-off "boundaries" for Caracol; however, the western boundary exists outside the lidar coverage, somewhere in Guatemala (likely bounded by the Mopan or Chiquibul River), and more lidar needs to be flown south of Caracol to firmly establish the extent of settlement going into the Maya Mountains.

As a result of these lidar flights, we were able to demonstrate that the ancient city of Caracol covered an area of minimally 200 km^2, had

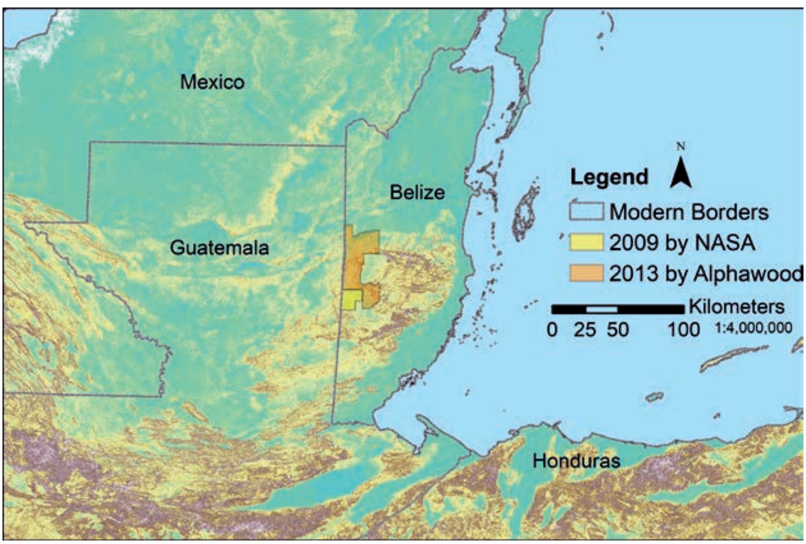

Figure 3.2 Map of modern country boundaries and the locations of the 2009 and 2013 lidar acquisitions within Belize.

agricultural terracing covering some 80 percent of its landscape, and was integrated by a dendritic system of causeways with epicentral Caracol at its downtown hub. We could also count and plot the architectural groups present in the city. Examining multiple hillshades in 2009 resulted in an initial count of 4,732 residential plazuela groups (A. F. Chase et al. 2011, 395), and a visual reexamination of the landscape with the addition of the 2013 lidar resulted in a new count of 7,709 residential groups (A. S. Z. Chase 2021). Using the median distance among residential groups within the city (64.5 m) beyond the boundary defined by a falloff in agricultural terracing demonstrates that at least 5,949 of these easily identifiable residential groups clearly belong within "urban" Caracol; however, the rest of the settlement beyond this falloff would still have been situated closer to monumental architecture at Caracol than to any other center. These residences had their closest public plazas, ballcourts, large and monumental reservoirs, and E Groups all within the district nodes of Caracol's distributed urban infrastructure rather than closer to any other proximal locations.

PAST POPULATION ESTIMATES FOR CARACOL (BEFORE LIDAR)

Our original population estimate for Caracol was detailed in the opening chapter of our 1994 Caracol monograph (A. F. Chase and Chase 1994, 5). There, we commented on the differences in structure and residential group density that had already been found through mapping and that became even more evident in the 2009 lidar data (A. F. Chase et al. 2011, fig. 9). We noted that some parts of the site had one hundred residential groups (i.e., plazuelas, or patio groups) per square kilometer, but the overall average was about sixty to seventy per square kilometer, decreasing slightly with distance from the epicenter. Based on our mapping, we knew that settlement extended at least 7.5 km distant in all directions from the site epicenter.

Given these parameters, in 1994 we formulated a conservative population estimate: we estimated that the average number of structures per group as well as the number of groups would decrease as distance increased from the epicenter. Thus, for the area from Caracol's epicenter to 2 km distant, we estimated the presence of sixty residential groups per square kilometer, with 5 structures per group; for the distance ranging from 2 to 6 km from Caracol's epicenter, we estimated an average of forty groups per square kilometer, with 4.5 structures per group; for 6 to 7.5 km from the epicenter, we estimated twenty groups per square kilometer, with 4.5 structures per group. Knowing that excavation had demonstrated Late Classic occupation wherever we had investigated, we then applied the same correction factor used at Tikal in the Late Classic period—83.35 percent of structures simultaneously occupied—to come to a population estimate of 115,032 people for the 177 km^2 area that we had believed constituted Late Classic Caracol. This estimate used traditional assumptions of five people per structure within residential groups.

CURRENT POPULATION ESTIMATES FOR CARACOL (AFTER LIDAR)

Our more recent lidar estimations have focused not on the traditional structure but rather on the residential group as a whole (see the introductory chapter in this volume). In part this is because the plazas that form the centers of residential groups are quite evident in the Caracol lidar, especially when these plazuelas/patio groups possess a raised to partly raised platform (figure 3.3), whereas the structures themselves are not always as easily discernible. This raised residential form exists throughout the city of Caracol, and even nonraised, vacant terrain excavations evince the same patio group form as their raised neighbors. Excavations at Caracol have also demonstrated that not all structures in a plazuela were residential in function (see A. F. Chase and Chase 2014); this suggests that a group-based instead of a structure-based estimate would be more accurate, given the amount of excavation required to test for residential use of each and every structure.

To test the difference in structure versus residential group identification, we contrasted two square-kilometer areas that had been mapped in detail on foot and for which we had lidar coverage (Areas 2 and 4, which included intensive survey for terrace agriculture, published in A. F. Chase and Chase 1998b, fig. 2). We were able to demonstrate that only approximately 50 percent of the structures (but not plazuelas) were visible in the lidar (A. F. Chase, Chase, and Chase 2024). This means that a focus on structure-based estimates would be problematic for any pop-

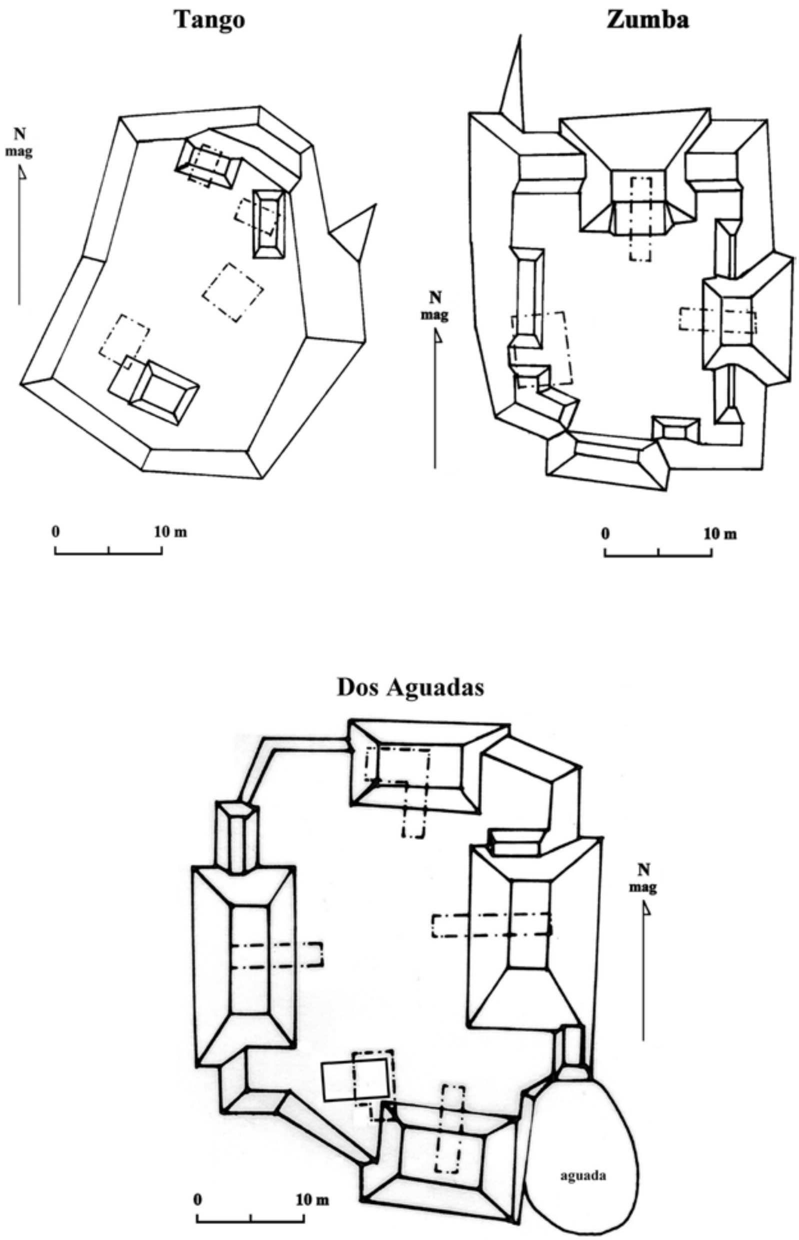

Figure 3.3 Plazuelas from the same neighborhood showing variation in size and status (reproduced from A. F. Chase and Chase 2014, fig. 2). Plazuelas are sometimes called patio groups by other scholars (e.g., Ashmore 1981, 48–49).

ulation estimate derived from either the 2009 or the 2013 lidar datasets from Caracol. In contrast, 68.42 percent (in Area 4) to 81.36 percent (in Area 2) of the plazuela groups could be easily identified through visual analysis of the lidar data. While the use of multiple hillshades can identify these residential groups, we used three passes of multiple visualization methods—primarily slope (Challis, Forlin, and Kincey 2011), local relief (Hesse 2010), and sky-view factor (Kokalj, Zakšek, and Oštir 2011; Zakšek, Oštir, and Kokalj 2011)—on the lidar-derived datasets. This process has resulted in the documentation of 7,709 residential groups for Caracol (A. S. Z. Chase 2021); future passes with other visualization and remote identification techniques (e.g., Davis 2020; Kokalj and Somrak 2019) would further increase this number to tease out the last 20 to 30 percent of plazuelas that remain difficult to identify.

Importantly, these nearly 8,000 recorded residential groups represent only that part of ancient Caracol that exists in modern Belize, but this ancient city extended into modern Guatemala, for which no lidar coverage currently exists. This area in Guatemala consists of an additional estimated 10 to 40 km^2 (discussed further below). Thus, using the range from our two square-kilometer samples of 68.42 to 81.36 percent for all groups at the city represented in the lidar data, we estimated that there were actually between 7,058 (with 5,949 urban plazuelas and the 81.36% factor) and 10,144 (with all 7,709 plazuelas at the lower 68.42% factor) residential groups at Caracol in the Belizean portion of the city alone.

The next question in estimating the ancient population is, How many people occupied a residential group? Ethnographic and ethnohistoric figures have noted anywhere from four to nineteen people per household (Haviland 1972; Villagutierre Soto-Mayor [1701] 1933, 136, 480; Thompson 1972, 1971); the consensus from these numbers was that each house would have been occupied by at least five people (Rice and Culbert 1990), and this was the original figure adopted as the multiplication factor for each structure (as each structure was believed to have been occupied by a nuclear family; see Haviland 1972, 136). While the number surely varied, we have previously argued that each residential group was occupied by an extended family, consisting of approximately eleven people per group (see A. F. Chase and Chase 2014). Here, we use a slightly reduced figure of ten individuals per group, which is consistent with figures used elsewhere in Mesoamerica for an extended family unit (Smith et al. 2019). Since residential groups often have four structures centered around a central residential plaza, this estimate is significantly lower than a structure-based one would generate.

These numbers suggest that the overall population for the part of Caracol in Belize (again, exclusive of the Guatemalan settlement) ranged between 70,580 (70,580 / 91,460 using the 81.35% factor) and 101,440 (78,280 / 101,440 using the 68.42% factor) individuals at its height during the Late Classic period, assuming that all residential groups were simultaneously occupied—which agrees with our current excavation data for that period. Yet, including all recorded residential groups (such as those closer to Caracol than to other urban centers) provides a higher and narrower range between 9,146 and 10,144 residential groups, indicative of a population between 91,460 and 101,440 people in modern Belize alone. These numbers, while calculated with newer lidar data, are in line with previous estimates of the number of residential groups and population numbers; the earlier research (A. F. Chase and Chase 1994; A. F. Chase et al. 2011) bolsters these results despite the difference in methodology.

To estimate the portion of settlement within modern Guatemala, the relative citywide population densities can be applied to the additional area around potential districts in Guatemala observed in NASA's global 30 m resolution Shuttle Radar Topography Mission (SRTM) dataset (JPL 2013; A. F. Chase, Chase, and Chase 2020, 345–46). While inexact, this provides a slightly more accurate view of the city's maximum potential population. Within Guatemala, Caracol would have incorporated minimally La Rejolla (Escobedo et al. 2008, 264–65) and likely also San Jose (Escobedo et al. 2008, 309–10) and Las Flores Chiquibul (Escobedo et al. 2008, 305–6) as district nodes (figure 3.4) by its Late Classic apogee, given what we know of their settlement and road systems.

A known causeway connects La Rejolla to Ceiba, an earlier center engulfed in the Late Classic expansion of Caracol's settlement. Part of the causeway that runs to San Juan (south of Ceiba), however, continues to the west off the edge of the lidar dataset. Thus, based on eastern causeway patterns, it may connect to either or both of the other two potential districts—San Jose and Las Flores Chiquibul. Adding La Rejolla alone increases the settlement size of the city by minimally 10 km^2, and the addition of the other two likely districts would bring that projected total up to at least an additional 40 km^2. In aggregate,

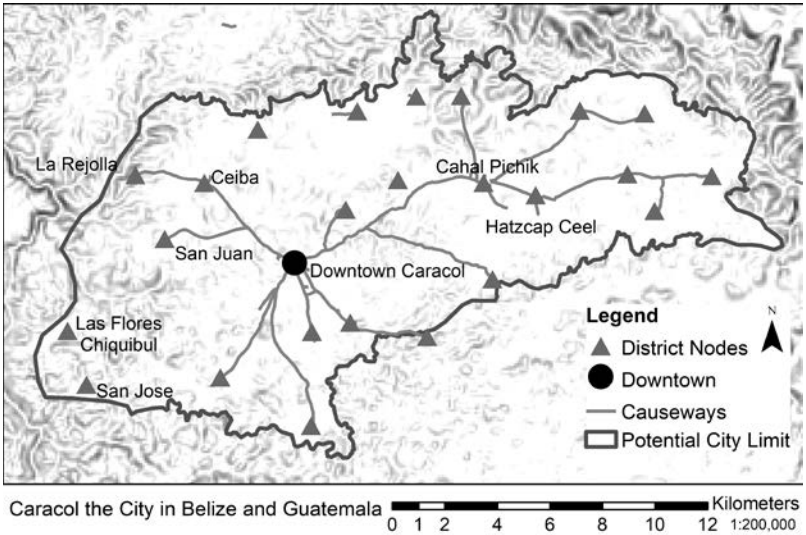

Figure 3.4 Map of Caracol overlaid on STRM-derived (JPL 2013) slope map showing potential district nodes in Guatemala.

this means that Caracol the city, at its apogee around 700 CE, occupied about 240 km² of area in total.

Approximately 3,529 (3,529 / 4,573) to 5,072 (3,914 / 5,072) people at 10 km² or 14,116 (14,116 / 18,292) to 20,288 (15,656 / 20,288) people at 40 km² would have lived within this area. These values follow from the conventions outlined above for the portion of Caracol in Belize at 200 km² of settlement (i.e., population multiplied by 0.05 for 10 km² and 0.2 for 40 km²). Taken together this brings the total population estimate for Late Classic period Caracol around 700 CE to between minimally 74,109 (74,109 / 96,033) people at the lower estimate, with an additional 10 km², and maximally 121,728 (93,936 / 121,728) people at the higher estimate with an additional 40 km². In other words, the initial population estimate of around 100,000 people proved particularly prescient as a lower limit for the Late Classic population, but that population may have actually been higher (especially given the additional population methods that follow).

Studies of other ancient Maya cities, however, still use alternative population estimates with structure or area metrics, and thus we have also attempted to apply these approaches to Late Classic period Caracol.

Using the two square-kilometer samples, we can estimate structure count per plazuela and structures per area of the digitized plazuelas. The first assumes a static number of structures, while the second attempts to account for larger or smaller plazuelas throughout the city, and it comes out to approximately 92.6 m^2 of plazuela area per structure within these samples. Applying these estimates to the entire city (using the area of digitized shapefiles) generates population counts that are significantly higher than that of the plazuela estimate, with upper estimates of 273,000 people for structure counts and 235,000 for structure area—assuming full occupation of all structures.

Yet, not all plazuela structures at Caracol were residential (see A. F. Chase and Chase 2014). Incorporating a conservative factor that removes about 50 percent of structures as auxiliary or ritual structures and not individual dwellings—and using family units of five people per structure—produces estimates in line with the higher plazuela totals for Caracol outlined above and shown in table 3.1. Finally, while some projects conduct population estimates using a constant factor of people per hectare, those estimates generate inconceivably large population estimates for this city (likely due to differences between infield and outfield agricultural urbanism; see A. F. Chase and Chase 1998b; Fisher 2014; and A. F. Chase and Chase 2016a).

Table 3.1 Comparing different methods for population estimates

	Partial population estimates			**Caracol totals**	
Pop. est. method	**200 km² Belize**	**10 km² Guatemala**	**40 km² Guatemala**	**Low (rounded)**	**High (rounded)**
Visible plazuelas	77,090	3,855	15,418	80,900	92,500
Missing plazuelas	101,440	5,072	20,288	106,500	121,700
100% structure counts	227,415	11,370	45,485	238,800	272,900
50% structure counts	113,710	5,685	22,745	119,400	136,500
100% structures per area	195,420	9,770	39,085	205,200	234,500
50% structures per area	97,710	4,885	19,545	102,600	117,300
25 people per ha.	500,000	25,000	100,000	525,000	600,000
50 people per ha.	1,000,000	50,000	200,000	1,050,000	1,200,000

Note: Importantly, both 50% structure estimates line up with the plazuela-based estimate, which factors in missing and vacant terrain structures. This reinforces the conservative estimate of more than 100,000 people during Caracol's apogee and suggests that the population may have been higher.

CONSIDERATIONS AT THE DISTRICT AND POLITY LEVELS

When the city of Caracol was at its peak population, it also served as the capital of a much larger polity (D. Z. Chase and Chase 2021; A. F. Chase and Chase 2020, 1998a), meaning that the total population under the sway of this primate city was actually much larger than those individuals living within the city itself. There are indications of centrality in the archaeological data appropriate to the city's broader political role. For example, the urban population was served by a series of districts with monumental architecture; however, the importance of the site epicenter as the Downtown Caracol district is apparent when compared with other outlying districts at the site.

Residences were not distributed equally within the city; higher areas of population clustered near the downtown and sprawled south of the east–west causeway, which joined Downtown Caracol with Hatzcap Ceel and Cahal Pichik early in its history (see figure 3.5). Significantly, however, within its district, Downtown Caracol has 221 percent of the average number of plazuelas in other Caracol districts located within Belize (figure 3.6). The city center was also the nexus of the dendritic causeway system for the city as a whole, ensuring that everything flowed through the downtown (A. F. Chase and Chase 2001; D. Z. Chase and Chase 2014). It possessed inordinately more monumental architecture than any of the other twenty-one district nodes embedded in the city (A. S. Z. Chase 2021, 122–58; 2016), and it alone possessed a Uaxactun-style E Group (A. F. Chase and Chase 2017b, 1995) and the monumental complex of Caana (A. F. Chase and Chase 2017a). These values and architectural forms demonstrate that the epicenter was an outlier from the other district nodes within the city, which fits with Downtown Caracol's role as the seat of a much larger Caracol polity. The actual population estimate for the polity of Caracol (and not the city), however, remains a future, and difficult, estimation challenge.

POPULATION CHANGE OVER TIME AT CARACOL

The city of Caracol may have been the seventh largest city in the world in 700 CE, according to Modelski (2003), and the revised population estimate presented here reinforces the older estimates used in that re-

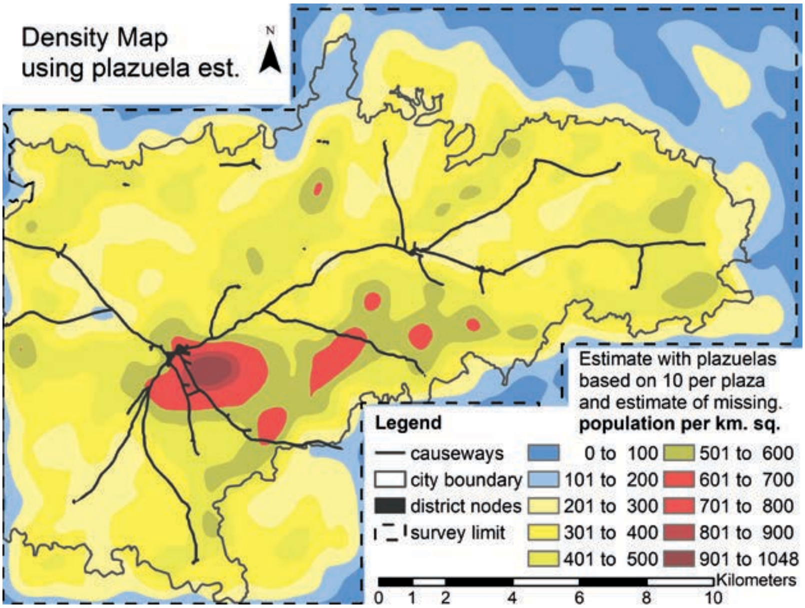

Figure 3.5 A plazuela-based population density map of people per square kilometer for Caracol. The public architecture and causeways represent formalized open space and showcase lower densities than the surrounding areas, and this map shows no density break between districts while showcasing the lower density north and east of the city.

search. Yet, Caracol did not always possess the population that it had at its height. Archaeological data provide a way to estimate past populations through the six major timeframes used by the Caracol Archaeological Project (table 3.2), using the plazuela population estimation method described above. While these values rest on data from excavations undertaken in 152 residential groups, and while some peripheral districts have not been sampled, they provide a first approximation of the change over time in the city's urban population.

By the end of the Preclassic period (in 250 CE), Caracol became a single city from the conurbation of Downtown Caracol, Hatzcap Ceel, and Cahal Pichik, with between 11,168 to 18,344 people (based on the Late Classic estimate above). In Early Classic 1, dating from 250 to 400 CE, Caracol's lineage of rulers was founded when the city had between 13,199 to 21,680 people, suggesting an internal population growth rate of 0.111 percent (see method in Hutson, this volume). In Early Classic 2,

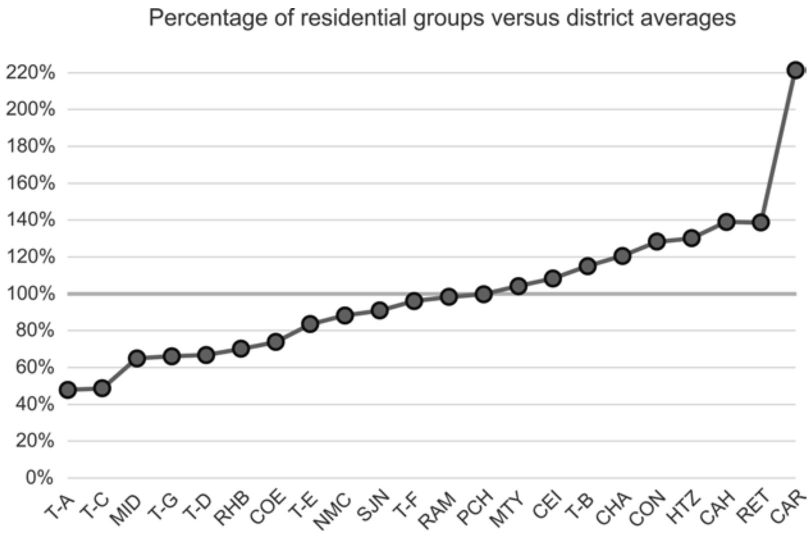

Figure 3.6 Relative district populations within Caracol, showcasing the outlier nature of Downtown Caracol (labeled CAR at the right-most point) with 221 percent the average number of plazuelas within its district. Adjacent districts also exhibit higher populations, however, likely settlement spillover from the city center (reproduced from A. S. Z. Chase 2021, fig. 5.4).

Table 3.2 Periods and selected events used by the Caracol Archaeological Project

Period	Start	End	Settlement feature	Event(s)	Major political event(s)
Preclassic	–600	250	Initial settlement	41	Temple of the Wooden Lintel built
Early Classic 1	250	400	Early conurbation	331	Caracol divine rulership founded
Transition represents appearance of cylinder tripods; it could be at 380 instead					
Early Classic 2	400	550	East–west expansion	426	Copan dynasty founded from Caracol
Late Classic 1	550	680	Population boom	562, 631	Starwar at Tikal, then at Naranjo
Transition occurs when Naranjo defeats Caracol; also the end of divine rulership					
Late Classic 2	680	800	Settlement sprawl	798	Political change to non-divine rulers
Terminal Classic	800	900	Abandonment	884	Final monument erected

Source: See D. Z. Chase and Chase 2017, 2021; A. F. Chase and Chase 2017b.

dating from 400 to 550 CE, Caracol underwent a period of east–west expansion, with a population increase to between 24,367 and 40,024 people, suggesting likely in-migration with a growth rate of 0.409 percent. In Late Classic 1, 550–680 CE, Caracol underwent a population boom along with its period of external warfare to 52,788–86,707 people, indicating likely in-migration with a growth rate of 0.552 percent. In Late Classic 2, 680–800 CE, Caracol would have had its maximum population, between 74,109 and 121,728 people, with an intermediate growth rate of 0.283 percent. Finally, in the Terminal Classic, dating from 800 to 900 CE, Caracol's population drastically declined to between 39,085 and 64,199 people, representing a decreasing rate of 0.640 percent. Shortly thereafter, the people left, depopulating the city, as excavations to date have not recovered Postclassic remains or occupation (table 3.3).

While these periods each cover at least a hundred years, they show an interesting curve of population growth and decline through excavation data combined with population estimates (figure 3.7). Tabulating the extant Caracol burial data manifests much the same patterning, but with a steeper population loss in the Terminal Classic era (see table 3.4); the fewer Terminal Classic burials, however, may be due to an actual population loss or to the fact that many Terminal Classic residents continued using Late Classic style ceramics in their interments (A. F. Chase and Chase 2004, 2007). Whatever the case, Caracol's inhabitants appear to have died later in their lifecycles than their peers at many other Maya sites (see Márquez Morfín and Hernández Espinoza 2013, table 2). Ad-

Table 3.3 Periods and diachronic change with conservative population estimates over time at Caracol

Period	Pop. est.	Growth rate (%)	Low est.	High est.	Count	Percentage (%)	Start	End
Preclassic	15,070	n/a	11,168	18,344	22	15	–600	250
Early Classic 1	17,810	0.111	13,199	21,680	26	18	250	400
Early Classic 2	32,880	0.409	24,367	40,024	48	33	400	550
Late Classic 1	71,230	0.552	52,788	86,707	104	71	550	680
Late Classic 2	100,000	0.283	74,109	121,728	146	100	680	800
Terminal Classic	52,740	–0.640	39,085	64,199	77	53	800	900

Note: Based on current excavation datasets and group-based population estimates of ten people per plazuela.

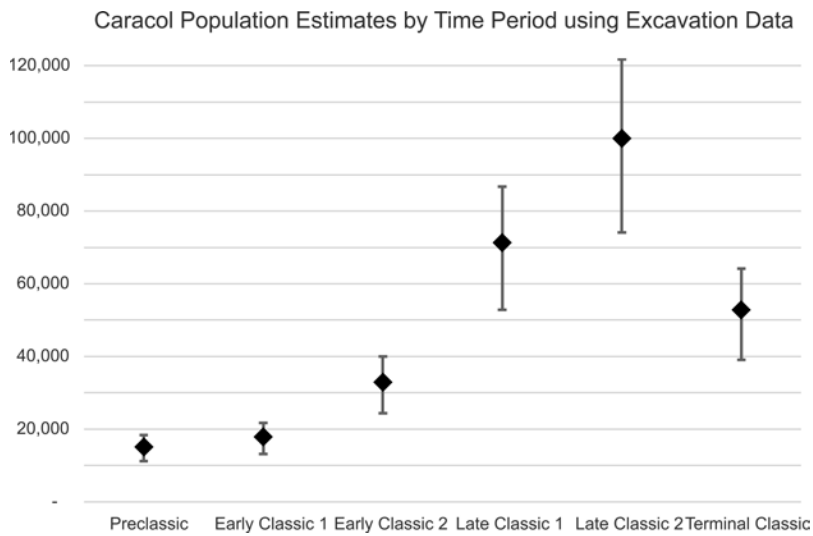

Figure 3.7 Diachronic estimates of relative population based on excavation data of residences at Caracol, separated into six main periods used at the site (see also tables 3.2 and 3.3).

Table 3.4 Caracol's population as reflected in burial data per time period, with age and sex identifications where possible

Period	Child 0–5	Sub-adult 6–15	Young Adult 16–25 M	Young Adult 16–25 F	Young Adult 16–25 ?	Adult 25–35 M	Adult 25–35 F	Adult 25–35 ?	Older Adult >35 M	Older Adult >35 F	Older Adult >35 ?	TOTAL
Preclassic	0	1	1	0	2	1	3	2	0	1	0	11
	0.00%	9.09%		27.27%			54.54%			9.09%		
Early Classic 1	3	5	0	0	1	1	2	3	1	0	2	18
	16.66%	27.78%		5.56%			33.33%			16.66%		
Early Classic 2	6	1	0	0	2	9	8	18	1	0	8	53
	11.32%	1.89%		3.77%			66.03%			16.98%		
Late Classic 1	13	12	0	1	2	10	8	52	3	1	17	119
	10.92%	10.08%		2.52%			58.82%			17.65%		
Late Classic 2	26	36	1	2	6	37	26	156	10	10	31	341
	7.62%	10.56%		2.64%			64.22%			14.96%		
Terminal Classic	3	0	0	0	2	2	0	9	0	1	1	18
	16.67%	0.00%		11.11%			61.11%			11.11%		
TOTAL	51	65	2	3	15	60	47	240	15	13	59	560
				20			347			87		
	9.11%	9.82%		3.57%			61.96%			15.53%		

ditional excavation may help fine-tune these population numbers, but a bifurcation in wealth items between the haves and the have-nots during the Terminal Classic era at Caracol seriously complicates ceramic dating (D. Z. Chase and Chase 2017, 217). Given this fact, the final phase of occupation shown should be taken as a lower boundary instead of an absolute value. Even so, the city of Caracol experienced a drop in population before the specific events and processes that led to its actual collapse (see also Haldon et al. 2020, 26–31).

CARACOL'S POPULATION IN CONTEXT

Caracol represents one of the largest cities of the ancient Maya, and like several others, it exhibited connections to Teotihuacan (Sugiyama et al. 2020; A. F. Chase and Chase 2011). While Caracol and Teotihuacan exhibited widely different urban forms—to some degree based on differential use of infield and outfield agriculture (see A. F. Chase and Chase 2016a; and Fisher 2014)—they had similar estimated populations of around 100,000 people (this chapter for Caracol; and Gornflo, Robertson, and Nichols, this volume; and Smith et al. 2019 for Teotihuacan). Few ancient cities of the New or Old World reached or exceeded this threshold before the modern era. For those that did, most were located in East or Southeast Asia (Modelski 2003). Trigger (1974, 102) argued that any preindustrial city with 100,000 or more inhabitants must have been the center of an empire to sustain such a large number of people.

To put these population estimates for ancient Caracol in a modern postindustrialized context, the most recent population of Belize (SIB 2013, 25) was 322,453 people in 2010, and Belize City, the largest city in Belize, represented only 57,169 people out of that total population. This means that the ancient population estimate for Caracol was not only rare for its time but would be the largest city in its region today. The ancient city of Caracol at its height had over a quarter of the population that the country of Belize has today, and nearly double that of modern Belize City. Caracol was occupied some 1,300 years ago, however, and represents only a single ancient Maya city within modern Belize. In other words, this landscape sustained many, many more people in the past than it does today (see also Canuto and Auld-Thomas, this volume).

We cannot overemphasize the degree to which the ancient Maya made their cities thrive within their tropical environment by fully modifying and manipulating their anthropogenic landscapes to suit their needs (A. Chase et al. 2020; A. F. Chase and Chase 2016b, 2020; D. Chase et al. 2020), but they also did this in a sustainable way—given the longevity of ancient Maya cities—not necessarily found or achieved in modern contexts. Thus, the archaeological data gained from Caracol surely have lessons to share for modern settlement and urbanism within the tropics of Central America.

CONCLUSION

As noted, Caracol is but one of many large Maya cities dating to the Classic period. Examining its size and population numbers not only provides us with some insight into how numerous the ancient Maya were at approximately 700 CE, but also suggests how complex their society must have been to organize and support these large populations. This is not a simple dichotomous society of farmers and divine kings, but rather one of complex roles and heterogeneous social levels, which would have incorporated administrative layers of governance, including both bureaucrats and diplomats. Population provides additional information on social organization and complexity that augments existing archaeological, iconographic, and epigraphic datasets.

Another important consideration is that, by the Late Classic period, Caracol's economic system was interconnected to other parts of the Maya world and dependent on those areas for certain necessary products. This means that this city—like modern globalized cities today—did not act as an independent self-contained unit. It interacted with a multitude of other cities, towns, and villages over a sizable area. Being able to accurately estimate population numbers and how they were distributed over space—and then modeling them over time—at multiple Maya cities should help us to better understand and detangle the interconnected nature of the ancient Maya world. Population estimates in conjunction with other data permit us to better model past systems of interactions and interdependencies in order to better understand aspects of the networks and flows underlying both urbanism and social complexity.

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