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Collected and compiled by
Colonel R. H. PHILLIMORE, C.I.E., D.S.O.,
(late Royal Engineers and Survey of India)



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CHAPTER VII

SURVEY OF MYSORE, 1800-5

Preparations, 1799 to January 1800 — First Season, February to October 1800 — Sonda, 1800-1 — Second Period, October 1800 to January 1802 — Third Period, January 1802 to October 1803 — Fourth Period, October 1803 to December 1805.

AFTER the capture of Seringapatam and the death of Tipu Sultān, 4th May 1799, Mackenzie assisted the Mysore Commissioners by compiling maps of the frontiers from the meagre and unsatisfactory materials that were the best available [I, 119]. On his return to Madras, much shaken in health, the Governor General appointed him, early in September, to undertake

a survey on an extensive scale of the territories lately subjected to the Company and to the Rajah of Mysore; such a survey is in the first place absolutely necessary to the accurate settlement of our frontier: it will also tend to augment our knowledge of Indian Geography, and to produce immediate and important benefits in establishing and conducting our government in the conquered provinces, for I propose that the attention of the Surveyor should not be confined to mere military or Geographical information, but that his enquiries should be extended to a statistical account of the whole country, and that he should be supplied with the best means in our power to assist him [2]. ...

In order to assist Captain Mackenzie in his enquiries, I propose that Doctor Heyne, the Company's Botanist on this Establishment, and Mr. Mather, who has lately given proofs of his accuracy in the survey of the Baranahal [I, 114, 354-5, pl. 9], be attached to that officer¹.

The survey was to be carried out under the general control of the Resident in Mysore, Barry Close [49 n.12], who directed that "a minute survey of the boundary of the Territory belonging to the Rajah of Mysore" should take first priority².

The survey of southern boundary eastward from the Gazalhati Pass had already been allotted to Thomas Sydenham [I, 194], but as his health had broken down, Mackenzie asked Close that Warren might replace him;

Lieutenant Warren of 33rd Regiment, who is here now, & well known to Colonel Wellesley, is desirous of being employed in the Mysore Survey. Tho' my own opinion is that the work would be sooner completed by several Surveyors working in concert, ... yet I do not wish to propose this till I am favoured with your sentiments, as probably the additional Expence might not be approved of. But he might be employed on the business which Mr. Sydenham was to have executed³.

Close supported this proposal.

as the business of surveying is laborious and particularly severe on the constitution, and as dispatch is desirable in perfecting so great an undertaking⁴.

Hampered by ill-health, Mackenzie spent several months at Madras making preparations and collecting instruments, equipment, and staff, and formulating a detailed programme. After consultation with Close he submitted on 5th January 1800 an elaborate *Plan of the Mysore Survey*⁵.

The *Survey of Mysore* should embrace two great leading objects, *Mathematical* and *Physical*. ...

The *Mathematical* Part including a Geographical and Geometrical survey will comprehend;

1. A *Survey of the Frontier and Exterior Boundaries of Mysore*...according to the Treaty of Partition of June 1799. ... The ascertaining with some precision the boundary and line of demarkation between the Rajah of Mysore, the Nizam, and the Mahrattahs, is necessary to be attended to early, in order to avert, or clear up, any difficulties...from the intermixture of

¹Minute by Lord Mornington; MMC. 4-9-1799; cf. Secretary's letter, DDn. 63 (3). ²DDn. 68 (169), 21-11-1799. ³DDn. 41, 14-11-1799. ⁴DDn. 68 (169), 21-11-1799. ⁵MMC. 11-2-00; see also BM Addl MS. 13659 (227).

inferior Divisions, from parts of Talooks or Purgunnahs being sometimes insulated...from their ancient Cusbas [103]¹. ...

The new Boundary also, with our Provinces of *Coimbatore*, with that of *Malabar*, our new possessions in *Kanara*, the *Koorg Rajah*, and our new *Western Boundary*², ... all require investigation and to be previously fixed. ...

2. A Series of *Primary Stations* to be obtained throughout Mysore in all its extent, for which the Country, from its numerous Peaks and Hills, many of them remarkable for the buildings upon them, is peculiarly favorable, forming a series of Triangles connected by *Bases* to be carefully measured, ... and joining the Surveys already executed in the *Malabar Province* on the west [I, 131-2] with that of the *Baramahl* on the East [I, 114 II, pl. 11], will form the ground of a work mutually illustrating, and correcting, the labours of the several surveyors employed afterwards on the several portions of the Country in detail (see 3), and from the combinations of the whole with those on the *Malabar* and *Coromandel Coasts*, will be materially useful in extending the result not only to both Seas, but, by following the same plan to the Frontier North and South, will lay a foundation for obtaining a more correct system of the General Geography of the Peninsula. ...

3. On this...foundation the Country in detail is to be laid down. The Position of every Town, Fort, village, ascertained by correct bearings of the *Primary* or *Secondary* stations, a register of which should be preserved for reference and verification afterwards; beginning with the parts next our frontier, and proceeding in succession to embrace every individual plan, carefully remarking all the rivers and their courses, the roads, the Lakes, Tanks, Defiles, Mountains, and every remarkable object, feature, and property of the Country.

In this manner, by laying down the smaller Districts or Purgunnahs and their respective boundaries in detail, the limits of the greater Divisions will naturally follow. ... *Mysore Proper*; ... *Sirah*, ... *Coimbatore*, now wholly belonging to the Company; ... *Chittaldroog*, *Bednore*³, or what is above the ghauts; *Canara*, or rather that part of the ancient Country so called, and laying on the Sea Coast, with the Lower Part of *Bednore* and *Soonda* [I, 131 II, 96-7, pl. 11]. *Soonda*, *Harponally*⁴, *Anagoondy*, ... ceded to the *Maharattahs* or *Nizam*, or still occupied by our troops, may be eventually included. ...

The Provinces of *Coimbatore* and *Canaru*⁵, being wholly ceded to the Company, may perhaps not be understood to be included in the survey of the *Rajah's Territories*, but...they ought undoubtedly to form part of the general system.

4. The situation, Extent, Figure, and contents of the Country in all its Divisions being thus obtained. ... the position of the principal points ought at the same time to be corrected by *Astronomical* observations connected by a series of triangles. ... This branch might be executed by persons expressly employed for this purpose, acting in connection with the general survey, and duly communicating its progress; the corresponding observations being also regularly transmitted to the observatory at *Madras*. ...

5. But another important Branch, a *Land* or *Agricultural* survey would be equally desirable. ... It would include the Divisions of the lands into Hills and Mountains, plains and valleys, cultivated and waste, the species and quantity of each kind of cultivation; the Revenues, allotments of Land, also the water works, canals, reservoirs, and a number of objects connected with these. ... But whether the time and labour required for its execution could be spared from the immediate calls of the other deserves consideration.

II. *Physical*. This Branch includes all remarks, facts, and observations, that can be conducive to the improvement of *Natural History* [113-5]. ...

Particular Branches. 1. Botany, Mineralogy, Medicine. ...

2. The Diseases, medicines, remedies, etc. ...

3. The air, climate, seasons, periodical rains [105].

4. Soil, its produce, modes of Cultivation, water works, tenures of land. ...

5. The various descriptions and classes of *Natives*, their customs, languages, manners, etc. ...

6. *Animals*, wild and tame. ...

7. *Revenues* and *Population*. ...

Mackenzie asked for the employment of

at least four surveyors on the detail of the whole country, but as the expence of such an Establishment might at once be deemed too great, ... it might be sufficient to employ, for the first season, the number of Assistants already appointed for this purpose; I have however little doubt that the employing several competent surveyors at once would be ultimately found more satisfactory and economical. ...

¹ Headquarter town. ² of the Carnatic. ³ Mysore, 57 D/11; Sirah, 57 C/14; Chittaldroog, 57 B/8; Bednur or Nagar, 48 O/1 see pl. 11. ⁴ Harponahally, 48 N/13. ⁵ Had been annexed by Haidar Ali [I, pl. 9].

In addition to the duties involved in that of the General Superintendency of the whole, the particular survey of the Frontier, perhaps of some Districts, and many details of arrangement, ... it is proposed that the Superintendent dedicate as much of his time as possible to institute a series of Enquiries into the *Statistical History* of the Country [2, 107, 111]. ...

It is to obviate any doubt of the practicability of this plan...that I have delineated, at a length requiring some apology, the mode that I would propose for carrying on these surveys, by a succession of persons working in concert, ... as being less liable to interruption from the casualties so often detrimental to Indian Surveys.

In laying this before the Resident, Mackenzie recommended that the *agricultural* survey "should be executed separately after the first part, or else we run a hazard by undertaking too much at once, of retarding and confusing the whole", and indeed this part was never carried out [184].

He continues ;

I propose to send Mr. Mather up to measure a Base in some convenient place this side of Bangalore, which will serve to connect the angles and stations he will be directed to establish in the Ballaghaut¹ with those already taken in Barramahli, and, after extending those so as to embrace the chain of hilly country dividing Seringapatam from Bangalore, and fixing a Series of Primary points in that tract, from the Cavery North to the parallel of Nundydroog², ... a country well adapted for these operations by its remarkable points and Peaks, he will next proceed to survey that Portion of the country in detail, ... so that we may expect in one Season, if not interrupted by unforeseen accidents, to have this completed by him alone ; after which the tract extending thence West to the Ghaats may be undertaken. ...

I propose...myself...examining the Northern parts...circuitously round to the Bednore side, as soon as my state of health and the approach of the dry season will permit. I am more desirous of going myself into this part of it, as it connects with the Surveys I have seen carrying on in the Nizam's Country, and the mutual boundaries of both will require early illustration in these parts ; my anxiety would have induced me to enter on it immediately, did not the earnest advice of the Medical gentlemen and common prudence weigh with me to postpone the attempt for some time longer, for tho' my health is considerably recovered, and my complaint removed, a relapse would be not only dangerous but entirely overthrow the Plan of this Survey, so far as my slender tho' earnest exertions might be hereafter required³.

A month later ;

I have waited some days to acquaint you of my sending off Mr. Mather, the Board having approved of the Establishment proposed for him and Mr. Heyne and, the several Indents for Instruments, Camp Equipage, and Lascars, being now countersigned, I hope in a very few days to acquaint you of his proceeding towards Mysore. ...

I am fully occupied here in a manner that I hope will conduce to the accuracy of the Survey and will enable me to enter upon it better prepared, so that the Northern Frontier, and perhaps the Circuit of the whole, may be taken by myself in less time, by being previously informed of the districts thro' which it will run, and this will be more necessary as it may be liable to alterations before it forms a *permanent Boundary*. ...

Neither the state of my health nor the season could admit of my proceeding earlier, and all the Arrangements of people, Equipage, and Instruments, which always take too much time here, will be in the meantime effected, besides much done in digesting a body of Preliminary Information on so extensive a subject⁴.

In due course all preparations were completed ; Mackenzie, with Mather and Warren as surveyors ; Dr. Heyne, in charge of botany, mineralogy, and natural history ; several boys from the Observatory Surveying School [343] ; lascars, artificers, and all necessary equipment and instruments ; the first completely organized survey expedition to take the field in India.

Mather and Warren, forming the first contingent, left Madras early in February 1800.

FIRST SEASON, January to October 1800

"On 25th January 1800", writes Mackenzie, the General Plan of the Objects and method proposed for executing this survey was sent in

¹The Mysore Plateau [1, 244]. ²57 G/11. ³DDn. 41, 9-11-1790. ⁴ib., 5-12-1790.

to Government and approved of, as were the measures previously proposed for employing two Assistants, Messrs. Warren and Mather, who were instructed in January 1800 to commence the Survey in Districts nearly adjacent to each other, to the Barramah already surveyed, and to the Eastern Frontier¹. ...

It was the 10th of March before I could leave the Presidency in a state to undertake the survey, originally owing to bad health, but latterly to the necessity of making preparatory arrangements. Immediately before I left Madras, receiving intimation² recommending the survey of the boundaries of the Soonda, & of the Rajah of Mysore's territories with the Mharattas, as a primary object, I determined to proceed directly through Mysore towards the North West point, there to begin with the exterior frontier.

On the way I visited Seringapatam from Bangalore during April to arrange various details, and eventually left Bangalore on May 8th³, reaching Chittledroog on May 21st⁴.

To help in his general survey, Mackenzie secured the help of James Colebrooke, commanding the Corps of Guides at Seringapatam, and he writes to Wellesley just before leaving Madras ;

I some time ago received by the Post a Copy of Captain Colebrooke's Plan of the marches of the Army [122]. ... I should long since have returned you my acknowledgements for this additional proof of your remembrance, had I not thought you would be better pleased at the same time to know of my being on the point of commencing my Journey. Tomorrow my Tents will be off, and I follow next day. ...

I suppose it will be necessary to have a respectable Guard in this situation, and I presume the Resident will take every measure for procuring me the assistance the country and its managers can best afford ; but I beg to suggest to you the expediency of giving some intimation to the Commandants of the military Posts to give me every assistance. ...

I proposed to Captain Colebrooke to send some of his guides with me ; ... I hope your permission will be granted for his detaching any two he chuses, to meet me at Bangalore or its neighbourhood⁵.

To Colebrooke he wrote ;

What I propose is that the confidential person you send, with as many guides with him as you can conveniently spare (suppose two), should keep a field book, for your use, of the roads they travel along with me, or near me. ... You will by this means have the results of their Journey added to your stock of information, and I shall derive immediate assistance from their talents⁶.

This general survey of the roads was extended by Mather and Warren, and copies supplied to the Quartermaster General⁷ [103, 104]. In his first report to the Governor, Mackenzie writes ;

The Survey of the Roads, Passes, & Objects interesting in a Military & Geographical light, I began from Conjeveram⁸. I do not now accompany these with Tables of the distances ; ... they will...follow...with a General map of the Roads. It were to be wished that the Surveys of the Roads effected for some years back with our armies were arranged on this, or some other, uniform method, which would make them more useful for reference on the march, & for encampments. ...

Though the partial Surveys of Fortresses, or Posts, was not part of my original Plan, as I apprehended it might interfere too much with the proper objects of this undertaking, I ventured to depart from this rule in a few instances⁹.

Wellesley was at this time commanding a large force on the north-west borders hunting down a Marātha freebooter named Dhoondia and, writes Close ;

Anwutty¹⁰ and the Southern parts of Soonda have been lately disturbed by Robbers who possibly belong to Dhoondiah, and this Free-booter, by the latest Accounts, lay with a considerable number of Followers on the Northern limits of the Savenore Province. At present we have a large Detachment at Hurryhur, and we shall soon have a Battalion at Honelly¹¹.

I would recommend therefore that you carry forward your Survey to Hurryhur, and proceed as circumstances may permit. ... The propriety or otherwise of your crossing the Toombuddra¹²...must be determined by the State of the Frontier at the moment, and the Escort which the Hon'ble Colonel Wellesley may be enabled to furnish you with.

¹ DDn. 42, View (8). ² From GG in C. to Mad. ; MMC. 4-3-00 & DDn. 68 (34), 4-2-00. ³ MR(O). map 212, Boundary of *pariyana* Bangalore, surd. by James Ross, April & May, 1800. ⁴ DDn. 41, 11-10-00 ; Report to Governor, Madras. ⁵ DDn. 41, 7-3-00. ⁶ DDn. 68, 12-3-00. ⁷ DDn. 41, 17-0-00. ⁸ 51 P/9. ⁹ Report (14-5) ; DDn. 41, 11-10-00. ¹⁰ Anwatti, 48 N/2. ¹¹ Savenur, 48 N/5 ; Haribar, 48 N/14 ; Honnali, 48 N/12 ; see pl. 11. ¹² Tungabhadra R., 48 N, 57 A, E.

Was the Maratta Territory on the North Western Frontier under a regular Government, it would be very desirable that the line of Boundary should be laid down in the presence of Persons appointed for the purpose by the two Governments respectively, but at the present the Savanore Province is extremely disturbed. Appah Sahib, the Maratta Chief, to whom it seems to belong, cannot give it protection or reduce it to any fixed Form of Government. ... Under such circumstances I conceive it may be most advisable to lay down the Boundary as it may be ascertained from the Reports of the Revenue Servants, and an examination of the Territory accounts¹.

Mackenzie replied from Harihar² ;

I was advised by the Hon'ble Colonel Wellesley of some parties of Banditti having entered the Soonda Country ; who cautioned me against proceeding into that district, as a sufficient escort could not in these circumstances be afforded. I therefore awaited his arrival to accompany him to this place, but my illness in the meantime intervened. In conversation I then had with him, he was decidedly of opinion that the Survey of Soonda could not at this time, with any regard to prudence, be attempted, & the nature of that Country at this advanced season rendered it still further improper to hazard the health of the whole party³.

During July he surveyed the boundary along the Tungabhadra between Honnali and Harihar, reporting to Wellesley ;

The Rains setting in very severely, I found it necessary to lay aside that design [the survey of Sonda] for this season, as it would be dangerous to health to go among the Jungles & hills in this wet weather. The river was much swelled & rapid for 3 days, & [I] took the first favorable interval to retrace it. I am now tracing another route back to Hurryhur, where I propose carrying on the Survey of the frontier till that of the Mharattas & Nizam's meet. ... By the accounts of all the Amildars, the country was perfectly quiet from Anawooty Southward. ...

I propose to send in to Government a Report or View of the Progress already made when I have done with the Mharatta Boundary and, as I have much writing to copy off in triplets, ... I have most earnestly to request the favor of your intercession with Colonel Montresor⁴ to permit me to retain the man I have got from the 77th Regt.⁵, at least till I effect this. It is of some import to the speedier Progress to have these reports made up soon, as my Enquiries into the State and History of the Country increase every day, along with the other objects of the Survey⁶.

He writes to Close from Harihar :

I returned here yesterday after surveying the Boundary of the Rajah's Districts with those of the Mharattas...as far up as Honelly. The Toombodra, which in fact forms the Boundary so far, having risen very high & overflowed the numerous ravines running from it, rendered the Survey very tedious, as I laid down every village &c. on either bank, & paid a minute attention to the rivers⁷.

Whilst held up at Harihar by the rains, Mackenzie measured a base-line ;

This situation being also favourable to establish some foundation for correcting this survey, ... I availed myself of the nature of the ground, the favourable weather, and the well defined points (many surmounted by buildings), to have a convenient base measured with some accuracy, extending 4,400 yards, and permanently marked by stones firmly inserted at each extremity [105, 204].

In this work, which is so necessary to all Surveys, ... I derived considerable assistance from the Industry and Assiduity of Ensign Arthur, who joined me at Bangalore on 27th April, & has ever since assisted, along with me or detached, on the more active duties of the Geographical Survey, and in taking observations to ascertain the correct positions of the different places. ...

I had early commenced an Enquiry into the Extents, Limits, Subdivisions, Population, and Productions, of the several Purgunnas we passed through⁸.

He halted at Harihar till October, when he sent Government a full account of the work up to date, including that of Mather and Warren to the south-east ;

I had it in view by this Survey to obtain a detailed knowledge of these tracts, usefull to an exact adjustment of Frontier with Mysore on that side ; for though these districts had been repeatedly traversed by our Armies & were always the first scenes of our operations in Mysore, the internal Divisions & Boundaries had not been noticed. ...

¹ DDn. 08 (201), 27-5-00. ² Well-known to air-surveyors of 1844. ³ DDu. 41, 1-7-00. ⁴ Sir Thos. Gage Montresor (1774-1853) ; Eng. 18th Foot, 1780 ; comdg. Poona Subsy. Forc. 1800-13 ; Gen. 1841. ⁵ Private Haslam of E. Middlesex Regt. ⁶ DDn. 41, 26-7-00. ⁷ ib., 1-8-00. ⁸ ib., 11-10-00.

Mr. Mather's health being unfortunately injured by his former labours of this kind, though he had proceeded up in January, it was far advanced in the season before he could begin; he, however, by his Industry & experience was enabled by the 7th of August to send me Plans of the Districts of Osoor, Bangalore, Ankusgeri, & Solagery, being a Survey comprehending every village & the Boundaries within a space of nearly 490 square miles¹.

Lt. Warren also entering on the tract committed to him early in February commenced his Survey by measuring a base of considerable length on a regular systematical Plan, and by the last Report from him had, after completing it and establishing his Stations, very nearly completed a Survey of the Purganna of Oseotta².

In acknowledging this report and sanctioning his various requests, Government desired Mackenzie to issue such orders relative to the details of the Survey, as you shall think calculated to extend the sphere of information, and to combine the whole subject in a comprehensive and distinct view³.

SONDA⁴, 1800-1

When in July 1800 Mackenzie had found himself prevented by the campaign against "Dhoondiah Waugh" from surveying the frontier between Sonda and the Marātha district of Savanur⁵, he obtained permission for the survey to be taken up from the other side by Johnson of the Bombay Engineers, then stationed at Goa [156], and wrote to him from Harihar [95] ;

The Survey of the Frontiers with the Mharattas was particularly recommended by the Supreme Government to be first attended to; in compliance with this I came here; ... but as...your situation particularly qualifies you for more conveniently executing the detailed Survey of the Province of Soonda, Upper and Lower, ... I think it would be a proper object for you to attempt, as well as the Portuguese Territory, as soon as your health and the weather would permit. ...

I always supposed the whole of Lower Canara was to be executed by the Bombay Surveyors, and understood Captain Moncrieffe had been employed on the Northern Part [I, 132]. Let me know how far his limits extended.

I know Major Munro [158] wishes to have a detailed survey of Soonda executed in the same manner the Baranah was [I, 144], with all its interior Divisions, Boundaries, Villages, Tanks, & the quantity of land, waste and cultivated; you should therefore consult him, and by the time I have Colonel Close's reply you may be able to make your application. ...

You will observe that the Survey of the Frontier is not merely a military one of the roads, but takes in the actual Boundaries, Land Marks, and Divisions of the Countries on both sides, and perhaps it may be therefore desirable to have it continued on the same Plan by one person; but as I have sufficient work afterwards to occupy my own, and my assistant's, attention in Mysore, my private opinion is that a Surveyor would be usefully employed to execute the whole of Canara, Soonda, and the Goa territory (while we have the latter in our power)⁶.

By November Johnson was placed under Mackenzie's orders⁷, and given the following detailed instructions :

You will as soon as possible proceed to Survey the District of Soonda above the Ghaats. As the Frontier with the Mharattas...is considered one of the first objects to be attended to, I hope you will be able to commence with it in the first place, from where it connects with the Portuguese territory of Goa, or the Lower part of Soonda, till it touches the Bednore District⁸ near Anawooty. The parts of Soonda below the Ghaats may become an object of the Survey afterwards. ...

After laying down the Exterior Boundaries, you can next proceed to that of the Interior, in the course of which you will have opportunities of inserting the several Cuhals, Forts, Villages, the Roads and Rivers with their courses, the Ridges of Hills, and every object interesting on a Geographical or Military light. To forward which you should previously get a List of the Villages in each District from their respective Amuldars. ...

¹ Hoshur, 57 H. 14; Ankisigiri Drug, Sulagiri, 57 L/2; Map, MRIO. 134 (1), one-inch scale. ² Hosote, 57 G/10; 1-inch map, MRIO. 147 (16). Mackenzie's Report (19-21), DDn. 41, 11-10-00; BPC. 26-7-04. ³ DDn. 68 (30), 9-2-01. ⁴ see pl. 11, *Soonda*, now N. Kanars; *Imp. Gaz.* XXIII (82). ⁵ pl. 11, Sanour. ⁶ DDn. 66, 7-7-00. ⁷ DDn. 41, 16-11-00. ⁸ now Shimoga Dist. 48 N/SW.

It is not my intention to enter into the detail of the manner in which the Survey should be executed, such as measuring a fundamental Base, taking observations for the Latitude and the Azimuth, selecting Primary Stations, etc., as your own experience in this line will point out the measures best adapted for executing it. ...

The Scale used for our Provincial Maps is that of one mile to an Inch, which adopted by you will render the connexion more convenient. It will be usefull also to fix and notice such points and places within the Mharatta bordering Districts as can be conveniently done, and without retarding the Primary object, the Survey of the Frontiers¹.

Unfortunately, after only about a month's work, Johnson was called away for engineer duties, and the survey of Sonda was left for a more favourable opportunity [158].

SECOND PERIOD, October 1800 to January 1802

Starting out from Harihar on 12th October 1800, Mackenzie continued triangulation and survey eastwards towards the mountainous tract of Sandur², following the Outward Boundary of the Mysore Dominions with that of the Nizam, taking therewith an Actual Survey of the Districts contiguous to that line. To favor dispatch, a communication was opened with the Managers of the Nizam's Southern Districts, which soon after became unnecessary by their Cession [I, 119 n.3, 152]. ...

The Northern Survey was of itself sufficiently equal to our utmost efforts at this particular period, when...the Country under Survey had been but recently reduced, & had nearly then been the scene of new commotions, but for the Active Movements of the Army; beyond the neighbouring River [Tungabhadra] its nature wild & Mountainous & little known; & the season of the year adverse to our operations. ...

As our Party was yet efficient, I had sanguine hopes by the conclusion of the Rainy Season to have surveyed round the Northern Extremity of Mysore, whence its Extension to the Southward was esteemed less liable to obstructions. ... This opinion is sanctioned by the completion of 56 Purgunnahs surveyed, in addition to the most material part of the Boundary. ...

The Party on the Northern Survey consisted only of one Assistant (Ensign Arthur of Engineers), one young man from the Surveying School [James Ross], and an Establishment which...was but barely equal...to the incessant demands...in a wild Country at 400 miles generally from the Presidency, & with few resources but what we had with us. ...

The irregularity of the line of Boundary separating Harponelly [pl. 11] from...the most northerly of the Rajah's Districts...obliged me to spread the Party repeatedly to effect the Survey sooner, reserving to myself, with most of the Outward Frontier, the Investigations of the Country³.

The Boundary, turning North, ... enters among a wild country composed of several ridges of Mountains. I was thus forced to grope my way in this wilderness composed of the wildest combination of naked rocks & rugged hills (separated by unprofitable Jungles), whose aspects were constantly varying, or their view intercepted by new points & peaks, presented so frequently & so differently in their appearance, that repeated journeys were necessary to select & define Points that, after much labour on tryal, were sometimes necessarily changed for more convenient stations⁴. ...

All these parts are separated and divided in such an irregular manner by this uncommon ridge (in the bosom of which is Sundoor...) as to render it much more troublesome and tedious than I could have foreseen; but this & ill-defined state of the Boundaries rendered it...more necessary, while we were in the vicinity, to bestow some attention to it for once⁵. ...

By the Beginning of December every object of the Survey was completed from Honelly to the furthest Extremity of Mysore North, excepting Goodicotta, & after carrying on the Series of Angles to...the Fort of Herrial⁶ beyond the Boundary...Mr. Arthur parted, to carry on the Survey of the remaining part of the Boundary between Goodicotta & Harponelly⁷.

The whole party was now overwhelmed by sickness;

On our separation at Herial [December 13th], a Cursory Survey was carried by me thro' the valley bordering on the Soondoor mountains on the NE. to the Toombodra at Camlapore⁸, ... when...the increase of the Sick...frustrated every attempt for a time. ... I was not myself

¹ DDn. 60, 10-11-00. ² 57 A/12. ³ Report to Govt. DDn. 42, 12-7-03 (3-6). ⁴ DDn. 42, Memoir of Survey (15). ⁵ DDn. 41, 24-12-00. ⁶ Hirehalli, 57 B/10. ⁷ DDn. 42, Memoir (22). ⁸ Kamalapuram, 57 A/7.

exempted from the general malady, tho' seldom in a degree that prevented the necessary attention to my duties & the state of the Sick.

Removal from an unwholesome air was at this time judged expedient ; but, reflecting that the Sickness general throughout the Upper Country from Soonda to Seringapatam had already affected the Survey in other Quarters, & the danger ensuing to the Work if relinquished in this Stage, I was deterred from proceeding to the Coast, tho' earnestly recommended by different Medical Gentlemen ; the time requisite for such an Extensive Journey, & for collecting a New Party (the unavoidable consequence of the natives visiting their families under this discouragement) would have temporarily suspended, & in all probability prevented, completion altogether ; while by remaining to encourage them & by removing to more healthy situations there was a probability on the commencement of the Hot Season of resuming the operations with more effect.

In this State the total want of Medical aid added much to our distress [360], & I was repeatedly obliged to apply to Chitteldroog & to the Camp in the Ceded Districts for Medicine ; nor were we relieved from this embarrassment until, by the humane solicitude of General Campbell¹, casually apprized of our situation, a Surgeon, Medicine, & Conveyance, were sent from Gooty² for the relief of the Sick, which enabled us to carry them to Rydroog³ in the beginning of February⁴.

Mackenzie writes to Lambton in January ;

I was labouring hard when we were entirely deranged, first by the illness of Mr. Arthur, and then of 17 of my party in one day : of late however the worst is over, only that his weakness will deprive me of Mr. Arthur's aid for some weeks⁵.

and to General Campbell, commanding troops in Ceded Districts ;

I hope soon to terminate this troublesome job, tho' I labor under great debility owing to 10 months incessant labour after the shock my constitution had last year, and I now have this general weakness in consequence.

On reaching Rydroog I have next to Survey the irregular Boundary of the E. side of Chitteldroog. ... Sera, and then from near Ruttingherry turn E. towards Hindooporam⁶, and the S. Boundary of Nundidroog, and perhaps closing at Amboor, where I began in March last year. I expected at one time to have completed this (about 300 miles of Boundary), besides the Investigations of the Country, before the end of March, tho' I am now doubtful, alone and unsupported, if I can do it in that time : the construction of the Maps and Details of the Country are next to follow, so that I have a very audacious task to perform⁷.

Arthur went down to the Coast in February, and after working eastwards to " a labarinth of rocky Mountains " near " Nidigull and Mudgery " [pl. 11], Mackenzie brought his triangles back to Chittaldroog by the middle of May ;

After a stay of 33 days at Chitteldroog, which was barely sufficient for the repairs of a decayed Field Equipage, replacing the Cattle, & various necessary articles wanting after a journey of 15 months ; some respite of rest to our harassed Party, & the relief of the Guard, exclusive of the time required for the Investigations of that Country, its Divisions, Boundaries, etc., ... I proceeded (June 28th)...to the Westward, having previously removed to Serah, as the next central point of operations, the Stores and Necessaries not immediately in use⁸.

The greatest Part of the Province...of Chitteldroog, comprising...3,850 Square Miles, being surveyed by means of the Triangles now established, the further extension of these to the W. and SW. became necessary for closing the whole ; to effect this a Journey to the Westward... became necessary. The approach of the Rainy Season hastened our departure, as the severer falls of rain might effectually preclude any attempt for several months if not taken at this time, while the Eastern side, being supposed less obnoxious to that inconvenience, could be taken with more safety thro' all seasons generally.

From the 28th June to 30th July a Series of Triangles were extended, connecting the former stations of Chitteldroog, ... running to the Southern Extremity of the Chitteldroog District. ... In consequence of the Foggy, Cloudy, Weather incidental to this Season, that (enveloping the higher summits of the Mountains in Vapors seldom dispelled till late in the day, & then only partially) obstructed distant Views of the most eligible Points, ... I did not... attempt to take more than were requisite for a detailed Survey of the Western Part of the Country & Boundary, in a manner admitting of correction afterwards...in more serene weather.

¹ Dugald Campbell (1742-1809), Mad. Cav. ; Comdg. in the Ceded Distrs. 1800-3. ⁵⁷ E/12. ⁵⁷ B/14. ⁴ DDn. 42, 12-7-03 (10-1). ⁶ DDn. 66, 12-1-01. ⁷ 57 G/0 ; 57 G/11 ; 57 L/0. ⁸ 26-1-01, DDn. 66. ⁹ DDn. 42, 12-7-03 (24).

The rain becoming still heavier, & sickness again appearing among our party, I proceeded Eastwards...to Heroor [July 29th], situated in a more open Country & Salubrious Air, between Serah & Chitteldroog, where we arrived on 30th June. ...

While the Quarters of the Party remained Stationary at Heroor for 29 days to promote the recovery of the Sick, & to bring up the Drawings & other combinations of the Survey, which by the late rapid execution of the Field Work devolving upon one person singly had considerably accumulated on my hands, repeated excursions were made in different directions ...to Survey the remaining parts of the Provincial limits of Chitteldroog. Connecting Stations were established on...the first of the Points fixed in Major Lambton's Survey that we fell in with [117-8]¹.

Being joined at Hiriyr by Heyne and Arthur, Mackenzie proceeded Eastward...to carry the Triangles...to the banks of the Pennar, whither Mr. Mather was to carry his Survey to a common point of Junction, but this design was again interrupted by the serious illness of Mr. Arthur. After extending the Stations...to Mudgerry...I went into Serah on the 8th September to arrange measures for effectually closing the remaining part.

The approach of the N.E. Monsoon...spreading generally to this part of the Country left me no time to lose, & as the care of the Sick had already retarded more active exertions, the Assistants & some of the followers in a state of Convalescence under the care of the Surgeon were left at Serah, while I proceeded with a party barely sufficient for the necessary operations, and a reduced Field Equipage. ...

Between the 29th of September & the 7th October the Boundary...was surveyed round Mudgesy; thence E. & S.E. to its termination...on the Pennar, where Mr. Mather, after surveying a great part of Greater Ballapore, met me. ... Part of the line carried by me at this time thro' a tract extremely Mountainous & Jungly, tho' only about 25 miles in a direct distance, was 71 in the measurement of the Boundary; on the whole of this Journey I travelled 158 miles before I reached Pennaconda on the 11th October, to proceed to survey the District of Paughur [pl. 11]. ...

The Survey of the Paughur District & part of Nidicull was then begun; ...—frequent rains—We were fortunate however to close that laborious part round the Mountains to the Pennar again...by the 9th of November. ...

After a detention of 3 days at Paughur by illness, I was barely able...to close on some small insulated Tracts...belonging to these districts, ... after surveying on this Journey 241 miles & 40 yards from 30th September to 16th November². ... After this harrassing Journey of 48 days in the rainy Season, in constant movement with few halting days, ... we returned into Serah (November 16th 1801) without any Sick (my own case excepted). ...

Tho' we had escaped from any ill consequence at this time, the Party...naturally looked forward to some relief from a severe duty, that...gave them some claim to that respite, which might have been equally beneficial in the reduced State of my own health. ... But in this State of the Survey...it was due in justice to our Employers, and I may add to our credit, that it should be closed with all the accuracy then possible to give, to join the Extreme Stations of the Northern & Southern Surveys, to verify both Bases by a re-measurement at Ballapore³, & to fix the Principal Points of connection on the Western & Eastern Lines of Primary Stations, which the heavy weather of July had prevented; ... for which two different and distant journeys were necessary, tho' at the hazard of further personal exertion & risk of health.

Mr. Arthur's health being still precarious, and not equal to the more exposed duties of the Field, he was directed, ... to close the connection with the Base at Ballapore, while I proceeded by Chitteldroog...& thence extended the Stations to adjust that side of the Series, ... & I proceeded thence to Seringapatam (December 3rd)⁴. ...

From the 3rd to the 15th December, by travelling fast (but under repeated returns of the Ague), I was enabled to take the Stations that were wanting to complete the Series. ... The Serenity of the weather & clear unclouded Sky at this Season enabled me to obtain from the Summit of Cottaell a view of Nidicull so much wanted, and which alone rendered the Journey necessary. ... I proceeded to Seringapatam & then to Ballapore, where on the 5th January Messrs. Arthur & Mather had completed the re-measurement of the Base before my arrival⁵.

The following are Mackenzie's instructions to Arthur for the re-measurement of Mather's base at Ballapore [205-6];

¹ DDn. 42; Memoir (29-34), 25-5-03. ² ib. (36-41). ³ Dod-Ballapur, 57 G/11. ⁴ DDn. 42, 12-7-03 (27-8). ⁵ ib. Memoir (46).

Wishing to close the Work...with the greatest accuracy it can admit of, so as to enable the continuation of it to be readily taken up from the Extreme points of this Survey, I propose taking a circuitous journey of a few days to connect the Western part with the Northern and Eastern points, which are separated by the Western ridge of hills, ... after which I propose going to Seringapatam on business.

As I am desirous in the meantime to connect the furthest points of our Survey here with that carried on from the South by the other Survey, and that the re-measurement of Mr. Mather's base...will be useful, not only for a verification of the Triangles carried on from Hurryhur, but for connecting the whole of this work, and also serving as a base to extend the Surveys then to the westward; and tho' your lately recovered state of health does not appear to warrant your immediately going into the more laborious duty of the detailed Survey, yet, as you seem to think you can without risque take such Stations as are necessary for the connection with the base, I have to request, in your Journey South towards Nundydroog, that you will take such as conveniently lie in the way, ... until you can connect this point with the base near Ballapore¹.

There was indeed a further reason why Mackenzie was particularly anxious for his work to reach the highest standard possible, and that was his desire for it to prove well when connected to Lambton's triangulation, which had started early in 1801 [3, 118]. There had been some mention of a discrepancy between their measurements, and Mackenzie writes to Arthur;

I send in purposely for your perusal a letter from Captain Colebrooke, where you will see a very clear and gentlemanly statement of what passed at Bangalore regarding an error of 24 miles imputed to my measurements; I had applied to him for a comparison of our measurements, and you will observe how they agree. ...

The Angles I take now...may possibly correct these, or reduce this distance, which I imagine has grown up insensibly. ...

A base at the termination will be necessary to correct it as much as possible, and I have thoughts for this purpose of measuring that taken by Mather not far from Mudgery, because it answers the double purpose of connecting the whole of the Surveys of the East side together. ... Then the Correction of Lambton's may be applied in general, as intended in the Institution of that work [234].

Lambton proposes still to measure two Bases from the Coast to his present; he is also directed to remeasure his first base for greater accuracy and verification² [256]. ...

I am truly glad that matters are in such train for measuring the base; at present I do not consider it of that importance as to require much time, as the angles taken from it agree so nearly with those of Lambton's base; but it will be useful to measure it once or twice to satisfy all parties; and if any time hence it should be judged necessary, another might be taken more deliberately in the hot dry season, clear of the inconvenience of water, etc³.

Arthur's account of the measurement of this base is given later [205-6], as also is Mackenzie's comparison of the closing between the different sections of the triangulation [207-8].

Meanwhile Warren and Mather had been making good progress to the south, working on technical instructions issued from Harihar in October 1800 [97, 211].

Mr. Warren had completed Ooscotta and Junguncotta, and was directed to survey Colar [pl. 11]; and Mr. Mather had, after completing the more Southerly Districts of Ruttingury and Denkanicotta, been obliged to suspend that of Alambaddy next extending along the Cavery, from the unhealthiness of the season and country. I had therefore directed him to survey Ballapore, Donelly and the North East Districts south of Mr. Warren's, with a view of sooner concluding by their united labors the whole line of exterior boundary with the Districts adjoining, by the time I estimated to connect our operations on the Pennar River⁴.

In October 1801 Mackenzie wrote to Warren;

Having lately united my survey of the Boundary with the Ceded Districts⁵ with Mr. Mather's survey in Burra Ballapore District, I have directed him...to extend that of the Outward Boundary round...till it meets the Outward Boundary of Colar Purgunnah. ... I recommended him to acquaint you, that you may be able to effect a meeting with him for uniting your two Surveys of the Outward Boundary at some landmark, as done lately on the Pennar⁶.

¹DJn. 06, 3-12-01. ²ib., 12-10-01. ³ib., 18-12-01. ⁴Mather's Memoir, 1800-1, MRIO. M 116; Dn. 42, 12-7-03 (22). ⁵Map entitled "Survey of the Northern Division of Mysore, ... 27th. June 1800 to 15th Dec. 1801", MRIO, 132 (15). ⁶Pennar R., 57 G to 66 B.

As soon as your attention can be spared from the completion of the Ooscotta Map, ... you should turn your first care to the Survey of the Outward Boundary of the Colar Purgunnah, ... from the Southern Extremity till it meets Mr. Mather's on the North, leaving that of the Interior Country till this is first finished. By this means the Line of Outward Boundary will be completed from the Toombodra to near the Cauvery. ... Your Primary Stations of connexion may be extended at the same time from the furthest taken by you on that side to the Boundary, and to connect with Mr. Mather's [207]¹.

To both Warren and Mather he writes :

Being desirous that the Survey of the Outward Boundary with the Ceded Districts should be laid down on one Uniform Plan, I have to request, in protracting your part of it, that you will use the Scale of two English Miles to an Inch (that is, one half of that used for the Provincial Maps). The Extent of the whole Line of Frontier to be laid down on one Chart rendering this less bulky and equally convenient for that purpose².

On conclusion of his final trip to the west, Mackenzie left his assistants to carry on the work, and at the end of January 1802 returned to Madras ;

One Principal Object of the Survey being now completed (excepting a part of the Outward Boundary of Colar then in Progress, & soon after finished by Mr. Warren), including the General Line of Demarcation obtained by the Partition of 1799, from near the Cauvery at Alambaddy on the South towards the North near Bellary, & thence WSW. generally to the Toombodra near Honelly & the Borders of Belnore³, amounting to 795 miles in length (which had been only supposed 510), together with 24 Purgunnahs...wholly, & part of 20 more, surveyed, I made the necessary disposition to avail myself of the Permission you were pleased to grant me of proceeding to the Coast, after an absence of 22 Months on a duty that had with little remission of personal fatigue & incessant application, considerably affected a Constitution already impaired by a course of service of several years on the most detached & distant duties of this Presidency⁴.

THIRD PERIOD, January 1802 to October 1803

Mackenzie now spent more than two years at the Presidency working up his maps and reports, whilst the survey was continued by his assistants.

Warren completed his length of the eastern boundary of Mysore by January 1802, and completed the survey of Kolār District by July 16th⁵. During this survey he submitted an interesting report on the gold workings at Kolār⁶. He then went down to the Presidency to finish off his maps and memoirs, and was transferred to Lambton's survey in October.

Mather continued survey westward through the southern and central parts of Mysore, and was indeed the mainstay of the survey; on him devolved the important task of training the boys from the Surveying School [343-5].

Mr. Mather's Survey down to a certain period having been laid before you, it is only necessary here to observe that, having come to the Coast in August 1802 on account of his health, & in the time necessary for that purpose having arranged & completed the Memoirs & Plans of his Survey (in Triplicate), ... after re-establishing his health & equipment he proceeded up to Mysore. ... Having resumed the Survey on the 31st March, by his last Report of 12th June he had completed the Purgunnahs of Nellamunglum [pl. 11] Nidjigull, ... and some progress was made in Chinnaruidroog. ... He is further directed to extend it Westward to meet the Tract under Survey on that side extending along the Southern Boundary of Serah⁷. ...

His Maps of the first 11 Districts on a scale of 1 mile to an Inch & Memoirs and Registers of the same in Triplicate; with reduced Charts⁸ of the whole on a Small scale of 8 miles to an Inch, were sent...in November last, & his Work since that date contained in Plans of the last 7 Purgunnahs are also communicated⁹.

¹DDn. 41, 23-10-01. ²DDn. 41 & 40, 10-11-01. ³From 57 H/7, East and north by 57 K/11, west to 57 A/16, then south to 48 N/12. ⁴DDn. 42, 12-7-03 (30), & cf. DDn. 41, 27-12-01. ⁵Map, MRIO. 146 (32); Memoir, MRIO. M 115, & FD MR. 93. ⁶As AR. 1804 Misc. Tracts (1-7); JASB. III, Sept. 1834 (463). ⁷DDn. 42, 12-7-03 (47). ⁸Maps, MRIO. 133 (44-5), 147 (10); ib. 134 (3), reduction by Morison of Mather's survey round Ballapoor, 2 m. 2 inch, 1801-2. ⁹DDn. 42, 1-10-03 (18).

Arthur's work was much interrupted by ill-health ;

Mr. Arthur...was under the necessity of descending the Ghats again immediately on my leaving Mysore, under the Surgeon's Certificate, & finally to proceed to Sea for the recovery of his health, whence he returned in January last [1803], & has been enabled to resume the survey in Mysore on 20th March on the Purgunnah of Mailcotta [pl. 11] which I directed him to survey as not so immediately dangerous to health, & in pursuance of the plan of filling up the several Districts in succession, & in coincidence with the adjacent Districts proposed to be surveyed by Mr. Mather & Mr. Morison. ... The Actual survey of Mailcotta is reported to be completed on the 21st of last month¹.

By October 1803

he has Surveyed Mailcotta wholly, Kisanarajepoor including about 500 miles by estimation, & he is directed to go on with Periapatam & Narsupoor² [pl. 11].

Meanwhile Warren's place had been filled by William Morison³, who, after attending the Observatory and my Office here for some time to get acquainted with the nature of the operations, ... & being equipped with Instruments, &c., proceeded to Mysore in October last, where he commenced the survey of Nagmunglum and the Districts adjacent, extending North towards Banaveram⁴ (where I had terminated the survey in December 1801), and East towards the Tract whereon Mr. Mather is now proceeding ; my intention being, by taking up these tracts in succession by the Assistants, to accelerate the filling up of this space by several hands working at once towards the Centre, by which means the Country comprehended between the Northern Survey, Seringapatam, and Bangalore, would have been completed in a much less proportion of time, as the Fundamental Points bordering on three sides were already ascertained⁵.

Morison reached Seringapatam on 2nd November 1802 & Mackenzie wrote to him ;

I was happy to hear of your safe arrival at Seringapatam, & that everything has occurred so much to your satisfaction, and so favorable to the object of commencing your operations. Your choice of ground...for your commencement has been left to your own judgement, any where within the Districts pointed out for your Survey ; my suggestion of your Surveying the Road from Bangalore by Otradroog was merely from a view of getting it in addition, without losing any time in going after it ; but, situated as you are now, it can no longer be an object ; I have been accustomed to Survey roads in my passing to or from a place, & it was merely in that light I mentioned it, of taking it in the way had your Perambulator been up in time⁶.

Morison showed every promise of becoming a valuable surveyor, being a man of outstanding talent who eventually became a member of the Supreme Council, but he had only been at work about three months when he was recalled to his unit to take part in the Marātha War of 1803-6.

In July 1803 Mackenzie submitted his second General Report with maps and memoirs⁷. He estimated that, of the whole area to be surveyed, viz., 51,660 sq. miles excluding Coimbatore, about three tenths had now been completed ;

by himself,	7,400
Mather	3,741
Warren	2,071
Arthur	500
Morison	314
the Bombay surveyors in Kanara [I, 132] ..	2,000
Total	16,026 ⁸

The plans were submitted in triplicate, one set for the Resident, one for Government, and one for the Court of Directors, this last copy being lost in the *Prince of Wales* in 1804 [107].

The Plans are laid down on a Scale of a Mile to one Inch, chosen as the most convenient for the Provincial Maps, ... wherein...every object of importance, Political or Military, may be conveniently introduced ; these, collected at the end of the Survey into one Body or Atlas [112, 292], will at once preserve & furnish such Information as may be occasionally required.

The Memoirs are divided into two parts, naturally arising from the separate Management of the Countries under Survey ; viz. The *Company's* & the *Rajah of Mysore's* ; ... whence a

¹ DDn. 42, 12-7-03 (49). ² ib., 1-10-03 (27). ³ appointed 25-8-02. ⁴ Bānāvar, 57 C/3. ⁵ DDn. 42, 12-7-03 (50). ⁶ DDn. 06, 11-11-02. ⁷ DDn. 42, 12-7-03 & Report with map, BM Add MS. 13660 ; also DDn. 42, 26-5-03. ⁸ ib. 42, 1-10-03 (49).

body of useful information of the Extent, Nature, & Resources of these Countries may be derived. ... The Population in one is taken by enumeration of Heads by Estimate, in the other by Accounts of Houses & Families from the Register of the District.

The *Short Description of the Districts* are arranged under the heads...circulated to the Surveyors. ...

The Register of *Villages, Tanks, & other Waterworks, Stock, &c.*, will be useful in assisting Plans of Internal Oeconomy & Management of the Districts. ...

The *Historical Sketches* are abstracted from Written or Traditional Accounts¹.

Copies were also submitted of,

1. Large Map of the Northern Provinces of Mysore, Surveyed in 1800 & 1801, Scale 2 miles to an inch.
2. Particular Map of the Purgunnahs Paughur & Nidigull of Mysore with...the Ceded Districts, necessary for more clearly understanding the Intermixture of Boundaries on that side [92]². Scales 1 mile to an Inch.
3. Plan of the Triangles taken & computed as the foundation of the Work.
4. General Map of all the Purgunnahs, ... Scale 4 miles to an inch³.
5. Book of the Roads surveyed in Mysore, ... 42 Pages.
6. One Volume containing Collections of the Registers. ... Historical Accounts...of the Northern Purgunnahs. ...
7. Remarks on 16 Forts, ... extracted from the Journals. ...

The Outward Boundary of Mysore, reduced from the several Surveys...for insertion in a General Military Map. The same to Mr. Goldingham for insertion in a General Revenue Map. General military charts...to General Wellesley and to Commander in Chief⁴.

Abstracts of Astronomical Observations taken with the survey in 1800-1801, ascertaining the situation of the several points connected with the Primary stations of the survey⁵.

On reviewing the whole that has been effected within 44 months by only 3 Surveyors, with the moderate establishment attached, most of whom have been repeatedly obliged to relinquish the work for a considerable portion of that time by the sickness incident to the Upper Country, it is believed that more has been done comparatively in the Geographical part alone, and of a more complicated nature, than has been hitherto effected in the same time in this country. ...

Though the interruptions mentioned...have retarded the progress, ... it is to be presumed that with the knowledge now obtained...what remains may be effected in less comparative time with the same means. ... On this account the employment of a sufficient number of Assistants (four at least), and the immediate patronage and encouragement...of such as distinguish themselves, ... deserve some consideration⁶.

The Memoirs included information about

the situation, extent, and Boundaries, and contents in square miles of the several Purgunnahs of the Partition of 1799. ...

The population by castes, and Houses (as no actual enumeration by Census can be immediately ascertained). ...

Woods, Jungles, Forests.

The Nature of the Soil, and the gross quantity, cultivated or waste, plain or mountainous, has in some instances been estimated, and it is intended to follow this thoroughly...in all the Districts, so far as practicable without going into the minute details of a Land Survey⁷.

Mackenzie further reported that

the Southern Boundary & Districts adjacent South of the Cauvery have not yet been attempted for want of Assistants, & as it is conceived that they are less material to be Surveyed for the present⁸.

Up to the beginning of 1803 Arthur Wellesley had been commanding the troops in Mysore, and took the utmost interest in the progress of the survey, and Mackenzie writes to Warren in 1801 ;

I am glad that Colonel Wellesley has so favorable an impression of the General design of this work ; I can only say the intentions are sincere on this side to render it as generally useful, and as soon as is consistent with tolerable accuracy ; how far this turns out to satisfaction must be left to others to determine⁹.

¹DDn. 41, 20-11-02. ²MRIO. Misc. 1-0-06, map illustrating exchange of districts under supplementary treaty of 20-12-05. ³ib. 3-0-03; a large paste-up map; scale 4 m. to inch. dated 1-5-03, "Northern and Eastern Provinces of Mysore, with the Boundaries of the several Purgunnahs"; see also ib. 132 (8). ⁴DDn. 41, 22-2-03. ⁵DDn. 42, 12-7-03. ⁶ib. 1-10-03 (37). ⁷ib. (39). ⁸ib. (29). ⁹DDn. 66, 21-10-01.

A year later, in submitting to Wellesley maps of the forts and roads¹ [94], Mackenzie writes,

I particularly regret that the Roads are not more numerous. It was my intention to have prepared a Military Chart on a larger Scale after the other Plans of the Survey were given in, but the present requisition for the Public Service rendered it necessary to construct it before the whole Surveys were reduced².

FOURTH PERIOD, October 1803 to December 1805

At the end of 1803 Lambton commenced his trigonometrical measurement from coast to coast [238-9], and in October of that year Mackenzie, who was still at the Presidency and fully aware of Lambton's plans, writes to Mather ;

You may recollect that before the Institution of the different Surveys the breadth of the Peninsula was much wanted [I, 178-9], but in the Spherical Trigonometrical Survey it appears still not effected ; while our Surveys being confined to the N. and E. Boundary & Districts, it was not yet within our reach. I am very desirous of having this closed first by our Survey for early communication to England, & as the Season will be now favorable, & your young men sent to their several Districts [106, 344], I wish you could take an early opportunity of carrying on your Series of Triangles...till you lay hold of some stations on the Ridge of Ghats, that may be afterwards connected with the Surveys on the other Coast. ...

I do not think it would take much time, & it would give me great satisfaction if it was effected before Major Lambton & his two Assistants carry them to that side...— *do not mention this to anyone whatever, as I confide absolutely in yourself alone*—it was always in my contemplation had I gone up earlier ; but as I have not yet got my own situation remedied [330-1], I cannot go up this fortnight³.

Again about three months later ;

If you could connect Mangalore Flag Staff...it would be extremely desirable, as I should be happy to have the breadth of the Peninsula determined by our Survey twelve months before the other [238, 241]. If I had your computations of these Triangles now, I would transmit them directly. Observe for the Variation at the Base, & I could write you to observe the Latitudes ; if you are not accustomed to take the Stars, you may take several of the Sun at noon or by equal altitudes. ...

On comparing your Stations with Major Lambton's so far as the latter go, a very near agreement prevails. ...

If you can take it [Mangalore Flagstaff] by a sudden journey well prepared, setting your Assistants to their work in your absence, it would be extremely desirable ; for 43 miles I suppose 10 days would suffice going & coming. I would in this case recommend particularly your not mentioning your intention till you actually out it in execution ; you cannot imagine how these things get wind, & are magnified or misrepresented in the reports circulated ; you need not therefore be surprized that I am desirous of having it first reported officially by ourselves⁴.

In April 1804 ;

I am much pleased with your account of the progress in the Base [*inf*], and hope by this time you have begun your journey to Mangalore, as I am anxious to have that object over by the time I arrive with you, when we will concert measures for the ensuing operations⁵. There is no record of the achievement of this enterprise, nor does Mackenzie ever claim to have anticipated Lambton's measurement of the breadth of the peninsula.

In December 1803 Mather reports that ;

Although my operations have of late been considerably retarded through the whole of my Party being less or more afflicted with the fever & ague (from which I am not quite except). I yet entertain no doubt of closing in the Triangles, which will include...one or two stations on the Western Ghats, ... in the course of this month. ...

The very sickly state of Benjamin Ward and William Howell and several of my followers, induced me to send them on to Chiteldroog for medical aid⁶.

To Mather's latest plans Mackenzie replies ;

As a new Base will now be necessary, not only for verifying the triangles from the East, but to serve as a foundation for extending a series of stations more correctly for surveying the

¹ Large scale plans, Kolār, Harihar, etc. MRIO. (1). ² D1)n. 41, 23-10-02 ; various maps of roads, MRIO. 181 (2-78) ; 152 (1-85). ³ DDn. 66, 23-10-03. ⁴ ib. 23-1-04. ⁵ DDn. 43 (51), 4-4-04. ⁶ From Mather, 6-12-03 ; BPC. 26-7-04.

districts South and North of your present field of operations, & as it does not appear that the Spherical Trigonometrical Survey has yet been extended into that Quarter, or can give any aids to the Survey of the Western limits near the Ghauts for some time, & which now admits of little delay from the approach of the hot season, I therefore approve of your suggestions of measuring a new base in any convenient level situation¹.

Again in April ;

I duly received...your account of the method followed in measuring the Base near Azimpoor² [pl. 11] ; the near agreement of its triangles with those of the former base is very satisfactory. As I am desirous that its marks should be kept clear till I go thither myself, I hope you will take care to have its extremities marked by stones, and request the Amildar to prevent the line from being destroyed or ploughed up for at least one season.

As the progress of the survey south will bring you gradually towards the limits of Koorg, which requiring more than usual delicacy, ... I have to request your particular attention not to carry any operations of the survey into that Rajah's districts, nor to maintain any intercourse with its inhabitants until authority is received. ... You had better not carry any Stations into...those Districts that may immediately border with Koorg³.

Meanwhile Arthur was surveying the south-western districts of Mysore, and Mackenzie writes to him in October 1803 ;

I wish you at the first opening of the fair weather to extend your Triangulation as far as you conveniently can towards the Western limits in the Parallel of your present work, as a means of accelerating the Survey in that direction while the fair Season admits. ...

The course of the Cauvery & Himawatty⁴ will in this respect be a useful direction to your work, & your notices of the origin and course of these & other rivers & any uses that may be derived from them, & the effect of the periodical rains in their rise and fall, will be an useful addition to the observations which I see with satisfaction in your journal⁵ [107, 115].

And again ;

In consequence of your application...requesting...orders about the Survey of the Boundary with Koorg, having communicated the same to the Resident of Mysore, ... it is not intended you should survey the boundaries of that Country⁶.

Mackenzie was particularly anxious to keep Arthur away from the frontier districts because he had been reported for indiscreet behaviour on more than one occasion [367-8], and at the Resident's request he was directed to fill in the area east of Melukote⁷.

During 1804 the work was steadily extended towards the west ;

The Eastern and Northern Districts of Mysore being completed, & a considerable part of the interior in progress Westward, I had it in view to complete the whole Western tract lying along the Ghauts during the fair season, preparatory to which I directed the two Assistants to extend the Stations early in that direction, that we might enter on the detailed survey in concert, & thus join the whole to the central parts in one season. ...

I suggest employing some of the more experienced of the young men educated at the Surveying Seminary for a time, until the whole of the Boundary with Koorg & with the Company's immediate possessions in Malabar, Cannanore, & Coimbatore, were complete⁸.

* In October Mackenzie wrote to Mather ;

In carrying the Survey along the Outward Boundary with the Company's Districts, you will as usual observe and notice the permanent landmarks, and where doubts or disputes may exist give notice to me thereof. The Teak and Sandal Woods in that quarter will also be a particular object of your attention, and to estimate their extent, quality, &c. ; so far as may be consistent with the health of your party, your observations on these Woods will be conducted with your usual discretion⁹.

He did not himself go up to Mysore till June 1804, and six months later took up the survey of the Coorg frontier, in company with a mission that was to settle various disputes ;

Previous to my being apprized of any disputes of this kind, I had in the progress of the work directed the assistant surveyors to extend their Preliminary Triangles to the Westward ; and in consequence the survey of the Districts...already executed furnished sufficient foundation

¹ D.Dn. 43 (34), 22-1-04. ² Measured by Mather, March 1804, and re-measured by Mackenzie, Sept. 1805 [107]. ³ Map of Mysore Taluk, etc. by Mather, 1804; MRIO. 132 (5). D.Dn. 43 (52), 29-4-04. ⁴ Hemavati R. 48 O/12 to 67 D/1. ⁵ D.Dn. 43 (12), 24-10-03. ⁶ ib. (27), 10-12-03. ⁷ ib. (61), 9-5-04. ⁸ ib. (32), 30-12-03. ⁹ ib. (78), 17-10-04.

for extending those of the Boundary...towards Koorg. ... It remained to take the same measures in the Districts adjacent to Koorg on the North. ... To avoid premature discussions or surmises productive of uneasiness, as it was esteemed a matter of delicacy, the Assistants were directed...to avoid touching on the disputed tract till the survey was actually authorized. ... On account of the rainy season and the danger of going too soon into the unwholesome damp foggy air of the Western Forest, it was agreed on to be protracted till the season was sufficiently advanced to permit of entering on it with safety.

Being acquainted of the Mission...about the middle of January [1805], on 17th I left Mysore, and proceeded with Mr. Mather and our respective establishments to resume the survey of the Western Districts, and to be at hand as occasion might require. Mr. Mather proceeded to survey...while I went more circuitously...to ascertain the stations on that route. ...

The Field Work of the Boundary commenced on the 2nd February, ... and was continued unremittingly to its conclusion at the Southern extremity on 12th March. ... In addition to the primary object of the Settlement of the North and East line of Demarcation of 134½ miles, the following results may be deduced from this survey ;

1st. The square contents of Koorg proper...—from the medium of its length from South to North, 57½—and medium breadth from East to West, 29½—1,696½ sq. miles.

2nd. The connection of its principal points being fixed with the primary stations of the Mysore Survey, a basis is established, by extending a detailed survey at any convenient time thro' this secluded region to the Company's possessions of Malabar. ...

3rd. ... A more thorough knowledge obtained of its avenues on the North and South sides, and of its climate, soil, productions, etc. ...

In the course of this work considerable advantage was found in the increasing experience of the Company's apprentices attached to my establishment, three of whom, with one of my own, were usefully employed in the detailed work [104]¹.

In discussing the disputed boundary, the British Commissioner says that he had found that in 1792

the frontier of Coorg connected with the Sultaun's territories was defined by actual survey, two Gentlemen having been deputed by the then Supreme authority in Malabar to effect that object². For a copy of the frontier as laid down by those Gentlemen I have written to Mr. Warden³, which if I receive from him...as little will remain to be done, ...on that head, but that Major Mackenzie should verify it⁴ [I, 131].

In reporting on the settlement of the boundary, John Malcolm, who was now Resident in Mysore, forwarded Mackenzie's complete memoir, with annexed Map, ... and from these Documents his Lordship in Council will observe that the public service has...derived the greatest benefit from the zeal & ability of that distinguished officer⁵.

In April 1805 the survey reached Bednur [I, 125 ; II, pl. 11], and Mackenzie wrote to Mather ;

It being desirable that as much of the country of Upper Bednore bordering on the Western Ghauts should be surveyed as the weather may permit before the rains set in, and as you have already established a foundation by the operations last year, I have to request that you will proceed with all possible dispatch, to include as much of the country as possible before the rains set in, and to extend your primary stations also. ...

As I propose proceeding thither myself very shortly to Superintend in person the execution of this part of the Survey, you will in the meantime proceed on the former principles adopted, of taking districts alternately bordering on the Ghauts...by which the limits of the whole will be sooner obtained, and the remainder may be readily filled up at a future opportunity⁶. ...

I could wish the scale for Bednore to be one mile to an inch, admitting of the features of the country more distinctly ; to which I wish you to direct for particular attention from the young men ; as they are now tolerable acquainted with this, it will scarcely take them more time⁷.

He sent a special report to the Governor General at Calcutta ;

In the course of this last year, such considerable progress has been made towards termination of the Mysore Survey, that it may be readily presumed that the Geometrical Survey of the Ballaghaut Provinces [93 n.1] of Mysore may be concluded in the next year, and such parts of Coimbatore and Canara as are not surveyed already. ...

For the purpose of stimulating every possible exertion by personally inspecting & sharing its labors, I left Madras in June 1804. ... Since that time I have been without intermission

¹ Memoir, DDn. 44.

² No record found, but Emmitt was probably one.

³ Sec. to Govt. of Bombay.

⁴ DDn. 68 (338), 18-1-05.

⁵ ib. (359), 25-3-05.

⁶ DDn. 43 (94), 11-4-05.

⁷ ib. (98), 1-5-05.

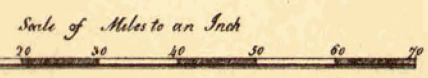
MYSORE

Reduced from Mackenzie's map of 1808, scale 12 ^{miles}/_{inches} to an inch, compiled from survey of Mysore and Kanara 1800 to 1807 [111 n 8].

Place names underlined indicate Mackenzie's trigonometrical stations which were quite independent of Lambton's survey and were not connected to Madras till 1808. Lambton's triangles over this area are given in plate 16.



Map of The Territories of the RAJAH of MYSORE, together with CANARA & PUNGAOOR &c. belonging to the E. I. Company from The Survey of MYSORE To which are added (as far as Calicut) & the BARRAMAHL from the Surveys of these Districts



Calicut Argary

employed on Field Duty in the South Western parts of Mysore, directing the Work and executing a considerable part of the Geometrical Survey; and it is satisfactory to me now to observe that under so long a continued exertion under the vicissitudes of climate and season peculiar to this country, the Parties employed have been enabled without casualty to carry it to the extent more particularly stated herewith. ...

Together with the internal Geometrical Survey, the whole of the Mysore Boundary is now ascertained, excepting a very small portion with Wynaad¹, & that of Soonda & part of Bednore to be done next season. In the last year the litigated Boundary with Koorg was minutely surveyed. ...

The elucidation of the History of the several Governments that have rapidly succeeded in this State will, I conceive, be very interesting as, by the Inscriptions, Grants, and other documents that came into my hands, a regular progress is traced up to the first Muhammadan invasion in the 13th century, and even beyond it to the 8th, but more obscurely [355]. ...

The Military Part of the Survey has been less minutely attended to from the want of any Military Assistants; yet some of the young people from the Company's Seminary have been instructed on the method of describing Rivers, Defiles, etc.².

In August 1805 Mackenzie lost his last military assistant, Arthur being removed at the request of the Resident, who had received further complaints from district officials [105]. Extracts from Arthur's journal for 1804-5 are given later [208, 312].

In September Mackenzie remeasured Mather's base-line at Ajampur in Shimoga District³ [104] and in November reported that,

in order to prepare...copies of the Documents of the survey lost in the Prince of Wales [102], I immediately sent for such of the originals and fair copies as had been deposited at Madras and Seringapatam, which I directed...to have...copied off, in addition to the surveys since done, which in the interval had increased to double what had been reported on 13th July 1803.

The increase of duty from these demands...induced me to remain at Shimoga⁴ during the rains, as a healthy station where I could with more advantage employ the united efforts of the establishment while the sick were recovering; on the first appearance of a change of weather I proceeded to survey some of the Eastern districts of Bednore, and then to Adjampoor, as a central situation where, with the necessary operations depending on a verifying base measured there, I proposed on the arrival of the documents from Madras to combine the latter surveys with the general map already executed.

On their arrival, ... I conceived it more conducive...to the order of the Honorable Court of Directors...directing the survey to be concluded as soon as possible, ... to proceed to survey the remaining part of the Northern and Western quarters of Bednore. I therefore detached one of my assistants [Mather]...with a surveying party into the districts of Cowlydroog...and Anantpoor, and I am now proceeding with the remaining part into the districts of Honelly [pl. 11]...& extending towards the North Western Ghaats⁵.

To Mather he writes;

I have been extending my Stations on this side to the first two Hills from my Base at Hurryhur in 1800 [95], ... and the difference is only 180 feet, which in the Base would be probably only 80 feet; it is also probable I may reduce it still further; this gives me great satisfaction in closing these parts of the work together⁶. ...

I am happy to find you are going on so rapidly with the Survey; the method and time is entirely at your own disposal, so continue to take your own measures, but I could wish you to be particular in laying down the great features of the Country & the sources of the rivers when you come to any, if any rise near the Ghaats in these districts.

We have not got on so rapidly here as I expected; not owing to any want of pains or labour, but it becomes necessary to lay down the preceding two Districts before I enter on more; it is however near a conclusion now⁷.

Early in 1806 the whole survey moved down the Ghâts westward into Kanara.

¹Wynad; an old subdivision of Malabar District, 58 A/NW. ²DDn. 43 (121-2), 25-6-05. ³Memoir of Mather's base, Sept. 1804, and Mackenzie's, Sept. 1805, MRIO. M 140 & 50. ⁴pl. 11, *Seemogga*. ⁵MPC. 13-12-05. ⁶DDn. 43 (140), 12-12-05. ⁷ib., 16-12-05.

CHAPTER VIII

MYSORE—(Contl.)

Survey of Canara & close of Mysore Survey, 1806-7—Natural History & Botany—Relations with Lambton.

THE present districts of North and South Kanara were ceded to the Company in 1799. They were for some years occupied by Bombay troops though both were administered from Madras until North Kanara, first known as Sonda, was transferred to Bombay in 1861. Though Moncrieff and his assistants had already made a rapid reconnaissance survey [I, 132], Mackenzie included both provinces as his responsibility¹, and writes in 1803 ;

The Canara Province, & probably part of Lower Soonda [92, pl. 11] appear from Maps communicated to have been surveyed by the Bombay Officers, but the Documents on which these Surveys have been founded do not accompany, & it is much to be regretted that the idea of one General Systematic method is not followed by the different Surveyors, as laid down for this Survey, which would have the important effect of more accurately combining the labors of the different Surveyors & sooner completing the Survey of the whole Country.

In the Western Maps no notice appears to be taken of the Woods which are said to be of importance on that side [167], & it is therefore doubtful whether these tracts are embraced in the Surveys².

Johnson's survey of Sonda in 1801 having fallen through, [96-7] Mackenzie did little in that direction, but early in 1806 took up the survey of South Kanara, sending one party under Mather to work northwards from the south, whilst he himself worked southward from the direction of Honāvar. He writes to Mather from Shikārpur [pl. 11] ;

When you come to the Western side...I wish you to take the Angles of as many conspicuous objects as possible in the Lower Country while the weather is fair, as it will facilitate the establishment of Stations there, should it be necessary. While you are at Cowlydroog³, a Sketch plan of that Fort might be taken by the young men, & I will thank you to have its principal Points...inserted⁴.

and later, from Gersoppa⁵,

I do not think it necessary, in the present circumstance of Canara being under the Management of our Government, to Survey the interior limits of these Districts, & for the present you have to ascertain the Outward limits only ; South with Malabar, & East...along the Ghaats on the points where they are accessible.

By the time your Survey extends North to the present limit of the Southern Division of Canara, you will receive directions whether it is to be Surveyed or not ; at present I am desirous that you should extend your Survey gradually from the South Extremity towards the North, as the Survey from this side will be extended towards it, and the intermediate Districts can be taken by the party first approaching. ...

You have my permission to go to Mangalore whenever your health or business may require it⁶.

To the Resident of Mysore he reports, from Honāvar, the survey of the greater part of Bednore...towards the Ghats⁷. From the peculiar nature of the Country, it is extremely difficult to survey minutely, but tho' in fact it embraces little of any valuable land, yet, as forming the natural boundary with Canara, it becomes desirable...to take this opportunity of including it with the Survey. ... The Ghaats where I descended lately...to Gersoppa approach within 12 miles of the Sea, but are nearer in some other parts. ...

¹ *Plan of the Mysore Survey* [91-2]. ² DDn. 42, 1-10-03 (30). ³ Kavaledurga, 48 O/2. ⁴ DDn. 43 (145), 10-1-06. ⁵ Gersoppa Falls, 825 ft., 48 J/12. ⁶ ib (166), 1-4-06. ⁷ "Map & Memoirs of Western Borders, 1805-6" MRIO. M 125.

I hope to have the opportunity of connecting my Stations with several points on the Sea Coast, but by a circuitous mode, as [owing to] the Fog & haze already prevalent, and the superior height of the Ghats from the Summits already ascended, we could seldom distinguish any well defined points of the low Country, excepting some Islands on the Coast, until the Series could be carried by the hills forming this valley to the Sea.

I trust, however, before the rains begin that the whole line of Western limits along the Ghats, & a considerable part of Lower Canara, ... will be completed¹.

Again to Mather in May, from Coondapoor,

I wish you had early attended more to the Plan laid down...in my Instructions. ... You were then acquainted of my intentions of executing rapidly as much of Canara as could be done this Season, by employing parties from its North & South Extremities to meet towards the centre, & for this purpose I had myself proceeded from Honore, [intending] when I descended the Ghats northwards to have carried it gradually Southward², and I expected that your party would in like manner have proceeded on your Series of Triangles to the South Extremity, & thence worked Northward. I have, however, no objection to the method followed, provided your returning over the same ground may not occasion any part to be left undone by the loss of time³.

and from Mangalore,

I arrived here on 17th, & as the S.W. monsoon may be expected to set in soon, I am desirous of having all the Surveying parties collected & withdrawn from Canara as soon as possible⁴.

Mather had been in poor health for some time, and now asked leave to resign:

Owing to the heavy rains in the low country, the having my charts and baggage to transport across a country almost under water, the want of boats to cross the river, and above all the sickly state of my people. I was prevented from reaching this place [Belur]⁵ till yesterday; and after all my anxiety about these poor fellows, whom I could not think of leaving exposed to distress and probable inattention. I have been obliged to leave some of them below the Ghats. I have travelled the whole way in the rain, which has operated much to my disadvantage, and even here the monsoon is allowed to have set in some time ago.

The accompanying letter, which I request may be transmitted to Government, fully explains my present situation, and nothing but the prospect of going down to the Western Coast, and the hopes of benefitting thereby, prevented my applying to be permitted to relinquish the survey when at Nuggur⁶; ever since the first attack at Cowleydroog, I cannot say that I have enjoyed a day's good health, or a night's repose, and from that stroke I have no idea of ever freely recovering; my native air may be of use.

Since the Rheumatism invaded my limbs so severely, it has almost deprived me of the use of them. By removing into some of the more Easterly Districts of Mysore, and beyond the influence of the monsoon, I might derive some small benefit perhaps.

The survey being so near a close occasions me to leave it with regret, but it's some consolation to think that the young men are sufficiently experienced now to complete the field work under your frequent inspection and directions; and that my absence will therefore be the less felt. I have endeavoured to do every justice to the survey while engaged on it, and now while unable to follow it up with sufficient activity, and give it full effect, I think it highly improper to hold a situation which can only be considered nominal, and that too attended with a considerable expence. ...

The remaining memoirs wanted to complete last year's surveys are in hand, also fair copies of the Districts lately surveyed⁷.

Mackenzie appears to have been more concerned at the prospect of losing Mather's services, his mainstay for the last six years, than he was at his ill-health, and he urged him to stay and see the maps completed;

It was my wish at the close of the work executed since November last to have the results brought up at some central place, while some attention was meantime paid to fill up the remaining Districts at any favorable opening of the weather, as was done in former years. Your case rendering it necessary for you to proceed Eastward immediately, the two young men recently come in shall wait only till I have your answer, as I judge they will be necessary for you in Copying off or revising the work on which they were employed with you⁸.

¹ DDn. 43 (159), 13-4-06. ² Map; *Canara Province, Honavar to mouth of Kollur Nadi*, [Kollur N. 48 K/10], 1½-inch scale; April-May 1806; MRIO. 146 (5). ³ DDn. 43 (182), 7-5-06. ⁴ *ib.* (184), 20-5-06. ⁵ 48 O/16. ⁶ Nagar (Bodnur), pl. 11. ⁷ Map; *Plan of part of Barwar* [K/11], 1-inch scale, J. Mather, 20-5-06; MRIO. 134 (5). MPC. 8-7-06. ⁸ DDn. 43 (169), 20-6-06.

He wrote to Government ;

The delivery of the materials...might as well be done at the Public Offices at Madras as in Mysore. The fair copies and reductions of his plans may be executed, certainly, as he suggests, at my Office, when the state of the survey will permit of its being fixed or stationary and of withdrawing the Sub-Assistants for that purpose ; but the original plans, field books, and documents, should be previously revised...under his own inspection. ...

Of the Rajah of Mysore's Country, the interior of the two districts of Sirah and Bangalore, and some detached portions of a few others of no great extent, only remain now to be executed, ... and I have remained here since the 11th instant only with the intention of recovering the sick, and of bringing up in the rainy weather several details of our late surveys, previous to detaching a party to Serah, when I proceed to the southward and eastward to complete in my way the portions wanting, which during the rainy season may at fair intervals be attempted on that side without much difficulty.

In addition to the whole nearly of Bednore, or the N.W. part of the Rajah's Dominions, the Northern Division of Canara and part of Soondah has been completely surveyed by the parties with myself since the beginning of April last. The most considerable part of the southern division of Canara appears to be geometrically surveyed by Mr. Mather's party ; but...the customary accounts of the state of these Districts...appear to have been omitted¹.

After completing his maps and reports at Bangalore, Mather left for the Presidency early in September, leaving the young assistants to fill up various gaps on the plateau². Mackenzie was now

the only European Officer engaged on this Service ; ...since June last the Assistant most considerably employed in the Geometrical details has withdrawn ; & for twenty seven months the Medical Assistant has been from ill-health absent [115]. ...

The number of Native Sub-Assistants & Apprentices at present attached are Five from the Surveying Seminary, Natives of European Parents, & one, a private servant of mine³ [156].

In January 1807, he sent Ward, Summers, and Lantwar, to survey the Company's districts of Punganuru and Ambur⁴ on the eastern frontier of Mysore, and Dunigan and Howell to finish off Kanara, writing to the Collector ;

I am very anxious to have this corner completed &, with regard to the other Districts to the Eastward, it will depend much on the celerity with which this comparatively small part is done ; but, whether that be attempted this season or not, for the more expeditious closing of South Canara I send the young men who actually had done the former part last year. ...

I proceed myself shortly to the Eastward to get Poonganoor...&c. surveyed, as the 3 Districts there only remain to complete the Survey up to the Ghauts on that side, while Canara completes it to the Western Sea. I have thoughts of going then to the Presidency. ... We have now the whole of the Mysore Rajah's Territories completed in detail⁵.

Dunigan was given the following orders ;

On the stations carried from...the Western Ghauts, etc., to Mangalore and the sea coast, you will carry the few primary stations that are now requisite to Mount Delhi⁶ on the coast, on the South, and on the North to the points of...Coondapoor, Boulydroog, etc. ...

You will on your return from Mount Delhi to Mangalore complete the measurement of that Road, and any part that is wanting to complete that from Mangalore to Cundapoor.

On your arrival at Mangalore you should be careful to adjust the channel of receiving and sending your letters, which I conceive may be done with facility by proper notice as usual to the Ports along the coast, by your leaving directions at Mangalore, Coondapoor and Nuggur. ... This I have to direct you will pay particular attention to, in order to prevent the very great inconvenience and loss of time that occurred last year, for want of keeping up the regular correspondence with me. On your applying to...the Postmaster in my name, he will readily render you any assistance in forwarding and receiving your letters, and [I] will direct mine for you, to his care⁷.

Again at the end of April ;

I am happy to understand you have completed the South part of Canara ; and doubt not but the remaining part of Barcoor and Nuggur will be fully completed before 1st June, when you know that it will be impossible to remain below or near the Ghauts to survey. Let me therefore request you to expedite Barcoor [pl. 11] as soon as possible, and to ascend the Ghauts even without waiting to protract it.

¹MPC. 8-7-06. ²Map; *Purgunnah of Bangalore*, Sept.-Oct. 1806, M. Dunigan. MRIO. 146 (1) DDn. 43 (176), 27-8-06. ³ib. (218), 3-3-07. Dunigan; Ward; Hamilton; Summers; Howell; Lantwar. ⁴Fdbk. Feb.-June 1807; MRIO. M.58. 67 K/11; L/9. ⁵DDn. 43 (209), 19-1-07. ⁶Mount Dolly, 48 P/4. ⁷DDn. 48, 10-2-07.

There is another object I wish you to complete at this opportunity ; that is a plan of the Fort, Town, and Environs of Bedenore [92 n.3], comprehending all the public and remarkable buildings and places within the Hound hedge, the Barriers, Gateways, Futtepett, and all the Environs on the same scale as that of Bangalore.

When this and the District of Nuggur is done, you can return by Coppal, and take the few villages wanting of that quarter ; and, if you could contrive to visit the Heads of the Goom and Budra², it would be very satisfactory to me to have a minute and detailed description of them. ... Observe particularly the state of the water there, and the dimensions of the head springs, breadth, depth ; enquire of the most intelligent Natives of the commencement and duration of the different seasons, Rainy or Dry, and by what circumstances attended [115]. ...

I trust you will be able to close these remaining parts before the Monsoon sets in, as it is my wish you should then set off towards Bangalore and Colar to join the parties on this side³.

The whole coastal strip between Malabar and Goa was completed, and only Sonda was left unfinished⁴. The completed maps shewed

nearly every village, ... the exterior boundaries of Canara...with the province of Malabar, with Koorg, the districts of Bednore, and the Portuguese Territory of Goa ; and the interior limits of the divisions with one another...also added.

The district of Banawassi, part of Soonda [pl. 11], could only be surveyed at that time on account of the climate, the heavy rains and succeeding fogs, with the woody nature of the country, precluding survey for the greater part of the year ; the circuit and limits of Bilghi were only then ascertained on the same account. ...

The lists previously furnished by the provincial officers from the records of each district were found of great utility on the survey, by enabling the surveyors to verify nearly every individual place, the actual positions of which are inserted by their bearings from each other or from some fixed stations [213]. ... Detailed descriptions of the boundaries were also added, which, with the enumeration of houses, families, castes, tanks, nullahs, and other information furnished from the Cusbas in the course of survey, were included in the memoir of each district⁵.

In May Ward was sent to complete the survey of Denkanikota and Alambadi districts to the south-east [pl. 11], that Mather had been unable to survey, and Mackenzie accompanied him before moving down to the Presidency in June ;

My rapid journey to Allambaddy was directed principally to a personal inspection of that tract, while under survey, which has been represented in such unfavorable lights as to deter the party I had directed to survey it...early in 1800 [100]. ...

To arrange such a various mass of materials as this Survey since 1800 has afforded, would have derived advantage from being finally digested in the country that is the subject of investigation, from the reader access to further information, and even correction, but...the necessity of taking early measures to furnish for Europe a General Map & Illustrations, ... from the desire of replacing the total loss at sea [102] of what had been compiled 4 years ago...will...point out the [need] of attempting to fulfil these duties on the coast⁶.

In February 1808 his last maps and reports were completed and sent home⁷ ;

The map now laid before the Hon'ble Court has been formed from actual survey, and comprises...41,060 square miles, which will be accompanied...at an early period by the Memoirs descriptive of the Districts which have been surveyed.

The Hon'ble Court of Directors have been already informed of the great attention which has been given by Major Mackenzie to the study of the ancient History of this country, and in pursuance of that plan that officer has presented...to the Hon'ble Court a M.S. Volume containing a register, specimens, & Translations, of Inscriptions, Grants, & Ancient Monuments, & affording very valuable information on subjects connected with general knowledge & science [2, 107]. ...

The merits of Major Mackenzie have been so frequently, and so warmly, represented, ... that the Governor in Council can add no stronger encomium to what has been already deservedly bestowed, but he is satisfied that the farther proof now afforded of the indefatigable zeal & Talents of that officer will not fail to obtain that public attention which it appears justly to merit⁸.

Mackenzie had been much bothered by the restrictions of tight financial control,

¹Coppadroog, pl. 11. ²Bhadra R., 48 O/4-9. ³DDn. 48, 28-4-07. ⁴*Memoirs of Survey of Canara*, ... by W. L. Lantwar. MRIO. M 142 C. 1806-7. ⁵to Board of Revenue, DDn. 83, 14-3-09. ⁶to Resid. in Mysore, ib. (223), 4-6-07 ; *Report...on Mysore Survey*, Madras, July 1807 ; BM Addl Ms. 14380 (24). ⁷M to CD. 20-2-08. ⁸General maps, scale 12 or 24 m. to inch ; MRIO. 132 (9) [pl. 11] ; 138 (44, 47, 48) ; Misc. 3-0-07 MRO. map 204.

and especially by the reduction of allowances ordered by the Directors in 1801, which prevented the employment of further military officers [330-1]. He refused however, to desert the work himself, and declined several offers of more lucrative employment ; "I never considered it out of danger of being left incomplete"¹.

The stringent orders for economy at the end of the Marātha war were accompanied by the recall of Marquis Wellesley, and in 1807, Sir George Barlow, who was acting Governor General, wrote to the Madras Government suggesting the curtailment of Lambton's and Mackenzie's surveys ;

In Bengal several very useful surveys have been suspended until the state of the Public Finance shall admit of the appropriation of funds for their prosecution [12, 60]. Adverting to the extensive information which must have been already obtained by these surveys, they might be suspended or limited² ; to which Madras replied that the Mysore Survey would be completed in the current year when its whole expense would cease. This was somewhat premature, for Mackenzie required another year to finish his detailed maps, in spite of being warned that the particular desire of the Governor in Council to bring that work to an early conclusion has been exclusively founded on those considerations of public economy which have imposed the unavoidable necessity of making every possible reduction in all the departments of the public Service, and the Governor in Council observes with satisfaction that you have evinced...a commendable attention in limiting the expense of the work. ...

It appears from what you have at present stated that you expect to furnish your final Report regarding the survey in October next, and...all expenses connected with it should cease from that period³.

In submitting his final maps, scale two miles to an inch, Mackenzie put them forward as the start of an atlas of the south peninsula [102, 276] :

Whatever defects or merits may be found in this attempt at the Improvement of Indian Geography can attach solely to this work itself, as no part whatever, either in its Ground Work or materials, is borrowed from any other [121]. The Plan & Mode of Execution of the Survey is inserted among the Papers now transmitted [91-3], & from the materials furnished by the labors of the Surveyors employed on it. These maps are reduced from the Original Surveys, conducted on a Series of Stations established by the Assistants in the Several Districts respectively surveyed by each ; & collated with a Series of Trigonometrical Stations carried throughout the whole by myself, of which a Particular Plan & Memoir shall be transmitted, comprehending the whole extent of the Mysore Survey. It becomes unnecessary therefore to send a Copy of the Charts lost in 1804 in the Prince of Wales, as they comprehended only a part of what are now included in those...here referred to⁴ [102].

This achievement was a magnificent success, and entirely due to the sound planning, organization, and perseverance of its Superintendent. On this model he based the series of methodical surveys which were spread over the Madras provinces during the next 25 years, and which had the further advantage of being directly based on Lambton's trigonometrical survey. It is to be noted that Mackenzie's account above makes no mention of Lambton's triangulation and, indeed, he made no attempt to connect his work to Lambton's triangles after once satisfying himself that there was but little discrepancy between them [3, 119]. There is therefore no justification for Blacker's statement to the contrary, contained in the following appreciation ;

The Map of Mysore is deservedly a model of topographical Survey, and such as might have been expected from the highly respectable talents employed on it. Its foundations are the great Trigonometrical lines established by Col. Lambton, on which depends a minor net of Triangles, and referring to them, the topographical features of the ground. Colonel Mackenzie took a share of the practical operations himself⁵.

In attributing its success to the individual talents of the officers employed, Blacker is again misleading ; the great success of the survey was due to the sound lines on which it was directed by Mackenzie ; for the first season he certainly left the detailed methods to Warren and Mather, but the methods which eventually prevailed, and which largely influenced subsequent surveys of the Presidency, were those worked out between Mackenzie and Mather.

¹ DDn. 43 (251), 29-7-08. ² MPC. 7-10-07. ³ DDn. 68 (140), 17-8-08. ⁴ DDn. 43 (239), 18-10-08. ⁵ DDn. 204 (170), 12-7-25.

The defeat of Tipu Sultān opened up the whole Mysore plateau above the Ghāts, which had an entirely different climate and character to the Carnatic districts. In the first orders given for Mackenzie's survey the Governor General directed that he should be accompanied by Dr. Heyne, the Company's botanist on the Madras establishment [91]. He gave orders at the same time for the Sultan's garden¹ at Bangalore to be appropriated as a botanical garden, under the exclusive management of Doctor Heyne, ... as a depository for useful plants sent from different parts of the country. ...

A decided superiority must be given to useful plants, over those which are merely recommended by their rarity or their beauty, and it will be Doctor Heyne's primary care to attend to such as may furnish any facility in the supply of food or forage ; ... to collect with care all that is connected with the arts and manufactures of this country, or that promises to be useful in our own ; to give due attention to the timber employed in the various provinces of his route, and to the possibility of introducing the growth of useful trees into such of our provinces as are deficient in that necessary produce, and to collect with particular diligence the valuable plants connected with his own immediate profession [1. 376]².

In 1800 he further appointed Dr. Francis Buchanan to investigate "the state of agriculture, arts, and commerce, in the dominions lately acquired from Tippoo Sultan". Buchanan reached Seringapatam in May 1800 and, after touring through Mysore and corresponding with Mackenzie, he moved on in November to tour through Malabar. His account of *A Journey from Madras through the Countries of Mysore, Canara, & Malabar* was published in London in 1807³.

In his "Plan for the Mysore Survey" Mackenzie proposed that to Dr. Heyne [1, 350]...the Branches of *Botany, Mineralogy, and Natural History*, may... be assigned, whose employment, talents, and ardour for prosecuting the improvement of these useful branches of service early pointed him out as one who might be well employed acting with me in the Nizam's country, and now still more so in a Country now intimately blended in its interests with our own Provinces.

His reports...will communicate considerable light on the Natural History of the Ballaghaut [93 n.1], and when his time can occasionally admit, I shall expect a considerable degree of assistance from him in the other parts necessary for elucidating the Statistical account of Mysore⁴.

Heyne left Madras in March 1800, taking with him an establishment which included,

One European Draftsman or Painter. ...

Two native painters, or Draftsmen, of Plants.

Two Plant Collectors, natives accustomed to this service. ...

Three peons and Harcarrahs for preserving & carrying minerals, plants, and other objects of Natural History⁵.

After a few weeks at Bangalore he reported that,

Some days after my arrival here, the Sultan's Garden was given up to me, which since my return from Seringapatam I have endeavoured to put in a condition to answer the purposes mentioned in your letter to Captain McKenzie of 6th February last.

The trees & Plants brought with me from Madras, as Oaks, Pines, Nutmegs, Cinnamon, &c., I have to report as promising very well, and upwards of 250 different seeds have been sown. ... The extent of the Garden is, according to actual measurement, 41 English acres odd, ... [and] employed in it 20 Gardeners, 2 Mastrees, and a Daroga, paid by the Circar⁶ ; to which Government replied ;

You will only occupy such portion of the Garden at Bangalore as may be sufficient for the purpose of a temporary Depot for the Plants which have been sent from Madras, or such rare or useful plants or seeds as may be found during the course of your tour with Captain McKenzie. ... This temporary establishment at Bangalore is in no respect whatever to interfere with the primary object of your statistical enquiries with Captain McKenzie⁷.

Heyne accompanied Mackenzie during his first few months on the north-west frontier, but in October returned to the garden at Bangalore, Mackenzie reporting to the Resident that he had been very troublesome ;

¹ Now the Lal Bāgh. ² MMC. 4-2-00. ³ Buchanan's Map of Mysore, MRIO. 143 (1) ed. by Charles Crawford; copy ib. (2). ⁴ MMC. 11-2-00. ⁵ ib. 6-11-1799. ⁶ DDn. 41, 4-6-00. ⁷ ib. 17-5-00.

In short, My Dear Sir, I find that whatever I propose cannot be well received, ever since May last, tho' I had taken much pains about this gentleman's establishment, and his acting with me was at his own repeated solicitations¹.

The doctor's departure was particularly inconvenient, as the surveyors now moved into unhealthy country [97-8] ;

Had you been here now, perhaps it would have been convenient you should remain in your medical capacity till we were nearer some of the Posts, as Agues are now prevalent in in this part of the country, and we have been obliged twice to recur to Chittledroog for medicines.

Your Botanical Journals, Drawings, and Descriptions belonging to these pursuits, are not immediately wanted, so far as I know, and, as a permanent situation has been assigned in Bangalore for more conveniently lodging your Papers and Collections, they can be more securely deposited there, under your own inspection, till the pleasure of Government is known².

In the spring Heyne moved down to the Carnatic to examine "copper mines in Bomrajah's country"³, and though he reported his movements, he paid little attention to instructions given by Mackenzie, who eventually wrote to the Resident ;

I find that Dr. Heyne has arrived at Bangalore after a circuitous Journey. ... Pray May I take the liberty of asking if you are acquainted with the object of this Circuit, of which I have little other information than a Bill for expences of enquiring after Copper Mines, which I have only countersigned lest I should be supposed hostile to this pursuit, or indifferent to the respectable authority introduced.

Dr. Heyne having repeatedly applied to me for orders and directions. ... I have judged it advisable, now that he has passed me and announced his arrival at Bangalore, to suggest the expediency of his pointing some of his attention to the Country under Survey, provided it does not interfere with other orders⁴.

He writes to Warren at the same time ;

I have certainly been very much disappointed in that [help] I expected from one party, where every consideration might have recommended another line of action. The gentleman you mention I have occasion to know is arrived at Bangalore, and, if I may judge from several of his letters, seems not very willing to drop a contention which in the end cannot be very satisfactory to Superior Authority. It is the first time in my life I experienced anything of the kind carried on with such perseverance, and where I feel conscious I deserved another kind of behaviour⁵.

To Arthur he writes ;

Dr. Heyne...is now again engaged in a correspondence with me on an old subject : I never knew such behaviour ; he has repeatedly applied for orders, and, when at last he got an answer, he makes shift to decline compliance⁶. ...

I am very much teased with Dr. Heyne's letters about his orders and directions, and Contingent bills ; he appears to me very desirous of renewing a paper altercation, which I shall certainly not continue long with him⁷.

Heyne rejoined Mackenzie's camp in August 1801, but still continued an unaccommodating attitude, and Mackenzie concludes one letter ;

For my opinion of your capacity in branches of which I am so little qualified to speak I can only refer to my former sentiments publicly expressed, that I am sensible that little advantage can be expected in any undertaking where a mutual concert is wanting ; to maintain that has ever been my wish, and...I can give assurance of my readiness still to promote, so far as lies in my power, every part of your labors⁸.

Heyne now remained with the surveyors, attending to the sick, till he was given leave to the Presidency early in 1802 on account of ill health. A few months later he was put on a separate establishment. Amongst the reports he submitted whilst attached to the survey were "Meteorological journals from March 1800 to March 1802", and a "Memoir on Copper Mines near the Ongole⁹ District in the Lower Carnatic¹⁰". He published an account of his work in Mysore in his *Tract II, Statistical Fragments on Mysore*¹¹.

On Mackenzie's return to Mysore in 1804 [105], he was given the services of Dr. Leyden as surgeon, with instructions to prosecute "enquiry into the Natural History & Production of the Mysore Country¹²" [92], including ;

¹ DDn. 41, 24-12-00. ² ib. 23-12-00. ³ *Memoir on the Copper Mines in the Calastry & Venkatgherry District*, MRIO. M 117 ; Kālahasti & Venkatagiri, 57 O/9. ⁴ DDn. 41, 27-8-01. ⁵ DDn. 06, 4-7-01. ⁶ ib. 12-7-01. ⁷ ib. 14-7-01. ⁸ ib. 5-8-01. ⁹ 66 A/3. ¹⁰ Heyne's Journals from 27-3-00, MRIO. M 117. ¹¹ *Heyne's Tracts*, see also *FD MR.* (94). ¹² MGO. 14-1-04.

1. Botany & Mineralogy, including Remarks on the Trees, Woods, Plants, Minerals, & other productions of the Country. ...
2. The Diseases, or Medicines, Remedies, peculiar to the Natives & to Europeans in the Country. ...
3. The Air, Climate, Seasons, the Periodical Winds & Rains [92. 105] & their effects on the Country & its cultivation.
4. The Soil, Productions, State of Agriculture, Modes of Cultivation; the Waterworks. ...
5. The various descriptions of Natives, their Languages, &c.
6. The Animals peculiar to the Country.
7. The peculiar Manufactures of the Country, the state of Art¹.

The following May, Leyden's health broke down—the Survey was left without any medical attendant—and these special enquiries had to be dealt with by the surveyors.

RELATIONS WITH LAMBTON

The purpose of the following pages is to refute Markham's statement that Mackenzie and Lambton "do not appear to have worked harmoniously"², and to show the extent to which they kept in friendly touch with each other, not only during the survey of Mysore, but in later years also.

It is true indeed that towards the end of his life, when harassed by ill health, Mackenzie showed himself impatient with Lambton's persistent efforts to increase the allowances of his staff, and held the papers up for nearly three years, much to Lambton's disgust, but there was nothing personal in this obstruction.

The first test of their mutual goodwill came in 1801 when Lambton tried to get the services of his brother officer Warren. Mackenzie held out against this for some time, rightly insisting that his needs at the moment were the more urgent, but when the first important task was completed, and Lambton was ready with his instruments, Mackenzie graciously surrendered [117, 119].

Lambton's proposals for a trigonometrical survey were first made early in December 1799 [3, 233], when Mackenzie's plans were well forward, and Mackenzie's reactions are expressed in the following letter to Barry Close [91] ;

Mr. Webbe³ [233-4] has communicated to me Captain Lambton's Propositions for a Spherical Survey &c., and requested me to mention to you my Sentiments on the subjects, as a private communication, which I do with greater pleasure as it agrees with an idea I have suggested in my Plan of executing the General Survey in Mysore, of having the whole corrected by a Series of Astronomical Observations [92].

Far from interfering with the Surveys as I propose them in this Plan, ... they will be useful in rendering the whole more complete, if...they are carried on in concert with the Mysore Survey and with the Observatory at Madras. I therefore think that Captain Lambton's proposal merits encouragement, and that the Instruments necessary, which are rare, would... be very properly employed with a suitable Establishment in carrying this design into execution. ...

On considering this subject, my thoughts would take more time than I can spare now, but...they may be of use in elucidating the Progress of our Surveys in India in General (for in one point I cannot agree with Captn. Lambton where he says "that no correct method has yet been used for determining the position of such points" [250])⁴, ...

Captain Lambton's Propositions fall in with what I have suggested regarding the connection of the whole...by a series of Triangles and astronomical observations [92]. ... I therefore thought all that was necessary for me (not knowing at that time of Captn. Lambton's Proposition), to suggest it merely as a thing desirable for its greater accuracy, confining my own operations immediately to what is sooner within our reach by common means. ... I shall be ready to give it every support in my power.

I have had some conversation with him on the subject this morning, and communicated to him my General Plan. His is precisely on the same ground as the Trigonometrical Surveys carrying on in England and France, and which in the former has since 1790 carried the Triangles

¹DDn. 43 (09), 13-7-04. ²Markham (73). ³Josiah Webbe (1767-1804); MCS. 1783; Sec. to Govt. 1796-1801; Resd. Mysore, Nāgpur, Sindhis, 1801-4. ⁴But Lambton was most certainly justified; DDn. 41, 6-12-1799.

to the Lands-end from Hampshire in 1798. The clear pure atmosphere of this climate is much better calculated for observing distant objects, but the want of an apparatus sufficiently correct for a work of its estimation in the scientific world will be the greatest impediment; tho' I should hope this will be overcome by a person possessed of so much of the ardour and true spirit necessary for the pursuit¹.

A few weeks later Government advised Mackenzie that they had appointed Major of Brigade Lambton...to make an Astronomical Survey of the southern part of the Peninsula, and chiefly of those Countries which are embraced in the general plan of your more detailed survey [233-4].

As this work is intended to come in aid of your labors, and, to enable you to conduct them with greater dispatch, while it is more immediately directed to purposes of general geography, Major Lambton has been ordered to communicate freely with you on every point connected with the great and important object of your mutual pursuit; and, as from the distinct nature of his undertaking it has not been deemed expedient to place him under your orders, his Lordship has the firmest reliance in that zeal for the public interests, of which you have offered many honorable proofs, that you will conduct your communications with Major of Brigade Lambton with that openness and cordiality which can alone ensure an useful coincidence in your pursuits, and an honorable results to your joint labours for the public benefit².

Though he could not delay his survey for Lambton's results, Mackenzie called on his surveyors to co-operate;

As this work is intended to come in aid of these labours, a free and liberal communication is desired; you will be pleased, in case of Major Lambton's coming on that duty into or near the Districts you are employed in, to give him every aid of local information, or such other as he may require to facilitate his operations, without retarding your own immediate Survey³. whilst to Moncrieff in Kanara [96, 108] he writes;

It will be an useful work in establishing certain points of connexion, but will of course require time. I am ordered by Government to give him every assistance in my power, and I suppose your Surveyors will be the same. ... I believe it now generally understood that all ...works undertaken for the Public Service are rendered more useful and more correct by reciprocal communication⁴.

In September he writes to Lambton regretting that, though he had prepared a sketch for him, he had had to pass it to Buchanan [113], but would prepare another as soon as possible. He gives information as to local prices, congratulates him on the narrow escape of his instruments from an accident on the road, and trusts that he has a good set of followers. He continues;

I have in the course of my Journey not been inattentive to the points that might be useful in your operations, but through the whole of my Journey I did not observe any flat level that could admit of a mile nearly without some interruption; there are many commanding open situations with favorable heights near them, well adapted for Stations, and I shall, if you wish it, when leisure permits point out some of these. ...

Let me have the pleasure of hearing from you often; I know not when we may meet, but it will be with much satisfaction on my side wherever it happens⁵.

After measuring his base at Bangalore, Lambton writes;

It appears from the late acquisition of ceded territories [152], that a wide field will be laid open for me; and from the meridional course that I propose taking, there is some probability of my extending my operations much to the northwards; and, if your view should lead you that way, it will much increase the inducement I already have of proceeding northward, as I know it to be so much the wish of Government that our labours would be combined⁶; to which Mackenzie replies;

Permit me...to thank you for your communications on the state of the weather⁷, and the goodwill you evince towards keeping up a mutual communication with this side. I am hopeful you will not find me defective in contributing my best efforts to the same ends. ... The Sketch Plan I sent you lately you will consider a general directory for your guidance. After giving a detailed account of the main routes, with special consideration for Lambton's large instruments, he continues;

When we approach each other we may easily contrive a meeting, which will be equally desirable on both sides. ... Write me freely if you wish for any further notice that I can give⁸.

¹ DDn. 41, 5-1-1800.

² DDn. 66 (11), 6-2-00.

³ DIm. 66, 23-3-00.

⁴ ib. 13-3-00.

⁵ ib. 14-9-00.

⁶ DDn. 63 (16), 22-11-00.

⁷ a brief meteorological journal.

⁸ DDn. 66, 7-12-00.

To a suggestion that Warren should be transferred to Lambton's survey [115, 119], Mackenzie wrote a discouraging letter to the former, and made this friendly reply to Lambton ;

Your proposition required some consideration, tho' my reply to Mr. Warren himself would indicate my earlier sentiments. In this little interval I have had the most unpleasant accounts from all parts of Mysore of the Survey being suspended, and... I do not feel that I can with any propriety accede, and, as you are so good as to mention "*it will go no further*", I feel more at ease in saying I am concerned and vexed that you should have a proposition to make that I could not heartily support ; but consider, My Dear Sir, the consequence of once introducing a clashing between the two Surveys, which I am convinced never once occurred to you.

Rest assured I shall never omit any opportunity of shewing the sentiments I early expressed on your Plan, and before Mr. Warren asked to be employed with me¹. Lambton replied that he had made his request

on a proviso that it might be attended with no inconvenience to your operations. But I never entertained an idea that you could wish to get any person off from your Establishment. Be assured I feel perfectly satisfied with what you have done, and in addition to this testimony I am sure you will be gratified when I tell you that I am likely to make much greater progress than I at first expected. ...

I think it is probable we may fall in with each other somewhere in the Sera district². By that time I hope I may have something to offer you that may be of service. Let me know when you think you will reach Sera, and weather [*sic*] you mean to run into the ceded territories³.

Frequent letters were exchanged during the next few months, with sketches of the country, loans of drawing paper, and enquiries for health ; on 20th June Mackenzie writes ;

I wish much we could have met for some days, as it would have been extremely satisfactory to both, I believe, to have some intercourse after our late long Journeys. If you come to Heroor only, I could go thither with a tent, but all my Establishment &c. must be left here, as I am not in train for proceeding on that part of the Survey without I take a circuit back again at a loss of time, and in fact I am very desirous of getting done altogether with this part of the Country [99]. But why could you not post down here for a day or two ? You need not bring a Tent, as I have room enough for you ; and I can send my bearers to Ayamunglum⁴, and a Horse to Heroor to meet you. Come to a resolution soon, as my stay depends on your answer.

Again on August 12th ;

I have received your favors of the 11th Ultimo, enclosing a Table of the Latitudes of your Principal Stations, for which I request you will accept my best thanks. It is very satisfactory to me to find that your Stations taken with such accuracy confirm those I had taken in the common way. ... When those to the Northward of Serah are connected with that point, I shall send you a Copy of the Stations, but this cannot yet be done till I have brought it up to that part. ...

I am sorry to hear of your indisposition continuing so long, but I hope ere this you have got clear of it. I will be glad to hear of your getting the use of your eyes again, but it will be necessary for you to be very cautious for some time. My sight is a good deal affected ; so much that I cannot write at night ; but it proceeds from a different cause, and is not an inflammation ; I find the use of glasses very much affects them⁵.

Lambton wrote from Nundidrug on 6th September ;

I find one of your Deputies [Mather] is in the Ballapore District [pl. 11] ; I wish he had applied to me : he might have had several of my points which I presume would have been of service to him, and unless these Points are taken up by the Surveyors of Districts, one of their great uses is lost ; to which Mackenzie replied ;

The Stations North of this will be exceedingly useful to you, and save you some time as they would to me had I previous noticed of the clearest and most distinguished points. My Stations near this connect with yours, and I subjoin a note containing Hills and Droogs you may possibly take in your intended Progress, and that will very much facilitate a combination of the whole. ...

I have wrote to Mr. Mather to communicate with you on all occasions ; your ideas of the utility of your Stations being known perfectly coincides with my own. ...

¹ DDn. 66, 12-1-01. ² Sira, 57 C/13. ³ DDn. 63 (23), 1-2-01. ⁴ Aymungala, 57 B/12. ⁵ DDn. 66.

The Stations or Points you determine being made known to the Surveyors will be included by them in the detailed Surveys, and enable me to combine the whole into one General Map afterwards. In like manner, the Stations already taken by the Surveyors being made known to you will enable you more particularly to remark these for the same purpose¹.

He wrote to Mather on the same day ;

Major Lambton wrote me lately, and I only deferred writing to him till I could hear from you. I annex a Paragraph of his letter ; his Stations and connected Points will certainly be useful to you, and I could wish you to keep up and cultivate the best understanding with him, as being very essential to the Service we are all employed on ; he is himself very ready to communicate, and in his private character, independent of his Public, is deserving of every proper attention.

How far you make use of his Stations in this Stage of your Survey I leave you to judge, as I wish to leave the Details of the Provincial Surveys as much as possible to the Surveyors, going on one Uniform Plan [101] ; and it was my opinion that Major Lambton's Survey would come very properly to correct and reduce the Principle Stations of each to their proper places in the General Maps to be constructed from the Several Surveys. I merely mention these hints for your information of my Sentiments, which have been always friendly to Major Lambton's and every other Useful Work.

A meeting took place in October, Mackenzie writing from Camp 2 Coss W. of Hindoopour. ... I should if you are near ask the favor of you to meet me at some convenient place, ... but as it must be inconvenient for you with your heavy apparatus, and I am lightly equipped on this Journey, I can without much inconvenience push on to Goodbunda² if you are fixed there. If not, let me know where I may find you by going a day's journey Eastward (but not 30 miles from the river, for that distance in these circumstances staggers me a little). I am also desirous of going to Pennaconda for a day ; if you could contrive there to fix with Captain Colebrooke who I fancy is near you, where we might all meet for a day or two³. I shall have much pleasure in proceeding toward you...to... any place you please not too far off. If your Great Instrument is fixed at Goodbunda I should like that place in preference, but don't incommode yourself on my account. ...

Best compliments to Captain Colebrooke [122, 236] ; I am very desirous of seeing you both⁴.

Two days later he writes to Arthur ;

I have just got a note from Lambton, and expect to dine with him this evening ; I can now repay your bark [quinine] with interest : and again on the 12th ;

I had the satisfaction of finding Lambton with his whole Apparatus up, which is not the case every day. I stayed two nights with them at Bagashully, and had like to have been detained another by the rivers rising suddenly ; however I got off the noon of the 10th. ...

Mr. Mather's triangles, or three of them, sent to Major Lambton, coincide with his to within 160 yards, I think, on one, and half of that is allowed for difference of point of Station ; on the whole I think there is much reason to be satisfied with Mather's work, and Lambton, so far as I could learn, seemed of the same opinion. ...

He is going on with great success on the scheme he originally suggested, of settling certain great points for the correction of Detailed Surveys executed by Plane Triangles with inferior instruments. ... I had an opportunity of comparing the sides of the Triangles on our side with his, on the protracted plan ; from Mudghery to Mudgesy⁵ there was a difference of a mile and the others near it in the same proportion. Lambton is of opinion that this must be owing to carrying them so far from a small base, and the exact points in some instances not being possible to be ascertained without signal Staves⁶.

To Mather he writes ;

I mentioned to Major Lambton your wish to have some of his Stations. ... He is very ready to communicate any part of his work that may be useful, and you have only to apply to himself in writing or personally, and you will be sure of getting every satisfactory communication ; if you are near him at any time I recommend your calling upon himself, which is much better than any other medicine⁷.

Mackenzie wrote to Lambton on 31st October ;

I will be much obliged by your sending me your Triangles between the parallel of Pennaconda and...Serah [p. 11] as I wish...to compare mine, and trace out the cause of the

¹ Ddn. 63, 18-9-01. ² Goribidnur, 57 G/10. ³ obviously the zenith sector, as the Great Theodolite did not reach India till 1802. ⁴ ib. 6-10-01. ⁵ Maddagiri, 57 G/2 ; Midigesi, 57 G/1 ; Hill tops 13 m. apart [99]. ⁶ ib. 12-10-01. ⁷ Nothing indeed better than personal liaison. ib. 23-10-01.

difference, whether gradually increasing from my short Base near Hurryhur [95], or from some ill defined points further South, for in carrying on the Boundary I was under the necessity of taking several distant Hills where no distinct object could be seen¹. and again on 30th November ;

The difference in the line from Mudgeroy to Mudgeoy, ... is now entirely reduced by the Triangles taken since September so as to make the difference very trifling, the utmost being 30 feet. ... A station I took on the Summit of Nidicul helped very much to corroborate and confirm all my Stations round to a great extent [99].

A few days after his move to Madras [101], Mackenzie writes to Warren ;

Major Lambton's Carriage of Instruments is now allowed of, he tells me [334-5] ; I passed a day with him lately at the Mount, where he has begun to measure his Base [237, 256]².

To Mather he tells of the heavy work involved by the compilation of the topographical surveys, whereas

Major Lambton, having only a small Chart to form of his Triangles, the computations of which could be made in the Progress of the work, was of course enabled to bring his whole work forward some time ago, & has now begun to measure a new Base near Madras. I understood his Establishment is now put on a footing nearly equal to the former, & that in some Memoir he has given in (but which I have not seen) he suggests that taking up his points in tracing the rivers and roads would be more correct than any other work [237, 238].

For my own part, I am confirmed by comparing yours, Mr. Warren's, and our own Triangles with his, & their uniting so well together, that our mode is sufficiently correct for all that is required³.

Again on 18th May ;

Major Lambton has given me a Plan of his Stations. ... Give me your opinion regarding the utility of following up his Stations & filling up the space between. Do you think you could readily recognize his stations & by following these save time in preference to following those you know & fix yourself ? Give me your sentiments on this subject soon.

Whatever Mather replied, Mackenzie continued his own primary stations over the whole area of survey in preference to adopting Lambton's triangles and points [112].

In 1802 it was definitely agreed that Warren should join Lambton [115, 117], and Mackenzie writes to Arthur ;

Mr. Warren has been with me here [Madras] near a month, and is now reducing his Colar Survey to the Scale of a Mile to an Inch ; I dare say it will take a month or more. I believe it was settled before you left us that he is to be attached to Major Lambton, who is now to the Southward about Pondicherry ; his large Instrument not yet arrived. I was ordered to recommend someone to act in the situation Mr. Warren has been in, & I proposed Mr. Morison of the Artillery⁴.

whilst to Lambton he writes shortly after ;

I cannot disapprove of Mr. Warren's wishing to be employed in situation more agreeable to his own views or wishes⁵.

I am glad to find your Grand Instrument is arrived, of which I have heard so much [253]. I should like to see it, but it is not possible for me to be with you on Sunday, as it is the only day I can have to myself for some time ; you will therefore excuse me for this time. I am much hurried at present removing all my things [from Kilpauk] to a house at Viperay⁶, which will discompose me for some days ; As soon as I am settled there I shall expect you down for a day, but this we can arrange next week. ...

Have you got out the Philosophical Transactions of last year, or any further account of the Survey in England⁷ ?

To Warren he writes in October ;

I hope you keep your health ; I have not been very well with the late hot weather, and many others have been ailing. I have now got another Inmate in this large house⁸, which is necessary to fill up the vacancy in so vast a Mansion ; there is however room enough for you when you chuse to take a run down, as there would be were it much smaller.

Give my best compliments to Major Lambton, & tell him if occasion requires his coming down hither, that there will be a Couch for him at my Hotel at Veperay⁹.

The original "Plans" for both Mackenzie's and Lambton's surveys had been sent home to the Directors, and passed to Rennell for criticism. He failed altogether

¹ DDn. 63, 31-10-01. ² DDn. 66, 9-3-02. ³ ib. 10-3-02. ⁴ ib., addressed to Penang, 28-8-08. ⁵ ib. Monday, 17th. Sept. 1802. ⁶ a suburb of Madras. ⁷ ib. 7-9-02. ⁸ Probably Morison. ⁹ ib. 19-10-02.

to realise the nature of the proposals, and his remarks were little to the point [I, 376]. In replying to them Mackenzie thus refers to Lambton's survey ;

I trust that Major Lambton's own explanation of his Plan must by this time show it to have been entirely distinct from that entrusted to my charge ; both being instituted at different distant periods, and in no respect intended to be connected together further than in that communication and good understanding which works proposed for the improvement of Geography, and sometimes coming in connection, bear to each other [116].

This need not be indeed more strongly illustrated than by recollecting that this Gentleman's operations, for some time, have been directed to the country on this side of the Ghats [236-8], and was no more applicable to Mysore than to any other part of the Peninsula, to which the result of a Series of Great Triangles was meant to extend. ... The Northern Survey [99-100] was carried up to the Pennar¹ nearly about the same time that the Spherical Triangles were from Serah extended into that neighbourhood [235]². and to Lambton himself ;

The base at Ballapore...was measured by Mr. Mather & re-measured by him and Mr. Arthur, and the work done with a common chain [205]. Such precautions were used as leaves no little doubt with me of all the accuracy consistent with the nature of the means employed [sic].

I can have no objection therefore to your verifying it, as well as the other Bases when you approach them ; at Hurryhur [95] etc., or at any rate the nearest primary stations which you will find in the Chart sent you. I enclose a little sketch of the Base near Ballapore. ... Perhaps it would be curious to ascertain the real difference between a Base measured by a Common Chain, and by the improved one with all the allowances made, & I believe the difference cannot be very essential. Such an experiment by yourself I could have no objection to³.

In November 1805, Mackenzie wrote from the western borders of Mysore ;

I have been duly favored with both your Letters from Bangalore & Seringapatam. ... I have since September brought up both the detailed & fundamental part of my work to this place (Azimpoor), where I have measured a Base [107]. ... I shall want a few connecting Stations towards the centre of the Country, which I leave till the occasion offers more conveniently on my return. Meantime, by carrying them along the West side, I have the satisfaction to see they agree so nearly with yours, that on common maps the difference will not be perceptible ; & in the Southerly and Northerly & your extreme points...there appears on inspection of the maps very little difference ; Some difference is occasioned by the same points not being taken ; in others I know not precisely yours. ...

I return you my thanks for this plan ; I wish you had added to it on the East as far as... Vellore⁴, & on the West so far as you have gone to the Coast ; as in the latter it would point out to me some leading stations ; all along I have been obliged to grope my way in the dark as it were, & consumed much time in reconnoitring & taking Stations that frequently are laid aside for want of previous information.

I continued this way till June, when the state of the atmosphere alone forced me to relinquish the Survey in Bednore, and till within these few days the weather has not been sufficiently clear to tempt me out again. I am now on the wing again to close this part while the weather permits.

Your meridian lines will be of use to me in correcting mine, tho' in the mean time I have taken the variation at our Bases & some principal stations. In the whole of your Triangles I find we have gone over the same ground, & beyond these in several instances. As yours go no further than Hardanely⁵ on the South, I inclose all I can...to the Guzzalatty Pass⁶ ; you will find some difficulty in carrying them below the Ghaat, as the ground is so narrow, & I would recommend your going on that hill...where I caused a heap of stones to be erected near our Station ; you will have there a fine view of the Country below, & some good points I think for extending your Stations, even so far as Trichinopoly Rock, which I hope you will include before your return to the Carnatic, as it connects the Southern Geography [I, 170]. ...

On my present Journey I should wish to have any points you can give...to guide my attention towards the Ghaats, & if there be any material point on the Sea Coast that you have taken, it would be still more desirable⁷.

In 1808 after Lambton had moved south, Mackenzie wrote to Warren at the Observatory ;

Lambton's difficulties in Tanjore, I suppose, must have arose from the flatness of the

¹ Pennar R. 57 G/9. ² DDn. 42, 12-7-03 (57-8). ³ DDn. 66, 7-6-04. ⁴ 57 P/1. ⁵ 58 A/13; pl. 11. ⁶ 58 E/2. ⁷ DDn. 43 (133), 15-11-06.

Country, & its being so woody would also impede his Station [241]. I have not heard of him for a long time till you mentioned him, & thought he had gone on to the Madura Country¹.

The following letter written by Mackenzie just before sailing for Java suggest that Lambton had stayed with him in Madras before moving north to the Ceded Districts [245] ;

I am very glad to find by your letter of 14th that you made such progress, and came up so opportunely with your baggage. I trust by this time you are advanced well into the Ceded Districts. ...

I have the pleasure to enclose copy of your list of books and furniture left in this house. ... I have directed Mr. Ward by letter to deliver any part, or the whole, of them to you or your order ; and meantime to look occasionally to their security. The plate particularly to be placed in his own bedroom, as it is in my room at present. You have nothing to do but to write him to deliver whatever box or article you may want to your order.

The name of the senior of the assistants employed now in the Gandicotta district is Michael Dunigan, and I have directed him to attend to every requisition you may make on them for anything within their power, particularly accurate descriptions of the hills and best stations, the roads, the marks at the base, etc. ... I know not whether it would not be useful to them, though perhaps troublesome to you, that one of them should attend the measurement of your base, in order to attend particularly to the observation for the latitude and azimuth. I have lately sent a sextant to Dunigan ; ... I will write him to attend to your commands².

The full record of these friendly and chatty letters should safely dispose of the story that there was at any time any unfriendly feeling between these two remarkable men. It is evident that Mackenzie was well satisfied to find that his own triangulation was sufficiently accurate for control³ ; at the same time he was comforted by the close agreement between his work and the more precise results of Lambton's scrupulous care. The very possibility of such check was an obvious incentive to accuracy. Had Lambton's survey come first, with stations established and clearly marked, Mackenzie would have been only too glad to base his work on the more scientific triangulation⁴.

¹ DDn. 43 (246), 15-6-08. ² DDn. 83, 29-3-11. ³ Note his satisfaction at making his own connection to the Madras Observatory, rather than rely on Lambton [152]. ⁴ See also pp. 112, 115, 233-4.

CHAPTER IX

MADRAS MILITARY SURVEYS

Route Surveys, 1799-1804 — Military Institution, 1805-15 — Travancore, 1805-11 — Hyderābād & Berār, 1805-11 — Java, 1811-16.

FOR nearly two years after the fall of Seringapatam there was continued fighting along the western borders of Mysore, the principal leaders of the hostile forces being the Marātha adventurer Doondiah who roamed between Bednur and Savanur [94]¹, and the Pyche Rāja² of Kottayam, who defied the British troops from his mountainous home in north Malabar [I, 132]. So little known were these frontiers that in the treaty of 1699 Wynād [107 n. I. 123] was ceded to the British under one name, and allotted to Mysore under another ! !, a misunderstanding that was put right in 1803 by the transfer of other areas to Mysore in return for recognition of British possession of Wynād³.

Of the frontiers further north, Wellesley writes to Orr [I, 361] in August 1799 :

I am quite at a loss for some knowledge of the principal posts and roads in this, and the Bednore, country. I understand that though your official duty is in another line, you still pay attention to the surveys of the countries through which the detachment marches, and I shall be obliged to you for any communication you can make to me respecting them⁴.

Troops were moved up to Chitaldroog in June 1799, and advance columns occupied Beduur. After marching the Grand Army to Honnālī⁵ General Harris handed over to Wellesley at the end of August⁶. Doondiah was driven into Sonda [pl. 11] which did not prove the sanctuary he expected, as the Marāthas had declined the cession of that district, and British troops were able to occupy it by the end of September⁷.

Doondiah still remained undefeated and a menace to the border, and in May 1800 Wellesley led a considerable force against him and, after a troublesome campaign which revealed his skill as a leader, Doondiah was defeated and killed on 20th November⁸.

By March 1800 the Pyche Rāja was giving trouble further south, and there was some discussion about sending an expedition against him at once⁹; this however had to wait till Doondiah had been settled with, when combined operations were carried out early in 1801 by a Madras column from Mysore and a Bombay force from Malabar.

Much useful survey was carried out throughout these campaigns by James Colebrooke, brother to the Surveyor General, who took over command of the Guides in October 1799. He surveyed the marches of the Grand Army under Harris, Wellesley's marches on the Sonda frontier during 1799¹⁰, and the "Marches of the Army...under Wellesley from entering the Maharatta country to the total defeat of Dhoondiah Waugh at Coonacul"¹¹. This latter map covers the country from the Tungabhadra River near Harihar northwards to the Kistna and Gutpurba rivers. His native "guides" also did good work, and Wellesley writes in February 1800 :

I have written to Colebrooke to desire him to send some of his native guides, who are more useful than any people I have yet seen in exploring roads for our troops¹².

¹ Bednore, Sanoor [pl. 11]. ² A junior member of the Kottayam family; finally crushed in 1806. 58 A/2. ³ Aitchison, IX (183n). ⁴ *Supply. Desp.* 28-8-99. ⁵ 48 N/12. ⁶ Lushington (281). ⁷ Wilson II (22-8). ⁸ *ib.* (14); Logan (535); Gleig, I (268) gives 10-9-1800. ⁹ *BM Addl MS.* 13725 (56). ¹⁰ MRIO, Misc. 1-0-06; shows positions of Goa and Dhārwar. ¹¹ Kundgol, 48 M/7; map, MRIO. 118 (37). ¹² Gurwood, I (78).

The elusive and persistent Pyche Rāja took his name from his residence at Palassi, or Pazhassi, about five miles from Kottayam, the seat of other members of the family, whence the name "Cotiote Rāja" [I, 132 n.3]. This densely wooded, sparsely habited, tract lies some 25 miles north-east of Tellicherry and east of Cannanore, with the Wynād lying further to the east along the southern border of Coorg, towards Mysore.

Moncrieff and Williams had been able to reconnoitre the main roads from Tellicherry towards the Wynād [I, 132], but the first opportunity to run a line right through the country came when Colebrooke accompanied Stevenson's column in January 1801¹. They marched south-west from Seringapatam into the Wynād, and then westward over the Perya Pass² into Kottayam, meeting the Bombay troops who had already occupied Palassi³. The Rāja himself escaped to fight for many another day, and was not finally accounted for until the end of 1805.

The Wynād was more fully surveyed later in the year by Charles Rand, an officer of the Guides⁴.

Meanwhile in 1801 other columns of the Madras Army were engaged in subduing the *poligars* of Shevavunga⁵ in the south peninsula, and Bradley, of the Engineers, surveyed various routes through Tanjore, Madura, Trichinopoly, Tinnevely, and Rāmnād [pl. 16].

Later on, Valentine Blacker held command of the Guides and, besides making various surveys himself, was indefatigable in instructing the native guides in the principles of geometry and surveying, and he has brought that Corps to a degree of perfection in their duties which was never before equalled⁶.

Amongst surveys known to have been made by Blacker are one of the west coast near Anjengo and another of the country between Seringapatam and Coimbatore. He also constructed in 1805-6 a "Map of the Polliams dependant on Chittoor, laid down from actual surveys⁷", which covers a small area north of the Palar River between Chittoor and Arcot⁸, and appears to be one of the first surveys based on Lambton's triangulation, for in 1804 Lambton writes to the Quartermaster General, promising to furnish Capt. Blacker with all the points and distances which have been determined in the Chittoor District, from the Bomraji Pollam to the Mooglie Pass⁹, which I trust will enable him to make a complete military survey of the Pollurus¹⁰.

Scattered surveys were made at different times in various parts of the Northern Circārs¹¹, the more extensive of which were made by Sholto Douglas round Vizagapatam during 1810 and 1811 [160].

These scattered efforts did little however to furnish the army with the maps of the Madras provinces that were essential for military operations. The obstruction of the Nawāb of the Carnatic, and the objection of the Directors to the appointment of a Surveyor General, had prevented any continuous system of survey, and we have already noted how soon disappeared such fragmentary surveys as were made by individual officers [I, 119].

In January 1804, at the suggestion of the Surveyor General, Robert Colebrooke, the Governor General re-issued the General Order of 29th September 1788 [I, 106], ordering the regular survey of every military route, and the Commander-in-Chief at Madras, James Stuart, took this opportunity to press the urgent need for the extension of surveys ;

An accurate and extensive knowledge of the Geography and Topography of the Territories dependant upon this Presidency is of high importance. ... It is equally necessary as it relates to the Political limits of our possessions and of those occupied by our feudatories ; to the channels of omercial communication, and to the sources of Revenue, and the internal boundaries of

¹ Date in fdbk. M 114 and other survey records ; but Innes (70) gives 1802. ² 40 M/13. ³ 6 m. NE. of Kuthuparamba, 40 M/9. Journal, MRIO. M 114. ⁴ MRO. Map 179. ⁵ Sivaganga, 53 K/5. ⁶ Letter from Orr, 3-8-08. *EIMC.* I (323). ⁷ MRO. Map 272. ⁸ 57 O/4, P/5. ⁹ Mogli P. 57 K/16. ¹⁰ DDn. 63 (11), 14-9-04. ¹¹ Ichchapūr, June 1801, Edward Fraser ; NW. Boundary. Ellore Circār, Sept. 1808, Capt. G. Hare ; Rājahmundry coast, David Barclay ; DDn. 246 (114, 126).

the Country. But to the successful conduct of Military affairs this knowledge is indispensable. ... Destitute of that knowledge, our Military measures must be crude and imperfect, ... and liable to be counteracted by an Enemy acquainted with the Country. ...

An extraordinary and inexcusable neglect of Geographical pursuits in the Peninsula of India was long prevalent. No regular surveys were instituted with exception of the survey of the Jageer executed by Mr. Barnard [I, 88]. We possessed no other knowledge of the nature of our territories, of our frontiers, or great roads, but what was furnished by the routes of the armies in the Field, and these, being executed under every circumstance of disadvantage, were incorrect and extremely confined. ... The knowledge which we have of the Carnatic and Southern Countries has been derived principally from the voluntary exertions of Individuals [I, 97-100]. ...

These embarrassments were at last apparent to Government after the conquest of Mysore ; and a regular plan was adopted for the survey of that Country. The labours of Majors McKenzie and Lambton have afforded the most decisive and honorable evidence of the advantages of that measure ; ... they have introduced a system of scientific, accurate, and just surveying, and have contributed to enlarge the bounds of General Science.

It appears to the Commander-in-Chief that the existing Surveys are not sufficiently extended, or directed to Military purposes. It is an object of importance that the Surveys...should be completed at as early a period of time as may be practicable. ... Extensive Provinces have been added to this Government of which no regular surveys, and very few Geographical materials, exist. ...

The Commander-in-Chief recommends that Major McKenzie may be directed to consider his survey to embrace the Ceded Districts, with the Provinces of Soonda and Canara ; to recommend such a number of additional Assistants as may be necessary for that service, and to direct the attention of his Assistants to a particular examination of the Towns, villages, roads, passes, defiles, mountains, rivers, forests, ... as may be necessary to render his survey in the greatest practicable degree subservient to Military purposes¹ [103, 107].

Lord William Bentinck, then Governor of Madras, was greatly interested, and at his suggestion the Council again addressed the Directors urging the appointment of Mackenzie as Surveyor General [I, 264-5, 298] ;

The importance of an accurate Topographical knowledge of our possessions in India in a Political, Commercial, and Military view, is obvious ; as well as the advantage of maps calculated for that purpose. It is on this principal that the temporary Establishment of an Office for the Collection, Revision, and reduction under one convenient scale of all existing Geographical and Topographical surveys, has been deemed advisable, and that the Board have adopted the Resolution of recommending to the Honorable Court of Directors, the permanent appointment of a Surveyor General at this Presidency. ...

Major McKenzie and Captain Lambton have undertaken surveys on scientific principles ; they have determined points by means of measurement and calculation, which before had been laid down on very doubtful suppositions. ...

But, however meritorious their personal exertions may have been, the utmost endeavours of themselves and of their few Assistants under the influence of a torrid climate, and amongst many interruptions from the circumstances of the times, will never be equal to the labor of a topographical survey of the extensive territories subject to this Government.

The time of men of science engaged in Geographical pursuits will be chiefly occupied in fixing capital points, and it appears to me that their talents are even misapplied when directed to attainments within reach of inferior capacities. ...

Plans of the nature which I have described cannot be constructed either without great personal exertion, or within a short period. ... But although such sketches and remarks must be highly useful where none before existed, yet it is easy to conceive how imperfect, and even unintelligible such works must often be, where no system of Drawing, and no fixed signs to represent particular objects and features of a country have been established, but where every Officer pursues a different mode of expressing the objects which he sees².

The Governor then worked out a scheme for training young infantry cadets of the Madras army in a regular school of survey [314-5], which should become "a Nursery of accurate Surveyors and able Officers³".

This was the origin of the Madras Military Institution, and no official corroboration has been found for Markham's statement that it was founded on Mackenzie's

¹ C.in.C.'s minute, 10-8-04, MMC. 14-8-04.

² Minute of 20-9-04 ; MMC.

³ M to CD, 16-10-04

advice¹. He may have inspired the Commander-in-Chief's minute which is, however, dated some weeks after his departure to Mysore, but he could have had little to do with Bentinck's proposals for a training school.

MADRAS MILITARY INSTITUTION

Detailed orders for the formation of the Institution were passed in November 1804, and a class of 12 was chosen from the company of Gentlemen Cadets, to be instructed "in geometry, drawing, and other branches of Military Education", whilst "Ensign Troyer of His Majesty's 12th Regiment of Foot" was appointed "Drawing and Mathematical Instructor"² [2].

Survey by planetable was to be taught with strict regard to the essentials of a military map, and the more advanced pupils would "proceed to the trigonometrical calculations". The course was intended to last two years, but the first class was not released for over two and a half.

The first class assembled in April 1805 and, after several months at lectures and theoretical instruction, did three months practical surveying from February to April 1806.

The Madras Record Office still holds a survey of Madras town on the scale of 300 feet to an inch, in eight sheets, and another of Ryaporam, scale 200 yards to an inch, carried out by these young officers between August 1805 and April 1806³. They also completed the survey and fair mapping of a "Topographical Survey of Madras and its Environs"⁴. The following October Troyer submitted two copies of the survey by the Senior class of the Military Institution, the one upon a scale of 4 inches to the mile, destined...to be deposited in the Quarter Master General's office, and the other, upon a scale of 2 inches to the mile, which your Lordship may be pleased to send to the Honourable Court of Directors. The accompanying skeleton of the survey shows the part which each Gentleman has surveyed and drawn; the united plans from the hands of 12 Gentlemen form the first mentioned copy. ...

This topographical survey was made by means of the accurate bases given by the previous operations of Major Lambton; the great triangles determined by him were filled up with the details which constitute a topographical, and properly speaking a military, plan.

The instruments used in this survey were two common telescopic theodolites, and the best plain tables such as local circumstances could furnish [229]⁵.

A second class of 18 joined in April 1806, and both classes took the field at the end of the year, Garling, of the senior class, acting as assistant instructor. The senior class made a survey of Pondicherry and its vicinity⁶;

The extent of ground to be surveyed by the Senior Class comprehends 1134 square miles. 378 square miles only are destined to the Junior Class, on account of its being their first essay, and of the shorter time allotted to them for it. ...

The survey is to be made on a scale of 4 inches to the mile, a specimen of which has been presented to your Lordship with the first survey of the Senior Class, but from their present proficiency higher expectations may be formed of the goodness of their performances. These are to be accompanied by descriptive memorandums. ... Any fort falling into the Survey... will be Surveyed particularly upon a Scale of 600 feet to the inch. •

The bases resulting from Major Lambton's operations will again form the foundation of this Topographical Survey. My best endeavours will be directed towards the determination of such a number of intermediate points, independently of the particular work of each Gentleman, as may ascertain the junction and accuracy of the whole. ...

The allowances granted [331]...are to be drawn only during the time of the Survey, which for the Seniors is to be 7 months, namely from the 1st of January to the end of July, after which they are to be recalled to Madras for the purpose of rectifying their work, and finishing a fair copy of it, ... and at the same time for pursuing some further mathematical and Military Studies.

The Junior Class is to be recalled at the end of 4 months for the continuation of the pre-cribed course of Studies. ...

¹Markham (73). ²MMC. 13-11-04. ³MRO. Maps 56 & 60; Love also mentions a survey of St. Thomé. ⁴IO Cat. ⁵MMC. 21-10-00. ⁶MRO. Map 292.

In the division of equal parts to be surveyed by each Gentleman of the Senior Class, 18 square miles have been taken...as the extent which he may be able to survey within one month, or 108 square miles in 6 months. But by taking into consideration the time necessary for arriving at their destined place, for the reconnoitring of their ground, and any unexpected obstacle, one month has been added to that time, so that 7 months are allotted to each Gentleman for the Survey of the above mentioned extent¹.

Troyer and Chavasse did the triangulation ;

From the middle of January...I was occupied with carrying on a set of intermediate triangles between those of Major Lambton's survey, ... extending it...as far as Trinomallee. Lieutenant Chavasse was forming a trigonometrical connection...in which he was interrupted by indisposition, and obliged to transport himself for medical aid to Cuddalor. We shall have the honor to present you the whole of our trigonometrical operations at the close of our calculations at Madras.

In three months the ten planetablers of the senior class completed from 40 to 108 square miles each, totalling 731² ;

The differences in the quantum of the work...proceeds merely from more or less difficulty met with in the respective surveys, and the disappointments with respect to plain-tables not delivered by the instrument maker at the time at which they were promised. ...

The Junior class, ... under the particular Superintendence of Lieutenant Garling, have meanwhile nearly finished the survey of the general area allotted to them, and are now proceeding to connect, by sections voluntarily undertaken, their surveys with that made last year by the senior class in the environs of Madras³.

With his reports of December 1807 Troyer recommended the posting of the senior class to various field surveys [317], and a new programme for the junior classes ;

The former possessions of France and Holland⁴ on the coast were surveyed by the Institution during the last season. This survey...includes several tracts beyond the limits of the Foreign possessions, and while the Gentlemen of the first class were engaged in its prosecution, the Junior class surveyed the country extending along the coast from the Presidency to the boundary of the French Districts, thereby connecting the survey of the environs of Madras, already executed by the Institution, with that of the foreign possessions.

During the ensuing survey it is proposed that the Districts extending from Tripassore towards Chingleput⁵ shall be allotted to the Junior Class, and that those stretching Westward from the Meridian of Tripassore towards the Ghauts, which border on...Tripety and Chittoor⁶, shall be surveyed by the first class. The facility of surveying the former districts in consequence of the flatness of the Country is suitable to the attainments of the Junior Class, and the mountainous nature of the latter has suggested the expediency of allotting them to the first class. ...

But considerations of much higher importance urge the propriety of surveying without delay the tract to the northward of Tripassore. ... The contiguity of that tract...to Madras, its strength and military advantages, ... together with the importance of its position, which commands the most direct communications with the Ceded Districts and the Northern Division, render it extremely desirable that it should be accurately examined and known, but it is an extraordinary circumstance that we are at present almost entirely ignorant of the topography of that country ; no maps or surveys of it are to be found under this Government, and we possess less knowledge of it than we do of the Nizam's and Peshwa's. ...

Major Rennell, in constructing his map of the Peninsula, particularly adverted to the deficiency of geographical materials of the countries between Madras and the Kistna [I, 99], and few additions have been made to them since the date of his Memoir.

If the Government should approve of the plan, ... the Institution will produce in the course of two years a complete and most accurate Topographical survey of the whole of the Western Pullams. ... If the Western Polygars should be suppose to entertain sentiments adverse to their allegiance, ... nothing would contribute more to prevent the effects of that disposition than an accurate knowledge of the roads and fastnesses of their Pollams⁷.

To the Quartermaster General, Troyer proposed that the Junior Class are to continue the former survey on the side nearest to Madras, upon an extent of seven hundred and twenty nine square miles, on a scale of six inches to a mile, as this will be their first essay in Topographical surveying. ...

¹ Report from Troyer, 31-10-08; MMC, 29-11-08. ² Cuddalore to Coleroon E. & West to Rajanagarik; reduced to 1/4-inch scale; MRIO, 133 (10). ³ MMC, 10-4-07. ⁴ Pondicherry, 58 M/13; Karikal, 58 N/13; Negapatam, 58 N/13; Tranquebar, 58 M/18. ⁵ Map of Tranquebar Town, 400 ft. to an inch; April 1808; James Swinton. ⁶ 57 P/14. ⁷ Tirupati, 57/0; Chittoor, 57 0/4. ⁸ MMC, 4-12-07.

The senior class are...to survey the extent of ground noted on the plan, taking in a part of Bomrauze's Pollams as a country less known, and comprizing in the whole one thousand seven hundred and twenty-eight square miles.

Except for the western *pollams* [370], of which the survey could not be sanctioned, this programme was completed by the end of May 1808 ;

Each officer of the Senior Class has finished the four sections comprehending 108 square miles allotted to him. The junior Class have exceeded the portion allotted to them by about 600 square miles, which is chiefly owing to the zealous exertions of Lieutenant Garling, my Assistant. ...

I reserve to myself the honor of laying before you the plan of our trigonometrical operations as well as the Book of the calculated triangles, with the fair copies of the particular surveys of each officer¹,

The next four months were spent in making fair copies on the four-inch scale, and in reducing to the 2-inch scale, each officer working on his own area²; the senior class also received " a course of instruction in some branches of the higher mathematics ".

The programme for the early months of 1809 covered an area immediately north of Madras, but the season was cut short by " the White Mutiny ", in which a large proportion of the British officers on the Madras establishment mutinied and led their regiments against Government on the pretext of various grievances, the most prominent of which was the abolition of the Tent Allowance³. Even the cadets were led astray, and eighteen of the junior class at the Institution were ordered to their regiments in February⁴. By August more than 1300 officers had been placed under custody, whilst fewer than 150 had signed the *Test* of loyalty that was demanded [314]. Peace was at length restored, and the senior class sent out on survey ;

The operations of Major Lambton's survey...have not been carried much to the Northward of Madras, and the present engagement of Major Lambton in the Southern parts of the Peninsula render it improbable that he will return to this Quarter for a considerable period of time. But as the tract of country to the Northward of the Presidency is of great Military importance, and is very little known, it ought to be surveyed with the least practicable delay by the Institution, and it will be requisite for that purpose that it's general Geography should be previously determined by Trigonometrical operations. ...

It is proposed that a survey shall comprehend the Pulicat Lake, hitherto very imperfectly known, the countries to the Northward and Westward of the Lake, and a part of the mountainous tract occupied by the Western Polygars. The considerations which I have stated induce me to recommend that a Trigonometrical survey of these countries may be conducted by Lieutenant Garling, assisted by Lieutenant MacGlashan of the Institution, and that a subordinate topographical survey of the same countries may be prosecuted at the same time by Lieutenants Young, Conner, Fyfe, Cameron, Hancock, Dunn, and Lethbridge of the Institution⁵.

This survey included Kālahasti and Tirupati⁶, and was carried on until August 1810, when Garling was ordered to take the party across the peninsula to survey the Portuguese territory of Goa [156].

Henry Bevan⁷ [320] gives the following account of life and work at the Institution. He came out to Madras in January 1809 and joined the cadet company, then at Cuddalore ;

Being favourably reported of by the Officer in charge, in May following I was recommended as a candidate for the military institution at Madras. ... Towards the middle of 1809 the military institution was suspended by Government. ...

Soon after I had joined ... , it was resolved to employ the officers...in a practical survey, for which they were eminently qualified. It was my good fortune to be engaged in this service; and bidding adieu to all controversies, civil and military, we devoted ourselves to providing camp-equipage, and all other necessaries, preparatory to our quitting Madras.

When all our arrangements were completed, we crowded to the southward on a topographical

¹From Troyer, 24-5-08; MMC. 1-7-08. ²*Triangular Survey of S. portion of Fellore, North Arcot*; Hills neatly hachured; unfinished reduction; MRO. Map 271. ³Cardew; Wilson (233, 236). ⁴MMC. 18-2-09. ⁵From QMG. 22-12-00, MMC. 2-1-10. ⁶57 O/10 & 6. ⁷b. co. Limerick, 9-8-1790; m. 30-10-32, Mary Ann Curtis, of Guernsey, who d. of cholera, Salem, 23-7-37; ret. 25-10-37; d. 1846.

survey near Gingee¹. ... Each section contained 27 sq. miles, on a scale of four inches to the mile, and two at least of these sections were expected to be completed by every officer previous to his return [215]. A military memoir or record, embracing the resources, population, roads & pathways, facilities of defence, obstacles, statistics, with such military and other useful reminiscences as could be obtained, was to accompany each official return.

Captains T. and A.² superintended the whole of the officers during the survey. Having completed my share of the duty by the end of February 1810, I amused myself the remainder of the time allowed in hunting and shooting. ...

We completed fair copies of the surveys, and continued our studies in the higher branches of mathematics, during the remainder of 1810, so as to be able to use the theodolite and calculate angles by logarithms. ...

We proceeded on our second survey, to fill up the Topographical details in those triangles that had not been completed in the preceding year, in the vicinity of Gingee, Arnee, etc. Having finished mine before the time specified, I was requested by Capt. S. to undertake that part of Capt. M's. survey which he was compelled to leave unaccomplished owing to a severe attack of fever, peculiar to Gingee, but which through the mercy of Providence I escaped, and finished the survey, for which I received the thanks of Capt. S. and Col. B.³ the Q.M.G. ...

Bevan was employed on other surveys after leaving the Institution, and records that

considerable hardship, fatigue, and exposure, are consequent on the detail and minuteness of topographical surveying, as I have frequently had my feet blistered while on that duty, being... obliged to clamber up to the tops of rocks in order to gain a prospect of the country where flat and covered with jungle; especially when it became necessary to obtain an elevated position to command a bird's-eye view of its general features, ...

An order just arrived from the Court of Directors had the effect of removing me from the "Survey Branch", as "no officer for the future was to be allowed on the staff, or hold any employment, until he had done two years regimental duty with his corps" [314]⁴.

On the appointment of a Surveyor General in 1810, the Quartermaster General was at the same time given a definite establishment of surveyors for work on surveys that were essentially of a military character. The Military Institution remained under his orders, but the programme was to be settled in consultation with the Surveyor General⁵;

Some rules should be established for the conduct of surveys which are undertaken by the students of the Institution; unless these shall be arranged in communication with the Surveyor General, it may occur, as it has before I believe been the case, that the same tracts may be surveyed twice over. ...

An idea being prevalent that it is intended to prosecute a General topographical survey over the whole of the Country, I think it necessary to take this opportunity of stating that there is no such intention.

The students of the Institution have, it is true, nearly completed a topographical survey of the soubah of Arcot; ... and when surveying parties are sent out for the purpose of instruction, it may be advisable that they should be employed in prosecuting that work so far only as may be necessary for teaching them, but at the same time the employment of these parties, ... in communication with the Surveyor General, will be the means of saving expence at a future period⁶.

Classes of students continued to be posted to the Institution up till 1814; sometimes a large class of 20 was appointed every second year, and at other times a class of 10 was appointed two successive years. Troyer continued as Instructor, doing most of the minor triangulation himself. Garling's place as assistant instructor was taken by Walpole, and an extra assistant was obtained from time to time from the ranks of past pupils, to assist during the field season.

The area covered by the Institution surveys before they were closed down in 1816 is shown on plate 24. Being on the large scale of 4 miles to an inch, they showed a mass of valuable detail, but it was unfortunate for their value to civil officers that they showed no administrative boundaries; possibly it was wise not to

¹57 P/7. ²Troyer and his assistant, presumably Garling. ³Capt. S. probably intended for T. (Troyer); B—Blacker. ⁴Bevan (33, 38, 44). ⁵Draft regulations by Mackenzie, 12-12-10. MRIO. M 59. ⁶Governor's minute, MMC. 29-1-11.

leave such a controversial and important matter to very young officers. Reviewing the work several years later, Montgomerie writes ;

It is in this faithful delineation of the features of the country that their chief merit consists, for in many other respects these surveys are very defective. The absence of all Revenue or Political Boundaries, and the inaccuracy of the names, renders these Surveys of far less value than they would otherwise have been, and from the carelessness of some of the Officers employed the detail in some sections is inaccurately laid down. These defects however admit of future correction, and it must at the same time be admitted that by far the greater part of these Surveys are, with the exception of the Goa and Soonda Surveys [156-9], the best of Indian Topography and Geography¹.

Each pupil reduced his own work to the two-inch scale at the end of the season, but no immediate attempt was made to compile a general map. In May 1810 James Kinsey, of the second class, was appointed

to be a temporary Assistant in the Institution for the purpose of arranging and Registering the different trigonometrical and topographical materials &c. which have been collected there from various surveys [275]² ;

but on the appointment of the Surveyor General a few months later he was absorbed into the Q.M.G.'s department for other duties.

Two years later Troyer made definite proposals for compiling the surveys into useful maps :

A Copy of the existing Plans of Surveys upon a more commodious reduced Scale has been a great Desideratum, since the mass of the Topographical materials produced...has now increased to the amount of about 10,000 Square Miles, upon a Scale of 4 Inches to the Mile, lodged in three rectangular Boxes.

The scale upon which the Plans have been executed, although by no means too great for a Survey particularly intended for Instruction, will prove...inconmodious ; ... the few details and the great uniform features of some tracts of the Country may be represented with sufficient distinctness in a much smaller Compass. ...

I beg leave to represent the expediency of an immediate beginning of the work, for the success of which...the acquired skill in drawing of Cornet Montgomery and Ensign Mountford, of the present Class, ... would be of the greatest Service³.

In June 1812, therefore, Montgomery and Mountford, both of whom were beautiful draughtsmen, started to reduce the surveys to the $\frac{1}{2}$ -inch and one-inch scales⁴, and a magnificent job they made of it. They each completed a separate map, and Troyer submitted both to the Surveyor General in February 1815 :

The first copy, drawn by Lieutenant Mountford...upon a scale of half an inch to the mile, is...destined to be sent to the Hon'ble Court of Directors, and consists of 6 plans comprizing 14,094 square miles, which have been surveyed from 1805 to 1813 inclusively. One of these plans contains the Javady Hills⁵ which form one connected mass of mountains separate from the Ghauts, upon the limits of the Carnatic and Mysore, to which the profiles of the whole elevated tract of Country are added. ...

The other copy...executed by Cornet Montgomerie⁶...upon a scale of 1 inch to the mile, which scale admitted of a more distinct representation of the country, is destined to remain in the Surveyor General's Office, and consists of 14 plans comprizing 16,018 square miles, surveyed from 1805 to 1814 inclusively [pl. 12].

Both the copies are accompanied with a trigonometrical skeleton⁷, ... in which the triangles furnished by Major Lambton are marked with red lines, and the intermediate triangles...by the Military Institution...with black lines. ...

The agreement in the junction of the operations of so many hands was by itself no indifferent trial of the accuracy of each particular work⁸.

In forwarding these maps to Government, Morison commented that, while the public have derived great advantage from the Establishment...by having disseminated thro' the army a degree of useful science which must add materially to the professional efficiency of the Officers of the Army, ... a valuable survey of an extensive tract of country may be considered to have been carried on at little or no expense whatever⁹.

¹ Ddn. 246 (80 1827). ² MMC. 22-5-10. ³ Ddn. 127 (295), 10-6-12. ⁴ MGO. 17-7-12. ⁵ Unfinished map of Javadi Hill (57 L/SE), 1-inch scale, MRIO. 136 (1). ⁶ MRIO. 143 (5-18) MRO. map 271. ⁷ Copy by Montgomerie, scale 4 m. to an inch, MRIO. 144 (3). ⁸ From Troyer. 2-2-15 MPC. 427/1816 (706-17). ⁹ From Morison, ib. ; 20-2-15.

Mountford prepared another general map, scale 8 miles to an inch¹, which Mackenzie specially commended for "the beauty and neatness of the work; ... the Plans in question comprehending the greater part of the lower country between the Rivers Kistnah and Coleroon, now completed in detail on one uniform method²".

The success of the Institution in setting a high standard of survey and draughtsmanship was even more important in providing a generation of military surveyors, who put into practice and improved upon the systems evolved by Troyer and Mackenzie, and gave Madras a series of maps that was unequalled anywhere in India till the Himalayan and Punjab surveys of a later generation. The principal factors of the Madras system were :

First ; The trigonometrical survey of Lambton, with its great triangles broken down by secondary triangulation as first introduced by Troyer, and developed by Garling.

Second ; The survey of detail by planetable as taught at the Institution, which superseded or supplemented Mackenzie's system of theodolite traverse according to the nature of the ground.

Third ; The regular survey of administrative districts with internal and external boundaries, and the systematic collection of statistical information.

Fourth ; A steady supply of well trained assistant surveyors.

Fifth ; A body of educated officers trained in the best principles of survey, fit to act as surveyors in charge of extensive surveys.

Finally ; A sound organization in the form of a Survey Party, or unit complete in every essential feature for carrying on a survey over a number of years irrespective of individual casualties ; supported by an efficient headquarter office at the Presidency. The details of this organization were worked out with great thoroughness by Mackenzie.

The following tribute was paid to the Institution by Andrew Waugh in 1846 :

In former years there existed at Madras an institution founded by My Lord Wm. Bentinck, and placed under Captain Troyer, by whose able tuition several Officers were trained up to be excellent Surveyors and Draughtsmen, and as Assistant Surveyors were subsequently appointed to each survey, the knowledge and skill acquired by the seniors was duly communicated by a system of field instruction to those recently appointed.

Promotion also at that time was made to depend...on proofs of proficiency, founded on work actually executed in the field. ... This system produced vigor and efficiency, and a great deal of good work was done. Under this system were educated such men as Captains Garling, Conner, and Du Vernet³, and by its means were produced the excellent Military Surveys of that Presidency on a scale of one mile to an inch, exhibiting all details required for Military or Civil purposes in the existing state of the country⁴.

The happy choice of Anthony Troyer as instructor is of particular interest. He was brought out to India as an A.D.C. by Lord William Bentinck in 1803, having been an officer of the Austrian army, and educated at the Austrian military academy. Starting the surveys of the Institution shortly after Lambton had completed his first series of triangles along the Madras coast [236-8], he was able to introduce for the first time in India the soundest principles of topographical survey, breaking down the main triangles of the trigonometrical survey by his own minor triangles, and filling in the detail by planetable on sections laid out in a continuous rectangular grid. Holding the post of instructor for eleven years, he trained a large number of officers in this system which, in its main principles, has persisted to this very day. He was fortunate in finding a talented and able assistant in James Garling, who held independent charge of one survey after another from 1810 till his death in 1820.

TEAVANCORE, 1805-11

Though the Company had always been on friendly terms with the rulers of

¹ A reduction to scale 4 m. to an inch was also made by Ward, DDn. 246 (37, 90). ² From SG. 17-6-16, MDC. 15-6-16. ³ Du Vernet was not at the MMI, reaching India in 1823. ⁴ DDn. 462 (58), 24-9-46; see also DDn. 452 (70-3), 13-1-44.

Travancore, and had possessed a Factory¹ on its coast since 1684 [I, 96 n.1], little was known of its geography. It may be remembered that when Pringle crossed Travancore in 1779 he was closely watched, and prevented from making any observations or surveys [I, 96].

In 1798 James Dardell, engineer to the subsidiary force at Quilon, was deputed to survey the harbour and roads to discover a safe anchorage for the Company's ships². By 1804 he had completed "a Plan of the backwater from Cranganore to Quilon, drawn from materials collected at different periods"³ [pl. 16].

On Dardell's death in January 1805, the Resident wrote that since the death of Captain Dardell... the Dewan has requested me to express on his part...an anxious desire for the presence in this country of an Engineer and Surveyor, for the purpose of completing, in the first instance, the service upon which Captain Dardel had been employed, and for commencing...a regular survey of the Territories of Travancore⁴.

John Blair, of the Madras Engineers, was appointed to take up this survey under instructions from the Resident at Quilon⁵ ;

The Northern portion of Travancore being intermixed with land the property of various petty Chieftains, with some spots subject to the Honorable Company, these divisions of property, and the line of limit bounding each, should if possible be accurately ascertained and laid down⁶.

He does not appear to have made much progress, for he writes at the end of June ;

I lost no time...in commencing upon a survey of the Travancore country but I was much impeded at first, and latterly entirely prevented from proceeding, by the badness of the weather, which has been constantly hazy when it did not rain, so that little could be done in the way of surveying. I therefore with the less reluctance availed myself of your permission to proceed to this place [Quilon] for medical advice⁷.

In January 1807 he was appointed to the Nizām's Dominions and, as Ravenshaw who was to have relieved him asked to be excused, Thomas Arthur, who had been some years under Mackenzie on the Mysore Survey [95-107], was appointed to Travancore, and joined his duties before the end of the year, the Q.M.G. advising Government

that he had received detailed instructions for his guidance. ...

The state of the Travancore survey seems to demand the attention of Government. The high importance of that country, ... and the immense resources which it possesses, makes it extremely desirable that a comprehensive and minute survey...should be obtained without delay, and the present moment of General tranquility in the Peninsula affords a most favorable opportunity for the accomplishment of that object. The surface of the Travancore country, covered with mountains, lakes, and plantations, oppose greater obstacles to the prosecution of a survey than exist in any other part of the peninsula, and the climate in many parts of Travancore is extremely unhealthy⁸ [3].

Four officers from the first class of the Military Institution joined Arthur in December 1807⁹, apparently Biss, Dalgairns, William Harris, and another. Finding progress impeded by the lack of roads, Arthur applied for a small party of Pioneers ; ... indeed it would appear scarcely practicable, without excessive tediousness, to carry on a survey if a country like Travancore, so studded with wooded heights and so generally impervious, unless some such assistance be furnished¹⁰. A party of 25 Pioneers under a sergeant was supplied.

In November 1808, Garling and five other officers of the first two classes of the Institution, including all those in Travancore¹¹, were sent to Bombay to accompany Malcolm's mission to Persia¹². The mission was held up, and the officers were employed for several months under Malcolm, drawing a map which stretched from the Indus to the Nile. On the break up of the mission in April 1809, Garling returned to Madras, and the remainder rejoined the Travancore survey [174].

¹Anjengo, a British possession till 1947 [pl. 16]. ²Bo FC. 13 & 16-10-1798. ³MMC. 10-12-11 & DDn. 246 (49). ⁴MMC. 8-3-05. ⁵Survey of Part of the Kingdom of Travancore, including Aramboddy Lines; Blair: DDn. 127 (32), 26-10-06. ⁶MMC. 11-6-05. ⁷ib. 16-7-05. ⁸ib. 6-11-07. ⁹DDn. 64 (93), 27-8-10. ¹⁰from Resident, 23-4-08; MMC. 19-7-08. ¹¹Chavasse, Dalgairns, Wm. Harris, Alexander Stewart, Swanston. ¹²MGO. 17-11-08 & BSC. 20-2-09 (50).

In December 1808 disturbances broke out in Travancore, which were only suppressed by a strong British column which marched from Palamcottah and forced the Aramboli Gate¹, the principal pass over the Ghâts. In this action Lambton distinguished himself as engineer² [242]. His assistants, Swinton and Riddell, made a *Sketch of the Aramboly Lines*, 200 ft. to an inch³. Arthur also won the thanks of Government for distinguished conduct in the defence of Quilon on January 15th⁴.

At the close of the campaign the survey was pushed on ;

The Commander in Chief...entirely concurs in the...opinion stated by the Resident...and by Major Blacker⁵, relative to the expediency of accelerating the completion of the survey of Travancore : ... an application may be made...to send to Travancore such of the Gentlemen of the Military Institution as may not be required in the Persian Gulph [131], and...he may... desire Major Lambton to transfer for the present to the survey of Travancore as many of his Assistants as can be spared⁶.

Swinton and Riddell were placed under Arthur's orders till the monsoon set in [243], and other officers, besides those from Bombay, joined the survey in May 1809. Arthur appears to have had under him, at one time or another during the next two years, Alves, Chavasse, Dalgairns, Harris, Murray, Stewart, and Swanston⁷. Early in 1810 he submitted his maps of southern Travancore to the Quartermaster General, including,

Topographical Plan : Net of Triangles, and...calculations for correcting the Base—Observations for Latitude and Longitude, and for calculating the Meridian—with a covering letter :

Thus, Sir, We have endeavour to execute your orders, and we should derive infinite satisfaction if, at a future day, when the operations of Major Lambton shall have been carried across our labours, if you (whose indulgence will not fail duly to bear in mind the paucity & imperfection of our instruments) should then consider this our maiden attempt at a complete whole not altogether unsuccessful⁸.

On the appointment of the Surveyor General in October 1810, all the military assistants were withdrawn to their units [322] and, as his proposal to employ sub-assistants from the surveying school was turned down⁹, Arthur finished off his general map, leaving the survey uncompleted. The last surveyor left was Alexander Stewart who

reports his being employed generally on a different duty, in lining out roads for the Pioneers, and lately...that the Party of Pioneers usually attached to him had been withdrawn, and that the survey cannot be carried on without the aid of Pioneers, or of a number of Country people¹⁰.

Arthur remained in Travancore as engineer till his death in 1817, making occasional surveys for roads¹¹, and of the boundaries of Cochin¹². The haphazard progress, and the eventual abandonment, of this survey is typical of work carried out before the appointment of a Surveyor General ;

From 1806 till 1811, tho' different Officers were successively appointed, very little progress had been made, ... in a great measure owing to the repeated removals and changes before any one part was completed, whence its results, coming under the inspection of this office in January 1811, scarcely included 595 miles of detailed survey out of 6761 miles estimated for that country ; in these circumstances that survey was discontinued at the time, and suspended till an opportunity could offer of taking it up with greater prospect of effect by employing a sufficient party for that sole purpose¹³.

HYDERĀBĀD & BERĀR, 1805-11

On his appointment to superintend the survey of Mysore, Mackenzie was allowed to retain his post¹⁴ as Engineer and Surveyor to the Subsidiary Force at HyderĀbād [I, 112, 350 ; II, 3], although it was obviously impossible that he would be able to continue the duties of that post [312, 330].

¹ 58 H/12. ² *As AR. XI. 1809 (47)*. ³ *DDn. 246 (51)*. ⁴ *MGO. 4-2-09*. ⁵ now DQMG. ⁶ *MMC. 21-3-09*. ⁷ *East Quilon with coast. C. G. Alves. MRO. Map 396 ; MRIO. M 239. List of Plans, DDn. 127 (32)*. ⁸ *Map of Trichoor, with Mountains to the East. 1809, by Harris, Chavasse, & Swanston ; MRO. Map 401*. ⁹ *ed., Bawady Fort, 18-1-10 ; Lieut. John Harris, M 106. MRIO.* ¹⁰ *MRC. 20-10-10*. ¹¹ *MMC. 28-2-11*. ¹² *Routes in Travancore, MRIO. M 11 ; MRO. Map 388.* ¹³ *MJC. 1813-5 ; MRIO. M 107 ; Map. IO Cat. (414)*. ¹⁴ *Report by Mackenzie ; M Rev Bd. 28-6-17.* ¹⁵ and the allowances attached thereto.

Occasional route surveys were made through the Nizām's Dominions during the next five years, and during the campaign against the Marāthas of 1803 James Colebrooke surveyed the marches of the Subsidiary Force through Borār, his map extending from Ellichpur towards the south and west¹ [165]. Berār was at this time but little known and Mackenzie had in 1795 pointed out that he had been able to add nothing to its geography [I. 118].

In 1805 the Commander-in-Chief pointed out that the Engineer to the Subsidiary Force at Hyderabad has been absent from the duty of that appointment for three years and, from the employment of that Officer, he sees no prospect of his return to that station. ...

The Commander in Chief, upon his first arrival, felt surprised that so important a station as Hyderabad...should remain without the presence of an Engineer of reputation, but—unwilling to disturb any arrangement that appeared to favor so distinguished a character as Major Mackenzie—he did not immediately follow the strong impulse of his mind and recommend a successor; but he should think himself at present culpable if he did not...state his intention—in case Major Mackenzie cannot resume his duty—of naming another Officer to replace him. ...

In the Event of the continued absence of Major Mackenzie, the Commander in Chief proposes to recommend Captain De Havilland, an officer of ability and high Character².

In approving De Havilland's appointment Government ordered that he should be given

such instructions...as may be best calculated for the early completion of the survey, in which considerable progress had been made by Major Mackenzie previously to his removal to his present station in Mysore.

The Subsidiary Force was at this time on field service against *pindāris* in Berār, where Robert Gordon, of the Bombay Engineers, kept the route of the march from Ahmednuggur with the [Poona] Subsidiary Force under the command of Col. Wallace—from Ahmednuggur 24th May 1805—Aurangabad 2nd June—Ajuntah 10th June. On June 14th met at Jannair with the Nizām's Subsidiary Force; marched to Futtaypour and cantoned for the rains³.

It was of this route, or another of about the same time, that Gordon commented: "The above route from camp near Fatehpur to Jaulna is far from being correct, it having been my first [attempt] at surveying, and that too with a Pocket Compass⁴", and it may also have been Gordon who surveyed the return march of a detachment of the Poona force "having under my charge 20 Pontoons", leaving Fatehpur 20th September, and reaching Ahmadnagar 7th, and Poona 18th, of November⁵.

On his march northwards De Havilland surveyed the route "from Hyderabad to Ajuntah, via Daroor and Aurangabad⁶", and after joining the Subsidiary Force at Fatehpur, beyond the borders of Berār, he asked that he might be furnished with a correct Draught of Surveys which have heretofore been made of these parts of the Peninsula. ... What of this nature has come under my observation since my arrival in Camp appears to me imperfect, nor can I rightly distinguish what parts may be depended on as a foundation, or Basis, on which to construct a general and correct map.

My appointment with Surveyor's allowances makes this one of my principal duties and, being provided with instruments for taking celestial observations, ... the detached routes, surveys, and sketches, will be connected with ease and accuracy. But, if I am ignorant of what has already been done in this line, it is evident I may neglect what requires my earliest attention, while I am throwing away time and labour on points already well known⁷.

Close, now Resident at Poona, writes that,

At the period when the Pindarries entered Berar, ... I suggested to Colonel Wallace, who was then in advance, that it might be expedient to employ the Engineer of the Hyderabad Force in examining the different passes in the Injaundry Hills which lead from the Tapti into the Northern parts of Berar, in making a Sketch of these Hills and the Country connected with them, and...a minute description of the routes generally frequented by the Pindarries and other Freebooters⁸.

De Havilland accordingly completed a

¹ Map, MR10. 67 (16); By treaty of 1804 Berār had been ceded by the Nāgpur Rājā to the Nizām; by treaty of 1853 the Berār districts, Amratī, Buldāna, Akola, and Yeotmal, were placed under British administration, and attached to Central Provinces. ² MMC. 15-4-05. ³ Ajanta, 46 P/10; Jannar, 46 P. 13; Maok MSS. LX (38); DDn. 278 (52-3). ⁴ Maps, MR10. 118 (8-10). ⁵ Maok MSS. LX (24). ⁶ Dhārār, 50 B/1; DDn. 246 (145). ⁷ From De Havilland, 6-7-05, MMC. 339/1805. ⁸ B Pol C. 26-6-06 (18).

Map of the Northern Frontier of their Highness the Nizam's and the Peishwah's Dominions, from Aunnier to Soanghur¹, surveyed by order of Colonel Wallace, Commanding the Force in advance, in January and February 1806².

Of this survey Wallace writes

I cannot sufficiently applaud the zeal and industry and, as far as I can judge, of ability, which has been displayed by Captain de Havilland in the collection of Geographical information respecting this country during the short period he has been in it. His exertions have been indefatigable, and he has never lost an opportunity of adding to his materials.

He notices in his last letter to me the great want there exists of a general and careful compilation of all the surveys which have been made of the Deccan. There is no doubt that such a work would be of the utmost utility³.

De Havilland's map was passed to the Surveyor General, and Colebrooke writes that the map

appears to be not only correct, but to have been finished in a very masterly style. I would therefore recommend...that Captain De Havilland should be employed in compiling a General map of the Ducklin. ... This map should include the whole of the Nizam's and Peishwa's Dominions, and as much of Goondwanah [25 n. 5] and the Eastern parts of Berar as he finds it practicable to survey. ...

The country included between Nagpoor and Hyderabad, and to the eastward of a line drawn between those two capitals through Nirmul⁴, is hitherto but very imperfectly known: I would therefore recommend the whole of this track, as far east as the Beingunga⁵ and Godavery, to his immediate attention, as a survey of it would prove highly beneficial to geography.

Should Captain De Havilland be able to penetrate into the country on each side of the Godavery, which is partly tributary to the Nizam, or to procure from the natives (one or two of whom he could instruct and provide with pocket compasses) any routes from which a map of the countries of Bustar⁶, Jeypoor⁷, and Rampah, could be constructed, such a document would prove of infinite value. ...

I have indeed already recommended to his attention the country lying in a North Easterly direction from Hyderabad as far as the Godavery and Wupla Rivers⁸, and this Tract being all included in the Nizam's Dominions, he would, I imagine, not meet with any obstacles to prevent his commencing the survey of it immediately⁹.

De Havilland could not, however, be spared for this survey, and he was recalled for engineering duties. His post with the Subsidiary Force was taken by John Blair [131], who surveyed a route "from Hyderabad to the top of the Sindwah Pass" during 1808¹⁰.

During the cold weather of 1808-9 the Poona Subsidiary Force was again on service in Khândesh under Wallace, where its routes were surveyed by George Brown of the Bombay Pioneers, who records that his route was "absolutely measured by a perambulator and surveyed", and that "Captain De Havilland's Survey was found perfectly correct"¹¹.

In 1807 Blair was given the assistance of two officers from the Military Institution, Burnett and O'Donnoghue, and these officers, together with Jourdan and Hanson who had been sent up to the Poona Subsidiary Force [166], surveyed the marches of the army operating against the *pinâri* leader Mir Khân. Early in 1810 they reached Sironj¹², and connected with Morrieson's survey from Bundelkhand [50]. Burnett and O'Donnoghue then worked in the neighbourhood of Jâlma¹³, but were unable to manage without strong guards, and in February 1811 were ordered to rejoin their units [314]¹⁴. Jourdan and Hanson worked round Hyderâbâd till the end of 1810 [3].

Surveys were made in Berâr by Skeffington Lutwidge, who filled in with routes brought in by guides and *harkaras*¹⁵. Other surveys carried out in the Nizâm's territories at this time are routes surveyed by John Sinclair on the south-east frontiers, between Paloncha, Khammammett and Tiruvur¹⁶, and down to Masulipatam¹⁷.

¹ Amner, a fort on Tapti R., 55 C/14; Songarh, 46 G/12. ² MRO. Map 542, and possibly MRIO. 76 (63). ³ B Pol C. 26-6-06 (19). ⁴ 56 I/8. ⁵ Wainganga R., 55 O, P. 965 E, F. 765 J/9. ⁶ Warilla R., 55 L, 56 M. ⁷ DDn. 68 (125), 9-7-06. ⁸ DDn. 246 (149). ⁹ Map, MRIO. 118 (8). ¹⁰ *ib.* 72 (56). ¹¹ 47 M/13; Register of Triangles, MRIO. M 159. ¹² MMC. 1-3-11. ¹³ Map, MRIO. 76 (62); DDn. 246 (142). ¹⁴ 65 C/10, C/4, C/12. ¹⁵ DDn. 246 (140, 151).

JAVA, 1811-6

During the Napoleonic wars, the French not only overran Holland, but in 1811 occupied Batavia, capital of Java, which was the chief Dutch possession in the East. As their presence there menaced the Company's scattered settlements in the "eastern islands", the Governor General, Lord Minto, organized a large force, mainly composed of Madras troops, which captured Batavia on 26th August 1811¹. Stamford Raffles² who had first suggested the expedition was appointed Lieutenant Governor of the island, which was held by the Company until restored to the Dutch in August 1816³.

Mackenzie was appointed Chief Engineer to the expedition, the first division of which sailed from Madras in April under Rollo Gillespie⁴; several officers who had passed through the Military Institution held staff appointments. Mackenzie led the first reconnaissance of the shores of Java, and selected the point at which the force made a successful landing, and further distinguished himself in the operations which followed⁵ especially at the capture of Cornelis, where large scale surveys were made by Ensigns Anderson and Sim under his direction⁶.

After the withdrawal of the expeditionary force, he remained on special duty under the civil government, being made "President of the Committee for investigating the state of Landed Tenure", and also employed...in collecting and arranging the Topographical and Military Reports and Surveys of the former Government [Dutch]; in investigating the History and Antiquities of the Island [278, 304]. ...

The topographical surveys commenced under the late Government have been found to merit every attention, and on the suggestion of Lieutenant Colonel Mackenzie they will be continued partly on the same plan. ... Java must ever be considered as a great agricultural Country, and as the Granary of the Eastern Islands, ... and the information and opinions furnished by Lieutenant Colonel Mackenzie will enable Government...to establish a more enlightened and advantageous system of internal administration⁷.

In August 1813 Mackenzie returned to India, and remained in Bengal till March 1815 after completing his reports on Java [83-4, 302]. With these he submitted two general Statistical Tables of the population, stock, and lands of the Provinces in Java (no General Inspection of this kind having been executed under the former Government)⁸.

Many useful Dutch maps were found and revenue surveys were continued by the Dutch staff [293]⁹; but, as might be expected, these were not sufficient for military requirements, and various surveys were put in hand under the orders of Commander of the Forces, now Gillespie. These led to an acrimonious correspondence between him and Raffles [293-4], which was in keeping with the bitter feud which continued between them until Gillespie obtained a transfer to Bengal.

The officers employed on these surveys were William Thorn, in charge of the Q.M.G.'s Department; William Colebrooke, of the Royal Artillery, at first Military Secretary and later D.Q.M.G.; and James Bayley, a graduate of the Military Institution who had been one of Lambton's assistants [242-3]. In May 1813 Thorn asked that Bayley's return to Madras might be delayed as it would be attended with considerable inconvenience to the Service from...the unfinished state of the extensive Survey which he had commenced for 10 miles round Batavia, and which he is willing to complete if time is allowed him. A few months longer Residence in Java...would be profitably employed in various other useful pursuits at the same time, such as the finishing of certain Routes...which, having their origin with him, can only be serviceable in his hands for finishing off. ... The before-mentioned Survey was undertaken by him without having any salary or allowance of any kind.

Thorn further mentioned that a survey of his own,

¹ *Conquest of Java*. *Thomas Stamford Raffles (1781-1826); Penang 1805-11; Java 1811-6; Kt. 1817; Governor Singapore 1820-4; founded Zoological Gardens, London; FRS.; LLD.; *DNB.*; *DIB.* ² Formally handed over, 19-8-16; *Java Govt. Gaz.* *M. Gen. Robert Rollo Gillespie (1766-1814); *DNB.*; *DIB.*; Hero of Vellore Mutiny, 10-7-06; Nepál War. killed at Kalanga, 31-10-14; MI. St. Paul's Cathl. ³ *Conquest of Java* (185, 189). *Capture of Cornelis, 13 to 26 Aug. 1811; MRIO. 107 (12-25). *From Raffles to GG.; 15-7-13; MMC. 17-9-13; GO. Batavia. *Mackenzie to Colonial Dept., Ft. William, 14-12-13. MPC. 31-5-14. *Raffles I (6); Appx. (olv); J. Cor. 1812-6.

the Topographical Survey of the high Military Road throughout the whole Island, ... had taken up 10 months in the performance, and was entirely executed at my own Expense¹.

In reply to Raffles' request for further particulars, Thorn pointed out that his road survey

was made with the consent and full approbation of the Lieutenant Governor, to whom I had the honor of mentioning the subject in conversation, and who was pleased to offer me every assistance in the prosecution of so useful a work. ... The first and principal of the Duties of My Department consists in a thorough knowledge, generally and locally, of all parts of the Country [300-2]. ... I was aware that no authentic or Correct Surveys of that nature existed. ...

I had hoped my offer of a presentation of a fair Copy of the Chart (which has cost me two months additional labour and expense) would have been kindly received by the Hon. the Lieutenant Governor. ... The Chart speaks for itself, and I venture to say it would have Cost Government more than five times the sum above mentioned (one thousand Dollars), had it been done by regular Appointment.

Bayley could quote no orders for his "Survey of the Environs of Batavia", but pointed out that in his own presidency, Madras, the Quartermaster General had full authority to appoint his own officers to carry out military surveys [321-2], and added that he could hardly show his sense of duty better than by dedicating my few leisure hours to such pursuit. Raffles however refused to allow Bayley to remain and complete his survey, though he was

fully disposed to concur in an approbation of the Motives which have induced those Officers to execute the Surveys in question, as well as in a liberal remuneration. ... While he is perfectly ready to concur in a Donation of 1000 Spanish Dollars to Major Thorn, if the Commander of the Forces deems that sum proper and adequate, he feels it his duty to request that the Major General will cause the Surveys which have been executed or commenced upon by Major Thorn or Lieutenant Bayley to be transmitted to Government.

He further declared that it was

clearly and unequivocally defined...that the Topographical Surveys of the Island shall be in the charge of a separate Department, ... under the immediate eye of the Government. ... Under the instructions and recommendation of Colonel Mackenzie, some Topographical Surveys have been completed or undertaken, and an Office has been established in the Government House at Buitenzong² and at Samarang³, in which several of the Surveyors of the late Government are entertained [203]. ... The Lieutenant Governor considers the delivery to Government of the Surveys executed by Major Thorn to be absolutely indispensable, as well as every other that is known to exist in any Department of the Service [293-4]⁴.

Though Gillespie sent in copies of the two surveys, he refused to surrender the original documents or fieldbooks, which he sent off to the Commander-in-Chief in Calcutta, where Raffles also referred the matter;

It is with regret that I am under the necessity of submitting to your Lordship's consideration a correspondence which has occurred relative to certain Surveys executed in the Quarter Master General's Department, ...

At the period of the capture of the Colony, many of the Surveys and Charts of the late Government fell into the hands of the Captors and, although it was my endeavour to collect them for the purpose of being registered and collected under Superintendance of Colonel Mackenzie, I am aware that many of them were not delivered to Government. ...

Some months ago a copy of a Survey executed by Major Thorn was presented to me through a private Channel, and, conceiving that the undertaking might eventually be useful to Government, I did not object to its continuance, although its commencement was not regularly authorized. ... The work of Lieutenant Bayley, however, ... was only just commenced, and there are already accurate and complete surveys of the Environs of Batavia executed by the late Government. I therefore did not conceive it necessary to retain Lieutenant Bayley. ...

It was with extreme regret that I now found the question was rendered a discussion between Government and the Commander of the Forces personally. ... The Documents were still withheld from Government, and there was no security for their being retained in the Secret and Official manner, so clearly and pointedly defined by the Hon'ble Court of Directors [288]⁵.

Raffles was supported by the Supreme Government [294], but before their reply was received Gillespie had left the island, and there was no further dispute, the

¹JMC. 23-5-13 (406). ²near Batavia. ³280 m. E. of Batavia. ⁴JMC. 23-6-13 (580-658).
⁵ib. 13-7-13 (45).

direction of all future surveys resting with the Lieutenant Governor. After long delay Thorn received his thousand dollars.

At the beginning of May 1812 William Colebrooke had been deputed to reconnoitre the eastern end of the island, and had made sketches of the bay of Pachitan and neighbouring islands¹; in July he was appointed to survey the Solo River;

I prosecuted the admeasurement of the River in the months of Aug., Sept., & Oct., 1812, under instructions from Maj Gen. Gillespie to execute a Military Survey & prepare a Report upon the practicability of establishing a Military Communication by means of it². The Field Books were made out but, as I was appointed to the General Staff while occupied upon them, the Reports were delayed in order that further Information might be obtained which would render the Survey useful, not only as a Military, but as a Geographical & Statistical work.

On my return to Java in 1815, I applied to the Commander of the Forces that Lieut. Everest (an officer in every way qualified) might be appointed to complete the Task, & from his mathematical & astronomical knowledge the Lieut. Governor was pleased to combine some collateral objects in his Instructions, such as determining the positions & estimating the Height of certain Mountains in the longitudinal Range of the Island³.

Everest himself reported to Colebrooke later that "In the month of June 1815 I was ordered to Samarang to be employed in Completing a Survey of the Solo River which had been carried on by you in 1812, & on my arrival at Samarang I received" official instructions to survey the river by the most accurate methods possible, preferably by a series of astronomical observations, as the nature of the country would not permit of a regular traverse. He was to examine and report on the possibility of improving the navigation of the river, and from his astronomically fixed points to determine,

if practicable, the exact positions of the Mountains Merappie & Mer Baboo, with the Latitude & Longitude of Solo. ... the result of your observations on these two points should be communicated...without waiting for your general report of Survey⁴.

This survey occupied from July 1815 to January 1816⁵, when Everest returned to regimental duty.

When final orders came for evacuation of Java and its restoration to the Dutch, Everest was deputed to make a rapid reconnaissance of the harbours and communications on the southern coast. Going to Solo in July, he started by making a survey of the Bay of Pachitan with soundings [138];

Having immediately proceeded from Solo on a second excursion to explore the road, and examine the Bay of Segoree Keddee and other Bays on the South Coast, ... I never allowed myself time sufficient to prepare or digest the materials thus hastily collected. On my return I was attacked with a fever occasioned by the Fatigue I had undergone, and many days thus unavoidably elapsed before I found myself well enough to apply to business. ...

On leaving Batavia I was compelled to purchase a Carriage, being unable to hire one and, having broken it by oversetting in the Hills, the Cost cannot be realised, and I shall thus be a loser of 200 Spanish Dollars. As I proceeded from Chenhon to Samarang by mail, it was impossible to take any cumbersome instruments with me, and my Survey was executed by means of a micrometrical Telescope which I purchased for one hundred Spanish Dollars⁶.

Another surveyor who contributed largely to the mapping of Java was Godfrey Baker, an officer of one of the volunteer battalions from Bengal. He made various large scale surveys of fortifications and other sketches for the civil Government during 1812⁷, and during 1815 and 1816 made special surveys of the southern part of the island. The following notes are taken from his official letters and his *Memoir of a Survey in the Native Princes' Dominions of Java*⁸;

When the British landed in Java, there had not probably been 6 Europeans who had seen more than a few miles of the flat shore 16 miles S. of Djoejocarta. ... In 1815 information was received of the projected restoration of Java to the new throne on the Netherlands, and the necessity of some military memorial and survey of those regions became obvious. ...

Holding a Staff situation in the Native Princes' Dominions as superintendent of the Forts,

¹Maack MSS. 82 (167-71); Blagden (238-9). *cf. Raffles, I (6). *BMC. 6-12-10 (26). *Instructions dated 13-7-15; BMC. 0-12-10 (27-8); cf. De Haan, vol. 02, part 4, p. 643, *Bijdragen tot de taal land, en Volkenkunde van Nederlandsch Indië*. *Plan of Solo R. by Colobrooke & Everest, MRIO. 177 (11); other plans by Everest, ib. 105 (35); 108 (50); 108 (29). *BMC. 20-11-16 (21). *JMC. 15-1-13 (88). *IO Maps, MSS. 24.

Public Buildings, and Roads, I had some time occupied my leisure in a private survey of some parts of the Country.

On May 19th he received instructions from the Lieutenant Governor ;

An accurate description of the South coast accompanied, where practicable, by sketches of surveyed routes, is the first point to be attended to. ...

The Dutch Maps of the Native Provinces are altogether so erroneous & imperfect as to offer no guide whatever ; it is therefore of some importance that whatever information you may collect, and whatever routes you may make across the country, should be accurately laid down in a General Sketch map of these Provinces. I am aware that we cannot look for anything like geographical accuracy without a regular Survey, but this is impossible to undertake at the present moment ; and your sketch of such parts of the Country as you may actually visit, and corrected by the best local information you may obtain, cannot fail to prove highly interesting¹.

Baker reports ;

I left Solo on the 20th of June 1815, proceeding through Djocjocarta to the South coast at Manchingan. Here I continued close along the South Coast Westward, more than one hundred and ten miles to Chilachap, of which Harbour and its vicinity I made a Survey on a very large scale. This done, I passed through the long narrow strait laying between the main Java Shore and the Island of Mossobambangan, and which connects the Bay of Chilachap with that of Sigoro...and the superb Harbour of Chipalat. ... Of this connecting strait I merely took an eye Sketch and soundings, so as to establish its practicability for Sloops, ... but of the Manting Mati, or Chipalat Bay, I took a Survey on the same extensive scale as the Eastern Bay. ...

Returning to Chilachap, as my Instructions restricted me to the Dominions of the Native Princes, ... I proceeded by water, sounding, and taking an eye Sketch of the River Donan. ... Although I had before made a private survey of the main route...to Sourabarta, yet for the sake of correctness I was induced to continue it backwards with some variations from my former route. ...

I continued the Survey Southward to Djocjocarta, which completed an extensive circuit of about 400 miles along all the main Communication of the interior of Java, with offsets either by actual Survey or the best information procurable. ... It was then the end of October and, the Rains settling in. I prepared myself to arrange and unite the whole of the materials collected in a proper form.

He was now called back to command his corps, till

on the 15th June last [1816] I received an order...to return to my former employment, and to complete my enquiries and Surveys². In July last I surveyed and laid down the whole route to Pachitan ; ... arrived at Pachitan I found Lt. Everest of the Artillery employed specially on the survey of that Harbour by the Commander of the Forces [137] ; this would not have prevented me from taking a more regular survey, had it not been that on July 27th I received a letter of recall, and reached Solo the 31st³.

In giving a full list of the material he had collected, Baker includes

A Fieldbook or Journal containing my route surveys through the Island, ... connected when practicable by observations with the Theodolite, at the end of each day's route, of the bearings and angles of the principal mountains of Java⁴.

He adds a list of ten of these mountains with their latitudes and longitudes as fixed by Everest ;

I believe Captain Everest also took altitudes & bearings, from Solo the Capital, of these mountains. They are very lofty Volcanoes [87]. To judge by the eye I should say they vary from 6 or 8 to 10,000⁵.

In October 1816 Baker took his reports and surveys to Calcutta where he spent several months finishing them off⁶. Amongst his maps⁷, which are beautifully neat and clear, is one copied by him from an original made " by the young Regent of Galoo ", a Javanese⁸.

¹from Raffles, 20-5-15. ²Report 15-8-15 ; BSC. 5-10-16 (2). ³Journal ; IO Maps, 24 ; MRIO. M 439. ⁴MRIO. M 436. ⁵IO Maps. MS. 24. ⁶BSC. 7-12-10 (10). ⁷MRIO. 106 (34-5, 41-2, 46) ; 108 (32-4), etc. ⁸ib. 107 (1).

CHAPTER X

CARNATIC DISTRICTS

Revenue Surveyors — Dindigul & Madura — Tinnevely — Tanjore, 1805-10 — Pudukkottai, 1813 — Trichinopoly, 1806-10 — Coimbatore & Nilgiri Hills, 1806-13 — Nellore & other districts — General Maps, 1812-6.

THE district surveys carried out by the Assistant Revenue Surveyors from the Observatory Surveying School were to comprise a general topographical survey of each district, followed by a detailed revenue and statistical survey that should give the Collector all the information he might want for administrative purposes [I. 145-7]. In some cases surveys were made under the control of the Superintendent of Tank Repairs with a special view to the improvement of irrigation, but as a rule the Surveyors worked directly under the Collectors, though receiving professional instructions from the Inspector of Revenue Surveys, an office held by the Astronomer at the observatory [I. 285; II. 2].

Though the Superintendent of Tank Repairs made occasional visits to the surveyors in the field [I. 144-5], the Inspector of Revenue Surveys never did so, but confined himself to providing professional instructions, instruments, and equipment—collecting and compiling regular quarterly reports—compiling general maps—and giving fatherly criticism. He was at the same time Superintendent of the Surveying School, and therefore responsible for the early training, and posting, of the surveyors.

Lambton helped whenever he could ;

I have always furnished the Revenue Surveyors with data in the different Provinces through which I have passed, so that most of the Provincial Surveys will have their foundation on this work [I. 145, 150]¹.

On the appointment of Mackenzie as Surveyor General from 1st December 1810, the post of Inspector of Revenue Surveys was abolished, the Surveying School closed down, and the surveys in progress, other than those for the Tank Department, transferred to the professional control of the Surveyor General², [I. 107-8] ;

Six of the Assistant Surveyors, or the apprentices, might with advantage...be attached to the Department of Tank Repairs and Watercourses, which is of so much importance to the cultivation of the country ; ... the services of those who have already been employed in that branch have been very useful in carrying on its details. ...

It is also the wish of the Governor in Council that one of the Assistants should be permanently attached to the Collector of Madras³.

By 1812 the Department of Tank Repairs had made surveys in "Tanjore, Trichinopoly, Arcot, Tinnevely, Coimbatore, Jaghire, & Nellore" [I. 149]⁴.

DINDIGUL & MADURA

In 1796 three of these boys had been sent to Dindigul [I. 285, II. 350, 352], which had been under the charge of an English collector since 1790, and was later absorbed into the district of Madura, which passed to the Company in 1801 [I. 107 n.6].

¹DDm. 63 (220), 24-7-10. ²M Rev Bd. 20-12-10. ³ib. 7-2-11. ⁴DDm. 127 (328), 30-7-12.

The Board of Revenue write in 1807 :

We have lately received a map of the Province of Madura, the Pollams of Nuttam, Dindigul, Madura, and Manapara, executed by the Surveyors attached to Mr. Parish [142 n.4] this work has been inspected by the Superintendent, who remarks that it will prove a very valuable addition to our present Topographical knowledge of these countries, when supported by a series of Triangles necessary to prove its accuracy¹.

The Superintendent's inspection did not go beyond a scrutiny of the maps sent in to Madras, and Warren had to report later that

Johnson...has not given in the Madura District that satisfaction to Captain Caldwell² [I, 321] which he had a right to expect from him³.

The Plan...was sketched several years since, in a very desultory manner, by J. A. Johnson ; it is now presented in a more eligible form, being properly supported by Triangles.

This work however is of no great importance, and far unequal to what might have been expected from an assistant of his standing in the service [I, 284], assisted as Johnson was by another boy [Pereira]. The plan was sent in October last, since which time he has done nothing in the way of his profession ; Mr. Parish seeing him thus unoccupied, has employed him as a Writer in his catcherry [141]. ...

The Survey of the Tanjore District is likely to be completed by the month of July next. I would therefore recommend that so soon as this is effected, Turnbull with his two Sub-Assistants be directed to proceed to Madura with a view to hasten the conclusion of the Survey, ... and that Johnson be recalled to the Presidency that he may not interfere with the Surveyors who are to replace him⁴.

It was of the Madura survey that Mountford wrote in 1819 :

The Survey of the Southern, or Darapooram, Division which you represent as being extremely imperfect, and no reliance can be placed upon the Map, ... was...executed so far back as 1801-02-03 by young lads sent from the Surveying School, and upon a much smaller scale than it has been thought necessary to adopt in a more recent date⁵.

In 1810 Turnbull took over the Madura survey, and by 1813 he and his assistants had surveyed the Sivaganga *zamindari*, Tirupattur⁶, and the northern part of Rāmnād, carrying down in 1814 to Rāmeswaram and the neighbouring islands, which then formed part of the Madura Collectorate⁷ [145].

In 1815 he resurveyed Dindigul⁸. In recommending this it was explained that the resurvey completed in 1801 had been lost [151], and that, considering the inexperience of the young men at that period, the loss was probably of no great importance⁹.

A section of Turnbull's resurvey, scale one inch to a mile, which covered most of the cultivated area, is reproduced as plate 13, and shows one of the best of these district surveys¹⁰. The party suffered greatly from fever, and survey was broken off in 1816, to be completed five years later.

TINNEVELLY

Although two boys from the School were posted to Tinnevelly in 1801 when the district was taken over by the Company they had accomplished very little when the Collector, James Hepburn¹¹, reported in November 1806 :

The work is, as yet, in no greater progress than the principal points in the District being ascertained, although these Assistant Surveyors have been employed in the District from the time of the assumption of the Carnatic [I, 107 n.6].

Since my arrival here, I have employed Andrew Read [142] in preparing a General Map of the District from the result of his own survey, and from some other original documents which I have been lucky enough to procure.

As a particular survey of this District is for many reasons very desirable—As the Monthly expence attending these people is considerable—As the survey has hitherto gone on very slow—and from certain other circumstances attending Andrew Read—I request that...the Superin-

¹ Fdbks. MRIO, M 56, 67, 69, 87, 95 ; *IO Cat.* (357) & MRO, Map 152. MRC, 10-1-07. ² Inspector of Tank Repairs. ³ M Rev Bd, 26-4-08. ⁴ *ib.* 12-4-10. ⁵ DDn, 148 (225), 29-11-19. ⁶ 58 K/5, & J/12 ; DDn, 127 (150). ⁷ Fdbks. MRIO, M 93, 94 ; Maps, *ib.* 130 (44) & MRO, Map 159. ⁸ Map, MRIO, 146 (11). ⁹ Resurvey sanctioned, MPC, 9-12-14. ¹⁰ MRIO, 3-PT-15, in 7 sections. ¹¹ MCS, ; Writer 1796 ; Collector Tinnevelly 1806 ; Tanjore 1813 ; fuel, 1820 ; ret, 1824.

tendent of the Surveying School...relieve him at the same time with the other, and that he do provide me with two active intelligent lads in their stead.

The second surveyor, Duke Orton, was "employed in the Collectors' Cutcherrie the state of his health not permitting him to go upon survey¹".

Three other surveyors, Robinson, Hill, and Fletcher, were thereupon sent to take over the work, and under the Collector's watchful eye completed a valuable survey during the next seven years. The following extracts from Robinson's journals² give an interesting picture of their life and work; Robinson had been acting as assistant instructor at the School [341. 352].

At the Observatory, Madras, January 1st 1807. [Temperature observations five times a day].

Left the Observatory Garden and removed to Johnson's [140] at St. Thomé³ on the 2nd of January 1807 at 10 a.m.—Thursday 8th January. At 9 a.m. left J. A. Johnson's at St. Thomé after breakfast. ...

[describes the road in detail, with distances].

At 4 miles and 6 furlongs 100 yards, we meet the spot on which they intend to erect a Seneath⁴ to the memory of Lord Cornwallis [31 n.1], which is opposite the 4 miles stone on the Mount Road. ...

Vandalore Hill and Choultry at 18 m. 2 f. 12 y.⁵, & at 30 yards to the right of the road is a well built upstairs house for the reception of travellers, which does the greatest honor to the founder of it (General Smith), as it is an excellent retreat to the unwearied traveller [sic]. Arrived at this place at 3 p.m. after a fatiguing march of 6 hours through the burning heat of the sun.

Friday 9th January. ... Met Mr. J. Cochrane⁶ here, who was on his way to Madras from Pondicherry. ...

Chinglepett⁷ is surrounded by a number of hills which at a Distance appear beautiful like an amphitheatre. ... I must also remark that we were this day [worried?] by an old mad fellow, who promised to rob and play the devil with us at night, which was not a little alarming to me, as I was a new traveller, and never before accustomed to such threats. ...

11th. ... Arrived at Permacoil at 10 a.m. ... Fletcher & I got up this rock at about 4 p.m. Saw the range of Mountains...to the N., also a range of Hills to the W., which we supposed to be the Hills at Salem. ...

Met two gentlemen surveying; Mr. Tulloch and another [of Military Institution].

12th. ... At 5 o'clock in the evening rode out to Pondicherry in company with Hill & Fletcher. The Walls of Pondicherry are entirely raised [razed], & the plough made to run over the ruins. ... There is a plain here with an avenue all around and seats at intervals for the Tete a Tete of the evening [sic]. The sea is close by, & surf beats with as much violence as Madras.

14th. ... Set out early from Pondicherry this morning; ... missed our way at first; ... met two French Vagrants. ...

15th. ... Travelled 25 miles 2 f. 112 yds. this day and arrived at the town of Chellumbrum⁸; ... crossed several large rivers, some of which contained water in them about waist deep, and which we forded with our horses. ...

Saw Wright⁹ and Allan [140] at this place.

16th. ... Spent the day at Wright's.

17th. ... Met a Conductor & several Gun carriages with a company of sepoy & some prisoners, Handcuffed, whom they were conveying to Madras. I imagine these to be some of the Vellore run-aways¹⁰. Wright accompanied us [part of the way]. ... Put up for a few hours at a Braminy Choultry in front of which is a fine tank full of water and a tavern kept by a Portuguese...close by.

18th. ... The lascar lost his child this day. ...

21st. ... Met the Madura Treasury going to Madras on a large heavy cart drawn by 12 Bullocks, & escorted by three or four Peons and a guard of sepoy. ...

We arrived at Trichinopoly at about 12 o'clock & put up at a Braminy's House. ... Gabriel the servant got sick on the 20th.

Friday the 23rd at noon. Observed altitude of the Sun.

Got acquainted with Mr. Sutherland, a shopkeeper at this place¹¹, & saw Mr. William Scott

¹ M Rev Bd 24-11-06. ² MRIO, M 12. ³ on sea front, S. of Madras, not to be confused with St. Thomas' Mount. ⁴ Robinson's spelling retained throughout. ⁵ Obviously keeping perambulator throughout. ⁶ Magte., N. Kanam, 1806-7. ⁷ 57 P/14. ⁸ Chidambaram, 68 M/11. ⁹ not identified. ¹⁰ Vellore Mutiny, July 1806. ¹¹ J. Sutherland, shopkeeper, Madras, E.R. 1811.

an old schoolfellow of mine, with whom I had the pleasure of dining with the day before we left the place. ... Could not see Silvester [Pope] although I had written to him [150].

26th. ... Left Trichinopoly. ... Fletcher parted company with us...as his route was for Dindigul.

27th. ... Met Capt. McDougal¹...who wrote to us in the evening for to produce our Passports². We accordingly dressed ourselves & went to him ; he spoke very kindly to us & put a few questions respecting our journey etc., & asked us to drink some wine and water.

29th. ... Reached Madura. ...

Went to Mr. Parish³ on the 30th & enquired of him where Mr. Hepburn might be ; who told us he was at Shevalpetra. ... Intended to hire a bullock coach as Hill's Horse was grown too bad for him to continue his journey any further on it, but Mr. Burby⁴ was so good as to lend us his to go on as far as Shevalpettoor⁵. Hill's horse got sick through fright at the fire-works at Seringham⁶, which we had been to see when we were at Trichinopoly.

Sunday, 1st February. ... Left Madura ; ... prevented from measuring the distance as the lascar did not bring up the perambulator with us.

3rd. ... Lost our road & the lascar not up with us in time with the perambulator. ... Dressed ourselves & went to Mr. Hepburn in the evening, who desired us to attend at his Cutcherry⁷ the next day at 11 o'clock.

4th. ... Attended on Mr. Hepburn at his Cutcherry at the appointed time. He put a few questions to me ; such as, whether I was ever employed under anybody before, &c. He desired us to call again next day at about the same time.

5th. ... Saw Mr. Hepburn again ; he told that he had written to Mr. A. Read [140] at Palamcotta to come down with all his instruments, &c. ... Saw Read at night. ...

6th. ... Saw Read again today ; he told me that Mr. Hepburn had desired him to deliver up all his instruments &c., to me. Pitched his Marquee and removed to it. ...

13th. ... Mr. Hepburn sent for me, to look at all the instruments that I had belonging to the Company. I informed him of my intention of going to Palamcotta to examine Read's base, and then to begin upon anything he would wish me to do there ; in reply to which he said he had nothing for me to do, and that I might begin with the particular survey whenever I thought proper. Spoke to him about Hill's horse at which he did not seem pleased.

Observations & computations of a time by meridian altitude & sun. Mr. Hepburn gave us two Peons to see us supplied with everything on our journey. ...

17th. ... Mr. Hanbury⁸, the Asst. Collector, sent for me & questioned me about Hill's Horse, &c. I informed him of my intention of going away to Palamcotta tomorrow. ... He said...that I had better begin with the River for Mr. Hepburn, and then proceed upon the General Survey of the District ; that Capt. Caldwell was expected, & that I am only to remain here for 8 or 10 months. Read is off to Tinnivelly today. ...

20th. ... Saw a man with a Tyger's skin today ; he told us that he was taking it to the Collector's where he would get 5 Pagodas⁹ for it, and that it had destroyed 4 men before they could get at it. ...

Arrived at the Collector's house (Tinnivelly) at 7 p.m.

Sunday 22nd. ... Hill went over to Read early this morning & requested of him to show him his base, which was readily agreed to ; Hill arrived by about 11 a.m. ; he told me that the base was over very uneven ground. Received a Letter from the post from Lt. Warren which was extremely afflicting [347]. ... Busy writing today.

23rd. ... Went over to look at Read's base ; the extremities of which are on rising ground and over very uneven ground. ...

Went to Mr. Stratton with Mr. Warren's letter ; he gave me a Plan of the Tinnivelly District (done by Orton), which he wanted me to correct. I intend to make a fair one for him. ...

24th. ... Hill finished copying my remarks on the Road ; as for myself, busy writing letters to Madras. Received Johnson's theodolite for Mr. Hanbury at Shevalpettoor, which was sent for him by Mr. Hepburn from Madras. Pasted paper for the plan for the Judge.

25th. ... Begun tracing & colouring the Plan for the Judge ; at home all day ; saw the Papers but nothing surprising in them.

26th. ... Busy drawing Mr. Stratton's Plan, & Hill in writing Read's angles to my book. At home all day.

Sunday March 1st. Finished Mr. Stratton's Plan & delivered it to him ; he was greatly

¹John MacDougal (1775-1813); Mad. Inf. 1795. ²All Europeans except civil officers within their own districts & military officers with units, required passports. ³George Parish (1780-1839); MCS. 1796. ⁴Conductor Daniel Burby. ⁵Shevalipetoor [pl. 15]. ⁶Seringam, 68 J/9. ⁷Court House. ⁸John Hanbury (1748/9-1834); MCS. 1804. ⁹About 17 Rupees [1, 278 n.7].

pleased with it, & bid me refer to him in case I should ever be at a loss for anything. ... Met Mr. Anatey & Lady as they were going out airing¹.

3rd. ... Pitched Flags &c., on my intended Base. Not well today also; Received a note from Mr. Hanbury concerning my abstract². Got a new glass put on to Read's theodolite as I had broken the old one.

4th. Hill & I began to measure the Base very early this morning, which we got prepared yesterday. ... Length of Base 143 chains. Not trusting to this measurement alone, we went out in the afternoon at $\frac{1}{2}$ past 3, & measured till $\frac{1}{2}$ past 6 o'clock. ...

6th. ... Fixed stone at W. end of base corresponding with that at E. end.

After making observations on neighbouring hills for the connection of his base, Robinson made a short theodolite traverse along the banks of the river³, and then received orders

to go down to the sea (at the mouth of the River) & take a series of Levels along one bank of the River for Capt. Caldwell [140].

19th March. ... Busy marking out the Divisions on two ten-foot rods & in getting sight vanes made for them, as I am to proceed to the sea to commence levelling. ...

[continues levelling for several days].

23rd. ... Prevented from Surveying in the Forenoon as it was a feast day with the natives, but went out in the evening at about $\frac{1}{2}$ past 3 p.m. and surveyed. ... We were complimented in the forenoon with the visits of several dancing girls.

24th. ... Theodolite Traverse. Computations of Southings & Westings. ... Came home a little after 12 o'clock & took breakfast. ... Bothered by Dancing Girls again. ...

Good Friday, 27th March. Went out this morning very early to survey by myself. ... Came home quite fatigued in the heat of the sun, & was obliged to trudge a great part of the way on bare foot. ...

Easter Sunday. Went out very early this morning to survey, did but little & came home by about 9 a.m.; a great deal of trouble at night in getting collies &c., to remove our baggage, as the heat part of the people were taken off to remove Mr. Hepburn's things; he being on his way to Alvar Tinivelly⁴ from Tuticorin. ...

1st April 1807. ... Went out surveying by myself this morning; left Hill at home to work at his plan. Mr. Hepburn met me this morning about $\frac{1}{2}$ of an hour after I had begun with my survey; he put a few questions to me &c., and desired me to bring up the survey as far as Alvar Tinivelly, as he has something to say to me. Day excessively hot; finished this days work as far as the Collector's tents. ... Did more today than any other day. ... I hear that Fletcher is to be here shortly.

2nd. ... Went to Mr. Hepburn with my Plan after breakfast; he appeared to be pleased with it & desired me to continue it up to Tanpanatum for Capt. Caldwell, who is expected here shortly. ...

5th. ... Finished my Plan & took it to Mr. H-n; ... told him that I intend to commence surveying from tomorrow. I am desired to carry it on as far as an ancient which is about 13 miles higher up, & to note down everything particular. ...

In coming from Mr. Hepburn's Tents on the N. side of the river to...the opposite bank, My Horse, contrary to his usual mode of stooping to drink, laid completely into the water while I was on him, saddle and all, leaving me wet into it.

[Fletcher joins from Madura on April 20th].

30th April. ... Arrived at Tuticorin at about 9. Saw Mr. Hepburn at 11 & requested him to give me leave to go back to Madras, at which he appeared to be displeased; ... advised me to consider on it, and to come to him the next day at about the same time.

Bad with a severe headache at night.

1st May. Saw Mr. H-n today; ... spoke to him again to the same purpose of letting me go; he desired me to write to him for leave of absence, and that he would give me a letter for Capt. Warren. ... Saw Orton today.

3rd. ... Left Tuticorin at 3 p.m. & arrived by 12 at night at Alvar Tinivelly.

7th. ... At Palamcotta. Wrote Mr. Hepburn for a Passport for to proceed to Madras. ...

10th. ... Wrote public letter to Madras for my discharge from the Service. ...

15th. ... Received a very impertinent letter from Fletcher.

17th. ... Went to church today.

18th. ... Hill & Fletcher off this evening to survey.

20th. ... Bought Mr. Copland's⁵ Palanqueen for 23 Pagodas, which I have promised to pay

¹Thos. Anatey (1770-1843); MCS. 1780; m., Madras, 2-8-01, Miss Frances Moutresor; Commercial Resid., Tinnevelly, 1806-11. ²Pay bill. ³Tambirparni R., 58 H/6 to L/2. ⁴Alvar Tirunagiri, 58 H/14. ⁵not identified; not MCS.

him at the end of the month. Left Palamcottah at about $\frac{1}{2}$ past 5 this evening.

On 21st May Robinson resumes surveying, traversing, and levelling, for the first time since 14th April, and continues till 3rd June ;

4th June. ... This being King George's Birthday, a Royal Salute of 21 guns was fired at the Fort of Palamcottah. Mr. Hepburn sent for me this morning & was extremely angry at my not going on with the Survey ...

23rd. ... Panpanusum at the foot of the Ghauts¹ ; ... cataract ; Pagoda ; ... The fishes at this place are so tame as to Eat out of one's hand when rice is given them, and to see them scrambling and jumping over one another for food produces a pleasing sight.

25th. [Measures a short base and takes the height of waterfall, 102.77 feet]². Having completed the survey of the River, I left Panpanusum. ...

29th. [Hands in his Plan and fieldbook to Mr. Hepburn at Tinnivelly].

30th July 1807. ... Cotalum³. ... Shew Mr. Hepburn our Plan and Fieldbooks, all of which he appeared perfectly satisfied with.

Mr. Hepburn's Garden is situated near the Hills, where it commands a beautiful prospect of the cataract which is not far off ; ... I am desired by Mr. Hepburn to call upon him when he comes to the Cutcherry, and also to find the height of the waterfall for him. Saw Mr. H-n. in the Cutcherry ; he shewn me a letter that he had received from the Board⁴ wherein my discharge is granted ; but am advised to write to him to be re-admitted into the Service, & have in consequence done so.

Fletcher is desired to proceed to Mallore to survey a piece of ground for the Revd. Mr. Ringtobe, to which place he intends to set off tomorrow.

Capt. Pepper has requested me to make him out a Plan of the situation of the different Polygar Forts in the Tinnivelly District. ...

8th August. Sent for by Mr. Hepburn to day and desired to proceed to Coilpatnam⁵ to survey some lands for Mr. Young, and to note what land has been cleared, how long it had been so, and whether once cultivated⁶. ...

20th. ... Survey the road to Courtallum. ... Day hot and sultry ; found myself somewhat fatigued, as I had made a circuit round the ground.

One of the labourers employed in clearing the jungle was severely wounded in the forehead & right ear by a Bear which attacked him in the open day, as he was refreshing himself with water. ...

28th. ... Mr. Hanbury sent for me to know whether I wished to return to Madras again ; answered him in the affirmative, that I had a great desire to return. Went over in the evening to see Mr. Hepburn.

There is no record of any visit to Madras, and Robinson and Hill continued their rambling surveys—completing the limits of Mr. Young's garden and his cotton farm at Vepulcottah—measuring the height of Comorin Point—and surveying the "Chittaur River"⁷ from its junction with the "Taumbrapoorney River"⁸.

After 8th December 1807 survey is continued in another book, and from 8th July to 18th August 1808 Robinson was making a continuous traverse survey, cutting in village sites⁹. He was inspected by Caldwell early in the year. Warren's report reading :

Robinson continues actively employed in the Tinnivelly District, and would have sent copies of his further labours had not Captain Caldwell's visit to that District required all his time and attention. However, as his practice cannot be checked by a more competent judge, and his labours applied to better purposes, the delay cannot be regretted.

Hill employed on a particular survey of the Brearmadusum Talook.

Fletcher surveying the Road from Palamcottah to Arumbully [132], and a piece of ground for Mr. Young ; during this last quarter this Assistant has made but very slow progress in his work, and is at present under the order of Captain Caldwell¹⁰.

In 1810 Hepburn reported the completion of the survey of several *tālūks* in the north of the District :

¹ Pāpanāsum, 58 H/6, place of pilgrimages. *Imp Gaz. Mad.* II (287). ² Sheet 8 of MR10. 2-PT-13 shews "alone at Waterfall". ³ Kuttalam, 58 H/1. ⁴ of Revenue. ⁵ Kāyalpatnam, 58 I/2, on sea coast. ⁶ Sheet 15 of MR10. 2-PT-13 shews two areas south and east Calcaud, Kalakuldu, 58 J/4, marked "Mr. Young's". ⁷ Chittār R. 58 H/5 to 13. ⁸ Tambraparni R.; MR10. 162 (4-22) original protractions, scales 1000, 2000, 4000 yds. to inch. ⁹ *Fdbk. Survey of Alwar-Tinnivelly Talook*; April-July 1808. ¹⁰ *M Rev Bd.* 26-4-08.

When I acquaint you that this detailed survey was commenced and continued for several months under the immediate inspection of Captain Caldwell (who was so kind as to take that trouble at my request), and that in its further progress it was examined into, and carried on, by Major Lambton (also at my desire), who expressed his approbation both of the correctness with which it was executed as also with the diligence of those employed on it [139, 244], I conceive that I am giving a much better testimony in favor of the Surveyors now serving in the Province than anything I could say from myself.

I shall only add that a regular diary of their work is rendered to me weekly, from which I am fully enabled to Judge of their particular labours for each day in the course of it¹.

Three months later Warren submitted several plans constructed by John Robinson, assisted by T. Hill and W. Fletcher², employed under the Collector of Tinnevely. These young men... have had the powerful assistance of Major Lambton and Captain Caldwell³. ...

Of this work I shall only observe that Robinson and his Assistants have done more in six months time than Read and Orton during seven years that they were employed in the same District previous to my taking charge of the Department. Robinson's performance being supported by the favorable testimony of Mr. Hepburn as to general conduct, I have been induced to present him with the honorary Medal for 1810 [347]⁴.

In May 1811 Hepburn had to report that the Revenue Survey is now, and has been for some time past, entirely at a stand in this Province, owing to all the three Surveyors having been seized with fevers while in the execution of their duty; for this reason Fletcher has not yet set out for Madras, not being at present in a state to move. ...

Robinson and Hill have been at this place for some time, and are now so far recovered as to make me think they will be able to resume their duties in the course of a short time⁵.

The survey was completed in 1813⁶. Robinson writing to the Surveyor General; I have completed with defining the Western Boundaries of this district, as also the obtaining the situation of all the passes. ... I shall proceed towards the survey of part of the Ramnad country⁷.

He asked in October how he should send in the maps and papers of the survey which made two cooly loads, and could not go by post, as "it would retard the whole of the Public Mail". He eventually handed them over to the Collector, and proceeded himself to Rāmnād, whilst Hill returned to Madras sick.

Protractions and reductions of this survey are preserved in 18 sheets, some of which are paste-ups about 8 feet by 4⁸. They shew base-lines and rays of minor triangulation, some points being marked "p.t.". No attempt was made to survey the range of Ghāts to the west, but isolated hills in the plains are well shewn. Robinson's own work is heavy and coarse, whereas the drawing and handprinting of William Bird is excellent.

One of Robinson's sheets⁹ shews the "Ruins of Panjahung Coorchy", about 20 miles west of "Putnun Mardoor" (on the sea), with sites about two miles west of "Monuments of the Officers of 74th Regt. - Moormen's Monuments"—Lieut. Collins' and Blake's Monument"¹⁰.

Joined by Chamarett and Aikin from Turnbull's party in Pudukkottai, Robinson surveyed the south-west part of Rāmnād *zamindāri*¹¹, and in September 1814 completed the islands along the Rāmnād and Tinnevely coasts as far as Tuticorin [140].

Markham's tale that the Tinnevely surveyors shirked the hilly area on account of its reputed unhealthiness¹² is not confirmed by contemporary records. The forest-clad Ghāts were only of interest to District Officers so far as the roads and passes through them were concerned, and we have seen above that Robinson had surveyed these. The Revenue Surveyors, unlike the officers at the Military

¹ Letter of 25-1-10; M Rev Bd. 12-4-10. ² Also Wm. Bird, later. ³ *Triangles in the Province of Tinnevely*; MRIO, M 11. ⁴ M Rev Bd. 12-4-10. ⁵ to Morison, 18-5-11. ⁶ Maps, MRIO, 147 (25); MRO, Maps 336, 339, 344, 353, 358. ⁷ MRIO, M 507, 18-9-13. ⁸ *ib.*, 21-10-13. ⁹ MRIO, Misc. 7-4-13 & 2-PT-13. ¹⁰ of 2-PT-13. ¹¹ Edward Henry Collins & John Blake both Mad. Inf.; kd. 5-9-1799, in attack on Panjulancoochy. ¹² *Edoks.*, MRIO, M 83, 567; Maps, MRIO, 136 (38 *et seq.*) & MRO, Map 156; MRIO, 136 (44-6) shew Rameswaram I. ¹³ Markham (76).

Institution, received no instruction whatever in the survey of hills, and Montgomerie writes of Robinson's map in 1826 ;

The Hills resemble a Sea of Ink. ... The detail of the Flat Country in general appears to be faithfully delineated, but the Surveyors appear to have had no idea of expressing the Hilly or Mountainous parts of the Country. The only written records delivered with the Plans of this Survey were a few rough Field Books, but from which a Register of 1800 Triangles was made out.

Robinson's own account is that

The Intersected Points of every part were carefully laid down, and the unknown sides and angles of each triangle calculated, and protracted on separate sheets of Paper to serve as sections for the guidance of the Assistants in filling in the detailed work, and as Mr. Thos. Hill...had subsequently been removed to the Presidency, the completion of the Map...was, I understand, drawn up by him in the Surveyor General's Office².

Thomas Turnbull's statistical report on Tinnevely was carried out in 1820-2, several years after Robinson's survey.

TANJORE, 1805-10

In October 1799 a treaty had been effected with the Rāja of Tanjore, under which the Company assumed entire control of his State, and five years later the Collector asked for a survey ;

In a Country like Tanjore, watered and intersected on every side by numerous natural and artificial channels, a correct scientific survey of the rise, course, and level of each of these channels is almost indispensable to the satisfactory management of Revenue Duty. ...

Independent of a regular survey of the Rivers and channels giving fertility to Tanjore, I have the opinion of Captain Caldwell, as well as my own observations, for stating...that...the Surveyors will be particularly useful in ascertaining scientifically several points on which will depend the...remedying...several defects in the present mode of supplying some very important districts with water, from the deficiency of which a great loss of Revenue has been sustained of late years.

The Board will also see the propriety of sending Surveyors into Tanjore, when I state that there is not any Map of this valuable Province ; from the compact situation of Tanjore, the Surveyors will be able to furnish one within a period comparatively short³.

In January 1805, therefore, Turnbull was moved from Madura, and joined in Tanjore by James Aikin⁴, whilst Christian Pereira was sent out from the school to assist Johnson in Madura⁵ [140].

In 1810 the Collector explained that the slow progress in Tanjore had been due to the peculiar difficulties which the Tanjore Country presents to a minute survey, in its almost universal intersection by rivers and large watercourses ; its being under water a considerable portion of each year, and the great number of villages it contains. ... A considerable portion of the Surveyors' time has *until lately* been occupied in laying down Plans and copying Field Books to accompany the Quarterly Reports, and that their being so occupied *materially* interfered with the Progress of the Survey.

Notwithstanding these difficulties, more than $\frac{2}{3}$ of the country has been minutely, and I hope accurately, surveyed, and the remaining part will be finished before the next floods in July. All the villages, rivers, watercourses, tanks, roads, and limits, have been laid down, and the survey when completed, will I think, form a very satisfactory record of the Province⁶.

Turnbull seems to have been more than an excellent surveyor, for the Collector commends him and Aikin "as well for their uniformly peaceable and sober conduct as for their diligence and attention to their business"⁷, whilst Montgomerie writes in 1824 ;

The Tanjore Collectorate was surveyed between the years 1805 and 1810 by the Revenue Surveyors under the Collector⁸. It appears to have been faithfully executed, and in as far as Topography was at that time attended to, the features of that part of the Country are well expressed. The Rivers and their branches are laid down with great minuteness ; had the cultivation been also expressed, it would have added to the value of this Document⁹ [151].

¹DDn. 246 (42, 46) & 222 (140), 9-6-27. ²DDn. 218 (60), 10-10-26. ³M Rev Bd. 22-11-04. ⁴and later by Chambers and Mackay. ⁵ib. 17-12-07. ⁶ib. 12-4-10. ⁷ib. 30-4-11. ⁸Map, in 12 sheets, one-inch scale ; IO. Maps II AC. (34) ; also MRO. Map 311, 2000 yds. to 1 inch, 2 sections ; shows triangles and a wealth of detail. ⁹MRC. 26-10-24.

PUDUKKOTTAI, 1813

Tondiman, Rāja of Pudukkottai, had always been a loyal ally to the Company, but it was not until 1811 that the Resident at Tanjore asked for a survey of his country ;

I suffer much inconvenience from the want of a map of Tondiman's Country, and beg leave to solicit...permission to Major Lambton to furnish me with a series of his Triangles embracing the whole of Tondiman's Country and a portion of the adjoining provinces.

If these Triangles are given upon a tolerably large scale, it will be easy for me to have them filled up by the Surveyors attached to the Collectors¹.

No surveyors were available till 1813 when Morison suggested the expediency of a surveying Tondiman's Country in connexion with Rāmnād, Shevagungu, Tanjore, and Trichinopoly. In the progress of these surveys the greater part of the boundary of Tondiman's districts has already been determined and, as the triangles established by Major Lambton on the Trigonometrical survey embrace the tract in question, the details of this work may be commenced without any delay, and with much advantage, by the Surveyors now at my disposal².

to which the Resident replied that

the proposition has been received by the young Chief with the greatest pleasure and thankfulness, under the hope that the Honourable the Governor in Council will have the goodness to comply with his request for a copy of the survey to assist him in the improvement of the cultivation of the country³.

Turnbull's party accordingly took up the survey in addition to their work in Rāmnād, and completed it between June and November 1813, with the help of Keyes and McMahon from Coimbatore [148]⁴.

TRICHINOPOLY, 1803-10

According to Montgomerie ;

The Trichinopoly Collectorate was surveyed between the years 1803 and 1810 by the Revenue Surveyors under the Collector. It depends on Triangles carried on from the Surveyors' measured bases, and subsequently corrected in a reduction by Colonel Lambton's Points.

Several parts of this survey have a very unsatisfactory appearance, and, from the character of J. Faulkner as a Surveyor, one of the two employed on that duty, I fear that much reliance cannot be placed on the work that may have been executed by him⁵.

Of one of the maps surveyed by Faulkner and Pope [142] in 1808, Warren writes that it "wants a series of triangles to render it complete ; as it is, it can nevertheless be very useful to the Collector". On the other hand Montgomerie writes again in 1826 :

This Survey bears every appearance of having been executed in a very loose style, together with complaints of great inaccuracy by the Collector of the District, and want of authentic material of construction⁶.

There is now at Madras a

General Plan of the Trichinopoly District from surveys by Silvester Pope and John Faulkner ; scale 3,000 yards to an inch ; signed by De Havilland, Inspector of Tank Repairs, June 25th 1818. Size 65 inches by 36⁷.

COIMBATORE & NILGIRI HILLS, 1806-13

The survey of Coimbatore District was in hand some time before 1807 and, writes Warren ;

Mr. Garrow...gives a satisfactory account of the services of Samuel Godfrey, who has been lately engaged in surveying the very unhealthy and mountainous Districts of Collagal⁸ and Sattigal. He is now extending his operations in the low lands of Coimbatore. ... Godfrey

¹ DDn. 127 (113), 26-11-11. ² MPC. 23 4-13. ³ Ib. 7-5-13. ⁴ Memoir, MRIO, M 37 ; Maps, MRIO, V (291) & MRIO, Map 420 ; Correspondence, MRIO, M 507, 1-9-13 to 2-11-13. ⁵ MRC. 26-10-24. ⁶ DDn. 246 (63). ⁷ MRIO, Map 411. ⁸ 57 H/4.

very properly grounds his Survey on the points and distances furnished him by Major Lambton. ... His perseverance in the Survey under repeated attacks of the hill fever is highly creditable to his zeal and industry¹.

He was joined by Keyes in May 1807², and a year later Warren reports that Godfrey has forwarded a survey of the Collagal Talook in the Northern Division of Coimbatore, supported by a series of Triangles, which does credit to this young man's assiduity. His progress has been impeded by indisposition, as well as that of Keyes, his Sub-Assistant, caught in the jungle among the...Ghauts³.

About 1809 Godfrey was relieved by McMahon, and in August 1811 the Collector reported :

The greater part of the low lands having been finished, I should think the remainder should not take up above six months more. The extensive range of Ghauts that border on Malabar, Wyenaud, called the Neelgherry or Blue Mountains, will require, without obstructions intervening, a period of at least six months more, but from the inhospitable climate of these Hills I have no hesitation in saying that the Surveyors will meet with continual interruptions from attacks of fever in themselves and followers⁴.

In January 1812 Keyes reported that they had continued Survey in the low lands on the N. of Coimbatore only to the 15th of October last, after which, in consequence of the unfavourableness of the weather and indisposition, with the orders of the Collector we retired into Bhovany⁵, where after completing the fair Plans of the Survey the reduced Plan of the whole was taken in hand⁶.

There is at present remaining but 200 Square Miles of the low country to be surveyed, together with the lands on the extensive range of the Neelgherry Mountains⁷, and again in May :

During the last month I finished the Survey of the Neelgherry Mountains lying on the Westward of Danaikencota⁸, and extending in length from E. to W. about 30 miles and breadth 16 miles, thereby making a superficial extent of 480 Square Miles; as also the elevated tract of Country about Davaroyputnum lying on the northward of the Mountains, containing 110 square miles.

I shall next extend my Surveys to the Southward upon the remaining part of the low Country⁹.

Keyes and McMahon were the first surveyors to enter the Nilgiri Hills, and it is not surprising that their training at the observatory had not qualified them to make much of a success of the hill features¹⁰. Their work during 1812 and 1813 included a "Plan of the Neelgherry mountains in the Danaikencota taluk, and part of the Sattimungalum and Coimbatore taluks¹¹". The main rivers and streams are sketched in, and the hill forms roughly shown by pencil hachures and colourwash. Though the hills were obviously visited, the original map gives no indication of triangulation or systematic survey.

The surveyors closed work about July 1813, and then joined Turbull for the survey of Pudukkottai in September [147].

In his published account of Ootacamund¹², Price describes this early visit to the hills after first noticing that Francis Buchanan [113], on October 24th 1800, was at "Davanaicota", and walked up into the hills, and got a distant view of the highest hills, and probably reached Arakod¹³. He then quotes Mackenzie's account of the survey of Keyes and McMahon, submitted with a map of the Neelgherry mountains in the District of Danaikencota in the Coimbatore Province on the original scale of survey of one mile to an inch.

I have selected this as an original specimen of the work of the Native Assistant Surveyors, and of the survey of a singular tract of mountainous country, situated centrally on the limits between the countries of Malabar, Mysore, and Coimbatore, remarkable for their singular Tribes of people, described to be dissimilar to the natives of the other Provinces in habits, manners, language, and complexion; some notices of whom are communicated in the Memoirs of the Mysore Survey sent home in 1808. ... This tract contains 495 miles of mountains and 250 of plain country, altogether 745 miles¹⁴.

¹M Rev Bd. 8-1-07. ²ib. 21-12-07. ³Triangles by Godfrey & Keyes, 1807-12. MRIO. M 20, 22. M Rev Bd. 24-4-08. ⁴DDn. 127, 27-8-11. ⁵Bhavani, 58 E/11. ⁶Fdbka. & Memoire, MRIO. M 20, 23. ⁷DDn. 127 (160), 1-1-12. ⁸Danayakkankottai, 58 E/3. ⁹DDn. 127 (256), 7-5-12. ¹⁰MRO. Map 73; MRIO. 133 (210). ¹¹MRO. Map 76. ¹²Price; cf. Francis (226) & Grigg (25 *et passim*). ¹³cf. *Imp Gaz. Mad.* II (289). ¹⁴MPC. 434/1816, 18-1-16.

Price was misled by the expression "Native Assistant Surveyors" [I, 283 n.8] into thinking that Mackenzie referred to some earlier party of Indian surveyors, and suggests that, being Indians, they would have been afraid of ascending the mountains, and that, "with no European to look after them", their map must have been "a fancy one based on hearsay". He says that "Mr. Sullivan, then Collector of Coimbatore, wrote in 1819 that they "were frightened by the extreme inclemency of the climate, and did not measure an acre". This again is misleading; the surveyors were not expected to "measure" hills, more particularly because these were, from the district officers view, entirely unproductive; furthermore there is ample evidence that most of these assistants carried on work bravely in spite of fever and sickness.

Price continues with some interesting facts;

In 1812, a surveyor named Keys, accompanied by McMahon, an apprentice, was set up to the Hills by Mr. Garrow, the Collector of Coimbatore, to make a plan of them. He started from Devanaikencotah and evidently travelled by the path used by the garrison of Malekota for communication with their base in the plains. His first letter was written on 30th March from "Tenad", no doubt Daynaud of later explorers¹, east of Kotagiri, ... and reached a point about six miles from Ootacamund.

McMahon was back at his starting point on the last day of April 1812. ... The report on his expedition which is given as Appendix No. 17 in Grigg's Manual does not create the impression that it is the result of much personal examination. It is doubtful if Mr. Keys set eyes on the Ootacamund plateau, and he probably kept to the Lower Plateau.

NELLORE & OTHER DISTRICTS

In 1804 Goldingham submitted to Government a Revenue map of Nellore and Ongole², laid down by computed Distances, and according to the internal Division of Pargannas, from correct information obtained under the inspection of J. B. Travers, Collector³.

The map was "executed with care" on the scale of 6 miles to an inch, and nothing further is known about the materials used.

During 1810 regular surveys were in progress under the tank department;

Three Assistants are at present employed under the Superintendent of Tank Repairs [139], and two others lately under the same controul have been employed on the survey of the Nellore District. The latter are...stated to be employed on a survey of the Eastern Ghauts, but it appears that they are still at Nellore. I have understood that they have nearly finished the survey of that district, in which case they should close that work before their removal to be employed on any other⁴.

Shortly after, Charles Johnston, Superintendent of Tank Repairs⁵, reports that,

in consequence of the removal of the young men attached to my Department (James Allan to the Observatory, and Joseph Jelly and William Mend to the Quarter Master General's Department, which was effected during my absence on the late Foreign Service), I was concerned to find upon my return to the Coast that the Nellore and Ongole surveys had been materially impeded⁶.

A compiled map on the scale of 4000 yards to an inch, entitled "A Topographical survey of the districts of Nellore and Ongole, reduced from the original"⁷, bears Johnston's signature.

In 1813, districts belonging to the Rāja of Venkatagiri⁸ were taken up by surveyors from the Ceded Districts [155], who also in 1814 surveyed the *jāgīrs* of Udayagiri and Pāmūru⁹.

The greater part of South Arcot was surveyed by students of the Military Institution [125-9], but there is at Dehra Dūn an original undated survey of country south

¹ Denād, 58 A/15, 8 m. E. of Kotagiri. ² 66 A/3. ³ MRO. Map 238. MRC. 0-12-04 (5). ⁴ Governor's Minute of 31-12-10; MMC. 29-1-11. ⁵ Charles Cornwallis Johnston (1786-1817) son of Richard J.—and Jean-Baptiste Maillard; b. Madras; Ena. Mad. Inf. c. 1802; d. Hyderabad 14-10-17. Probably acting for Caldwell who resumed charge in 1813 [1, 321]. ⁶ M Rev Bd. 8-4-11. ⁷ MRO. Map 241. ⁸ 67 O/O. ⁹ 87 N/8, M/8. DDn. 240 (100).

and east of Tricalore "done with the Planetable by William Mead, Sub-Assistant Surveyor"¹, and in 1808 Henry Lincoln, was working under the Collector of South Arcot for the purpose of making surveys of certain Indigo manufactories [15], & running levels thro' the course of several channels of supply, preparatory to their inspection by the Superintendent of Tank Repairs and Water courses².

A large part of Malabar had been surveyed by officers of the Bombay establishment [I, 131-2], but not in sufficient detail for the purposes of civil administration, and in 1802, after the transfer of the province to Madras³ [165], the Revenue Board forwarded to Government

a letter from Major Macleod⁴, stating that, as many parts of the province of Malabar have not been surveyed, he has employed a Surveyor and draftsman on a monthly pay of one hundred and fifty (150) rupees; that he has lately formed a new map from several others constructed by Engineers, and is now engaged in copying one of Mahé⁵ and its environs, to explain the encroachments said to have been made by the French.

Major Macleod has expressed an hope that the employment of this Surveyor will be approved, and has recommended that half a pagoda per day in addition be allowed whenever he may be employed on actual survey. Desirous of obtaining every information of this province, as yet so little known, we recommend the Collector's proposal, ... and that two Assistant Surveyors be sent from the school to Malabar, to assist the work.

This was duly approved, and it was ordered that

Silvester Pope and William Webb [I, 286], who are reported qualified, may be equipped with instruments proper for surveying, furnished with clothing, and be directed to proceed with all practicable despatch to Malabar⁶.

In 1804 the Principal Collector wrote from Palghât, submitting a report from C. Hemphel, surveyor-draftsman, on all the work he had done since his engagement in November 1801⁷. This included a fair chart of Malabar on the $\frac{1}{4}$ -inch scale, and large scale surveys of Tellicherry and Mahé. The Collector further asked that he might keep on

the two surveying boys, who will be most useful under the Gentlemen who are in the management of the interior districts; but so far the disturbed state of the country has impeded their survey⁸.

This was not approved, and Webb and Pope were moved elsewhere.

GENERAL MAPS

The preparation of general maps for the Board of Revenue, the Government, and the Directors, was first the responsibility of the Inspector of Revenue Surveys, and then passed to the Surveyor General who, in 1812, submitted to Government a Map of the Districts of Tanjore, Trichinopoly, Coimbatore and Madura, together with the Polliams of Nuttam and Manapara⁹, protracted on a scale of four English miles to an inch, ... a compilation of certain detailed surveys which have been carried on...for several years by the Assistant Surveyors of the late Revenue Establishment. ...

Although a considerable proportion of the surveys...were completed, previously to the extension of the Trigonometrical Survey under the direction of Major Lambton. ... yet a considerable part...have been prosecuted latterly, having the triangles of Major Lambton as their foundation. In constructing therefore the map of the districts, ... the first object was to lay down all the principal points which had been determined by the Trigonometrical Survey. ... The detailed surveys...have been verified and corrected, ... and...inserted in the map. ...

The surveys of the Shevaganga Zemindari and Tinnivelly are now in great progress [140-5], and I trust that in the course of the ensuing year it will be practicable to complete these, and perhaps the District of Rannad and Tondiman's country, ... when the Government will be in possession of a detailed survey...from Cape Comorin to the Southern Boundaries of Mysoor, the Baramahl, and the Province of Arcot, completed by the Surveyors of the late Revenue Establishment. ...

¹ Tirukkoyilur, 58 M/1; MRIO. 6-PT-19. ² M Rev Bd. 2-5-08. ³ from July 1800, Logan (531).
⁴ Wm. Macleod, Mad. Inf. from Collr. Salem, to be Principal Collr. Malabar, 1801; furl. 1804; Cuddalore, 1809. ⁵ 49 M/10. ⁶ MRC. 4-6-02. ⁷ Hemphel had drawn map of Malabar for Sartorius, May 1793 [I, 131]; MRIO. 146 (37). ⁸ M Rev Bd. 2-2-04. ⁹ Rannad.

I cannot...conclude without expressing the satisfaction which I have derived from the manner in which the Survey of Tanjore, in particular, has been executed [146]. The original map...is extremely minute in every respect. I have, accordingly, in the compilation now submitted, been careful to include in the minutest manner all the water-courses, and all the information which it has been practicable to exhibit on the scale. ...

The survey of North Coimbatour, including the Neelgherry mountains, ... has been also carried on the most satisfactory manner; but the surveys of Coimbatore south of Noel River¹, and of Madura and the Polliams, are altogether inferior to the surveys of Tanjore and the Northern Division of the Coimbatore country [147-8]; ... The whole has, however, been corrected by the application of the Trigonometrical operations. ...

The plan of Dindigul [139-40]...has never been in the possession of the Surveyor General, and...although I have made every enquiry towards its discovery, I have not been able to obtain either the original, or a copy of it, which will also explain the cause of Dindigul not having been inserted in the compilation. ...

I regret that the original plan of Madura and Manapara now forwarded are not in the best state of preservation. They seemed to have been much used before they were received into this Office².

Most of the original field sections of these district surveys shew not only the sides of Lambton's triangles, but also the minor triangles laid down by the surveyors. It is possible that this minor triangulation was plotted graphically and never computed; some of it was certainly laid down by planetable. The *Bengal Register of Maps* records the existence of "Plans of Triangles for several districts".

In 1814 Morison reported the completion of the Survey of Tinnivelly, Tondiman's Country, and Shevagungga; and I have now the satisfaction of adding that the district of Ramnad, together with the Island of Ramaswaram, has also been completed in the most satisfactory manner [145]. The plans are now under discussion, and a map of the whole will be ready at an early period. ...

The surveyors have been ordered to be employed in the Dindigul District, which when completed will be included in the map under preparation; when the Honourable Court will be placed in possession of actual surveys of the whole of the countries from the Cavery to Cape Comorin, East of the Ghauts.

I have already reported that the plan of Dindigul has been lost, and, considering that the survey of that District was of a very imperfect nature compared with those which have been more recently executed, ... it has appeared to me to be highly desirable to have the work done again before the surveyors should be withdrawn from that part of the country⁴ [140].

The final map was submitted in January 1816⁵.

¹Noyil R., 58 B/13 to E/16. ²MPC. 17-10-12. ³*Bur. Repr.* 596 (15-20). ⁴MPC. 9-12-14.
⁵ib. 18-1-16.

CHAPTER XI

OTHER MADRAS SURVEYS

Ceded Districts, 1809-13—Goa, 1810-13—Sonda, or North Kanara, 1813-5—Northern Circārs—Mackenzie's Review, 1810—Establishment, 1811.

ON completion of the Mysore survey, Mackenzie kept his assistants in Madras to work up the maps and memoirs, which he submitted in October 1808 [III-2].

Occasional field work was found for the surveyors—Ward ran a series of triangles from the eastern border of Mysore through Vellore and Conjeeveram¹, to Fort St. George, thus making a connection between the Mysore survey and the observatory independent of Lambton²—Hamilton and Lantwar made a survey of Conjeeveram—Summers surveyed the road from Madras to Pulicat—and Lantwar made various small surveys in Madras³.

Mackenzie had for some years cherished the wish to extend the Mysore survey northwards through the Ceded Districts up to the boundaries of the Nizām's dominions.

Under a treaty signed at Hyderābād, 12th October 1800, the Nizām had ceded to the Company the territories acquired from Mysore in 1792 and 1799 [I, 119] in order to provide for the maintenance of the subsidiary force. These ceded districts, covering Bellary, Kurnool, Anantapur, and Cuddapah⁴, were at that time in a very disturbed state and General Campbell [98] commanding the forces of occupation begged for a map, but Mackenzie was fully engaged on the northern boundary of Mysore ;

Unless something very pressing demands it, I should suppose that the part I am now employed on had better be first finished. ...

Your ideas of my being employed for some time at least in the Ceded Districts would not at all disagree with my wishes, if it can be arranged without detriment to my present employment, and with the goodwill of Government and all concerned; and, though I am ambitious of completing anything I enter on, ... it might not be found difficult to reconcile, but it does not depend on me⁵.

He was not able to leave Mysore, and the Ceded Districts were left unsurveyed, except for Munro's detailed revenue survey [180-2]. In December 1807 Munro's successor wrote to the Board of Revenue ;

As...there is no accurate map of the Ceded Districts, and the late Division of them into three separate Collectorships, without their respective boundaries are correctly ascertained, being likely hereafter to be attended with some inconvenience, I...submit to the Board the utility of employing three or four boys from the Surveying School for this purpose⁶.

On this, Mackenzie

suggested that four of the six Sub-Assistants on the Mysore Survey may be employed to advantage extending a survey into the Ceded Districts. ... I communicated last year to Colonel Munro...specimens of 2 districts surveyed [in Mysore], and he was of opinion the same mode might be usefully applied throughout. ... The instruments purchased on the Mysore survey are still fit for service, and the extension now...may some time hence save more expensive works⁷.

After inspecting the maps and memoirs of the Kanara survey [108-12], the

¹ 57 P/9. ² MRO. Chart 279; DDn. 43 (257), 20-10-08. ³ Fdbks. MRIO. M 60, 61, 117. ⁴ Bounded on the S. by Mysore—on the NW. by the Tungabhadra—on the N. by the Kistna [pl. 11]; Maps, 6 in. to degree, shewing schedule of revenues, sd. by Thos. Sydenham, Sec. to Resdnt. Hyderābād; MRIO. Misc. 4-6-1801. ⁵ DDn. 66, 19-12-00. ⁶ M Rev Bd. 4-1-08. ⁷ MPC. 16-8-08.

Revenue Board agreed "that it is highly desirable that survey of Ceded Districts should follow the same principles as the surveys of Mysore and Kanara"¹.

Dunigan and Ward were therefore sent up to the western districts early in 1809, two years before Lambton :

You are to proceed with all possible expedition, with the two Sub Assistants James Summers & William Howell...into the Districts Ceded by the Nizam in 1800, to Survey them in connexion with the Survey on which you have been already employed in Mysore, & in the Western & Eastern Districts ceded to the Company in 1799 [91-2]. ...

To enable you to execute your work with greater accuracy...you are to take an early opportunity of selecting a convenient place for measuring a Base Line to serve as the Fundamental Basis for extending the Principal Stations thro' that Country further to the North & East, & to verify & connect with the Stations of the former Survey. ...

The Maps of the Survey to be laid down on a Scale of 2 Miles to an Inch². On all occasions you should comply with any Requisitions of the Collector, acquainting me of the same³.

Leaving Madras on March 17th, the surveyors reached Hindupur⁴ on 3rd April and measured a base near Wajrakarūr⁵, each detachment then extending triangulation over the districts allotted to it. Ward and Summers surveyed "Bellary & Kumply, including the valley of Sundoor—Adwanny—Kurnool", whilst Dunigan and Howell took up "Gootydrög, Nudjar Carroor, ... Raidroog, Cullian Droog. Pro-tractions were laid down on the $\frac{1}{2}$ -inch scale⁶.

The following extracts from Mackenzie's letters to Ward include references to his collection of historical inscriptions [156] :

May 27th. ... Narain Row should avail himself of the opportunity to obtain every kind of Inscription & History, as he belongs to that Department, tho' I wished him to be near you as long as he can be useful. When he has got everything in your vicinity, you should concert with him & get such sanction as may be necessary for any part of the District.

I hope the Collector has sent proper people to attend you. ... Each of your parties will require an intelligent person.

Aug. 18th. ... As the time & vicinity is now favourable for sending Narrain Row to Godaval, I enclose him a letter for the Chief of that Place, with whose father I used to correspond a few years ago. ... This will enable him to obtain some useful Accounts & Histories there, but tell him not to stay long, as I shall want him to go to other places bye & bye.

Sept. 6th. ... I approve of your going on towards Ballary, as by that means you will complete the country in that direction. I am glad you mean to take a Plan of Adoni : let it be minute & every remarkable Place inserted, as it was never taken before, so far as I know. I wish you would take some Sketch view of it.

Nov. 4th. ... I have duly received your letter of 19th September mentioning your proceeding on the Survey of the Ballary Talook after completing that of Adoni, which is very satisfactory. ... You will of course include the Soondoor District with that of Ballary, distinguishing the Limit so far as the rugged nature of the Country will admit [97] ; but as the District, I believe, belongs to a Maratta Family, you will previously apply for the sanction of the Collector. ...

5th. ... The Sketch you sent of Adoni was very acceptable to me ; I have no doubt but you can do very well in that way.

In your Survey down by Comply you will come of course upon the Ancient ruined City of Beejanagur [I, pl. 9. *Bisanagar*]. ... Be particular in noticing anything remarkable that occurs there, for though I have been there already & have a Plan of the Ancient City, it is possible you may meet with things that escaped my notice, as we were sickly there [98].

Tell Narrain Row to be vigilant in getting every possible Historical Notices about Complee &c. ... Make my Compliments to the Old Anagoondy Man if you see him there.

Dec. 5th. ... I will be anxious to hear of your being done with that hilly country west of Complee, and when you have got through it, you should lay down your work in some open country such as Ballary.

Jan. 1st 1810. ... From...your reports of the completion of the Ballary & Soondoor Districts I derive much satisfaction. ... Should your health be so far re-established as to render it advisable, I entirely approve of your proceeding on the Survey of the Districts to the Eastward

¹ M Rev Bd. 3-4-09. ² but actually completed on 1 inch scale [155] ; DDn. 83, 15-3-09. ³ ib. 7-6-09. ⁴ 67 G/5. ⁵ 67 E/8. ⁶ MRO. Map 28, Province of Harpunhully, 1800-10, M. Dunigan ; Ward's Journal, MRO. M 138 ; DDn. 246 (104).

of Adoni. ... As I believe Canoul & Baganpilly are under the immediate management of their own Mahomedan Chiefs of respectable Family & Rank, who may not be so well acquainted with the Objects of these Surveys, I am particularly anxious that you should take every opportunity of rendering the Survey in these Districts as little obnoxious to them as possible. ... In requiring the Lists of Villages, therefore, & Boundaries, you will be as tender as possible, & regulate yourself in any difficulty by the directions & advice of the Collector, who I hope will order his Vaakeels to assist you.

July 10th. ... Your letter of 14th came in reporting the completion of the Survey of Canoul. ... The situation of any mines of Iron, Salt, or other minerals, should be marked and indicated by a star or any other mark, and in your memoirs should be referred to. ...

Meantime you can prepare yourself for your journey, as I have no doubt of being able to obtain the necessary sanction for your coming to the Presidency¹.

Ward was now given a commission in the Madras Infantry, and went down to the Presidency in August 1810; after finishing off his maps² and reports, he left on October 10th to join his corps at Wālājābād.

In January 1810 a third pair of surveyors, Hamilton and Lantwar³, had been sent up :

Jan. 29th. ... As a Line has been already measured at Ballapoor [99], which will serve as the Base of the triangles carried into Gurrumconda⁴, it is not necessary for you to measure one at this time; especially as your Triangles will afterwards come in connection & be confirmed or corrected by those extended from the Bases measured last year near Raidroog⁵. Taking the sides of one of the most convenient of the Southerly stations as your Base, you will carry on from thence your series of Triangles & of secondary stations; & the details of the Country...may be then laid down agreeable to former Instructions and Practice⁶.

Mackenzie writes later to Hamilton ;

May 12th. ... I approve of your intention...to go on to complete the Plan Work, so that you and Lantwar...make up whatever belongs to that District before you engage in another. A Plan of the Triangles with your Computations should accompany that of the Country you have surveyed. ... and to Lantwar :

I wish you to attend particularly to notice the Rivers, their sources and courses, and junction with others; the Ridges of Mountains, their Productions; the Tanks and Canals &c., and that you write the names very accurately, attending closely to the true Orthography as pronounced & spoke by the Natives⁷ [271].

Oct. 2nd [to Hamilton]. ... As soon as you have completed the Field Work, I wish you & Lantwar to meet...as most convenient & central, ... where you may finish your Plans and Memoirs, &...derive the advantage of comparing & computing your Triangles.

Exclusive of your Separate Plans, all Triangles of both should then be laid down on one Plan on a scale of 4 miles to an Inch; it is my intention that these Triangles should be afterwards extended North to some place near Kurpa, where a Base may be...measured to correct them.

Your stations on the West & also the Boundary, you should also communicate to Mr. Dunigan, who is directed to Survey the Tadnerry...Districts till they join yours, ... by which means all your works may be afterwards united more conveniently together.

He wrote to Dunigan ;

I was pleased to see the gradual progress of the Survey of Harponnelly &c. ... I imagine from your last that you have completed now the whole of the Country lying between the Mysore limits of Hurryhur, ... surveyed in 1800 & 1801 [95] & the Districts of Ballary, Raidroog &c., surveyed lately by Ward & yourself⁸.

The perusal of these papers...gave me considerable satisfaction, as they appear to be laid down very distinctly, and I doubt not but that the calculations of the triangles on which the whole is formed will be found correct⁹.

After Ward's departure Summers was directed to join Dunigan on the Survey of Anantapoor & Darmaveram, but as it is probable that he may be on the way coming up, I have directed Hamilton to communicate to you his Western Primary Stations, that you may save time by beginning as early as possible on the nearest parts till Dunigan comes into the District¹⁰.

¹ Letters to Ward, D Dn. 83 (*passim*). ² MRO. Map 27, Province of Adwanny, 1809; scale 2 m. to an inch. MRO. 135 (25, country S. of Tungabhadra R. and Kurmoal, 1810. ³ Followed by Ficker 12 months later [150 n.2, 103]. ⁴ 57 K/B, pl. 11. ⁵ Rāyadrug, 57 B/14. ⁶ DDn. 83 (49), 29-1-10. 'ib. (61). ⁷ MRO. Map 25, *The Collectorate of Bellary*, 4 m. to an inch; DDn. 83, 16-7-10. ⁸ DDn. 83, 30-9-10. ⁹ 'ib. 13-10-10.

To Dunigan Mackenzie wrote, acknowledging the Memoirs of the Koodelgee & Harponelly Districts, the Computations of Triangles & Journal of the Weather. ...

As the Survey of Durmavoram, Anantapoor &c. will terminate the Western Division of the Ceded Districts, I could wish you to proceed with all possible dispatch in Order to conclude that Part, & trust the late addition to your Party by James Summers...will tend to accelerate this object, & that he will make up by redoubled attention for the time he has lost. I should be extremely pleased if the whole Western Districts could be completed by the end of the year¹.

In September 1811 Dunigan and Hamilton measured a second base near Cudjapah, and survey was extended to the mountainous borders of the Carnatic. Dunigan reported in November that he would have made better progress had not the setting in of the Rains which poured incessantly for several days together retarded... the Field duty. Notwithstanding the then uncertain state of the Weather, I still continued to take advantage of every fair interval in completing that Portion of the Survey I allotted for myself...which was finished about the middle of August.

About this time the Weather clearing up for a short interval, I was anxious to avail myself of that opportunity of visiting some of the Principal Stations on the Nulla Mulla mountains² in order to connect my Triangles with Mr. Ward's Stations of Kurnool, and which I followed up (with the Survey of the Roads) by an Excursion across the Country, visiting the other Primary Stations made use of in the Surveys...allotted to Assistants Summers and Wm. Howell, who by this time had entirely completed their respective shares of the Work, and joined Mr. Hamilton. ...

Since my arrival in this quarter I was engaged for some time in looking out for a suitable spot of Ground for measuring a Base, and have happily succeeded in determining upon a fine level plane [*sic*]...in the Neighbourhood of Cuddalore³.

He completed this base by December, and then worked eastward towards Cumbum⁴, when the Surveyor General directed him

to connect the Survey of the Ceded Districts with that of Ongole and Nellore [149-50]. ... In connecting these Surveys I request that the boundary which divides them may be surveyed correctly, filling up at the same time all unsurveyed spaces in the tract between the Ceded Districts and the Company's Country, and taking great care to give no offence to any of the people of Calastery and Venkatagerry⁵.

Dunigan reported in November that this junction was completed, as well as "all the scattered portions of territory of the Venkatygherry Rajah" [149]⁶. In February 1814 he sent in his maps and papers with Howell and the *gomashita* Anand Rao⁷, whilst he stayed on to finish off various pockets along the Mysore border. The last surveyor reached Madras in May 1815.

In January 1816 Mackenzie submitted

a general Map of the whole of the countries ceded to this Government on the partition of Mysore by the Treaty of Seringapatam of June 1799, and from the Nizam afterwards by the Treaty of Hyderabad of the 12th October 1800, carefully reduced to a scale of 4 miles to an inch⁸. ...

The Map...includes the space of 28,989 sq. miles, surveyed on the same plan and system as that of Mysore, including the exterior limits of the Frontier and the interior limits of each Purgunnah of the Cessions; the Great Features of the Country, the mountainous ridges, the Rivers, Forts, Woods, Roads; and nearly, ... every village of each Purgunnah, ascertained by survey from the Official Registers of the Districts.

The original sections and plans of Districts deposited in Office exhibit the same on a scale of one inch [153 n.2].

The two accompanying volumes contain merely the statistical Tables of Population, and the Registered Lists of villages laid down by their positions from the Great, or secondary, stations⁹. This method, which I believe has not hitherto been employed, except in the surveys of Mysore and of Baramahl, ... has the peculiar advantage of preserving an authentic Record of every individual village; ... Whilst it affords considerable advantage in all future disputes of limits, it is attended with no additional trouble in the survey [213]. ...

¹DDn. 83 14-11-10. ²Nalamala Range, Eastern Ghâts; 57 I/NE. to J/NE. ³DDn. 127 (99), 1-11-11. ⁴87 M/2. ⁵DDn. 88, 1-8-13. ⁶DDn. 136, 16-11-13. Venkatagiri, 57 O/9. ⁷MRIO. M 567, *Memoir, Oodagery & Venkatagerry*, MRIO. M 83. ⁸Maps, with plan of triangles, MRIO. 132 (13) 2-2-14; 133 (27); 134 (16); 146 (11, 23, 24) & Ben. Regr. 565 (14). ⁹Village Registers, MRIO. M 17. 61.

Exclusive of these Registers, the usual remarks on the face of the Country ; on productions, soil, climate, &c., have been collected, which...I propose to arrange in the form of Memoirs Descriptive of each District¹, together with a brief abstract of the History of each Province. A considerable body of the latter species of materials has been obtained, but, as the whole were written originally in the Native languages by persons trained and employed for this purpose, it has been found impracticable to get the whole of them yet translated or properly arranged. ... It is my intention to reserve this for a period of more leisure than can be obtained under the present complicated avocations of this Office [93, 278, 304]. ...

The Survey has been entirely executed by from 4 to 6 Native Assistants², reared originally on the foundation of the late Revenue Surveying School, but trained to the Field, either by the late Mr. Mather or by myself, on the survey of Mysore [101, 106, 110]. ... To these were occasionally added other young men reared by me³, who were necessarily withdrawn on the establishment of this Office⁴ [303, 352].

GOA

In August 1810 orders were issued for the transfer of Garling and 7 other officers of the Military Institution⁵ from the east coast [2, 127] to survey the Portuguese territories of Goa. Two civilian sub-assistant surveyors completed the party⁶. Since the conquest of Portugal by Napoleon, all Portuguese possessions in India had been occupied by British troops for their protection against possible attack by the French ; civil administration being still carried on by the Portuguese.

Crossing the peninsula in November, the party travelled from Bangalore by three different routes, and surveyed each of them⁷. During the first season the island, city, and port of Goa were surveyed on the scale of 4 inches to a mile, but as five of the military officers were then recalled to join their regiments [321], and the survey transferred to the control of the Surveyor General [322], Garling was ordered to complete the general survey on the one-inch scale. He was, however, allowed to retain the officers till the end of the rains of 1811 so that they might complete their mapping [157]⁸.

For the next season Garling was allowed two military officers, Lethbridge and Dunn, and three civilians, Webbe [157, 175], Terry, and Long⁹, and in April 1812 he reported progress ;

The objects...have been to extend a net of triangles over the whole of the Territories—To fill up these triangles with Topographical detail—To measure the roads and to inspect the Ghauts—To compile a Descriptive Memorandum. ...

The boundary line, being made continue across the Mouths of the Rivers, will be found to enclose an area of about 1300 miles ; of this extent there remains to be done of Topographical detail not more than 110.

The arrival of Assistant Surveyor Webbe has enabled the Survey of the roads to be commenced on much earlier than otherwise could have been done. The Principal roads, ... all the secondary Ghauts, and three of the five principal Ghauts have been measured.

The whole of the Field duties of this Survey will...be completed in the course of next month ; there will then remain to revise and arrange the Triangles—some drawing in the Topographical part, which may be done, under inspection, by the Sub-Assistants—To revise and arrange the Routes—To compile the descriptive Memorandum.

On the Sketch I have exhibited what States border on these Territories, with a view to afford the means of judging of the propriety or otherwise of extending the Survey. The Country to the South...has been surveyed under Colonel Mackenzie ; the Survey of the Soopah Country¹⁰, as belonging to the English, and the Sattara Province as belonging to a Dependant of the Portuguese Government well disposed to the British, is undoubtedly practicable. ...

I have been along the Southern boundary of these Territories, ... and, for the more effectual junction of the Surveys, I have taken a Station on Bomanaut Gooda, ... and have intersected several more distant points which have been determined in the Map of Colonel Mackenzie¹¹.

¹MRIO. M 126. ²Ward, Dunigan, Hamilton, Summers, Howell, Ficker. ³Lantwar, Newman.

⁴MPC. 18-1-16. ⁵Lethbridge, Dunn, McGlashan, Fyfe, Hancock, Perry, Conner. ⁶Terry, Long.

⁷MRIC M 71. ⁸MMC. 17-6-11. ⁹MPC. 19-5-12. ¹⁰Supa, 48 I/11. ¹¹DDn. 127 (267), 10-4-12.

Garling was insistent that the party should not leave Goa before all the mapping and memoirs were completed :

The Descriptive Memorandum has been an object of great attention ; with the materials for it fresh in my memory on the spot. ... and with the assistance of the Interpreter at hand, I shall engage in its execution under greater advantages than after delay. ... The materials of the Survey in general, collected from many hands and therefore more or less unconnected, should be perfected without that loss of time which must attend a march. ...

Terry...is very unwell of the Fever with which he was suddenly attacked a few days ago whilst under the Ghauts. Mr. Lethbridge has also been obliged to go to Cabo for the benefit of Dr. Gilmour's advice¹. These accidents are by no means so common as the bad name which Goa has got gives most strangers to it to suppose ; compared with the country where we were about the Pollans², this climate may be said to be salubrious³.

At the end of May he moved into recess quarters at Cabo ;

On inspecting the work produced by the Surveyors, it has been found that a portion of that executed by Lieut. Dun is erroneous, and will require to be surveyed again [216]. The extent of this error is not more than may be obviated by one of the Assistants in three or four weeks, when the weather will permit out-duties to be engaged in. The error seems to have arisen from mistaking one point for another, but...it is quite unusual not to detect on the spot errors of such a magnitude. ...

The Surveyors will shortly complete the drawing of their work, and I hope to be able to transmit the register of the triangles with my next Report. ...

I...keep by me a connected Map of these territories, on a scale of one Inch to a Mile. Into this Map most of the sections have been sketched as soon as finished, ... which if completed would be found in every respect calculated to answer the wishes of the British Envoy...for a map to be furnished to His Excellency the Viceroy of Goa⁴.

To completely finish this Map, no expense need be incurred beyond that of retaining one Surveyor until the end of August, and...I beg to recommend Lieut. Lethbridge may be allowed to remain for the period⁵.

I have had the honor of a conference with the British Envoy on the subject of Surveying the Passes leading from the upper Country into the Sattara Province⁶. ... The Rana's permission to survey the Passes being first obtained, they may be commenced on in the fair interval that is looked for in August. ...

I have communicated to Lieutenants Lethbridge & Dun the arrangements...by which they are to be relieved from the Survey on the 30th instant. ... I have also communicated to Mr. Assistant Surveyor Webbe the arrangement regarding him : an opportunity for his proceeding from hence to Bombay is not expected to occur until the latter end of September, so that his services will be available in August for assisting in the Survey of the Passes ; he is in the mean time occupied in forwarding the details of the Survey⁷ [175].

Permission was given to extend the survey through the Ghâts towards the Marátha country except through the Rámghát Pass⁸, and the Munnaree country⁹ was partly surveyed in February 1813 :

The chiefs of the District were averse to the survey being made, and evaded giving their consent until a passport had been obtained from the Peishwa.

On [my] first entering the country and sending the passport to the Dessais they behaved with a civility which led me to hope they did not regard my proceedings with much jealousy, or that they would object to my making a general survey of the Country. ... Their subsequent conduct however gradually evinced their distrust, ... and at length they gave a distinct intimation that my proceedings must be confined to the road.

Their dependence on the neighbouring state of Sawunt Warree¹⁰ and the hostile preparations of the British Government against that State¹¹, sufficiently accounted for their temper, and made it prudent to quit the Munnaree District without much delay ; the country has not therefore been entirely surveyed, in particular the N.W. part. ...

The Survey has been taken up from the Trigonometrical points determined on the East frontier of Goa¹².

Garling sent in his map and descriptive memoir¹³ at the end of the rains of 1813 which he spent at Goa. Morison, acting Surveyor General, commented that

¹ Mad. Med.; Staff Surg., Goa. ² in Chittoor Dist.; 37 O. ³ DDn. 127. (259), 12-4-12. ⁴ MRIO. Misc. 0-0-13, 1-inch sections by Hancock. ⁵ DDn. 127. (287), 10-0-12. ⁶ Belgaum & Dhárwár Dist., 48 I; Sattára, 47 O/14. ⁷ Ib. (291), 19-0-12. ⁸ 48 I/1. ⁹ 48 E/14. ¹⁰ Návantvádi, 48 E/13. ¹¹ Dowse's operations, [166]. ¹² Memoir MRIO. M. 212. ¹³ Reduced Map, scale 2 miles to an inch, *IO Cat.* (480), & MRIO. 5-P2-14; Misc. 5-0-12, copy beautifully drawn by C. Ignatio of SGO. Madras [pl. 14]. Memoir, BM Addl MS. 14385, & DDn. 97.

“all the features of the country have been exhibited in the most masterly style”¹, and the survey was indeed the finest piece of topographical survey that had yet been executed in India; and in a hilly wooded country. Montgomerie writes of it in 1828 :

This Map was prepared from the Original Survey executed upon various scales—35 sections of various sizes and scales, not less than 1 mile to an inch, forming the original Maps of the Survey².—It depends on a Base on the Sea Coast accurately measured by Lt. Garling. ... It exhibits every species of detail of which the Scale is susceptible...and, with its descriptive Memoirs, may be considered of the first order of Topographical and Statistical documents we possess. ...

The Goa Survey, though not grounded on Colonel Lambton's Triangulation, yet, from the Circular Instrument used by Captain Garling being of great power, and capable of measuring angles with nearly as much accuracy as Colonel Lambton's [255], and proportionate care and Skill having been devoted to the observations and Calculations of the Principal Stations, it may be considered to rest on equally well authenticated data. The Triangles were in fact adopted by Colonel Lambton [247].

The detail of this Survey was taken up by means of Plain Tables and, large scales having been used, admitted of a minute and elegant Topographical delineation of the diversified features of the Goa Territories. Besides possessing all the merits of the Military Institution Surveys, this has none of its defects; the limits of the Districts and other Divisions are shown, the names are considered to be correctly written, and in addition to the Maps there are ample Memoirs³.

Lambton's inclusion of Garling's triangulation of Goa and Sonda with his own work was unfortunately done without Mackenzie's consent, and greatly offended him⁴.

SONDA OR NORTH KANARA, 1813-5

The district of Sonda⁵, which corresponded more or less with the present district of North Kanara, had fallen to the Company at the treaty of 1799, and was administered with South Kanara from Fort St. George. Thomas Munro being the first Collector of the two areas [181]. Mackenzie had been unable to take up the survey in 1800, and his arrangement for its survey by Johnson had fallen through [96-7].

On the completion of Garling's survey of Goa, Morison recommended that his party should move to Sonda, and field work was started in November 1813, at the end of the rains, with a party comprising Garling, Conner, Terry, Long, Faulkner, Ficker, Malcolm⁶.

Health had been none too good;

The indisposition of John Terry had increased in delirium and other symptoms of such an alarming nature, as in my mind to render the constant attendance of Richard Long near him; Terry is now convalescent, and may probably be given Medical Certificate [363]⁷.

The weather having cleared up, the Lascars were dispatched on 23rd to make the necessary preparations by placing flags. ... I quit Goa this evening for Markunny Station⁸.

John Terry has so far recovered as to resume duty; has been sent to Hullyal⁹, as the least unhealthy area. I have hired 4 lascars to be attached to him. ... Richard Long will accompany the Superintendent to be instructed in the use of the large theodolite¹⁰.

On December 5th Garling reported that Faulkner and two sub-assistants were sick at Haliyāl. Terry was at work and

Richard Long has been employed on Topographical detail. ... All flags are now removed from Portuguese Territory, and the survey is now independent of further communication with it.

Terry was sent down to Madras with asthma, and after some preliminary training Faulkner and his two Sub-Assistants...started work. ... Survey completed by Terry round Hullyal has been lost. Terry reports that the evening

¹ from SG. 20-2-15, MPC. March 1815. ² Map in 37 sections by Lethbridge; 2 inches to a mile, 1812; MRO. Map 680. ³ DDn. 246 (90). ⁴ DDn. 149 (51), 23-3-19. ⁵ Sonda Village, 48 J/14. ⁶ 48 J/15. ⁷ Descriptive Memoir, M 203; DDn. 08 (1). ⁸ MRIO. M 567, 2-9-13. ⁹ on Goa border, 48 J/7. ¹⁰ Hallyal, 48 J/15. MRIO. M. 567 1-10 13.

previous to his intended departure from Hullial, his survey was put in the usual place, and that in the morning it was missing. ... If nothing transpires in a few days, I shall consider it more advisable to survey the ground again; it will take six weeks to make good the loss¹.

An escort was provided and Garling asked for it to be continued during the rains;

The Office for the Soonda survey will at Onore² be quite a distinct Building from the dwelling house. I beg therefore that the Guard would be continued to the survey during the Monsoon, or...that measures may be adopted for having a sentry posted over the Office during the night, as that place will be the repository of the Papers and Instruments of the Survey³.

The survey was completed by the close of the second field season and, reports the Surveyor General,

the approaching Monsoon rendering it necessary to retire from that woolly unwholesome tract, I approved of Lieutenant Garling's removal in May last with the Establishment to Chittledroog⁴, to bring up there the necessary plan work, Memoirs, and computations; these always require time and convenience at the termination of the field work. ... The ill health of the party also rendered this necessary, as several were taken ill, and one of the Native Assistants was permitted to go to the Coast for his health; another having been permitted to go to Bombay returned here in June⁵.

It was not until September 1815, nearly five years after leaving for Goa, that Garling returned to Madras, with reputation as a topographical surveyor second only to Mackenzie, and a mass of valuable material;

The greatest part of the results of this survey has now come into the Office; with 4 Volumes of Memoirs and all the sections; and two maps of the Soonda District on a scale of one and two Miles; these are also put in hand in Office to prepare fair copies⁶.

The maps, and especially the hills, are beautifully drawn, showing considerable detail in spurs and minor streams, but with no definite heights. The title-page of the first volume of Memoirs reads;

Soonda Survey. Descriptive Memoir, Part the 1st. Containing Remarks Illustrative of the Map; General Account of the Districts of Soanda & Bilgy. General Account of the Countries surrounding the Soanda District. Account of the Traverse of Soanda. Account of the Rivers of Soanda. Chittledroog. July 7th 1815.

NORTHERN CIRCARS

There is little to tell of surveys in the Northern Circars during this period. In 1805 the question of harbour accommodation along the east coast was raised once again [I, 101-3], the admiral "on the Coast" sending to the Governor a copy of a letter...from Mr. Ebenezer Roebuck⁷, who has Constructed a dock at Coringa⁸; you must be attached to having a good port on this side of India to refit and repair His Majesty's ships in. ...

The subject then being of considerable and material importance, I beg...you will appoint a gentleman properly qualified to survey the River, Dock, and Bar, and examine into the grounds and solidity of Mr. Roebuok's proposition; likewise to suggest any mode by which it may appear probable to deepen the water on the Bar, and render the Passage up the river more convenient⁹.

Warren carried out this survey in his capacity as Marine Surveyor [I, 174; II, 195], and went on to survey "the roads of Vizagapatam"¹¹. On his return in June 1806, he submitted an elaborate report on his work¹², concluding that, in the then state of the Flat at the entrance of the Coringa River, any vessel not drawing more than 12' 6" of water, may easily enter in two springs at any time of the year¹³.

The Madras Government of 1855 considered that Warren's report contained information of such value that they published it with Topping's report of 1789 [I, 103, 191-2] and later reports they had just received.

¹MRO. 507 2-1-14. ²Honavar, 48 J/7 [I, 125; II, 108]. ³MPC. 3-6-14. ⁴in Mysore, pl. 11. ⁵MPC. 12-1-16. ⁶MRO. 122 (3), 126 (17), MRO. Map. 231. MPC. 12-1-16. ⁷DDn. 98, M. 203; see also BM Addl MSS. 14370-8, purchased from T. B. Jarvis. ⁸Son of Dr. John Roebuck (1718-04), *DNB.*; bro. of Benjamin (1754-1800), *MCS.*; arrd. Madras as Free Mariner 1790; m. Zippora, dau. of Richd. Tickell (1751-03), *DNB.*, uncle to the survr. [65]; d. 1807. ⁹65 L/1. ¹⁰MPC. 24-7-05. ¹¹ib. 25-9-05. ¹²*Plan of the Flat in Coringa Bay*; MRO. Map 107; MRO. 101 (18). ¹³*Mad. Sel.* XIX (2).

The Madras Record Office holds a map of "the Zillah of Rajahmundry, shewing different zamindari¹", signed 23rd June 1807 : scale one coss to an inch, in two sheets¹. It is a skeleton map shewing main rivers, roads, village sites with names, and conventional hills. It is unlikely to have been surveyed by any of the assistant revenue surveyors who generally used scales in miles.

Morison gives the following description of the surveys of the Northern Circārs used for his maps of the Military Divisions [162. 276-7] :

The map of the Northern Division has been prepared under many disadvantages. A variety of materials have been brought into use. Their value in many instances is of a doubtful nature, and it has been found difficult to reconcile or connect them with one another : some are even without scales, and none are accompanied with any Memoirs which illustrate their history.

Every attention has however been paid to the selection of those which have appeared to be most authentic : and, having obtained from Mr. Goldingham... a series of longitudes and latitudes determined by himself and the late Mr. Topping along the Coast from Masulipatam to Ganjam [I. 104-5, 102], the disagreements in connecting the results of the different plans have been corrected as far as practicable.

The map... is much more complete than any which has yet been formed of this Division, and, although it must be considered much inferior to the maps of the other divisions, it affords information upon which considerable reliance may be placed ; as such may be mentioned the plan of Chicacole², Bonully, and Tekelly, the whole of which has been adopted [I. 93]. The Ganjam or Itchapore District is laid down from a copy of Cotsford's map, which appears to be authentic [I. 93].

The Vizagapatam District by Lieutenant Douglas appears to be a series of routes in various directions, and contains much information which has also been included, though some difficulty was experienced in adapting it to the points fixed on the Coast by means of the longitudes and latitudes.

Parts of Colonel Peurse's route from Madras to Bengal [I. 40-2] have been adopted when better materials were wanting, and all other routes which extend inland have been laid down. ...

The map of the Masulipatam and Ellore Circārs by Messrs. Topping, Beatson, and Caldwell, has also been adopted, though far from being a complete survey. I have ascertained that no triangles were carried on in its progress, and that it is chiefly formed by means of a general connexion of routes, and several series of levels taken in various directions through the Districts between the Kistnah and the Godavery [I. 106]. ...

Much remains to be done in this Division, and I trust it will be practicable at no distant time, to allot an establishment of surveyors to such of the districts as appear to demand most immediate attention, if not to commence a general survey of the whole of the Circārs³.

The survey by Alexander Douglas was carried out during 1810 and 1811, and bears a note acknowledging "a sketch of the Golgondah Zemindari⁴ drawn by Captn. Stewart of the 1st Bn. 21st Regt., 1810"⁵.

MACKENZIE'S REVIEW, 1810

The year 1810 was a great landmark in the history of Madras surveys. In August an important report on the reorganization of the military departments was presented by General Hewett⁶, Commander-in-Chief Bengal, who had been deputed for the purpose, and it was on his recommendation that Mackenzie was appointed Surveyor General [298-9], with control of all the surveys and establishments which had grown up under the Revenue Board and the Quartermaster General [3, 299-301].

One of Mackenzie's first actions was to make a careful investigation of surveys and maps already completed or in progress, and to work out the future programme [302-3]. His first review is dated 29th November 1810⁷ and, like all his reports, goes into the minutest detail and is of inordinate length. He discusses

¹MRO. 96. ²05 N/15; Tekkali, 74 B/0; There is a delightful little $\frac{1}{2}$ -inch sketch of Chicacole area without survey's name, or date: MRO, 10-17-18. ³MMC, 20-8-14. ⁴05 K/0. ⁵Map, MRO, 147 (31-3). ⁶Sir George Hewett, C-in-C, Bengal 1807-11; Madras, April to September 1810. ⁷MRO, M 00

the materials surveyed by the establishments now existing, in some measure proposed to be new modelled & reduced to a system ;

1. The Military Surveys carried on under the Quarter Master General since December 1806.
2. The Revenue Surveys under an Inspector of Surveys since 1798.

Both of these have gone on the same foundation of a *General Geometrical*, & more latterly of the *General Trigonometrical Survey*.

In the military surveys, while the Gun & Carriage roads, the Passes, Defiles, & Fords, the accurate positions of Forts, Towns, Markets, would be primarily attended to, the Boundaries of Provinces and of the Districts, lately required in the Revenue and Judicial Departments, would scarcely be considered objects of the first consideration.

On the other side, the Tanks, Channels, Nullahs, & even wells, & the quantity & kinds of arable & waste lands, the soil, cultivation, weights & measures, & various minutiae connected with Revenue have required more scrupulous attention.

While, in both, the Rivers & Tanks, the seasons of their filling and of the rains, the most considerable towns, Marts, &c., would be subjects of investigation, together with the General Geological features.

There is reason to think that, independent of the incompetency to such serious duties, and of the early age of the native Sub-Assistants sent on these surveys, under no immediate professional control or observation, that the objects belonging to each may not have been so nicely discriminated. ...

In tracts of country minutely surveyed by the Military branch, the interior limits of districts may have been omitted as unimportant [129]. ... Roads and defiles may have been passed over by the Revenue Branch for want of that experience which could not have been expected from the tender age at which young natives, little conversant with such subjects, were sent out by themselves [2, 184].

Mackenzie then makes " a rapid view ", and estimates the area of territories under, or in alliance with, the Madras Presidency, including the Northern Circars, to be roughly 1,69,691 sq. miles.

The Survey of the Mysore Dominions may be considered as the Central Nucleus on which the several parts may depend ; ... as a kind of Model example by which former errors have been cleared (breadth of peninsula [I, 179 ; II, 104], and considerable lights have been derived on various subjects. ... The whole of the Rajah's Dominions have been actually geometrically surveyed, Memoirs and Plans submitted to Europe, and the original documents...now...being placed in Depot.

Coimbatour ought to have made part of the Mysore Survey, but a survey under the Revenue Branch having been early commenced there after its reduction in 1799, it was thought proper to turn all the early efforts of the Mysore Survey on to the Northern & Central parts. The reduction of the Mysore Establishment in 1802 [330-1] rendered it inconvenient to go in. ... The hilly tracts adjacent to Mysore ought to be particularly examined & the obscure avenues through it better known.

Dindigul is in the same predicament, as Roads & Passes, are well known, but the extent of Survey under the Revenue Institution is uncertain [140].

The trigonometrical basis established by Major Lambton's survey, having been extended to the West Coast, will...remove the effects of any errors resulting from diversity of operations, or inferiority of instruments ; ... these several surveys being carried on the same parallel to the East has now put the actual breadth of the peninsula in these parts out of all further doubt [I, 179 ; II, 104, 238, 241], & has laid the ground work of a Survey of the whole tract from the Pennar to the Coleroon.

The Province of Arcot, not long ago the principal seat of the Government of the Carnatic, & the great field & object of our Politics and Military Movements for several years, might... have been an object of the earliest consideration ; yet, notwithstanding several attempts (Kelly, Schlegel, Pringle, Beatson, Allan [I, 95-9, 109-11]) to carry on surveys along with our armies, ... the more remote parts were not examined with that accuracy that the subject deserved. Though several marches and routes were measured and surveyed by Pringle, Beatson, Allan &c., no regular geometrical survey of this country was ever attempted till after the establishment of the Military Institution, when their first parties were sent to exercise themselves in the districts extending from Madras to Pondicherry and Gingee on one side, and towards Arcot, Chitoor, & Nellore on the other [125-8]. ... Future parties should fill up whatever remains of the country South of the Coleroon, West of the limits of Salem & Barramahli, & North to the Pennar. ...

The Provinces of Tanjore, Trichinopoly, Madura, Rameswur & Tinnivelly were already deemed of that importance that their roads were repeatedly surveyed in the several campaigns made in these countries during the wars down to the last campaign in 1801 [123]; various plans by Call, Wersebe, Byres, Allan, Jennings [I, 87, 98, 110], were deposited in the offices of Government, but no regular survey was undertaken, tho' repeatedly suggested, until...from 1798 several parties from the surveying school were sent thither at different times, whose labours are still carried on.

At present the rich district of Tanjore is completely surveyed, to which that of Trichinopoly is also added [146-7], both districts being watered by the Cavery, whose means of fertilizing the country serves an important object of Hydrographic & Statistical Survey in addition to the geographical. Madura is also said to be surveyed [140]. Tinnivelly is in considerable progress, and parties are sent into Ramnad & Sevanga [141-6]. ...

The extension of the Trigonometrical survey into Travancore, carried along the West coast, & forming a junction with the Malabar Survey, will confirm or correct what has been done already. ... A military survey appears to have been established under cover of the subsidiary force since 1806, and assistants from the Military Institution having been added for 2 years back [131-2]. ... When we recollect that Canara, a country of 5000 miles sq., much of the same nature, was completed in 6 months of fair season by a party of 6 or 7 [108-11], it is not unreasonable to expect that Travancore, 7500 sq. m., should be completed within a proportionate space of time, under a proper direction¹. ...

Notions should be taken of that immense space lying directly behind the Circars, which, tho' so very near our limits, & immediately bordering, seems to be less known than any one part of India at present. The country between the Circars & Berar should be explored, at least by rapid journeys from several surrounding points. ...

In the Deccan...the only surveys hitherto conducted have been effected by Routes, Marches of Armies, corrected by some observations rather than by any regular Geometrical process. Previous to 1800 I am competent to speak, from having made it a particular subject of enquiry [I, 116-7], but since 1805 the direction has been transferred [132-4]. ... The greater part of the Provinces South of the Kistna have been actually surveyed in detail, tho' some parts may have been executed in a manner...less correct than others [150-1].

Mackenzie continued by urging that the whole country south of the Coleroon should be completed with the aid of Lambton's triangles and with personal inspection by the Surveyor General. The survey of Arcot should be completed by the junior members of the Military Institution on their annual training, and the civil revenue assistants should be employed on the survey of Ongole and Guntur, thus completing the whole country south of the Kistna in two seasons. The survey of the Circars would then follow, with that of Goa and other foreign settlements, and then the Deccan. He was an optimist.

After discussing the supply of "native assistants" from the Surveying School, and the instruction of officers at the Military Institution², he recommended that two officers should be appointed as Surveyors charge of the more distant surveys be given definite status, in each with a small establishment.

A later review was made by Morison in 1814, when submitting maps of the Military Divisions [160, 276-7]³ and on his return in 1815 Mackenzie took up the whole subject again, and submitted⁴ a sketch of the Southern portion of the Peninsula of India, showing the different surveys executed⁵. ...

The Establishment of this Office of Surveyor General has at least had one...very important advantage; of combining for the first time into one General Body the results of all the surveys executed in the Peninsula since the first acquisition of Territory from Mysore in 1792 [I, 113, pl. 1], the whole of which in this map are distinguished by colours of different shades, the parts unsurveyed being left blank. ...

Of this, 76,507 square miles are accompanied by a considerable body of information, Geographical, Statistical, and Historical, some of which has been already transmitted home, and much of the materials still remain to be arranged, translated, and digested. ...

¹ Ward's party surveyed Travancore in 4 seasons, 1816 to 20. ² Making no claim to personal credit for its foundation [124-5]. ³ MMC, 26-8-14. ⁴ MPC, 12-1-16. ⁵ map, 48 m. to inch MRIO. 130 (31); MRO. 18.

Of the Provinces and Districts following, Geographical, Statistical, and Historical Memoirs are already formed, or in preparation ; ...

Barmahl	sq. miles	6,400	Ceded Districts	sq. miles	28,989
Mysore	"	32,000	Goa, Sutter, & Manara	"	1,622
Canara	"	4,801	Soonda & Bilghi	"	2,795
TOTAL 70,507					

He gives the following list of Provinces, taken from south to north :

		Surveyed Estimated	Unsurveyed Sq. miles
<i>Southward</i>			
Tinnevely	[140-0]	5,599	...
Travancore	[130-2]	505	0,761
Madura, Sevasangau, Ramanad	[140]	0,508	...
Dindigul, now under survey	[139-40]	3,446	...
Tanjore & Tondiman's Country	[140-7]	5,145	...
Trichinopoly	[147 1]	2,064	...
Coimbatore	[147-9]	3,640	...
<i>Westward</i>			
Malabar (Geographically Surveyed)	[I, 130-2]	5,562	...
Canara	[108-11]	4,801	...
Soonda & Bilghi	[158-9]	2,795	...
Koory	[105-4]	...	2,218
Wynaad	[123]	...	1,638
Goa	[156-8]	1,192	...
Maratta Districts of Sutter & Manara	[157]	330	...
<i>Center</i>			
Arcoot Soubah, from the Coleroon to Arcot, including the Janghire, a portion unsurveyed	[125-7, 149-50]	14,143	1,776
Western Poligars, Venkatgherry, Calastray, &c., included in the different surveys	[127, 155]
Nellore, Ongole	[149]	5,350	...
Palnad (surveyed by Capt. Beatson)	[I, 110]	1,580	...
Baramahl	[I, 113-4]	6,400	...
The Ceded Districts	[152-6]	28,989	...
Mysore Rajah's Country	[61-121]	32,000	...
<i>Northward</i>			
Guntoor (excepting partial surveys & routes)	[I, 112]	1,206 ¹	2,577
Northern Circars	[159-60]	...	14,800
TOTAL		1,36,355	29,770

ESTABLISHMENT, 1811

The following statement, compiled from the Surveyor General's quarterly reports², shows the work going on during 1811 and 1812.

Surveyor General's Office

Surveyor General—Lieutenant Colonel Colin Maackenzie (absent with expedition to Java).
Acting—Major William Morison.
Assistant in the Office—Ensign Benjamin Ward.

Surveying School

Assistant Revenue Surveyors—William Scott ;
Silvester Pope ; James Allan ; Charles Baillie.
Apprentices—Thomas Anderson ; Charles Barnett.

Observatory

Acting Astronomer—Captain John Warren ; with 2 Brahmin Assistants.

Ceded Districts

Superintendent—Lt.-Col. Maackenzie (as above).
Assistant Revenue Surveyors—Michael Dunigan ;
James Summers ; William Howell ; Henry Hamilton.

Apprentice—Frederick Ficker and 13 interpreters.

Southern Surveys

In Tinnevely—John Robinson ; Thomas Hill
William Bird ; William Fletcher.
In Coimbatore—William Keyes ; Charles McMahon.

¹ by Military Institution 1815-6. ² MPC. 457/1811 & 302/1812 ; From SG. 23-8-11 & 17-3-12.

In Madurn—Thomas Turnbull; Christian Pereira;
George McKay; James Aikin; Andrew
Chamarett.

Department of Tank Repairs, Nellore and Arcot
[149]

Superintendent—Major J. L. Caldwell.
Assistant Supt—Captain Fotheringham.
Sub-Assistants—James Ross; Joseph Jelly;
William Cameron; William Meade.

With Collector of Madras

Assistant Revenue Surveyor—J. A. Johnston.

With Superintending Engineer, Fort St. George

Assistant Revenue Surveyors—Henry Lincoln;
David Ross.

With Expedition to Java

Chief Engineer—Lt.-Colonel Mackenzie [135].
Assistant Revenue Surveyor—John Faulkner.
Sub-Assistants—John Malcolm; William
Lantwar.
Draughtsman—John Newman (from Ceded
Districts).

With Expedition to Bourbon

Sub-Assistant—C. M. Campbell.

With Malcolm's Mission to Persia [175]

Assistant Revenue Surveyor—William Webbs.

Trigonometrical Survey

Superintendent—Major William Lambton.
Assistants—Lieutenants John Riddell & J. T.
Hodge.
Assistant Revenue Surveyors—Joseph De
Penning; Peter Lawrence; Joseph Olliver;
William Rossenrode.

Military Institution

Superintendent—Captain Anthony Troyer.
Assistant Instructor—Lieutenant Henry Walpole.
Assistant Revenue Surveyor—Marcellus Burke.

Goa Survey

Superintendent—Lieutenant James Garling.
Assistants—Lieutenants C. Lethbridge; C. D.
Dunn; R. McGlashan; J. Fyfe; E. J. Han-
cock; J. Perry; P. E. Conner.
Sub-Assistants—John Terry; Richard Long.

With Quartermaster General's Department

Assistants—Lieutenants C. L. Nelthropp; M. H.
Davidson.
Assistant Revenue Surveyor—Samuel Godfrey.

Northern Circars. Lieutenant A. S. Douglas [100].