Preface

The expedition ARK XIX/3 with the German icebreaking RV "Polarstern" was jointly organized between the Alfred Wegener Institute for Polar and Marine Research (AWI) and the Institut Français de Recherche pour l'Exploration de la Mer (IFREMER), the latter providing the unmanned deep-sea submersible "Victor 6000".

AWI and IFREMER offered this unique combination of infrastructure in 2003 to European scientists to permit access on advanced technology in marine research to a broader community. Therefore, this cruise was not only a milestone in the Franco-German cooperation but also an important contribution to the European marine research initiatives.

All still pictures and videos taken with "Victor 6000" during the expedition "VICTOR IN THE NORTH" are joint property of AWI and IFREMER with copyright by IFREMER. This material can be used for scientific purposes with the indication of IFREMER's copyright. It would be very much appreciated if the joint effort of AWI and IFREMER in organising the cruise ARK XIX/3 would be mentioned in the acknowledgements of any future publication written on the basis of material collected during the expedition.

Any commercial or other than scientific use of either pictures or videos collected with "Victor 6000" needs the written formal approval of IFREMER.

The entire cruise report is also available in digital format on a CD-ROM attached to this booklet because many of the pictures and graphs are in colour. All hand written dive log files are permanently stored at the AWI. For a certain period of time the cruise diary will be still accessible via the internet at www.polarstern-victor.de.
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Galgani, F, Lecornu, F.

Introduction
The presence of litter has been evaluated since 1992 along the European coasts at different locations (Baltic Sea, North Sea, Celtic Sea, French coasts and Adriatic Sea). Some high densities were found in different areas especially where the currents are eddying and in coastal canyons where they can accumulate. Fram Strait is of special interest because of the currents enabling the transportation of debris through the different water masses such as the Norwegian and the north Atlantic currents (deep and intermediate) coming from the North Sea and along the Norwegian coast. Beside, the presence of geomorphological factors in Fram Strait that could lead to an accumulation of debris is of special interest. The Molloy Deep is about 5500 m deep and could retain debris.

In this context, debris were observed and counted during dives of the ROV "Victor 6000" to demonstrate the presence of debris in “Hausgarten”. In addition, dives from the 1999 "Polarstern" expedition with the ROV onboard were also analysed in order to compare data and demonstrate the expected accumulation of debris in the Molloy deep.

Methods
Litters were counted by observers during 5 dives (No.s 227, 228,229, 230 and 232) performed during the ARK XIX/3c cruise (Fig. C6-1). Most of the dives were in central “Hausgarten”, except dive 230 located at “Hausgarten”-South. Dives data were computed using the ADELIE software (F. Lecornu, IFREMER). Counts were performed only during survey (routes) from the "Victor 6000" ROV with distance on the bottom varying from 1.150 to 12.670 meters. Densities of litters were calculated per km route. Additional data were obtained from the 1999 ARK XIV cruise.
Fig. C6-1: Routes of the ROV dives 227, 228, 229, 230 and 232 during ARK XIX/3c; surveys for litters were performed only along ROV transits.
Results

A summary of the results is given in Tab. C6-1. Total amount of debris found during the 5 dive was 17 for a total distance of 25.020 m. Density per km was ranging from 0.20 to 0.92 with a total percentage of plastic of 76 %.

Tab. C6-1: Litter on transits of the ROV "Victor 6000" during dives at AWI-"Hausgarten".

<table>
<thead>
<tr>
<th>Dive</th>
<th>Date</th>
<th>Position (lat N / lon E)</th>
<th>Depth (m)</th>
<th>Transits (km)</th>
<th>Debris (no. of items)</th>
<th>plastics/km</th>
<th>debris/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>30/06/1999</td>
<td>79 04.0 / 04 10.0</td>
<td>2365-2517</td>
<td>15.42</td>
<td>1</td>
<td>0</td>
<td>0.06</td>
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<tr>
<td>103</td>
<td>01/07/1999</td>
<td>79 03.8 / 04 11.1</td>
<td>2392-2458</td>
<td>1.89</td>
<td>1</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>104</td>
<td>03/07/1999</td>
<td>79 07.0 / 02 50.0</td>
<td>5339-5552</td>
<td>6.77</td>
<td>15</td>
<td>13</td>
<td>2.21</td>
</tr>
<tr>
<td>105</td>
<td>08/07/1999</td>
<td>79 28.1 / 03 00.1</td>
<td>2813-3410</td>
<td>13.95</td>
<td>7</td>
<td>2</td>
<td>0.50</td>
</tr>
<tr>
<td>106</td>
<td>10/07/1999</td>
<td>74 19.7 / 10 37.8</td>
<td>3154-3167</td>
<td>14.10</td>
<td>5</td>
<td>1</td>
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</tr>
<tr>
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<td>79 03.8 / 04 11.6</td>
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<td>12.67</td>
<td>9</td>
<td>7</td>
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<tr>
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<tr>
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<td>1</td>
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<tr>
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<td>78 36.4 / 04 05.0</td>
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<td>1</td>
<td>1</td>
<td>0.86</td>
</tr>
<tr>
<td>232</td>
<td>31/07/2003</td>
<td>79 04.0 / 04 07.0</td>
<td>2334-2344</td>
<td>3.25</td>
<td>3</td>
<td>2</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Discussion and Conclusions

The density of litters at “Hausgarten” is low when compared to some European basins (Baltic Sea, North Sea, NW Mediterranean and Adriatic Sea) but significant since such densities remains in the same range than some European deep sea and costal areas (Celtic Sea, Bay of Seine, Bay of Biscay). Plastic account for the larger part of debris as commonly observed in other European areas. Analysis of dive 104 (1999) demonstrate a higher density of debris in the Molloy Deep. From these results, we can conclude that debris is present at “Hausgarten” and could accumulate on deeper part of the area. Extrapolation to the entire Fram Strait (76.40 N/ 80.50 N; between Svalbard and Greenland) is not possible with insufficient data but could lead to total amount of debris of more than 10 millions.