

## THE LOGISTICS OF AGRICOLA'S FINAL CAMPAIGN

David J. Breeze

*"Famine makes greater havoc in an army than the enemy, and is more terrible than the sword". Vegetius, de re militari III, 3.*

The seven-year governorship of Britain by Cnaeus Iulius Agricola reached its climax in the final season with his defeat of the Caledonians at the battle of Mons Graupius (Tacitus, *Agricola* 29-38 covers the events of this year). We do not know the site of this battle, and recent suggestions range from Dunning in Perthshire, about 10 km south-west of the Tay, through north-east Scotland to the northernmost reaches of the island (Feachem 1970; Burn 1953; St Joseph 1978; Henderson 1984; see Keppie 1981 for a useful discussion). Nor is known the size of the army, its precise route, the length of the campaign, the arrangements for supply and the method of carriage of provisions. However, we are informed that the army marched light, fighting and winning a battle late in the season, and that it was supported by the fleet.

This paper was first given at the 1983 Durham University Adult Education Course on the Roman Army at the invitation of Dr Brian Dobson and was included in a bound volume of papers presented to Dr Dobson by his old students on the completion of 25 years service as an extramural tutor in 1985. It is amplified here. Its purpose is to consider some of the logistical problems which would have vexed Agricola and his staff during the campaign which led to the victory at Mons Graupius and in the process introduce the whole subject of the logistics of Roman armies on campaign. I am pleased to acknowledge my debt to the stimulation provided by D.W. Engels, *Alexander the Great and the Logistics of the Macedonian Army* (1978). Until the advent

of railways and motorised forms of transport all armies experienced the same difficulties of supply that would have beset Agricola. Most instructive are the accounts of the difficulties of supply overland experienced by the British armies engaged in the Zulu War of 1879 and the Boer War of 1899-1902 (Morris 1966; Pakenham 1979). I am most grateful to Mr J.W. Barber, Dr B. Dobson, Mr I. MacIvor and Dr Valerie Maxfield, who read this paper in draft, for their useful comments.

### *The Size of Agricola's Army*

Agricola had 8,000 auxiliary infantry at Mons Graupius and probably 5,000 cavalry (this is the natural implication of the account of 3,000 cavalry on the flanks and four cavalry regiments in reserve). The number of legionaries is nowhere mentioned, but may have been similar in size to the auxiliary infantrymen. In theory Agricola had over 20,000 legionaries from the four legions of the province available, but at this time detachments from all four legions may have been serving on the continent, while no doubt other soldiers would have remained at headquarters training and administering and also at provincial headquarters, or sick.

Two detachments from the four legions of Britain are known to have been serving on the continent about this time (*ILS* 1025 and 9200). One, a detachment of legion IX Hispana under the command of a tribune, L. Roscius Celer, served in an unspecified German expedition; the other, consisting of detachments drawn from all four legions of the province and forming part of a larger army group, was commanded by C. Velius Rufus. Both detachments have been traditionally linked to the Chattan war of Domitian fought in 83 (cf. Dobson 1981, 9), and, if this view is correct, would have been absent from Britain during the final years of Agricola's governorship, Mons Graupius being fought in 84, or more likely 83 (Birley 1976): the link has been strengthened by associating the detachment of IX Hispana with the weakness of that legion in Agricola's sixth season and the use of the fleet in order to bring his forces up to the requisite strength (Tacitus, *Agricola* 25). However, Kennedy (1983) has argued that the detachments were withdrawn for service on the continent not at this time, but for the Danubian wars against the Dacians (85-88) and, subsequently (88/9), the Germans.

Agricola, of course, may not in any case have taken all four

legions on the campaign. The division of the army into the columns the previous year (Tacitus, *Agricola* 25) may suggest that on that occasion only three legions were present. Suetonius Paulinus did not have all the legions with him on the Anglesey campaign of 60 (Tacitus, *Annals* XIV, 32-4).

It is difficult to estimate the number of clerks, building and maintenance staff and the like which might have remained at the legionary headquarters and at the offices of the governor and the procurator. In the second century at least 1,100 soldiers held posts in a legion, about 21% of the unit (Breeze 1974, 435-6), but of course many of these posts related to positions of command, standard bearers, or musicians, and these soldiers, as well as others not required at base, would accompany their unit on campaign. Indeed it might be expected that normally all soldiers, including the clerks who would accompany the legionary legates and governor, whose offices presumably travelled with them, would go on campaign. One group which might have remained at base were the new recruits and their instructors. Another would have been soldiers who were ill (Caesar, *BG* VI, 36 and 38).

Finally, we have to consider the possibility that the British legions were below strength. The three surviving *pridiana* of auxiliary units suggest that each unit was below strength, one by as much as 25% (Breeze 1984, 265). It is not impossible that Agricola's legions were in a similar position.

In conclusion, there is no direct evidence that Agricola's army was below strength during the final campaign. However, in the previous season his army was below strength and the continuation of this problem into the final season *may* be implied by his continuing use of the fleet. The nature of the explicit statement that the army was below strength in the sixth season suggests that there was a special reason for this problem and thus provides strong circumstantial support for the argument that the detachments were withdrawn at this time for service on the continent. It is just possible that the relative weakness of the legions is implied by Agricola's decision to keep them in reserve at Mons Graupius: this may have been not so much a desire to save Roman blood (Tacitus, *Agricola* 35), but a reflection of their reduced size. Taking into account all possible drains on his resources it seems not impossible that the legionary strength was equal to that of the auxiliary infantry. Agricola's army, therefore, may have numbered 8,000 auxiliary infantry, 5,000

cavalry and about 8,000 legionaries, a total of about 21,000 soldiers.

### *The Route*

The route taken by the army to Mons Graupius is not recorded by Tacitus, though he does state that he sent the fleet ahead to plunder and spread uncertainty and terror (Tacitus, *Agricola* 29). This short statement harks back to the comment on the activities of the previous season, which also took place north of the Forth (Tacitus, *Agricola* 25): he used the fleet to reconnoitre the harbours. It was first brought in by Agricola to bring up his forces to the requisite strength. Its continued attendance on him made an excellent impression. The war was pushed forward simultaneously by land and sea; the infantry, cavalry and marines, often meeting in the same camp, would mess and make merry together (Mattingly 1948, 75). It would be natural to conclude that the route of the final season also kept the army in contact with the fleet.

The known Roman marching camps north of the Forth point to all Roman armies following roughly the same route, skirting the south-eastern flanks of the Highlands to pass round the Mounth at Stonehaven and continue north-westerly along the edge of the mountains (St Joseph 1973 and 1977; Maxwell 1981): aerial reconnaissance along the coast line has produced only one camp, the 3.2 ha (8 acres) enclosure at Dun on the north side of the Montrose basin (St Joseph-1973, 225-6). Many camps of different sizes have been recorded along the main route north (Fig. 1). Some, in particular those in the 25 ha (63 acres) and 52 ha (130 acres) series, are generally accepted as Severan in date; others, primarily those with the distinctive "Stracathro-type" entrance, are normally dated to the Flavian period. However, doubt surrounds the correct date which should be assigned to the 44.5 ha (110 acres) series, all the members of which lie north of the Mounth, both third century and first century dates being proposed (St Joseph 1969, 116-8 and 1977, 143-4 respectively). Be that as it may, two marching camps with Stracathro-type entrances do lie north of the Mounth at Auchinhove and Ythan Wells (Maxwell 1981, fig. 2). The location of these camps may point to the position of Mons Graupius, but more important for the present discussion is the distance between the two camps: 23.5 km (14.75 miles). The distance between each pair of camps in the 25 ha

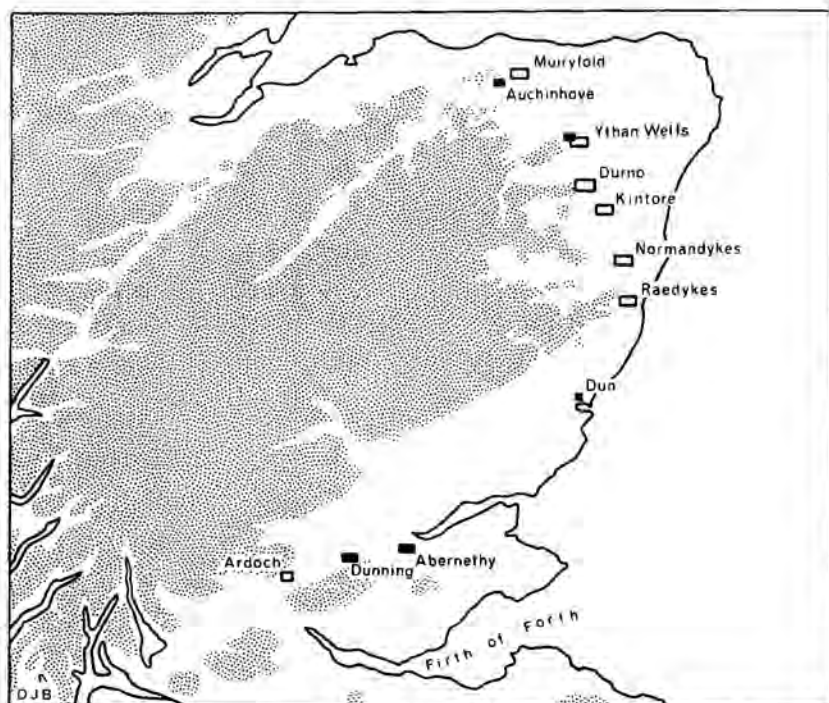


Fig. 1 Camps north of the Forth which may date to the Agricolan campaigns. Dunning and Abernethy each cover about 46.5 ha: a sherd of late first century samian ware was found in the ditch at Abernethy (St Joseph 1973, 220). Dun has also produced a fragment of samian of the same date (St Joseph 1973, 225). Auchinhove and Ythan Wells have Stracathro-type entrances which are only known at first century camps (Maxwell 1981, 29-35). Durno covers about 58.3 ha and has been proposed as the site of Agricola's camp before Mons Graupius (St Joseph 1978). The other camps from Raedykes to Muirfold have been assigned both to the first century (St Joseph 1977, 143-5) and the early third century (St Joseph 1969, 116-8, and more cautiously by Maxwell 1981, 40). The camp at Ardoch is earlier than the (probably Severan) 25 ha camp in the complex and may date to the first century (St Joseph 1970, 167-9).

series ranges from 10 km, where a river crossing is included in that day's march, to 23.5 km, the average being 16.4 km. The average distance between the camps of the 52 ha series is 19.9 km, while similar distances separate the camps of the 44.5 ha series. Thus an average distance of about 16-20 km (10-12.5 miles) between Agricola's camps may not be too far from the mark. Alexander the Great achieved an average rate of 24 km a day (Engels 1978, 16). Vegetius (I, 9) recommended 20 Roman miles (18.5 English miles = 29.5 km) in a period of five hours at military pace when training or 24 Roman miles (22 English miles = 35.5

km) at the quicker full pace. These distances, however, were covered during training when camps did not require to be struck and constructed. The distance covered would also relate clearly to the nature of the terrain crossed.

### *The March*

Agricola's army on the march would have taken up a considerable area, even travelling without heavy baggage. According to Josephus (*BJ* III, 7, 2) the infantry marched 6 abreast: allowing 2 m for each man would extend the column to 5.3 km. Each mule needed 4.5 m and if the same distance was allowed for the cavalry, and they walked 5 abreast, then a further 5.4 and 4.5 km respectively must be added to the length of the column (this is allowing the mules to carry 4 days' supply of grain: see Table 1). In the 1879 Zulu War the oxdrawn wagons moved 5 or 6 abreast (Morris 1966, 317). The resulting length of about 15.2 km is a minimum and may be compared to the postulated average distance of between 16 and 20 km between the Roman marching camps in Scotland.

The length of the column on the march is a subject not generally discussed by Roman writers. Sabinus in Gaul experienced difficulties with a lengthy column during his retreat in 54 B.C. (Caesar, *BG* V, 33; cf. II, 17 for Caesar's army being spread out in the march). Ammianus Marcellinus records that Julian's army during the Persian campaign of 363 extended over nearly 10 miles (XXIV, 1, 3): this army contained a little over 30,000 men (XXV, 7, 2 with XXIII, 3, 5). Julian had purposefully extended his army in order to try to confuse the enemy, but it was also marching in order of battle and therefore spread widely with the main body of infantry flanked to the right by several legions and the left wing including the cavalry (XXIV, 1, 2). When drawn up ready to march at the beginning of the day, and therefore presumably in close order, it was 4 miles long (XXV, 5, 5-6). This passage specifically refers to the soldiers and it is not clear where the baggage lay. Josephus (*BJ*, III, 5, 4) also records the army lined up ready to march after striking the tents and loading the baggage animals.

Although Julian purposefully spread his army both widthways and lengthways in 363, all Roman armies on the move were to greater or lesser extent scattered across the landscape (the order of march of the Roman army is recorded by several ancient



writers, but is not our primary concern here; cf. Caesar, *BG* II, 19; VIII, 8; Josephus, *BJ* III, 6, 2; Tacitus, *Annals* I, 51; XIII, 40; Vegetius III, 6). Usually the cavalry was in advance (e.g. Caesar, *BG* II, 19; Tacitus, *Annals* I, 51; Josephus, *BJ* III, 6, 2; Tacitus, *Annals* XIII, 40) and on the flanks (e.g. Ammianus Marcellinus XXIV, 1, 2). The legions might march one after the other (Polybius VI, 40 and as implied by Caesar, *BG* II, 19; Josephus III, 7, 2) or in battle formation (e.g. Tacitus, *Annals* I, 51; XIII, 40; Ammianus Marcellinus XXIV, 1, 2). Whatever formation was adopted by Agricola, his army certainly would not have formed a tight group; the 15.2 km is a purely notional figure.

Accounts of the Zulu war of 1879 emphasise the difficulties of movement and demonstrate how a tight formation might be broken. The wagons could quickly create deep ruts forcing other parts of the army to move to the side. Thus tracks up to 8 km wide could be created. In the Boer War, General Oliver's 6,000 strong force, together with its wagon train, stretched for 24 miles (Pakenham 1979, 379-80). Thus Agricola's army marching between camps could easily have straggled over a far greater distance than the theoretical minimum of 15.2 km.

### *The Length of the Campaign*

Mons Graupius was fought when the summer was already over, which ought to mean September (Birley 1976). It is not known where or when Agricola's army assembled. The Roman campaign season started in mid-March, but it may be doubted if campaigns in north Britain commenced before mid-May when the new growth of grass will first have provided fodder for the animals. If the army moved north of the Forth as late as the end of May and fought Mons Graupius in September, *if* the battle was fought in north-east Scotland (St Joseph 1978) and *if* the army spent one night in each camp, then the whole campaign, in theory, could have been completed in less than 2 months. If the campaign lasted a full season therefore it might be expected that the army spent perhaps 2 or 3 nights in each camp: a longer stay would create the risk of health hazards (Toynbee 1973, 308 quotes the seventh century military treatise by Leo VI that the army should keep moving camp for reasons of health; cf. also Vegetius III, 2, and also Caesar, *BC* III, 49 for Pompey's difficulties when his army was cooped up in cramped conditions), while local grazing and forage

would be exhausted (Caesar, *BG* VIII, 10). A stop of 2 or 3 nights in each camp would also allow scouts to be sent ahead to seek out the best route and the enemy and, perhaps, the site of the next camp. Ammianus Marcellinus records Julian's army twice stopping for 2 nights during the Persian campaign of 363, on one occasion specifically for the convenience of water and fodder, and while camped the emperor went out on reconnaissance (XXIV, 5, 3; cf. XXV, 1, 3).

### *Reconnaissance*

A knowledge of the land ahead was of considerable importance to an army on the march. Lack of information about the interior of Zululand in 1879 led to a false start and a second invasion, and this was 50 years after the establishment of Port Natal (Morris 1966, 504).

Pytheas must have sailed round Britain during his visit to the island over 300 years before Agricola, and he also explored inland (Cary and Warmington 1963, 47-56). He knew of Orcas Promontiorum — Dunnet Head by John O' Groats — and also it appears Pentland Firth. But Pytheas' account was not believed and it is difficult to see what use would have been made of it by Agricola: certainly Caesar does not seem to have used it. By the time of Agricola, the Romans certainly know of the Orkneys, the Hebrides and *Thule*. However, the elder Pliny, who died in 79, wrote of knowledge not extending beyond the neighbourhood of the Caledonian forest (*NH* IV, 102). Presumably he had in mind the land rather than the sea.

Care was taken to find out as much information as possible about the land and people ahead in advance of commencing the campaign from merchants (Caesar, *BG* V, 1; Tacitus, *Agricola* 24), refugees (Tacitus, *Agricola* 24) and travellers (Vegetius III, 6). On the march the army relied on guides (Caesar, *BG* I, 21), reconnaissance (Caesar, *BG* I, 21-22; IV, 21; Tacitus, *Agricola* 20 and 25; Frontinus, *Stratagems* I, II, 7; Ammianus Marcellinus XXI, 7, 7; XXIV, 1, 2), prisoners (Caesar, *BG* V, 9, 18; VII, 72; Tacitus, *Agricola* 25; Frontinus, *Stratagems* I, II, 5), deserters (Caesar, *BG* V, 18; VII, 72; Tacitus, *Annals* II, 11; Ammianus Marcellinus XXI, 7, 7) and no doubt friendly tribesmen. To aid this work the army contained scouts, interpreters (e.g. *CIL* III 10505 *interpres Germanorum*; *AE* 1947, 35 *interpres Dacorum*; Caesar, *BG* V, 36 *interpretes in Gaul*) and mappers (*AE* 1947,



61). Vegetius (III, 6) comments on the need for proper and skilful guides, and he notes that a general knowledge should exist of roads, routes, by-roads, mountains and rivers. How much Agricola and his staff knew of the detailed geography of north Britain is not possible to determine, but the choice of routes for the passage of the army clearly demonstrates a grasp of the essentials of the topography of the northern countryside (on maps generally see Sherk 1974; Millar 1982, 15-9).

### *The Soldier's burden*

Each soldier would require food and equipment on the campaign. The ration of corn for each soldier was 1.36 kg (3 lb) per day according to Polybius (VI, 34, 12-15) and in addition he ate bacon and cheese and drank sour wine; oil and salt will also have been required (Davies 1971, 122-5, quoting *Historia Augusta*, *Hadrian* X, 2; *Avidius* V, 3; *Pescennius* X, 3-4. The latter two are fabricated lives, but may have relevance here). Meat was not scorned if available (Davies 1971, 125 and 138-41). Polybius (VI, 31) allotted a place in his camp to cattle, while Caesar's soldiers ate cattle and vegetables when other supplies ran out (*BC* III, 47-48; cf. *BG* VIII, 56). Boon (1983, 11) has recently pointed out that the army on campaign did not always have access to the variety of provisions available to the peace-time army and as a result sometimes suffered from a lack of vitamin C, obtained most readily through eating green vegetables and fruit.

Josephus (*BJ* III, 5, 5) records that in addition to carrying 3 days' rations each soldier carried a saw, basket, axe, pick, rope, sickle and chain. These were required for cutting down trees, emptying ditches, foraging and the like. On Trajan's Column (III-V), soldiers marching out to a review carried, on a pole, a metal cooking pot, mess tin, string bag for forage and a leather bag (perhaps for clothes or water): axes appear elsewhere on the Column. Turf cutters, entrenching tools and *pila muralia* would also have to be carried. However, it is interesting that when the army is marching in two columns (CVI-CVII), advancing on a camp, no such equipment is shown carried by the soldiers: presumably they had been assigned to the baggage train. Many tents were required, and each weighed about 18 kg (40 lb). The soldiers were divided into tent groups of 8 men (*de metatione castrorum* 1), and each officer also had his own tent: Agricola's army would have required over 3,000 tents. Medical supplies

would be taken, and artillery, though whether Agricola took what may have been the normal complement of one *ballista* per legionary century (Vegetius II, 25; cf. Josephus, *BJ* III, 7, 9) on this campaign is conjectural. One item would, presumably, have been acquired on the march: firewood. Caesar's troops, collecting firewood in 54, were attacked (*BG* V, 26).

Finally, we may note that the soldiers might have had with them personal possessions, the bane of many a general. When Sabinus' force was attacked by the Gauls in 54 B.C., his army was thrown into disarray when the soldiers sought their most cherished possessions from the baggage train (Caesar, *BG* V, 33; cf. *BG* VII, 67-8). Roman soldiers had slaves, who might accompany them on campaign (Vegetius III, 6). Philip of Macedon limited his servants to one for every 10 infantrymen and one servant for each cavalryman to carry hand mills and other items (Engels 1978, 12). There might also be camp followers. These followed Caesar round Gaul, staying outside the camp except — by implication — when under attack (*BG* VI, 36-37; cf. *BC* I, 51), while Josephus (*BJ* III, 7, 2) records that the soldiers' servants led the baggage of the soldiers which was borne by mules and other beasts. There is no reason to doubt that they would have followed Agricola into Caledonia if allowed. The army would also have been swollen, at least for part of its journey, by a different kind of attendants, hostages, for Agricola gathered some after Mons Graupius (Tacitus, *Agricola* 38), and may have had some with him throughout the campaign. However, these would have been relatively few in number.

One of the abiding problems is the weight of food and equipment carried by each soldier: suggestions range from 30 kg (66 lb) to over 50 kg (a hundredweight) (the British soldier of the late nineteenth century carried 26 kg (57 lb): for a useful discussion of this aspect see Watson 1969, 62-66). Josephus (*BJ* III, 95) states that each soldier carried 3 days' rations, Cicero (*TD* II, 37), writing in the first century B.C., that every soldier took rations for more than half a month, while Caesar mentions 22 days' supplies on one occasion (*BC* I, 78). The life of the early third century emperor Severus Alexander, written perhaps 100 years after his death, records that when in hostile territory each soldier usually had to carry rations for 17 days; however, the soldiers' loads were lightened by the use of baggage animals. The fourth century historian Ammianus Marcellinus (XVII, 9, 2) notes that each soldier on campaign carried 17 days' rations on his back.

Watson (1969, 10) suggests that the 3 days' rations recorded by Josephus formed the iron rations, always carried by the soldier, with the extra days' rations, perhaps usually 17 days' supplies in total, taken by the army but usually carried in the baggage train.

### *The Beasts of Burden*

Many ancient writers refer to mules and carts being used by the army (for example, Caesar, *BG* VIII, 45; Suetonius, *Tiberius* 18; Josephus, *BJ* III, 5, 4). On Trajan's Column (Fig. 2), mules carry tents (scene XLIX), weapons (CVI: 2 shields and a helmet — probably one or 2) and cooking equipment (CXXXVIII), 2 mules pull 2 wheeled carts carrying auxiliary shields (CVI), *ballistae* (XL, LXVI), tents (CVII), and ?water barrels (LXI: 2 barrels), while 2 oxen pull 2 wheeled carts bearing weapons (XLIX: spears and shields) and ?water barrels (LXI: 3 barrels). In one scene (CX) 3 ?mules stand by a party foraging for corn. In *de metatione castrorum* (ch. 1) one mule is assigned to each tent group of 8 men. It is not known how the carts were divided: Richmond (1935, 11-12) assigned one to each century.



Fig. 2 Trajan's Column records the transport of supplies by two-wheeled carts drawn by oxen (left) or mules. (Photograph P. Connolly)

Oxen are slower than mules (Engels 1978, 15-16). While mules can work for 8 hours a day, if oxen work for more than 5 hours they require several days to recuperate. Moreover, they require longer to feed (8 hours) and digest their food (8 hours) than mules: they also require a break of a couple of hours at midday (Morris 1966, 316). On a level road, a little over 3 km/ph would be on an average speed for oxen: in the Zulu War of 1879 no more than 16 km was achieved in a day, and sometimes the distance covered was only 5-7 km (Morris 1966, 316). Mules were not as efficient as oxen in pulling carts as they were restricted by their collars which pulled on their windpipes.

### *Marching "light"*

Agricola's army travelled *expedito*. This can be translated as "without heavy baggage"; it also has connotations of mobility. Baggage tended to accumulate in all armies, thus creating logistical problems.

Tiberius, campaigning in Germany, limited the permissible baggage (Suetonius, *Tiberius* 18). Caesar often had to detach troops to guard it while the rest of the army marched quickly on (*BG* VI, 32; VII, 10; cf. VI, 5 when he marched light to deal with a specific problem speedily). Alexander the Great, before setting off through a sparsely settled region, burnt all excess baggage, wagons and personal possessions, beginning with his own (Engels 1978, 13). Xenophon carried out a similar process before making a winter march and noted that it saved half the army's rations (Xenophon, *Anabasis* IV, 1, 12-13; Engels 1978, 13). "Light" would therefore suggest that at the least Agricola restricted the amount of personal baggage and probably also the number of slaves and camp followers. However, it ought to go beyond this, implying economies on the strictly military side also. The number of *ballista*, for example, may have been reduced: a large amount of artillery would surely have been unnecessary in the north. More reliance may have been placed on mules rather than carts. However, in such circumstances the number of mules would have had to be increased, thus creating a different problem of additional fodder and water for the baggage animals.

The most radical method of reducing the baggage would have been to cut down on the amount of food and fodder carried for soldiers and beasts. This could only be done if adequate supplies could be guaranteed to the army on the march through foraging

and/or supply en route. These aspects require more detailed consideration.

### *Methods of Supply*

Many references in Caesar's writings attest his continuing concern with the supply of his army (e.g. *BG* I, 39; II, 3; IV, 7; V, 8; VI, 29; VII, 10; VII, 17; *BC* I, 48-51) and on occasions (e.g. *BG* I, 23) he suited his tactics to his need to maintain contact with his supplies; he also delayed his campaign in 53 B.C. until the start of the harvest (*BG* VI, 29; note also Corbulo's difficulties in Armenia: Tacitus, *Annals* XIV, 23). During the Civil War Caesar used Pompey's problems of supply, and in particular the provision of fodder for his cavalry, to put pressure on his opponent (*BC* III, 41-49). In Spain Caesar was able to starve a Pompeian army into submission when they ran out of fodder, water, wood and corn (*BC* I, 84). Both incidents emphasise the need for a plentiful supply of grass for the horses and mules. In the Zulu War the fact that Chelmsford could obtain supplies for a campaign of only 2 to 3 months' duration led him to avoid the lengthy task of protecting his camp at Isandhlwana, a decision which was to lead indirectly to the destruction of the camp by the Zulus (Morris 1966, 333-4).

Soldiers, oxen, mules and horses require enormous quantities of food and water (cf. Vegetius III, 1; note also Ammianus Marcellinus XXIII, 2, 8, for the supply of chaff). Table 1 indicates the grain, forage and water requirements for Agricola's army for one day. In theory a mule can carry sufficient fodder to feed itself for 20 days (a mule can carry about 90 kg: 200 lb), but if it did it would not be able to carry any provisions for the soldiers, cavalry and other baggage animals. In practice, allowing for a limited number of mules available (in A.D. 16 the supply of horses in Gaul was exhausted, helping to force Germanicus to use sea transport: Tacitus, *Annals* I, 40), the army could have lasted for only some 10 days before requiring further supplies. The addition of further mules or oxen would simply add to the number of mouths to be fed. Thus, exclusive reliance on the carriage of all supplies by the army was not a viable proposition. While Agricola's army presumably carried what supplies it could, it must also have relied upon additional supplies being provided from other sources.

Foraging was an important source of supply while on cam-

paign. Caesar foraged for corn in Britain in both 55 and 54 B.C. (*BG* IV, 31; V, 14) and he also foraged in Gaul (*BG* I, 16; VI, 36; VII, 16). Caesar foraged daily, recognising that if he stayed long in one place he would have to forage increasingly further afield (*BG* VIII, 10): he protected his foraging parties with cavalry (*BG* VIII, 17). Julian's army in Persia also foraged, and destroyed what it did not require (Ammianus Marcellinus XXIV, 1, 14; 5, 5; the problems of returning over land already foraged are also noted, XXIV, 8, 2). Trajan's Column shows legionaries cutting corn, using the sickle which we have already noted was, according to Josephus (*BJ* III, 95), part of the equipment of each soldier (Fig. 3). Caesar's army took corn both from fields (*BG* IV, 31) and from settlements (*BG* VIII, 10), where it was presumably in store, either as food or as seed-corn (cf. Caesar, *The African War* 65 for grain stores). Collection of corn from fields would imply the carriage of hand-mills by the army. Corn cut at harvest time would be dry enough to use without further drying. Corn cut earlier could not have been successfully milled but that does not preclude its earlier harvesting for use in gruel: Caesar (*BC* I, 48) noted the awkward time of the year, when last year's store of grain had been used up and this year's was not yet ripe (cf. *BC* III, 49).



Fig. 3 This scene on Trajan's Column shows legionaries cutting corn. (Mansell Collection)



The question arises as to how much grain and grass might be available to Agricola's army. The Highlands themselves had been largely deforested in the Neolithic and Bronze Ages (with the exception of small, isolated stretches of woodland surviving in the deeper glens), and were probably about as bare as today. Trees would be more numerous on the lower ground. The use of chariots by the Caledonians suggests the existence of open areas, while pollen analysis of samples from several sites on the Antonine Wall demonstrates that considerable clearance of woodland had taken place before the Romans arrived (in one instance the tree cover was only 10%, which is a similar percentage to that generally recorded today: Boyd 1984). Barley had certainly been grown north of the Forth for 3,000 years, but little is known of cereal cultivation in mainland Scotland in the Iron Age. However, cattle and sheep were unquestionably reared. In summary, it would seem that grass would be available for grazing, and in addition to cattle and sheep it may be presumed that cereals could be foraged, either from settlements or, later in the year, from fields. Local sources, however good, would keep the army supplied only for a couple of days. When Alexander the Great campaigned in hostile territory and had to rely on foraging he cut down the size of his army and travelled light (Engels 1978, 22).

Water, at least, was in plentiful supply in Scotland. The many streams and rivers flowing out of the Highlands will have provided ample water for the cavalry horses and baggage animals, and it is interesting to note the tendency of marching camps in Scotland to be placed beside a ready supply of water. Caesar (*BG* IV, II) is recorded moving to obtain water and at Dyrrachium diverted or dammed the rivers and streams running into the area controlled by Pompey's army so as to reduce the supply of water and weaken his cavalry (*BC* III, 49).

Another source of supply used by Caesar, and possibly available to Agricola, was friendly or conquered tribes. In 57 B.C. Caesar was offered corn (as well as hostages) by the Remi when they submitted to him (*BG* II, 3). He also captured corn (*BG* VII, 32).

Finally, to turn to the provision of additional supplies from the province by land and by sea (Fig. 4), following purchase (e.g. Caesar, *BG* I, 16) or requisition (e.g. Tacitus, *Agricola* 19; cf. Breeze 1984, 275-9 on supply). Caesar brought in supplies to his army in the field by land (*BG* III, 24), river (*BG* I, 16) and sea

(the implication of *BG* V, 8 is that supplies were to be forwarded to the army in Britain). Pompey supplied his army by sea during the Civil War (Caesar, *BC* I, 44). Julian in 363 supplied his army by ships which kept pace with the army marching along the banks of the Euphrates (Ammianus Marcellinus XXIII, 3, 9; XXIV, 1, 11; 14; 6, 4; 7, 4; the supply ships were burnt when it was decided to move away from the river: XXIV, 7, 4). Supplies were obviously vulnerable to attack or interruption (*BG* I, 48; II, 24; VIII, 30). Germanicus transported his army and supplies by ship through the North Sea to Germany, partly owing to the vulnerability of long baggage trains (Tacitus, *Annals* II 4-5).



Fig. 4 The transport of supplies by river appears on Trajan's Column. Here the ship in the centre is loaded with tents while those on either side contain barrels. (Photograph P. Connolly)

Agricola on the march in north Britain, if not relying exclusively or mainly upon foraging, would, like Caesar, have required to be supplied regularly with food, probably at least once a week. Although Tacitus does not explicitly mention this, supply by the fleet would have been the most efficient method. The most detailed comment on the use of the fleet is given in the account of the sixth season (Tacitus, *Agricola* 25). It reconnoitred harbours, strengthened the army, plundered and spread terror. No mention

is made of its value in ferrying supplies, though Tacitus may have passed over in silence such a mundane, or regular, function. Perhaps plundering ahead could be interpreted as foraging for supplies. Certainly Tacitus emphasises that the army and the fleet operated in close harmony, the soldiers and sailors often meeting in the same camp. Supply by sea would have been easier, and less vulnerable to interruption, than provisioning by mule or ox train travelling overland.

The relationship between the various possible methods of supply cannot now be determined, though the carriage of all food with the army is ruled out both by the description of the army travelling light and sheer logistical impossibility. A heavy reliance on foraging supplemented by supplies brought in by sea may not be far from the mark.

### *Conclusions*

The logistical problems which faced Agricola's staff would have been considerable, but no worse than has faced any army. The reference to his army travelling light in the final season is intriguing, but is it significant? Was Tacitus using the term because in this season — and no other? — Agricola did indeed travel light, or is this merely a word dropped to the account of this year by chance or for effect, perhaps harking back to the exploits of great generals of earlier generations? If he does truly mean what he says, why should it be this season in particular that Agricola travelled light? Could it be that he was making a determined attempt to bring the enemy to battle, perhaps to redress the near fiasco of the previous season when the ninth legion was attacked at night, possibly realising that his governorship must be nearing its end? The truth is impossible to determine, the possibilities speculative, but not without interest.

In travelling light, Agricola may have shed much excess baggage and perhaps also camp followers. Nevertheless, his army, if marching in a column, must have stretched over 15 km, though, as we have seen, it may not have adopted this formation. 15 km is not far short of the expected distance between the camps on the line of march. Indeed, allowing, as one must, for hold-ups on the march, it is likely that sometimes the last men were leaving one camp as the vanguard was arriving at the site of the next. However, it is not impossible that an advance party, moving ahead of the main army, laid out the new camp well before that

body of troops arrived: this is the situation Polybius (VI, 41) describes and a not altogether dissimilar two stage movement seems to be depicted on Trajan's Column (CVI-CVII). Caesar (*BG* II, 17) describes sending forward scouts and centuries to choose a camp site.

We have seen that it was not possible for Agricola's army to carry all its supplies with it. It might be surmised that foraging — from settlements and particularly perhaps for animals as the grain would not yet be harvested — would have been supplemented by supply by sea rather than the more costly overland route. In that case beach-head or harbour defences may yet be found on the east coast of Scotland (the small camp at Dun on the north shore of the Montrose basin is not such an enclosure: St Joseph 1973, 225-6). Several temporary fleet depots might be expected. In spite of the comments of Tacitus, Agricola's army does not appear to have followed a coastal route, unless a whole new series of coastal camps await discovery, a not impossible suggestion in view of the combination of the discovery of so many new types of camps over the last 40 years and yet the still glaring gaps in our knowledge. Transit camps relating to the transport of supplies to the army following a more inland route might also be expected.

It may not be without significance that Tacitus does not record Agricola experiencing any supply problems. He certainly usually tried to emphasise the difficulties his hero experienced (cf. *Agricola* 18, 19, 22 and 25) and commented, albeit in the later *Annals* (II, 4-5; XV, 15), on the supply of the army. Perhaps this silence is the most eloquent testimony to the smooth and efficient running of the Roman army's commissariat.

TABLE 1

Agricola's army's food and water requirements for one day.

	size	ration	weight in kgs
<i>Grain</i>			
personnel	21,000	1.36 kg	28,560
cavalry horses	5,000	4.54 kg	22,700
mules for baggage	3,050	4.54 kg	13,850
mules carrying provisions	3,000	4.54 kg	13,620
			<hr/> 78,730
<i>Forage</i>			
cavalry horses	5,000	4.54 kg	22,700
mules for baggage	3,050	4.54 kg	13,850
mules carrying provisions	3,000	4.54 kg	13,620
			<hr/> 50,170
<i>Water</i>			
personnel	21,000	2.3 l	47,670
cavalry horses	5,000	36.4 l	180,500
mules for baggage	3,050	36.4 l	110,715
mules carrying provisions	3,000	36.4 l	108,900
			<hr/> 447,785

- NOTE 1. No figures are included for oxen. Agricola travelled light in his final season and may not have taken wagons.
2. No provision is made here for remounts, which ought to have been taken, though may not have been as the army travelled light.
3. Rations based on those provided by Engels, Appendix 1. The mules are carrying supplies for 4 days only. Increasing the provisions to 7 days' supply would add 2,000 extra mules to the baggage train.

## ABBREVIATIONS

- AE *L'annee épigraphique*.  
CIL *Corpus Inscriptionum Latinarum* (Berlin, 1892- ).  
ILS H. Dessau, *Inscriptiones Latinae Selectae* (Berlin, 1892-1916).

## ANCIENT SOURCES

- Ammianus Marcellinus, *History of Rome*.  
Caesar, *Civil War*.  
Caesar, *Gallic War*.  
Caesar, *African War*.  
Cicero, *Tusculanae Disputationes*.  
Dio, *History of Rome*.  
Frontinus, *Stratagems*.  
Historia Augusta, *Life of Hadrian*, etc.  
Josephus, *Jewish War*.  
Pliny, *Natural History*.  
Polybius, *The Rise of the Roman Empire*.  
pseudo Hyginus, *de metatione castrorum*.  
Suetonius, *Life of Tiberius*.  
Tacitus, *Annals of Imperial Rome*.  
Tacitus, *Life of Agricola*.  
Vegetius, *de re militari*.  
Xenophon, *Anabasis*.

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