TABLE I

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Azimuth degrees E of N</th>
<th>Dip in degrees +ve downwards</th>
<th>Intensity $\times 10^{-2}$ m.u./gm</th>
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</thead>
<tbody>
<tr>
<td>KP19a1</td>
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<td>-22</td>
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<td>KP19a2</td>
<td>348</td>
<td>-19</td>
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<td>KP19b1</td>
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<td>0.354</td>
</tr>
<tr>
<td>KP19b2</td>
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<td>-14</td>
<td>0.304</td>
</tr>
<tr>
<td>KP19c1</td>
<td>324</td>
<td>-23</td>
<td>0.237</td>
</tr>
<tr>
<td>KP19c2</td>
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<td>-20</td>
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<tr>
<td>KP20a1</td>
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<tr>
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<td>KP20b1</td>
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<tr>
<td>KP20c2</td>
<td>145</td>
<td>8</td>
<td>1.233</td>
</tr>
</tbody>
</table>

AN INSTANCE OF HERMAPHRODITISM IN THE CAT-FISH, HETEROPNEUSTES FOSSILIS (BLOCH)

Occurrence of hermaphroditism has been reported in several teleost fishes and the problem was reviewed extensively by Az (1964). He pointed out that hermaphroditism appears to be a genuine rarity among the large and varied groups of cat-fishes. The only case reported by then among cat-fishes was in a male Mystus citrinus with oocytes in the testes (Singh and Sathyanesan, 1961). Later, Lehri (1964) recorded another hermaphroditic cat-fish, Clarias batrachus having left ovotestis and right testis. The present communication deals with the histomorphological aspects of the hermaphroditic gonads of Heteropneustes fossilis (Bloch), a cat-fish, in which no such phenomenon appears to have been reported so far.

During the course of an investigation on the gonads of H. fossilis, a 250 mm long specimen, when dissected, exhibited ovotestes on either side. Each ovotestis consists of a posterior ovarian part and an anterior testicular portion. The left testicular portion is broadly connected to the ovarian portion, whereas the right one is coherent by a comparatively narrow bridge (Fig. 1). The ovarian portions are dark brown in colour and moderately vascularized. The left ovarian part is almost cylindrical, while the right one is laterally compressed; the former is more turgid than its contralateral counterpart. The testicular portions are cream-coloured and flattened dorso-ventrally.

The ovarian portions taper posteriorly and become united to form a common duct. The measurements of the ovotestes are summarised in Table I. The mean gonosomatic index (weight of the gonads/weight of the body ×

FIG. 2. A.C. cleaned directions for the older (solid circles) and the younger (open circles) dykes.

magnetized whereas the younger dyke is reversely magnetized. This indicates that these two dykes were magnetized in two different periods and hence they should belong to two different periods of dyke intrusion. This is a case where the field data and the palaeomagnetic results are in striking correspondence with each other, and makes a first reported case of such a study on the dyke rocks of India.

The authors thank Dr. C. Radhakrishnamurthy of Tata Institute of Fundamental Research, Bombay, for his helpful suggestions. Prof. D. Lal of Tata Institute of Fundamental Research kindly provided facilities in the rock magnetism laboratories. The authors also thank Professors M. G. Chakrapani Naidu, B, Mohan Rao, G. Ramakrishnan and Dr. C. V. R. K. Prasad of S.V. University for their help and encouragement.

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100) of the males collected during the same period is 0.869, whereas that of the females is 5.985. The gonosomatic index of the hermaphroditic fish is 1.208 the value being intermediate between those of the normal males and females.

**Table 1**

<table>
<thead>
<tr>
<th>Right ovotestis</th>
<th>Left ovotestis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testicular portion</td>
<td>Ovarian portion</td>
</tr>
<tr>
<td>Length (mm)</td>
<td>Breadth (mm)</td>
</tr>
<tr>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

The ovarian wall, though continuous with the testicular wall, is comparatively thick. There are a number of immature oocytes along the ovarian wall which are deeply stained with haematoxylin. Several luteal bodies are also present in the same region. The ovarian portions contain a large number of mature ova. Oocytes at perinucleolus stage, yolk nucleus stage and yolk vesicle stage are also present. Atretic follicles and several stages of atresia are also observed (Fig. 2).

Solitary oocytes are present in the interlobular space of testis far away from the ovotesticular junction (Fig. 3). On the other hand, some of the seminiferous lobules extend into the spaces between the ova (Fig. 4).

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**Figs. 1-4.** Fig. 1. Photograph of the entire hermaphroditic gonad of *Heteropneustes fossilis* showing the anterior testicular (T) and posterior ovarian (O) parts, × 1.8. Fig. 2. Photomicrograph of longitudinal section of the ovotestis passing through the ovotesticular junction; note oocytes at different stages, atretic follicles (AT) and seminiferous lobules (ST), × 16. Fig. 3. Section of the testicular part showing an embedded oocyte; note various spermatogenic stages, × 155. Fig. 4. Section of ovarian part showing a seminiferous lobule (ST), × 60.

The ovotestes are enclosed by a common sheath. The testicular wall is comparatively thin. Beneath the outer peritoneum, there is a layer of connective tissue which is richly supplied with blood vessels. The interlobular spaces are packed with connective tissue, interstitial cells and blood vessels. The walls of the lobules are distinct but thin. Almost all stages of spermatogenesis are present; spermatids and sperms outnumber all the other stages.

Another interesting feature is the occurrence of sperms in the ovarian lumen; they are sometimes present in close approximation with the oocytes.

In *Barbus stigma* (Sathyanesan, 1957), *Lebiasites reticulatus* (Spurway, 1957), and *Mystus vittatus* (Singh and Sathyanesan, 1961), the testicular and ovarian tissues are interspersed with each other without any regular order. In the present case, however,
the testicular and ovarian regions of the ovo-
testes are clearly demarcated with the excep-
tion of a few sperms and oocytes occurring in
the ovarian and testicular regions respectively.
The condition, to certain extent, is comparable
to that reported in *Clarias batrachus* (Lehri,
1964). The existence of sperms adjacent to
oocytes is suggestive of their passage through
the ovarian lumen to be extruded from the
common genital duct.

Grateful thanks are due to Dr. S. M. H.
Khatib, Professor and Head of the Department
of Zoology, Nagpur University, Nagpur, for
laboratory facilities and encouragement.

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Nagpur, March 27, 1971.

1. Atz, J. W., In: *Intersexuality in Vertebrates Includ-
ing Man*, Eds., Armstrong, C. N. and Marshall,

**ON CONGERIA SALLEI RECLUZ, A
FOULING BIVALVE MOLLUSC IN THE
VISAKHAPATNAM HARBOUR**

While engaged in the studies of marine foul-
ing organisms in the Visakhapatnam harbour,
we suddenly came across in 1967 an exotic spe-
cies of a bivalve mollusc in the Southern
Lighter Channel. The mussel has been pre-
viously reported only from North American
Atlantic Coast in South Florida and West
Indies (personal communication from Dr. Ruth
D. Turner, Harvard University, Cambridge,
Massachusetts).

The family Dreissenacea to which the pre-
sent bivalve belongs includes only two genera,
namely, *Dreissena* and *Congeria*. The well-
known species, *Dreissena polymorpha*, is
almost exclusively a freshwater form and has
been extensively studied in the Baltic, Caspian
Sea, and the British freshwater reservoirs.
Wiktort has estimated that 87·7% of
the whole biomass in the Szczecin lagoon in
Poland is composed of *Dreissena polymorpha*.
In Great Britain, Yonge and Campbell and
Brian Morton have made extensive studies on the biology and ecology of this
mussel from the London freshwater reservoirs where this form is found as obstructing
masses on the walls of large diameter pipe-
lines. It has been known to attach to almost
any firm object including reeds, other bivalves,
wood pilings, stone work, canal lock-gates, etc.
*Dreissena polymorpha* is posing a menacing
fouling problem in many European freshwater
systems and also in the U.S.S.R.

It has been suggested that the ancestors of
*Dreissena* and *Congeria* must have been marine
animals which later became adapted to life in
freshwaters. There is very little account of
the fouling propensity of *Congeria*. The bi-
valve has firmly established in various loca-
tions in the local harbour on concrete pilings,
large diameter cast iron pipe-lines discharging
dredged material, the undersurface of barges
and other crafts and rock boulders in shallow
water. They appear as large bunches of
'grapes' attached to the substratum by byssus
(Fig. 1). As many as 500 or more animals have

![Fig. 1. Bunch of *Congeria sallai*.](image-url)

been counted in a single bunch. The mussel
grows to a length of about 30 mm. All size
groups are found in the same bunch suggest-
ing that the spats of the mussel settle down
on the surface of the older ones adding pro-
gressively to the bulk of the bunch.

Preliminary laboratory studies on the salin-
ity tolerance of *Congeria sallai* have shown
that the mussel is tolerant to a wide range of
salinity ranging from 2.85% to 34·81%. They,
however, seem to prefer lower salinity ranges
and are most abundant in locations where the
salinity range is from 22% to 32%. The mus-
sel has also been observed to thrive well in
locations subjected to heavy oil and other
types of industrial pollutants in the harbour
area.

It is obvious that *Congeria sallai* has been
introduced in the local harbour by ships call-
ing at the port from North American waters.
Active studies are in progress, in the Depart-
ment, on the biology and ecology of this