

## ARCHAEOLOGICAL RESEARCH IN THE BISHRI REGION — REPORT OF THE TWELFTH WORKING SEASON —

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### Geological and Geographical Field Survey in the Twelfth Working Season

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#### Introduction

The geological and geographical field survey in this working season was carried out in the period from the 17th to the 21st of November 2009 focusing on petrological description of the stone tools gathered at Tell Ghanem al-Ali excavation site, and collection of pebble samples at the 5 locations near the tell for further analysis in Nagoya University. Plenty of stone tools and fragments were found at Tell Ghanem al-Ali. The most of them seem that they were made of pebbles since their natural surfaces are recognised. The purpose of the study in this working season is to find a clue about the source of these stone tools from geological points of view.

Drs. Bassam Jamous and Michel Al-Maqdissi of the Syrian Directorate General of Antiquities and Museums kindly allowed us to carry out our study in Ar-Raqqa Prefecture. Mr. Ibrahim Khalil of Raqqa Museum helpfully assisted us to carry out the field survey. To whom we would like to express our gratitude.

#### Geological backgrounds

The rocks around Ghanem al-Ali consist of Neogene sedimentary rocks and Quaternary sediments of various origins. The Neogene sedimentary rocks, the basement of the area, consist of gypsum with fine-grained acidic tuff intercalations.

The Quaternary sediments are mainly made up of well-stratified silts, sands and pebbles overlies the Neogene sedimentary rocks abutting with unconformity. The sediments forming several terraces along the River Euphrates can be divided into the following two types; TD1 composed largely of alternating beds of grey fine to coarse sands and granule to boulder layers, TD2 composed mainly of milky- to yellowish- white silts and sands with minor intercalations of granule to pebble layers. TD1 is generally exposed in lower than TD2.

Table 1: Pebbles of Tell Ghanem al-Ali (from the 5th working season).

diameter	C	P	R	G	FSR	B	MR	Ss	M	Ms	Total	%
> 5 cm	1	2	1		2		1				7	2.2%
3–5 cm	1										1	0.3%
2–3 cm		1	4								5	1.6%
< 2 cm	100	72	37	44	20	6	9	7	2	3	300	95.9%
Total	102	75	42	44	22	6	10	7	2	3	313	100.0%
%	32.6%	24.0%	13.4%	14.1%	7.0%	1.9%	3.2%	2.2%	0.6%	1.0%	100.0%	

Keys: C:chert; P: pegmatite; R: rhyolite; G: granites; FSR: fine silicious rock; B: basalt; MR: metamorphic rocks; Ss: Sandstones; M: marl; Ms: Mudstone. n=313.

Table 2: Pebbles of Zor Shammar (from the 5th working season).

diameter	C	P	R	G	FSR	B	MR	Ss	M	Ms	Total	%
> 5 cm	1	1			2						4	0.6%
3–5 cm	6	10	3	2	12		1		1		35	4.9%
2–3 cm	12	12	16	2	5		4		2		53	7.4%
< 2 cm	123	144	114	76	95	43	13	3	11	3	625	87.2%
Total	142	167	133	80	114	43	18	3	14	3	717	100.0%
%	19.8%	23.3%	18.6%	11.2%	15.9%	6.0%	2.5%	0.4%	2.0%	0.4%	100.0%	

Keys: C:chert; P: pegmatite; R: rhyolite; G: granites; FSR: fine silicious rock; B: basalt; MR: metamorphic rocks; Ss: Sandstones; M: marl; Ms: Mudstone. n=717.

The granules, pebbles and boulders, clast-supported, well sorted, generally include well-rounded flatten clasts of red chert, granites, rhyolite, basalt and fine (microcryptic) siliceous rocks in a matrix of middle grained sands. The deposits are generally well stratified with various kinds of sedimentary structures such as grading, cross-bedding and clast imbrications. East-going paleo-current is supposed by the sedimentary structures.

Quaternary sediments sampled at the Fifth working season were analysed and the results are shown in Tables 1 and 2.

**Petrological description of the stone tools**

444 samples for petrological description were selected from the stone tools, that are already collected at the excavation site of Tell Ghanem al-Ali in the past working seasons (Figs. 2–4). In addition, 361 stone tools and/or fragments were newly collected at the Tell Ghanem al-Ali setting the sampling locality shown in Figure 5. 121 stone tools/fragments were also collected all around the tell. All of the samples were petrologically described during the period of this working season.

As for the lithic materials from the excavation sites, there are plenty of stone tools which have natural surfaces of pebbles as shown in Figure 2. They consist of various rocks such as fine silicious rock, coarse rhyolite (Fig. 3), quartzite, basalt, sandstone, chert, etc. Most of them are fine silicious rocks (known as the archeological term “flint”) and some of them contain fossils (Fig. 4). Most of the stone tools from the excavation sites are larger than 30 mm in diameter. The results of the petrological description are summarised in Table 3, 4 and 5. FSR Index is calculated by the equation of “FSR index = non-FSR / FSR” where FSR: the number of fine silicious rocks, non-FSR: the number

Table 3: Rock differences of the stone tools at Tell Ghanem al-Ali excavation site.

diameter	FSR NS	FSR NNS	FSR NS, f	FSR NNS, f	CR NS	Q NS	C NS	B NS	Ss NS	Total	%
> 5 cm	197	4	4	0	3	1	0	4	0	213	48.0%
3–5 cm	158	7	3	0	2	1	2	0	1	174	39.2%
2–3 cm	30	5	1	1	0	0	0	0	0	37	8.3%
< 2 cm	16	4	0	0	0	0	0	0	0	20	4.5%
Total	401	20	8	1	5	2	2	4	1	444	100.0%
%	90.3%	4.5%	1.8%	0.2%	1.1%	0.5%	0.5%	0.9%	0.2%	100.0%	

Keys: FSR: fine silicious rock ; CR: coarse rhyolite; Q: quartzite; C: chert; B: basalt; Ss: Sandstones; NS: natural surface; NNS: no natural surface; f: fossil. n=444. FSR index (non-FSR/FSR) = 0.0326.

Table 4: Rock differences of the stone tools at the sampling locality in Tell Ghanem al-Ali.

diameter	FSR <i>NS</i>	FSR <i>NNS</i>	FSR <i>NS, f</i>	CR <i>NS</i>	CR <i>NNS</i>	Q <i>NS</i>	C <i>NS</i>	B <i>NS</i>	Ss <i>NS</i>	Ms <i>NS</i>	Ms <i>NNS</i>	Total	%
> 5 cm	25	0	2	0	0	1	0	0	0			28	7.8%
3–5 cm	145	21	17	10	2	2	3	1	3	1		205	56.8%
2–3 cm	57	42	1	2	1	0	1	0	0			104	28.8%
< 2 cm	6	13	2	2	0	0	0	0	0		1	24	6.7%
Total	233	76	22	14	3	3	4	1	3	1	1	361	100.0%
%	64.5%	21.1%	6.1%	3.9%	0.8%	0.8%	1.1%	0.3%	0.8%	0.3%	0.3%	100.0%	

Keys: FSR: fine silicious rock ; CR: coarse rhyolite; Q: quartzite; C: chert; B: basalt; Ss: Sandstones; Ms: Mudstones; *NS*: natural surface; *NNS*: no natural surface; *f*: fossil. n=361. FSR index (non-FSR/FSR) = 0.0464.

Table 5: Rock differences of the stone tools at the surface of Tell Ghanem al-Ali.

diameter	FSR <i>NS</i>	FSR <i>NNS</i>	FSR <i>NS, f</i>	FSR <i>NNS, f</i>	CR <i>NS</i>	Q <i>NS</i>	C <i>NS</i>	B <i>NS</i>	Ss <i>NS</i>	Total	%
> 5 cm	41	0	0	0	1	1	0	0	0	43	35.5%
3–5 cm	38	8	1	1	1	1	0	1	0	51	42.2%
2–3 cm	11	10	2	1	0	1	1	0	0	26	21.5%
< 2 cm	0	0	0	0	0	0	0	0	1	1	0.8%
Total	90	18	3	2	2	3	1	1	1	121	100.0%
%	74.4%	14.9%	2.5%	1.7%	1.7%	2.5%	0.8%	0.8%	0.8%	100.0%	

Keys: FSR: fine silicious rock ; CR: coarse rhyolite; Q: quartzite; C: chert; B: basalt; Ss: Sandstones; *NS*: natural surface; *NNS*: no natural surface; *f*: fossil. n=121. FSR index (non-FSR/FSR) = 0.0708.

of the other rocks than fine silicious rocks of all the stone tool/fragment samples obtained. Smaller value of FSR index implies the inclination to FSR selection. Although the diameter ranges are quite different, the low percentage of fine silicious rocks in the gravel beds shown in Tables 1 and 2 implies the selectivity of fine silicious rocks for stone tools. Petrological composition of the pebbles in stone-tool-size range is then preferable.

### Pebble sampling

Large pebbles, that are well rounded and sized roughly over 30 mm, were sampled at 5 locations as shown in Figure 9. Samples collected at the sites A–D are the pebbles of Quaternary sediments and the samples at the site E are the floodplain deposits of the River Euphrates. Photographs taken at these sampling locations are shown in Figures 10–14. Further studies such as petrological description for sampled pebbles are prepared.

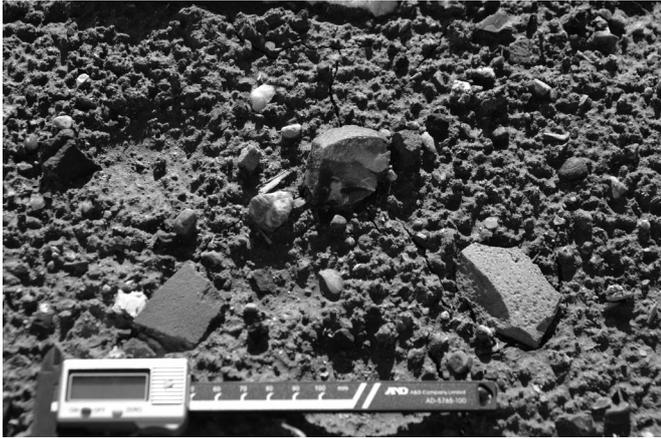


Fig. 1: Picture of stone tools/fragments found at Tell Ghanem al-Ali.



Fig. 2: Stone tools collected at the Tell Ghanem al-Ali excavation sites. They have natural surfaces of pebbles.

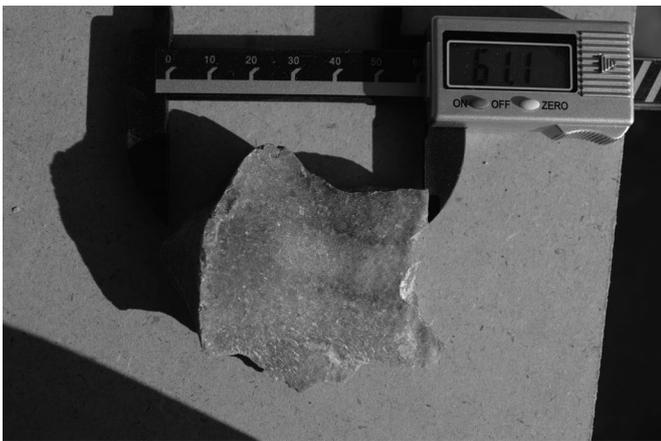


Fig. 3: Course rhyolite stone tool collected at the Tell Ghanem al-Ali excavation site.

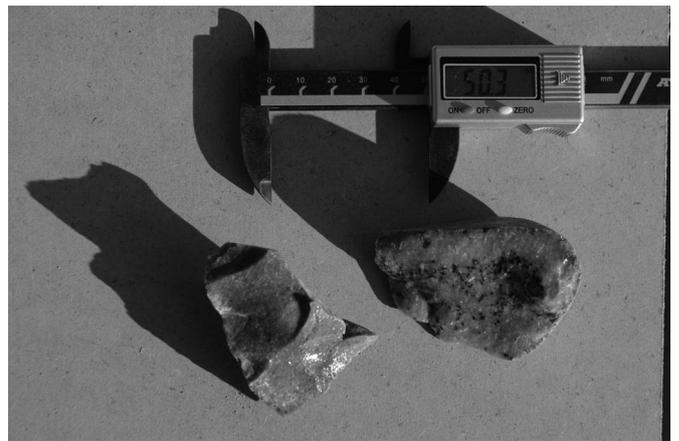


Fig. 4: Fine silicious rocks ("flint") stone tool collected at the Tell Ghanem al-Ali excavation sites. These rocks contain fossils.

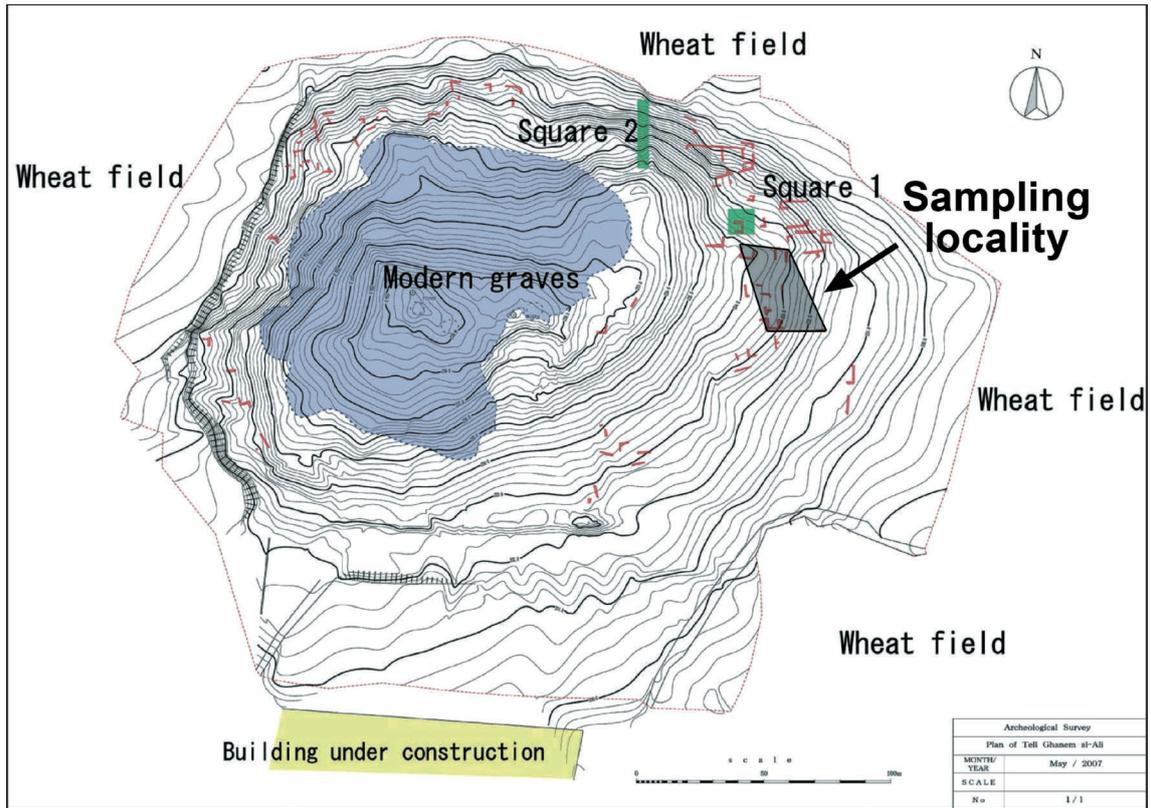


Fig. 5: Map showing the sampling locality at the Tell Ghanem al-Ali.

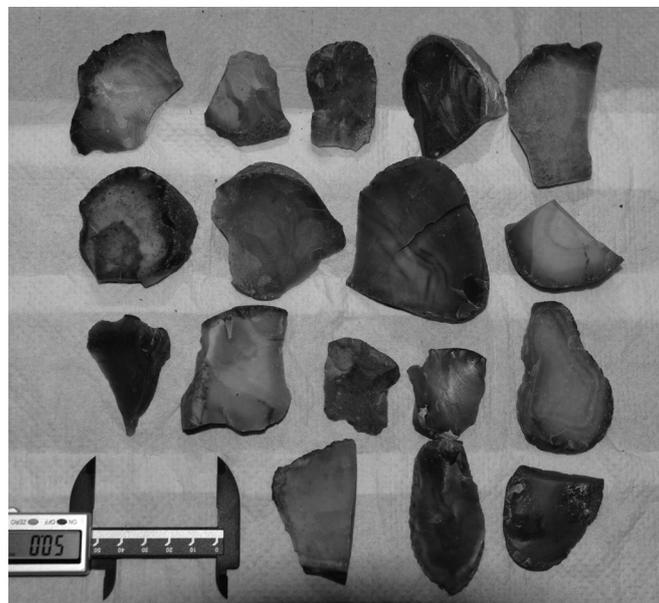


Fig. 6: Variation of fine silicious rocks used for stone tools. Stone tools were collected at the Tell Ghanem al-Ali.



Fig. 7: Chert stone tool collected at the Tell Ghanem al-Ali sampling localities.



Fig. 8: Fine silicious rock stone tool collected at the Tell Ghanem al-Ali sampling localities. Fossils of bivalve shells can be seen.

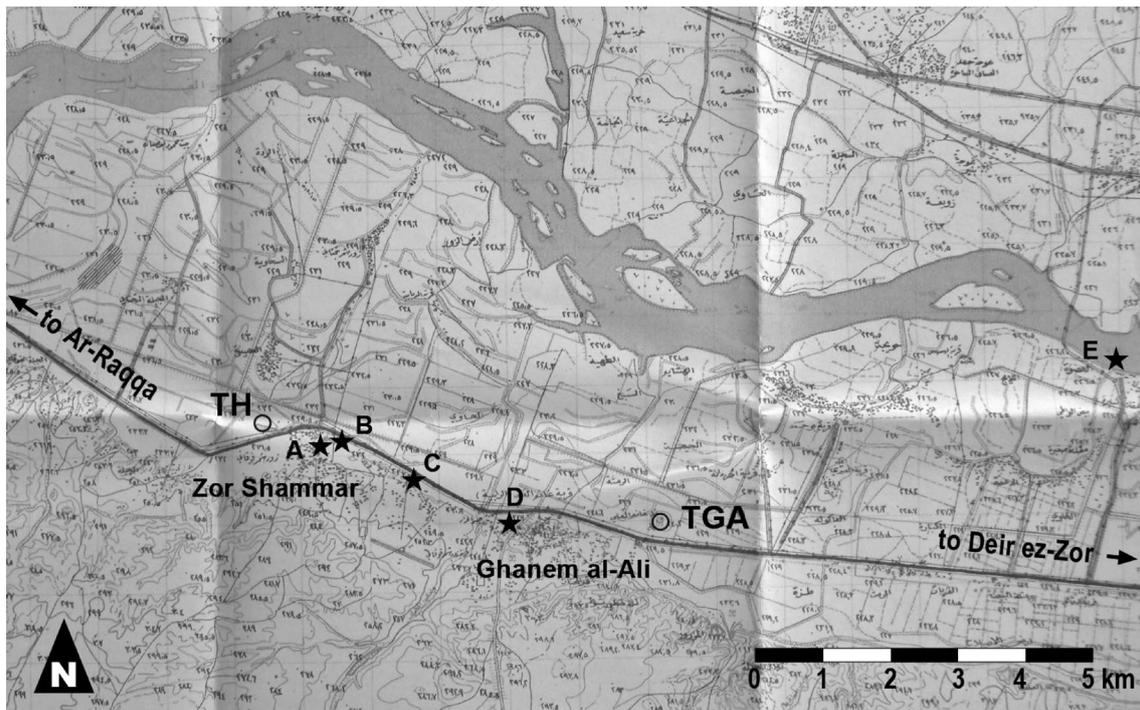


Fig. 9: Map showing the 5 locations of pebble sampling. TH: Tell Hamadeen; TGA: Tell Ghanem al-Ali.

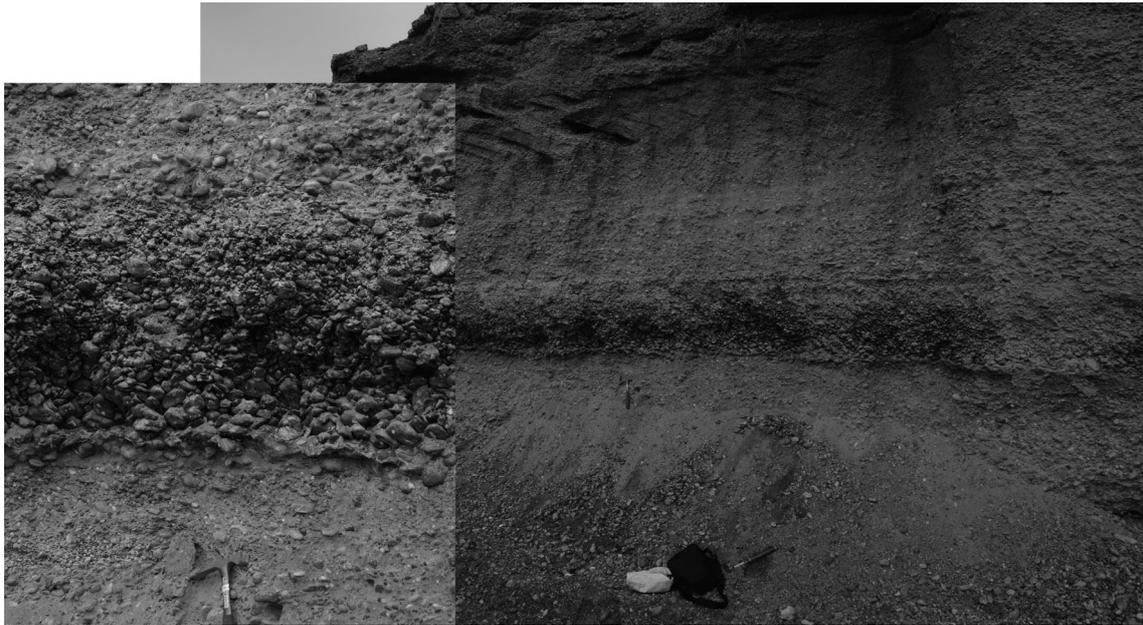


Fig. 10: Photograph of Site A. Left is the close up of the gravel bed.



Fig. 11: Photograph of Site B.



Fig. 12: Photograph of Site C.

## الموسم الثاني عشر من أعمال البعثة الأثرية السورية اليابانية المشتركة في منطقة البشري

أربعة أيام فقط لإعمال الموسم الثاني عشر للبعثة الأثرية السورية اليابانية والتي امتدت في الفترة الواقعة من 17 ولغاية 21 تشرين الثاني من عام 2009 حيث اقتصرت أعمال هذه البعثة لهذا الموسم على فريق جيولوجي واحد تركز عمله في المنطقة المجاورة لتل غانم العلي 0

### مسح جيولوجي وجغرافي للمنطقة المحيطة بتل غانم العلي :

(كازوهيرو تسو كادا , جامعة ناغويا 0يوسوكي كاتسورادا , جامعة ناغويا )

وتهدف أعمال هذا الموسم إلى دراسة ووصف الأدوات الحجرية التي تم جمعها من تل غانم العلي , وأيضاً جمع عينات حصوية من المنطقة رقم 5 المجاورة لتل غانم العلي , من أجل تحليلها ودراستها في جامعة ناغويا , وتهدف هذه الدراسة بشكل عام إلى الكشف والتعرف على مصدر هذه الأدوات الحجرية من وجهة نظر جيولوجية 0



و تتألف الأحجار الصخرية حول تل غانم العلي من صخور رسوبية وترسبات رباعية من مصادر متنوعة , إذ تتألف الطبقات السفلية في هذه المنطقة من تكوينات من الجبس والحمض 0 تتكون هذه الترسبات الرباعية من طبقات طينية تحتوي على الرمل والحصى , حيث دلت هذه الترسبات على وجود مصاطب عديدة لنهر الفرات يمكن تقسيمها إلى قسمين مختلفين 0

فقد تم اختيار 444 عينة من الأدوات الحجرية من حفريات موقع تل غانم العلي بهدف دراستها ووصفها , بالإضافة إلى 361 عينة من الأدوات الحجرية كان قد تم جمعهم من مواسم سابقة من تل غانم العلي 0

تم أخذ نماذج من هذه العينات الحجرية إلى اليابان بهدف تحليلها ضمن مخابر جامعة ناغويا , حيث لا تزال حالياً قيد الدراسة 0

إذاً اقتصر أعمال هذا الموسم على دراسة الأدوات الحجرية من تل غانم العلي والمنطقة المحيطة فيه من وجهة نظر جيولوجية بهدف التعرف على طبيعة تكوين هذه الأحجار ومصدرها ومنشأها 0